

AGRICULTURAL SCIENCE
FIRST TERM SCHEME OF WORK SS ONE

WEEK	TOPIC / CONTENT
1	Meaning and Importance of Agriculture Definition of Agriculture Importance of Agriculture to the Individual, community and the nation. Branches and types of Agriculture
2	Problems of Agricultural Development in Nigeria Problems created by inadequate: - Land - Basic amenities - Finance - Transportation - Shortage and processing facilities - Agricultural education and extension - Tools and machinery - Farm inputs.
2	Solutions to the Problems of Agriculture in Nigeria Possible solutions to identified problems The role of Government and non-governmental organization to the development of the country.
3	Husbandry of Selected Crops (Root and tuber crops) e.g. yam, cassava, sweet potatoes. - Method of propagation - Climatic and soil requirements - Land preparation - Manuring and fertilizer application - Harvesting, processing and storage of the selected crops
4	Husbandry of selected crops (cereals) e.g. maize, rice etc.
5	Land and its uses - Definition of land - Uses of land for: - Agriculture - Forestry - Wildlife
5	Factors affecting Land availability Factors affecting land availability for agricultural purposes: - Alternative uses of land e.g. building of cities, towns, industries, roads - Soil type and topography etc.
6	Husbandry of Oil crops e.g. Oil palm, melon, groundnut.
7	Husbandry of beverage e.g. cocoa, tea and coffee
8	Husbandry of latex crop e.g. rubber
9	Practical: Identification Identification of the common crops available e.g. oil palm fruits, cocoa pod, kola nut, rubber seed, cotton seed and lint, groundnut pod, different species of maize etc.
10	Revision
11	Examination
12	Examination

WEEK 1.

MEANING OF AGRICULTURE

Definition of Agriculture: Agriculture is the art and science (management) that deals with the useful working life cultivation of crops and the rearing of animals for man's use.

IMPORTANCE OF AGRICULTURE:

1. Importance of agriculture to man

- a. **Provision of food:** Agriculture provides food for man which is the most importance of agriculture. It provides us with crops like vegetables, tubers, cereals roots animal's produce eggs, milk, meat, fish etc which we need to stay alive.
- b. **Provision of materials for shelter:** Woods obtained from forest are used for making doors, windows, roof, furniture etc.
- c. **Materials for clothing:** Agriculture provides fiber(cotton) for making clothes. It also provides hides and skin for making shoes, belt, mat, caps etc.
- d. **It provides employment:** Agriculture provides employment opportunities for about 60__70% of the population engaged in Agricultural sector for one job or the other there by feeding the families.
- e. **Provision of income to farmers:** Provision of crops and animals provides money for farmers for being an agricultural worker. Agriculture provides income to farmers in form of salaries and wages.

2. Importance of agriculture to community

- a. **Development of Towns:** Agriculture helps in the development of cities and towns through the provision of social amenities like electricity, pipe borne water, school s, health care, good road are also provided which leads to the establishment of agro-based industries eg oil milk from oil seeds, cigarettes from tobacco leaves, paper from pulp wood etc.
- b. **Provision of facilities for recreation and Tourism.**
- c. **Agriculture helps in establishment of game reserve** where animals like horses, cocks are used for entertainment and horse racing.

2. Importance of agriculture to the nation.

- a. **Raw material:** Raw materials are produced by Agricultural sector for industries so that they can be processed into useful things eg paper from pulpwood, chocolate from cocoa etc. Industries that depend on agriculture for their raw materials is called agro-allied or agro-based industries.
- b. **Sources of foreign exchange:** Nations earns foreign exchange by exporting its Agricultural produce like palm oil , cocoa kolanut etc. Such money been earned can be used in turns to purchase goods for the improvement of agriculture. It will also minimize dependence on crude oil in the development of the nation.
- c. **Generation of Revenue:** Government of nations generates a lot of money from exportation of Agricultural produce through export, tax and duties. Money obtained in agriculture can be used to service other sectors of the economy.

BRANCHES OF AGRICULTURE

Branches of agriculture are areas of specialization in agriculture which includes:

- a. Animal Production/Science
- b. Soil Science
- c. Crop Production/Science
- d. Agricultural Engineering
- e. Forestry
- f. Agric Economics
- g. Apiculture
- h. Horticulture
- i. Pomology
- j. Agricultural Extension etc.

1. **Crop science:** Is a study of how crops grows and how they are used by man animals. It contributes in effective crop management and better productivity of crops.
2. **Soil science:** Is a study of soil on which plants grows. It contributes to ensure the maintenance of soil fertility and to provides soil ph. of a given soil type.
3. **Animal production/science:** Is a study of production and management of farm animals. It contributes in the production of animals' produce like milk, eggs, meat, fish etc.it increases farmers income.it ensure better feeds for growth and productivity.
4. **Agricultural engineering:** It involves designing, construction, maintenance and operation of farm machines and equipment.
5. **Agricultural extension and education services:** it promotes the training of farmers.it ensures provision of support and links farmers to research institutes.
6. **Forestry:** Is the study and management of forest and all its resources. It contributes in providing: timbers, fruits, vegetables, meats dye etc for man' s use etc
7. **Apiculture:** also known as **beekeeping**, is the practice of maintaining bee colonies, typically in hives, by humans. It's both an ancient tradition and a modern agricultural activity, vital for honey production and pollination.
8. **Horticulture:** is the branch of agriculture that deals with the **art, science, technology, and business of growing plants**. It focuses on fruits, vegetables, nuts, ornamental plants, herbs, and flowers.
9. **Pomology:** is a specialized branch of horticulture that focuses on the **study and cultivation of fruit crops**. The word comes from the Latin *pomum* (fruit) and *logy* (study).

TYPES OF AGRICULTURE

1. Subsistence Agriculture

Subsistence agriculture is the type of farming in which a farmer produces only enough food to feed himself and his family with little or no surplus for sale.

Characteristics:

- a. Small farm size
- b. Use of simple tools (hoe, cutlass, etc.)
- c. Family labor is commonly used
- d. Low yield and low income
- e. Mixed cropping is often practiced
- f. Farming is mainly for household consumption
- g. Little or no use of fertilizers or machines

Advantages:

- a. Low cost of operation
- b. Provides food for the family
- c. Does not require special training

Disadvantages:

- a. Low productivity
- b. No surplus for sale
- c. Encourages poverty and rural stagnation Examples: Small family farms in rural areas of Nigeria where crops like yam, maize, and cassava are grown mainly for home use.

2. Commercial Agriculture

Meaning: Commercial agriculture is the type of farming practiced for profit-making.

It involves largescale production of crops and livestock for sale in local and international markets.

Characteristics:

- a. Large farmland
- b. Use of modern machines (tractors, harvesters, planters)

- c. Employment of hired labor
- d. Use of improved seeds, fertilizers, and chemicals
- e. High yield and income
- f. Monocropping is common (cultivating one crop type)
- g. Capital-intensive

Advantages:

- a. Increases food supply
- b. Provides employment opportunities
- c. Promotes industrial growth and export earnings

Disadvantages:

- a. Requires large capital investment
- b. May cause environmental problems like soil erosion
- c. May reduce biodiversity due to monocropping
- d. Examples: Large-scale cocoa, oil palm, or poultry farms established mainly for sale and export.

DIFFERENCES BETWEEN COMMERCIAL AGRICULTURE AND SUBSISTENCE AGRICULTURE

S/N.	COMMERCIAL AGRICULTURE	SUBSISTENCE AGRICULTURE
1.	High capital investment	Low capital investment
2.	Use of machinery	Use of simple farm tools
3.	Export based	for family consumption
4.	Use of skilled labour	Uses unskilled family labour
5.	Use of large expanse	Uses small and fragmented farm land
6.	Farm records are kept	Farm records are rarely kept
7.	High output	Low output
8.	Needs well organized market	Does not usually involve organised market for sale of produce
9.	Operations may result in high environmental degradation	Operations usually result in in low environmental degradation.
10.	Monocropping system is usually practised	Mixed cropping is usually practiced
11.	Farmers usually specialize in crops or animal production.	There is usually no specialization

WEEK 2:1

PROBLEMS OF AGRICULTURE IN NIGERIA

1. **Land Degradation:** Soil erosion, deforestation, and desertification are common problems in Nigeria, leading to reduced fertility and productivity of the land.
2. **Lack of Irrigation:** Insufficient irrigation facilities and water scarcity affect crop growth, especially during dry seasons.
3. **Low Crop Yield:** Poor farming practices, inadequate fertilizers, and pest control measures lead to low crop yields, reducing farm productivity.
4. **Inadequate Storage Facilities:** Lack of proper storage facilities leads to post-harvest losses, reducing the value of farmers' produce.
5. **Inadequate Credit Facilities:** Farmers often struggle to access credit facilities, which hinders their ability to invest in their farms and improve productivity.
6. **Limited Access to Markets:** Farmers often lack access to markets, making it difficult to sell their produce and earn a decent income.
7. **Climate Change:** Climate change affects agricultural productivity, with changing weather patterns, rising temperatures, and increased frequency of extreme weather events.
8. **Pest and Diseases:** Pests and diseases such as cassava mosaic virus, rice blast, and maize streak virus affect crop yields and reduce farm productivity.
9. **Limited Mechanization:** Limited use of modern farming equipment and technology hinders efficiency and reduces farm productivity.
10. **Corruption:** Corruption in the agricultural sector hinders the development of the sector, with farmers often facing bureaucratic hurdles and lack of transparency in government policies and programs.
11. **Inadequate Extension Services:** Limited extension services and lack of trained agricultural extension agents make it difficult for farmers to access advice and technology on best farming practices.
12. **Poverty and Unemployment:** Poverty and unemployment are widespread in rural areas, leading to a lack of investment in agriculture and a brain drain from the sector.
13. **Lack of Research and Development:** Insufficient research and development in agriculture hinder the development of new technologies and innovations that could improve farm productivity.
14. **Transportation Challenges:** Poor transportation infrastructure hinders the movement of agricultural products from rural areas to urban centers.

WEEK 2:2

SOLUTIONS TO THE PROBLEMS OF AGRICULTURE IN NIGERIA:

1. Irrigation and Water Management:

- Develop efficient irrigation systems to ensure consistent water supply to farmers.
- Implement water conservation measures to reduce waste and optimize usage.
- Establish early warning systems for floods and droughts to help farmers prepare.

2. Land Preparation and Soil Fertility:

- Implement conservation agriculture practices to reduce soil erosion and improve soil health.
- Encourage the use of organic fertilizers and crop rotation to maintain soil fertility.
- Provide training on soil conservation and management techniques.

3. Pest and Disease Management:

- Develop integrated pest management (IPM) strategies to minimize the use of chemical pesticides.
- Promote biological control methods, such as introducing natural predators or parasites.
- Encourage farmers to use resistant crop varieties and implement good agricultural practices.

4. Post-Harvest Handling and Storage:

- Improve post-harvest handling and storage facilities to reduce food loss and waste.
- Develop cold chain logistics to preserve perishable crops.
- Implement quality control measures to ensure products meet market standards.

5. Access to Finance and Markets:

Establish agricultural credit schemes to provide financing for farmers.
Develop digital platforms for market access, price discovery, and payment processing.
Promote value addition and processing to increase farmers' income.

6. Extension Services and Training:

Strengthen extension services by providing training and capacity building for farmers.
Promote farmer-to-farmer extension services to share knowledge and best practices.
Encourage private sector involvement in extension services.

7. Research and Development:

Increase funding for agricultural research and development to address specific challenges.
Prioritize research on climate-resilient crops, animal breeds, and farming practices.
Encourage collaboration between researchers, farmers, and industry stakeholders.

8. Agricultural Policy and Regulation:

Develop a comprehensive agricultural policy that addresses specific challenges and priorities.
Implement regulations to ensure food safety, animal health, and environmental sustainability.
Encourage public-private partnerships to promote agricultural development.

9. Mechanization and Technology:

Promote the use of mechanized farming equipment to increase efficiency and reduce labor costs.
Develop mobile apps and digital platforms for agricultural data collection, analysis, and decision-making.
Encourage the adoption of precision agriculture techniques.

10. Climate Change Mitigation and Adaptation:

Develop climate-resilient crop varieties and farming practices.
Implement climate-smart agriculture practices, such as agroforestry and conservation agriculture.
Encourage the use of renewable energy sources in agriculture.

11. Soil Testing and Fertilizer Use:

Promote soil testing to determine nutrient deficiencies and develop targeted fertilizer application plans.
Encourage the use of efficient fertilizer application methods, such as drip irrigation.

12. Livestock Development:

Develop breeding programs for improved livestock breeds.
Promote disease surveillance and vaccination programs for livestock.
Encourage the development of livestock feed processing industries.

13. Agricultural Trade Facilitation:

Simplify customs procedures for agricultural exports to reduce trade costs.
Promote trade agreements with other countries to increase market access.
Encourage private sector involvement in agricultural trade facilitation.

14. Food Safety and Quality Control:

Develop food safety standards and regulations for agricultural products.
Implement quality control measures at farm gates, processing facilities, and markets.
Encourage private sector involvement in food safety assurance.

WEEK 3:1

ROLES OF GOVERNMENT IN AGRICULTURAL DEVELOPMENT

1. Establishment of Agricultural Policies:

To increase the production of suitable food crops.

To meet the needs and changing taste of the growing population.

To increase the quality and efficiency of producing the major export crops as demanded by the world market.

To provide employment opportunities through establishment of large farms.

To supply the essential raw materials which are vital to the development of local industries.

To increase the production of livestock so as to supply animal proteins in diets.

2. Agricultural Development Programme: Some of the government programmes for agricultural development in Nigeria are listed below.

- a. Extension Services,
- b. Farm Settlement Schemes
- c. Agricultural Loan Schemes,
- d. Credit Facilities,
- e. River Basins Development Authorities,
- f. National Agricultural Insurance scheme, subsidies,
- g. Agricultural education and research, quarantine and vaccines,
- h. Operation feed the nation,
- i. Green revolution,
- j. Agricultural Development Project,
- k. DFRRI, National Agricultural Land Development Agency.

3.Provision of Farm Inputs: Farm inputs are either provided by the government or subsidized to enable peasant farmers to buy and use their inputs on their farms.

4.Provision of Basic Amenities: Government decides to provide basic amenities in rural areas so as to decrease the migration of able-bodied men and youths from rural to urban areas so that they can stay and farm

5. Provision of Storage and Processing Facilities: Government decides to provide storage and processing facilities in all parts of the country in order to prevent food wastage and provide food in periods of scarcity.

6.Provision of Extension Services: Government has helped to employ qualified and experienced extension officers that carry new ideas and innovation to rural farmers.

7. Provision of Agricultural Education: Due to the fact that some of Nigerian farmers are illiterate, the government decides to provide adult education in order to enable them to read and write, so as to accept new and improved techniques and innovations in agriculture.

8.Provision of Quarantine Services: Plant quarantine regulations are made by government to prevent the introduction and distribution of foreign plant diseases and pests into the country.

9. Provision of Research Work: In order to improve the local varieties of crops and breeds of animals, the government set up some research institute to provide solutions to crops and animals' problems so as to improve production.

Examples of such institutes are:

- a. Cocoa Research Institute of Nigeria (CRIN) Ibadan. Nigeria Institute for Oil Palm Research (NIFOR) Benin. International Institute for Tropical Agriculture (IITA) Ibadan.
- b. National Horticultural Research Institutes (NIHORT) Ibadan.
- c. Rubber Research Institute of Nigeria (RRIN) Benin.
- d. Forestry Research Institute of Nigeria (FRIN) Ibadan.
- e. Leather Research Institute of Nigeria (LRIN) Zaria.

EVALUATION QUESTIONS

- a. State five roles of Government in agricultural development in Nigeria
- b. Give five examples of research institutes in Nigeria

WEEK 3:2

ROLES OF NON-GOVERNMENTAL ORGANIZATION IN AGRICULTURAL DEVELOPMENT

Research: – they research to come up with solutions to agricultural development and to develop new crop varieties as well as new breed of animals

Finance: – they fund many agricultural projects

Provision of inputs: – they provide inputs such as fertilizers, herbicides, pesticides and distribute to rural farmers

Extension services: – they create awareness to improve farmers' agricultural knowledge and render other extension services

Rural development: – they provide basic amenities like road, water supply for rural farmers.

Irrigation and drainage: – they provide these facilities to make year-round agricultural production possible.

Examples of NGOS include:

- a. West African Rice Development Agency/Association (
- b. International Institute for Tropical Agriculture (IITA)
- c. International fund for Agricultural Development (IFAD)
- d. International Livestock Centre for Africa (ILCA) / International Livestock Research Institute (ILRI)
- e. International Fund for Agricultural development (IFAD)
- f. International Crop Research Institute for Semi-Arid Tropics (ICRISAT)
- g. Hunger project
- h. Adventist Relief Agency (ADRA)
- i. Catholic Relief Services (CRS)
- j. World Vision International
- k. International Centre for Research in Agroforestry (ICRAF)

EVALUATION QUESTIONS

- a. Outline five roles of NGOS to agricultural development in Nigeria.
- b. Give five examples of non-governmental organization in Nigeria

ROLES OF SCIENCE AND TECHNOLOGY IN AGRICULTURAL DEVELOPMENT

1. Modern Farm Mechanization

Equipment: The introduction of tractors, plows, ridgers, and combine harvesters has replaced simple tools like hoes and cutlasses.

Efficiency: This allows farmers to cultivate large hectares of land quickly, making commercial farming highly productive and attractive.

2. Crop and Animal Improvement

Genetics and Breeding: Scientific research has led to the development of high-yielding, early-maturing, and disease-resistant crop varieties.

Livestock Breeding: Improved breeding techniques and specially formulated animal feeds accelerate growth and increase the production of meat, milk, and eggs.

3. Pest and Disease Control

Agro-chemicals: Science has created pesticides, herbicides, fungicides, and nematicides to combat crop diseases and pests.

Veterinary Medicine: Vaccines, antibiotics, and regular treatments protect farm animals from deadly infections and parasites.

4. Soil Fertility and Water Management

Fertilizers: Scientific soil testing helps identify nutrient deficiencies, allowing for the application of specific fertilizers (e.g., N.P.K.) to boost crop yields.

Irrigation and Drainage: Science and engineering allow for the construction of dams and irrigation canals, enabling farming in dry regions and during the dry season.

5. Harvesting, Processing, and Storage

Processing: Machines like maize shellers, threshers, and oil palm presses reduce the time and energy spent processing farm produce.

Storage: Modern facilities like grain silos, cold rooms, and freezers preserve perishable goods, thereby reducing spoilage and waste.

6. Agro-climatology and Weather Forecasting

Science helps farmers understand climate patterns and weather predictions. This guides them on exactly when to plant, irrigate, or harvest, minimizing the risk of crop failure

7. Transportation and Communication

Technology has enabled the construction of better roads and railways, making it easier to transport agricultural produce from remote rural farms to urban markets.

8. Animal Breeding

Development of new breeds of animals, that are tolerant to pests and resistant to diseases
high quality products e.g. eggs, milk, high feed conversion ratio, use of artificial insemination technology, application of genetic engineering and biotechnology to solve animal health problems and production of animals that are adapted to unfavourable weather conditions

9. Soil Science

Determination of soils that are suitable for particular crops, soil physical and chemical properties, Soil testing, fertilizers, soil mapping, Irrigation/drainage system appropriate tillage practices

EVALUATION QUESTIONS

- a. Enumerate the roles of science and technology in agricultural development

WEEK 4:1

HUSBANDARY OF SELECTED CROPS CEREAL CROPS

Yam (Discorea spp.)

Origin

Asia,
Latin America
Africa.

Varieties

- | | |
|---|---------------------------|
| 1. White guinea yam | <u>Discorea rotundata</u> |
| 2. Yellow/guinea/yam | <u>Discorea cayenesis</u> |
| 3. Winged or water yam | <u>Discorea alata</u> |
| 4. Arial yam | <u>Discorea bulbifera</u> |
| 5. African bitter or
cluster or trifoliate yam | <u>Discorea dumetorum</u> |
| 6. Chinese yam | <u>Discorea esculenta</u> |

Climatic requirements

Soil

it requires fertile, deep and well-drained loamy soil. Yam thrives well where there is a good amount of organic matter in the soil

Temperature

Yam tolerates a temperature range of 25-30°C, high sunshine

Rainfall

evenly distributed rainfall of 1000-1750mm per year.

Land Preparation

Prepare ridges or mounds, or plough a flat land or make holes of dimensions 30cm x 10cm x 30cm.

Planting

Yam is vegetatively propagated and whole tubers (seed yams) or yam setts or minisetts are included in planting.

Dress the tubers or setts with aldrin 2.5% dust or Aldrex-T before planting.

The planting depth is about 15-25cm depending on the size of planting material and land preparation. Plant the setts with their outer coat in direct contact with the soil

Planting Date:

yam is planted between June and August in Northern Nigeria

In Southern Nigeria, it is between March and May in upland areas but November-March in riverine areas.

Yam setts (and minisetts) are planted in Southern Nigeria between May and early July.

Spacing:

The spacing for yam is 1m x 1m while the minisetts are planted at 25cm intervals.

yam has a stocking density of 1,000 stands/ha, and 40,000 stands/ha for minisetts.

Fertilizer Application:

The recommended NPK fertilizer is 10: 10:20, or 12:12:17 at the rate of 250-400kg/ha in a ring of 5cm from the base of the crop at 7 weeks after planting.

Weeding:

Weeding is manually done with hoes or cutlass.

It may be carried out 2-3 times in a year depending on weed regeneration and intensity.

Cover crops can be used in a yam farm to control weed infestation.

Staking:

palm frond and branches of trees serve as stakes.

NOTE: Staking provides support for the yam vines. Research findings have proved that staked farms normally out-yield unstaked ones by about 40%. However, staking materials are very costly.

Harvesting:

Yam matures in 6~9 months and is harvested when leaves begin to wilt and the vines turn yellowish and dry. It is done carefully with sharp digging tools to avoid bruising the tubers and exposing them infection.

Storage:

Fresh yam tubers are tied to well ventilated and shaded barns but yam chips and $\pm$ lour are stored in containers.

Marketing:

Fresh yam tubers and yam products are sold in local markets in Nigeria.

Pests:

Yam Beetle,
Termites,
Crickets,
Grasshoppers,
Nematodes,
Termites,
Yam Scales,
Mealybugs.

Diseases:

Anthrachnose.
Leaf Spots.
Leaf Blight
Tuber Rot.

Uses of Yam:

Yam is mainly used as staple human food but the peels could be relished by livestock.

Some species e.g. *D. alata* have medicinal values.

ASSIGNMENT

Describe the following species of yam

- a. *Discorea rotundata*
- b. *Discorea cayenensis*
- c. *Discorea alata*
- d. *Discorea bulbifera*
- e. *Discorea dumetorum*
- f. *Discorea esculenta*

WEEK 4:2

Cassava (*Manihot* spp).

Origin

Cassava originated from South and Central America (Brazil, Mexico and Guatemala) and was introduced into Nigeria by the Portuguese.

It is now popular in all the tropical regions of the world.

Varieties

Two varieties of cassava are very common. They are:

1. Bitter cassava- *Manihot*, *esculenta* or *utilissima*
2. Sweet Cassava- *Manihot* *palmata*.

Each of these species have many cultivars or cultivated varieties.

Some high yielding hybrid cultivars

CH₁₂₅, C₅₀, C₂₈, 53010 and 55124.

Dan Warri (Hausa) is particularly suitable for cultivation in Northern Nigeria.

Nwangoye (Ibo) has red petiole, is low yielding but is early maturing.

Ecological Requirements

Soil

Cassava grows in a wide range of soils provided the soils are not waterlogged.

It does best in well drained sandy loam or light alluvial soils. Gravelly, stony and saline soils are unsuitable for cassava production.

Temperature

Cassava requires moderate temperature, high sunshine and humidity performs poorly under cold conditions.

Rainfall

Cassava is well adapted to cultivation under drought conditions and can grow where yearly rainfall is as low as 500mm but 1000-1200mm of evenly distributed rainfall per year is the optimum requirement.

Land Preparation

Cassava is planted either on flat, on mounds or on ridges.

Clear and burn the bush.

Where land preparation is mechanized, ploughing is followed by harrowing or ridging but traditionally, mounds or ridges are prepared without ploughing.

Planting

In commercial production, mature stem cuttings are used in propagation. Mature Stem cutting of about 25cm in length is planted by either burying $\frac{3}{4}$ of the cuttings at an angle of about 45° or placing them horizontally in the plough layer.

Leaves on the cuttings are removed to reduce transpiration.

Period of Planting

In the North between June and August. In the Southern Nigeria, March-October for the early crop and November-December for late planting.

Spacing

90-100cm x 90-100cm and this gives about 10,000 stands/ha.

Seed Rate

Cassava bundle contains 50 stems and 4-5 cuttings are obtained from each stem.
On the average, 50 bundles of cassava stems are required per a hectare of land.

Uses of Cassava:

It is used as staple human food in the tropics.

It is a livestock feed.

Cassava forms the raw material for so many industries such as starch, alcohol, drug etc., manufacturing industries.

Fertilizer Application

NPK 10: 10:20 is recommended

NPK 12-12-17 at 250-500 kg/ha.

Muriate of potash.

NOTE: Excess nitrogen leads to undesirable vegetative growth and increases the level of linamarin(cyanogenic glucoside) in the tuber.

Weeding

Weeding is manually involving remoulding of ridges and mounds with hoes to prevent exposure of the tubers.

use of herbicides

Harvesting

Cassava matures in 9-18 months. This is manifested by shedding of old leaves without the new flush forming. This is when there is maximum starch content in the tuber: Cassava is harvested as need arises because the fresh tubers are highly perishable.

Storage

Cassava tubers are processed into meal of retted cassava, tapioca, garri, starch, flakes, chips and flour. These processed forms except meal and tapioca can store for a fairly long time and may be kept in containers and bags.

Marketing

Cassava and cassava products are sold locally in Nigeria.

Pests

- i. Grasshoppers
- ii. Termites
- iii. Whiteflies
- iv. Mealybugs
- v. Green
- vi. Red Spider Mites.
- vii. Rodents
- viii. Ruminant farm animals.

Diseases

- i. Cassava Mosaic
- ii. Bacterial Blight
- iii. Leaf Spots
- iv. Root Rot
- v. Root galls

Uses of Cassava:

It is used as staple human food in the tropics.

It is a livestock feed.

Cassava forms the raw material for so many industries such as starch, alcohol, drug etc., manufacturing industries.

Assignment

1. State the differences between sweet cassava and bitter cassava.
2. Describe the process of processing cassava roots to granulated cassava (garri)

WEEK 5:1

HUSBANDARY OF SELECTED CROPS CEREAL CROPS

MAIZE (Zea mays)

TYPES

1. Dent Maize

Grains contains soft starch granules which are less densely packed which leads to indentation as a result of shrinkage.

The grains may be yellow or white.

Varieties

- i.TZB (FARZ-34)
- ii.TZB (FARZ-27, 096EP6)
- iii.FARZ-23

2. Flourey maize

The flourey maize seed (or grain) consists largely of soft starch which is surrounded by the corneous layer under the pericarp.

This maize is grown mainly in the most southerly parts of Nigeria.

Varieties

- i.Lagos White, Bende Local, Ikom
- ii.White and Akwete Local.

3. Flint maize

This variety has very little soft starch in its grain (unlike Dent corn).

Varieties

- i.NS-1,
- ii.Diacol-V-153
- iii.Samaru 123.

4. Popcorn

This is an extreme form of Flint maize.

It has small kernels (grains) on a small ear.

It is fried in oil to make 'guguru'

The starch granules are enclosed in a very tough and elastic membrane.

When heated this tough membrane resists steam pressure until it explodes.

5. Sweet Maize

This is valued for its sweet flavour.

This variety has a much higher sugar content than all the other types, and it is usually boiled or canned.

Varieties

- i.USDA-34

CULTIVATION

LAND PREPARATION

Clear the land and till the soil to a shallow depth of about 22cm.

In a virgin soil there is no need for tillage.

ECOLOGICAL REQUIREMENTS

SOIL

- i.Loamy soil is the best.
- ii.It needs well-drained deep soil that is optimally aerated.

Rainfall

760-1520mm of rainfall that is evenly distributed.

Soil P^H

pH 6.0-7.0 and a moderate temperature.

Method of Sowing

Maize propagation is by planting the grains (fruits) in situ.

Sowing

Sow 2-3 seeds per hole to a depth of about 4cm.

treat the seeds with aldrin 2.5% dust before planting to prevent pest infestation.

Time of Planting

Early maize is planted in March or April while late maize is sown in August or September.

Spacing

When hand sown, a spacing of 45-60cm along the row and 90cm between rows is recommended.

If maize is drilled, the spacing should be 25cm by 75cm.

Seed Rate

The amount or quantity of planting material (seeds) used per area of land is called the seed rate.

Average seed rate of 16kg/ha is usually recommended and this gives a stocking density of 35,000 plants per hectare.

Fertilizer Requirements

Application of NPK (15.15:15) at 2-3 weeks after planting and 2 weeks before tasselling, in a ring of about 10 cm radius and to a depth of 3.0cm round each plant.

In sandy soil areas the fertilizer requirement is a mixture of 112kg/ha of nitrogen, 82 kg/ha of phosphorus, 45kg/ha of potassium and 112 kg/ha of magnesium.

Apply fertilizers after weeding to reduce competition for nutrients between the crops and the weeds.

Weeding

This is usually manually done although chemical weed control with 2, 4-D, Atrazine, Simazin etc is being increasingly used.

Harvesting

Maize crops mature in three months.

Maize ears are harvested when the leaves turn yellow, the husk turn yellow and dry and the grains become hard.

In hand harvesting, the cobs are broken off with little attached stalk as possible, the cobs can be snapped from the stalk with the husks still attached or removed.

In mechanical harvesting, a corn picker is used to pick the ears, remove the husk and shell the grains in a single operation.

Where maize plants are grown for livestock feeding, the ruminants might graze on them directly or be fed with cut succulent maize materials as silage.

Storage

The ears may be tied together and hung over the fire place.

The dried grains may be stored in air-tight containers or in cribs.

Grains may also be stored in jute bags with appropriate protectant insecticides as phostoxin and aldrin T.

Marketing of Produce

Maize grains may be sold in local markets or to Nigerian Grains Board or to confectionery, livestock feeds and brewing industries in Nigeria.

Pests

- i. The main pests include
- ii. Birds,
- iii. Stem borers,
- iv. Earworms,
- v. Cut worms,
- vi. Weevils,
- vii. Rodents and monkeys.

Diseases

- i. Maize rust,
- ii. Smut,
- iii. Streak,
- iv. Leaf spot and blight

Uses

Maize serves as a staple human food, livestock feed and raw materials for varied industrial products e.g. corn flakes, semovita, alcohol (beer) etc.

WEEK 5:2

RICE (*Oryza sativa*)

Origin: Rice is a native of South East Asia from India to Japan.

Rice could be grown as:

- a. **Upland rice (Dry land paddy):** Where rice is grown as a rain fed crop.
- b. **Low land (Swamp) rice-** where rice is grown on irrigated or flooded river plains.
- c. **Floating Rice** - where there is deep flooding up to a few metres.

Varieties

1. *Oryza sativa*
 2. *Oryza glaberima*
- i. The *Oryza sativa* has two major classifications:
Oryza sativa var, *japonica*
 - ii. *Oryza sativa* var, *indica*

Climatic Conditions

Soil

Sandy loam to clayey soils provided that enough water.
Heavy alluvial soils which permit puddling are preferable to lighter soils.

The optimum pH

- i. 7.0-7.2 on flooded lands
- ii. 5.5-6.5 when the soil is dry.

Rainfall

1500--2000mm. Rice is best grown under irrigation.

CULTIVATION

Nursery Preparation

Rice seedlings may be raised in nurseries. The nursery is prepared to control weeds and to condition the soil to favour aeration.

- ✓ Select a nursery site close to the rice field. The size of the nursery is dependent on the area of land to be planted.
- ✓ Till the nursery soil to a depth of 10-12cm.
- ✓ Apply well decomposed organic manure and work it in.
- ✓ Water the nursery to field capacity in the evening preceding sowing.
- ✓ Soak the seed in water to remove light (immature and incompletely filled seeds before sowing).
- ✓ Broadcast seeds lightly walking backwards.
- ✓ Rake after planting to cover the seeds with a thin layer of soil.
- ✓ The nursery may be shaded with palm fronds. (Raking and shading protect rice seeds from bird attack and excessive direct sun rays).
- ✓ Remove shade after germination to avoid etiolation (process in flowering plants grown in partial or complete absence of light).

Planting materials

Rice is seed propagated.

Time of planting

April-May for the early crop. August and September.

In the Northern Nigeria, it is planted between June and July.

Spacing

spacing is 10--15cm and 20-25cm for short term and long-term cultivars respectively.

The closer spacing gives a higher yield.

Seed rate

The recommended seed rate is 60-80kg/ha.

Land preparation

Select a very gently sloping land.

Bounding and leveling may be required to supply and control water in the rice field.

Land preparation involves deep ploughing and puddling.

Puddling is aimed at:

- ✓ Maintaining a uniform water level,
- ✓ Aerating the land,
- ✓ Providing the soil with a fairly impervious subsoil,
- ✓ Burying all kinds of weeds and surface trash,
- ✓ Offering seedlings, the right conditions for vigorous growth.

Transplanting

- ✓ The seedlings are ready for transplanting at 4-6 weeks after sowing.
- ✓ Water the nursery in the evening preceding the day of transplanting to loosen the soil and reduce shock on the seedling.
- ✓ Pull up the seedlings in bunches and prune off the top portions of leaves and even roots to; (reduce transpiration and offer rigidity to the seedling when planted).
- ✓ Hold a bunch of seedlings in the left hand and using the right hand, thrust 2-3 seedlings into the mud.
- ✓ Transplanters move backwards while planting to avoid trampling on the planted seedlings.

- ✓ At the end of the planting day, the remaining seedlings are put under shade in clay slurry.

Fertilizer application

Nitrogen fertilizer application e.g. Ammonium sulphate, is best done at the time of inflorescence initiation.

Weeding

Weeding is done generally and manually with hoes.

Use of herbicides such as 2, 4-D; 2, 4, 5-T and Dalapon.

Harvesting

Rice matures in 3-6 months. The time of harvesting depends on the cultivar and is usually between 4-6 weeks when the moisture content is in the range of 16-25%.

At the time of harvesting, a knife cuts the grain sharply, and the husk goes off easily when the grain is rubbed on the palm.

Harvesting is done by cutting the culm, collecting the panicles and tying them into bundles called sheaves.

When harvesting is mechanized, it is done by combine harvesters.

Threshing

This is the separation of the paddy from the stalk and is done by beating the panicles against a hard surface.

Drying

The moisture content of the paddy is further reduced to about 13% by controlled drying especially if the rice is for planting and storage.

Milling

This is the detachment of the glumes from the actual grain. If only the glume is removed, the rice is brown, (unpolished rice) which is rich in vitamin B.

Rice is usually parboiled before milling.

Partial boiling (parboiling) has the following advantages:

- ✓ It gelatinizes and hardens the rice so that it stands storage longer.
- ✓ It reduces breakage percentages.
- ✓ There is diffusion of minerals and nutrients into the endosperm at parboiling.
- ✓ Parboiled rice is more resistant to weevils.

Processes of Parboiling

- ✓ Washing the rice to remove dirtiness, stones and incompletely filled grains through:
- ✓ soaking
- ✓ Steaming.
- ✓ Soaking
- ✓ Steaming
- ✓ Drying
- ✓ Milling
- ✓ polishing

Storage:

Rice paddy can be stored in bags until required for milling.

Milled rice may be stored in dry air-tight and insect free containers.

Marketing:

Paddy and milled rice are sold in local markets in Nigeria.

Pests

- i. Birds
- ii. Stem-borers
- iii. Rodents
- iv. Rice gall midge
- v. Fish
- vi. Crabs
- vii. Weevils
- viii. Grasshoppers

Diseases

- i. Blast
- ii. Smut
- iii. Brown spot
- iv. Leaf blight
- v. Stem rot
- vi. Root rot.

Uses

- i. Rice serves as a staple human food
- ii. Livestock feed.
- iii. It is used in the industries for the production beer, wine, spirits, wax, soap, anti-corrosives etc.

ASSIGNMENT

1. Describe the process of milling rice.
2. State the advantages of parboiling rice.

WEEK 6:1

LAND AND ITS USES

Land is the solid part of the earth's surface where activities like farming and livestock production take place.

- ✓ It is a free gift of nature commonly referred to as natural resource which includes land, forest, water, minerals, air, rocks and animal life. It is fixed in supply.
- ✓ Its value rises steadily in response to increasing demand for it.
- ✓ It is sub-divided into agricultural and non-agricultural land.

USES FOR AGRICULTURAL PURPOSES

1. Production of Crops

Land is used for production of food crops like yam, rice, maize, cassava, cowpea, etc and cash crops like cotton, cocoa, groundnut etc. Soil and atmosphere as well as their components, being parts of land, supply crops with all their needs for growth and development.

2. Livestock Production

Land is needed for grazing and building of animal houses like poultry, piggery, cattle, goats, sheep, etc. large expanses of land is set aside in savanna belts where there are abundant grasses for grazing by livestock.

3. Forestry

This involves the management of forest land and their resources for man's use. Forest reserves are established where there is low pressure for cultivation or low population density and where the land seems not to be suitable for agriculture.

Some forest reserves in Nigeria are:

- i. Mamu River forest in Anambra state.
- ii. Omo Forest Reserve in Ogun state.
- iii. Afi river Forest Reserve in Cross river state.
- iv. Okomu Forest Reserve in Edo state.
- v. Anara Forest Reserve in Ogun state.
- vi. Shasha River Forest Reserve in Ogun state. Etc.

4. Wildlife and Game Reserves

Wild life refers to animals and birds found in the bush.

It is conserved in Game Reserve. Land which is not suitable for agriculture and forestry may be used for game reserve.

It is located in sparsely populated areas.

The animals and birds in game reserves provide good recreational facilities and are good centres of tourist attraction.

They are hunted to provide meat, egg and fish for food, hides and skin.

5. Fishery

Some portion of land is set aside for the production of fish through fish farming. It involves the establishment of fish where fishes are reared artificially to provide necessary sources of protein and income for the people.

USES OF LAND FOR NON-AGRICULTURAL PURPOSES

1. Housing

This involves the use of land for the construction of residential houses and buildings.

2. Transport

Land is also used for construction of many forms of roads, railway lines, as well as airports.

3. Mining

Lands where minerals are found are used for mining e.g. petroleum, coal, tin, etc.

4. Industry

Majority of industries are located in industrial estates which constitute a large proportion of urban land.

5. Socio-Economic Activities

Land is also used for a number of socio-economic activities such as recreational centres, schools, markets, churches, hospitals and cemeteries.

WEEK 6:2

FACTORS AFFECTING LAND AVAILABILITY AND USE

1. Population Pressure:

Land tends to be available where the population is very low, such as in rural areas. But it will not be available for agricultural purpose where the population is high, such as in urban areas.

2. Land Tenure System:

Some types of land tenure system in Nigeria does not make land available for large scale agriculture. Prospective farmers who want to engage in farming find it difficult to acquire enough land.

3. Climate:

Different climatic conditions affect land availability and use.

Rainfall is the major determinant in distribution of crops. Areas with heavy rainfall tend to encourage the cultivation of tree crops like cocoa, oil palm, rubber, etc.

While areas with moderate rainfall favours food crop production like cowpea, maize, sorghum, etc.

4. Soil Type:

The type of soil in an area determines whether or not such land will be available for farming. Loamy and clay soils make land available for farming. While the presence of sandy soil in an area prevents the availability of such land for farming.

5. Topography (Slope of The Land):

Hilly, mountains and other forms of highlands do not make land available for agriculture as erosion may wash away any crop planted around hilly area.

On the other hand, gentle or even slopes tend to support the cultivation of crops.

6. Cultural Practices:

Cultural practices like bush burning, shifting cultivation, bush fallowing, deforestation, etc. do not make land available for agriculture.

7. Road Construction

Road construction and rehabilitation can limit the availability of land for agriculture.

8. Environmental Pollution:

When the soil receives any substance in excess of its carrying capacity, that soil becomes polluted by that substance. E.g. oil spillage in oil producing area makes such land unavailable for agriculture.

9. Expansion and Extension of Industries:

Land used industries are not available for agriculture.

10. Government Laws and Policies:

Land use decree of 1978 vests all land in the country in the Federal Government to be held in trust for the people.

It also empowers each State Government to act on behalf of the Federal Government on all matters related to land use in the state.

The decree makes it possible for anybody to acquire land anywhere within the country provide a certificate of occupancy is issued to the person after payment for such land is made.

11. Biotic Factors:

Pests and diseases, soil microorganisms, parasites and predators also affect land availability and use.

ASSIGNMENT

1. List ten forest reserves in Nigeria and their locations.
2. List ten Games Reserves in Nigeria with their locations

WEEK 7:1

OIL PALM (*Elaeis guinensis*)

Origin: Tropical West Africa

VARIETIES

1. DURA:

Characteristics of Dura variety.

- a. They are genotypically homozygous dominant and are represented by DD.
- b. It is the most abundant variety in West Africa.
- c. Unripe fruits are black while ripe ones are bright red with the tip being dark.
- d. Shell (endocarp) is about 2-8mm thick.
- e. Shell is about 25-55% of fruit weight and has Medium mesocarp content (35-55% by weight).
- f. Kernels tend to be large (7-20% of fruit by weight).
- g. It is very tall and makes harvesting difficult.

2. TENERA:

Characteristics of Tenera Variety

- a. Kernels are smaller than that of Dura (3-15% of fruit by weight).
- b. Medium to high mesocarp content (60-95% by weight).
- c. Shell is about 1-32% of fruit weight.
- d. Shell is thin, about 0.5-3mm thick
- e. It is the recommended variety.
- f. It has medium height after so many years and is very robust.
- g. It is a natural hybrid between Dura and Pisifera and gives far more oil than any of the other varieties.
- h. Genotypically, it is represented by "Dd".

3. PISIFERA

Characteristics of Pisifera variety.

- a. It is mostly shell-less
- b. It has small pea-like kernel in fertile fruits.
- c. Oil coagulates easily before maturity.
- d. Genotypically, it is represented by "dd".

USES

Oil palm serves as human food and livestock feed; is used in the manufacture of soaps, candles, pomades, drugs, margarine, lubricating oils and is used in production of fuel, brooms, mulching and building materials.

ECOLOGY

Soil- clayey loam soil where the land is flat undulating is preferable.

pH of 4.0-6.5.

temperature of 24°C- 30°C and at least five hours of sunshine per day in all of the year.

rainfall of between 2000 mm and 4000mm per year, and 1000mm and as high as 5000mm.

HUSBANDRY

- ✓ Oil palm is propagated by seeding. A single stage polybag nursery is now used.
- ✓ Select a site, plough the land, mark out the positions of the polybags; fill up the poly bags with the top soil and plant the differentiated oil palm seeds (seeds with clearly defined radicle and plumule) depth of 2.5cm.
- ✓ Make the planting hole by pressing the soil with your finger.
- ✓ The polybags are positioned at a spacing of 45cm between bags.

Advantages of the Polybag Nursery

1. The nursery life of the seedling is reduced by five months.
2. Total nursery cost is reduced.
3. Higher percentage of field establishment with poly bag seedling~ than with ground bed seedlings;
4. Labour cost of transplanting polybag seedlings is reduced as compared with that of ground bed seedlings.
5. Polybag nursery seedlings grow faster in the field than ground bed seedlings. .
6. Transportation of polybag seedlings is easier than ground bed seedlings.

- ✓ Mulch the polybags and apply 4.5 litres of water per seedling per week in two doses and 14gm of fertilizer (rustica) at 2 and 8 months after planting.
- ✓ A regular application of fungicides e.g. Dithane M45 or Captan controls anthracnose and freckle in the nursery.
- ✓ Field establishment involves underbrushng, felling of trees, beating down, opening of rides, creating fire traces, burning, marking out the positions, transplanting into the field, fixing of wire collar and planting of cover crops.
- ✓ Nursery planting takes place between March and May. The emerging seedlings are transplanted 12 months (one year) from the time of planting.
- ✓ The spacing is 8.8m in a triangular form with 7 .6m between palm lines. This gives a planting density of 150 palms per hectare.
- ✓ Planting holes are made to accommodate the ball-of-earth and the palm seedling at transplanting. The polybag is also torn at transplanting. .

WEEDING

Weeding is carried out manually, mechanically or with contact herbicides.

FERTILIZER

Fertilizer type - Rustica 12:12:17+2

HARVESTING

Oil palms mature in 3--6 years.

Ripe fruits are promptly harvested with chisel and long-handled-sickles (Malayan knives).

STORAGE

Palm oil is best stored in tin, plastic and plated metallic containers.

Store palm oil of low Free Fatty Acid (FFA); dirt and moisture content and at room temperature.

PESTS

Important oil palm pests are rhinoceros beetles, termites, grasshoppers, wild pigs, rats, grass cutters, elephants and weaver birds.

DISEASES

Oil palm diseases are freckle, anthracnose, seedling blight, blast, and red ring disease.

ASSIGNMENT

Describe the process of extracting oil from oil palm.

WEEK 7.2

PRODUCTION OF GROUNDNUT (Arachis hypogaea)

ORIGIN

South America, Brazil, Bolivia, Paraguay and Argentina

VARIETIES

Ground nut can be classified on the basis of growth habit, shape and size of fruit, number of reticulation and colour of testa.

Based on the branching habit of groundnut, it is divided into

1. **Bunchy** (erect) cultivar - the cultivar tends to be clustered and does not trail on the ground.
2. **Spreading** (runner) cultivar - this spreads on the ground and has the pegs scattered.

ECOLOGY

Soil: light sandy loam soil.

pH 6.0

Rainfall: 750-1250mm that is evenly distributed and plenty of sunshine especially at maturity, harvesting, drying and storage.

HUSBANDRY

Clear the land and till it very well to allow easy penetration of the pod bearing pegs.

Groundnut is seed propagated. It is sown between March and May in the Southern Nigeria.

Early May for Northern Nigeria.

Groundnut has a “closed season”, that is, the planting should not exceed a specified period which is Mid-May.

SOWING

Sow 1-2 seeds per hole at a depth of about 5cm.

Dress the seeds with Thiram and Spargon before planting to prevent fungal infestation.

SPACING

30cm within rows and 40-60cm between rows when the seeds are hand sown.

15cm x 75cm when drilled.

The stocking density ranges from about 7 4,000 to 140,000 stands per hectare depending on the variety used and the mode of sowing.

Hand sown groundnut has a seed rate of 60-80kg/ha but when drilled, the seed rate is reduced to between 34-45kg seeds per hectare.

FERTILIZER

Groundnut requires 100 kg/ha of superphosphate fertilizer, 100kg/ha of sulphate of ammonia.

Gypsum (calcium sulphate) may be used in dusting the groundnut plants about 60 days from sowing to give the flowering crops (or the new pegs) direct contact with calcium.

WEEDING

Weed and loosen the soil carefully at the early stage of growth of groundnut to enable the elongated receptacle to penetrate into the soil.

Weeding when fruit formation has started may be discouraged to avoid damages to the pod-bearing pegs.

HARVESTING

Groundnut matures in three months.

Harvest when the leaves begin to turn yellow and to wilt.

Pull plants out with band and detach the nuts or use a hoe to dig out the groundnut plant and then thresh.

Dry harvested nuts for 2-3 days and either manually or mechanically.

However, mechanical decortication (shelling) causes more damage to the kernels and this damage leads to infestation and early rancidity.

Groundnut seeds are sold locally or are exported.

USES

Groundnut is used in making salad oils, margarine, soap, livestock feed (groundnut cake and haulms or vegetative parts of groundnut) and in cooking.

PESTS

1. Crows
2. Rats
3. Squirrels
4. Thrips
5. Aphid
6. Termites
7. Millipedes
8. Weevils

DISEASES

1. Groundnut Rosette
2. Leaf spot
3. Rust
4. Seedling blight
5. Damping-off
6. Wilt
7. Stem rot
8. Root balls

WEEK 8.1

BEVERAGES

HUSBANDRY PRACTICE OF COCOA

Botanical Name: **Theobroma cacao**

ORIGIN

Cocoa originated in the Amazon rain forest region of South America and introduced into West Africa along the equatorial coast.

It is grown in the southern part of the rain forest belt.

CLIMATIC AND SOIL REQUIREMENT

Soil-Cocoa thrives well on deep fertile, well aerated loam soils which must be loose and friable.

Rainfall-1140mm annually and evenly distributed is required.

Temperature-not below 17°C.

DESCRIPTION

The cacao plant, when mature, reaches a height of 7.5-10.5 m.

It has a straight main trunk, if raised from seedling, but if vegetatively propagated, it branches profusely.

The leaves are dark green when mature. It flowers profusely in clusters.

The fruits, called pods, are green or red and ripen to a yellow or orange colour.

A pod contains on the average 20 to 40 seeds, which are called beans.

VARIETIES

1. West African Amelonado (Amelonado)

- This is the most
- Important commercial cacao variety in West Africa.
- It produces pods that are lightly furrowed, with a round end.
- The pod is green when unripe and yellow when ripe.
- Pods are produced between October and January.
- Grows slowly and starts bearing fruits after 5 years.

2. Upper Amazon cocoa

- Pods are long and rough with black hard wall.
- Deeply furrowed with round end.
- The pod is green when unripe and yellow when ripe.
- Beans are purple or dark red.
- It is high yielding and bears fruits 3 years after planting.

3. Trinitario

- Not too popular, grown in small areas.
- Pods are red when unripe, turn orange when ripe.

4. Criollo

- Produces high quality cocoa.
- Not widely grown due to low yielding qualities.

5. Hybrids

- A cross between amazon and amelonado.
- High yielding
- Resistant to diseases.
- Cultivars include; CRIN Elites and Series 11 hybrids.

CULTIVATION

Cocoa from seeds or vegetatively. Commercial trees are mainly grown from seeds, budding and grafting. Stem cuttings are commonly used for vegetatively propagated cacao. Seeds for planting are taken from ripe, healthy pods. Seeds are planted on their sides, usually between October and December, in a nursery. They are sown in rich forest soils in cylindrical baskets or black polythene bags.

These are kept under the shade of interwoven palm leaves, tall forest trees or shade made of polythene.

The seeds are covered lightly with soil and watered heavily. They are then watered lightly every other day; or daily during the harmattan.

Transplanting into the field is carried out 4-6 months after sowing in the nursery. This is particularly done when the rains are steady; usually between April and June.

Planting holes are prepared, 25cm deep and 15cm wide.

The polythene bag is carefully cut with a razor blade and carefully stripped off.

The seedlings, with the ball-of-earth intact, should then be lowered inside the hole, and the soil pressed firmly round the seedling without disturbing the roots.

The **spacing** depends on the variety of cacao. For instance, the Arnelonado is planted at 2.5m x 2.5m, while the F3

Amazon and hybrids are planted at 3m x 3m.

Weeding

Weeding is manual, chemical and cultural methods.

Mulching

Mulching should be done before the beginning of the hot, dry season.

Grass, leafy materials, or polythene sheets can be used.

Pruning

Unwanted side growths of branches are pruned to increase air circulation and light penetration.

Shade trees must be thinned and removed when the canopy of the cacao trees have closed.

HARVESTING

Cocoa matures between 3-5 years.

They ripen 5-6 months.

Most of the pods are harvested between August and January.

During harvesting, the pods are cut cleanly from the cacao tree with a sharp knife, cutlass, or a sharp knife mounted on a pole. The pods should not be pulled off, as this damages the flower cushion (the point on the stem where the flowers grow) which will reduce future yields.

Pods should be harvested as soon as they are ripe to prevent the beans from germinating inside the pod and also to prevent an attack by black pod disease.

PROCESSING

Harvested ripe, healthy pods are split open, usually by knocking two pods together. The beans are carefully removed and collected in baskets, trays or boxes for fermentation.

FERMENTATION

Fermentation is induced by heat which is essential to obtain a chocolate flavour.

➤ **Heap Fermentation**

Traditional farmers pile up the beans in heaps on banana leaves which they fold over to keep in the heat.

➤ **Box Fermentation**

Large-scale growers use sweat boxes for fermentation.

DRYING

Fermented beans can be dried in the open sun in 7-14 days, preferably on raised platforms.

They can be dried by artificial driers in about 24 hours.

GRADING

Grading is an attempt to ensure high quality, since the best quality cocoa attracts the highest price.

USES OF COCOA

- i.manufacture of chocolate.
- ii.cocoa beverages.
- iii.high quality soap and body pomade.
- iv.polyphenol rich cocoa powder drink
- v.has a lot of health benefits.

DISEASES

- i.Black pod disease
- ii.Swollen shoot

PESTS

- i.Mirids-These are sap-sucking insects.
- ii.Monkeys.
- iii.Mealybugs.
- iv.Weavils.

WEEK 8.2

COFFEE- (*Coffea* spp)

Origin - Southern Arabia, Yemen, Ethiopia.

Species

Coffea arabica.

Coffea canephora.

Cultivation

The traditional method of planting coffee is to place 20 seeds in each hole at the beginning of the rainy season.

Raise seedlings in nurseries that are then planted outside at six to twelve months.

Coffee is often intercropped with food crops, such as maize, beans, or rice during the first few years of cultivation as farmers become familiar with its requirements

Processing

Berries are traditionally selectively picked by hand (strip picked, where all berries are harvested simultaneously)

After picking, green coffee is processed by;

a. Dry process method

b. Roasting

Grading the roasted seeds

Depending on the color of the roasted seeds as perceived by the human eye, they will be labeled as light, medium light, medium, medium dark, dark, or very dark.

Roast characteristics

a. **Darker roasts** are generally bolder because they have less fiber content and a more sugary flavor.

b. **Lighter roasts** have a more complex and therefore perceived stronger flavor from aromatic oils and acids otherwise destroyed by longer roasting times.

Roasting does not alter the amount of caffeine in the bean, but does give less caffeine when the beans are measured by volume because the beans expand during roasting.

A small amount of chaff is produced during roasting from the skin left on the seed after processing.

Chaff is usually removed from the seeds by air movement, though a small amount is added to dark roast coffees to soak up oils on the seeds.

Decaffeination-

Seeds are decaffeinated when they are still green. This involve;

soaking the green seeds in hot water (often called the "Swiss water process")

Steaming them, then using a solvent to dissolve caffeine-containing oils.

Storage

Coffee is best stored in an airtight container made of ceramic, glass, or non-reactive metal.

Brewing

Coffee seeds must be ground and brewed to create a beverage.

The roasted coffee seeds may be ground at a roastery, in a grocery store, or in the home.

Methods.

Boiled-Brewing coffee by boiling.

Coffee percolators and automatic coffee makers brew coffee using gravity.

Steeped-Coffee may be brewed by steeping in a device such as a French press (also known as a *cafetière*, coffee press or coffee plunger).

Pressurized-The espresso method forces hot pressurized and vaporized water through ground coffee.

Serving

- a. **Drip-brewed**, percolated, or French-pressed/cafetière coffee may be served as *white coffee* with a dairy product such as milk or cream, or dairy substitute, or as *black coffee* with no such addition. It may be sweetened with sugar or artificial sweetener. When served cold, it is called *iced coffee*.
- b. **Instant coffee** is dried into soluble powder or freeze-dried into granules that can be quickly dissolved in hot water.
- c. **Liquid coffee** concentrates are sometimes used in large institutional situations where coffee needs to be produced for thousands of people at the same time.

Commodity market

Coffee is bought and sold as green coffee beans by roasters, investors, and price speculators as a tradable commodity in commodity markets and exchange-traded funds.

Diseases

- i. coffee leaf rust
- ii. Anthracnose
- iii. Brown blight of ripening cherries and leaf necrosis.
- iv. Twig dieback - yellowing and blight of affected leaves.
- v. Twigs wilt, defoliate and die at the tips.

Pests

- i. beetles,
- ii. larvae (caterpillars) of butterflies and moths.
- iii. coffee berry borer beetle (*Hypothenemus hampei*)

HUSBANDRY PRACTICE OF RUBBER

Botanical Name: *Hevea brasilienses*

ORIGIN

Amazon rain forest region around Para in Brazil.

Nigeria is the largest producer in West Africa.

CLIMATIC AND SOIL REQUIREMENT

Soil-Rubber thrives well on deep, fertile, slightly acidic and permeable soils.

Rainfall-2000mm-3000mm annually and evenly distributed is required.

Temperature-25°C-29°C.

METHOD OF PROPAGATION

By seeds or budding. Seeds propagation is first done in the pre-nursery in well prepared soil.

The sown seeds are well watered and mulched.

The seeds germinate within 7-10 days and are immediately transplanted in to nursery beds.

NURSERY PRACTICE

- Nursery beds are prepared near source of water supply at spacing of 15-20cm along the rows and 30-37cm between the rows.
- For budding seedling, the spacing should be 50- 60cm apart and 1-1.5m between rows.
- Seedlings are due for budding when they are 7 months old or when the stems are about 2.5-3cm in diameter.
- The buds are obtained from high yielding trees and inserted at about 8-10cm from the ground level.
- Inspection is done after 3 weeks and if the union is established, they are allowed to grow in the nursery for about 1-¼ years before transplanting.

Spacing-When transplanting, seedling plants should be spaced 2-3 x 4-5m while budded plants should be spaced at 3-4 x 6-7m.

Thinning-When the plants are 10-12 years old, the whole trees are thinned, leaving 240-280 per/ha.

Weeding-Weeding is done frequently, usually by hand through hoeing, slashing the weeds with cutlasses, planting cover crops or ring weeding through the use of herbicides.

Pruning-Unwanted and crossed branches should be pruned and the cut surface painted with a bitumen compound or tar. Diseased and badly formed trees should be removed.

Harvesting or Tapping-Tapping begins when the trees are 5-7 years old and is done early in the morning.

- A diagonal cut is made at a height of 50cm from the ground level on the left hand side of the tree as the tapper faces it.
- The cut runs from the high left to low right at an angle of 22.5° on seedling trees or 30° on budded trees.
- The cut is made with a curved gouge (tapping knife) which form a rill through which the latex can flow.
- A metal spout (cup) is fixed at the base of the cut to channel the latex into a container positioned by sticks or narrow pieces of metal.
- The second tapping is done at the right-hand side of the tree at about 75cm from the ground.
- After several tapping, the whole tree is left to rest during the dry season to increase the number of productive years.

Processing-The latex is collected in the evenings, poured into pails and diluted with water.

It is processed and dispatched to local factories or exported.

USES

- i.tyres,
- ii.tubes,
- iii.tennis balls,
- iv.rubber bands,
- v.shoe soles,
- vi.foam mattresses etc.

DISEASES

- i.Root rot (brown and dry root rot)
- ii.Tapping panel disease.
- iii.Patch Canker
- iv.Phytophthora Leaf-fall
- v.Rim Blight

PESTS

- i.Aphids
- ii.Mealy bugs
- iii.Spider mites
- iv.Scale insect

WEEK 9:2

Practical: Identification and Revision

Identification of the common crops available:

- i.Oil palm fruits,
- ii.Cocoa pod,
- iii.Kola nut,
- iv.Rubber seed,
- v.Cotton seed and lint,
- vi.Groundnut pod,
- vii.Different species of maize etc.

WEEK 10 – 11 EXAMINATION