Qn: Explain the various factors that affect crops grown in East Africa

1. Soil PH

Different crops require different specific pH for their proper growth e.g. tea require acidic soil, tobacco may require slightly acidic soil.

2. Soil fertility

Crops are nutrients which must be readily available for their proper growth.

3. Soil drainage.

Some crops like rice are able to thrive in poorly drain soil while others like maize cannot withstand poor drainage.

4. Soil structure

This affects the movement of air, transfer of heat and root development.

5. Soil texture

This can also affect the number of physical properties of soil which are very crucial to crop growth.

6. Temperature

Some plants like the cereals and grasses can live in areas with high temperatures.

7. Availability of water.

Water is used as a raw material for photosynthesis. Absence of water in a particular area can limit the growth of a particular crops more especially these that are not drought resistant in bananas.

8. Topography

This determines the number of factors like temp, humidity rainfall which all affects crop growth.

9. **Pest and diseases**.

Crops in some areas have been eliminated due to the presence pest and diseases. e.g. Tomato growing in most areas of Uganda is limited by bacterial wilt.

10. **Wind**.

At high attitudes strong winds are experienced which will affect the growth of crops.

11. Social factors

Some communities are growing certain crops since historically they have acted as food crop e.g. millet among the Itesot of Uganda.

12. Economic reasons

Some crops are cash crops therefore they must be grown to provide farms with income e.g coffee, tea, cocoa.

13. Government policy.

The government has been restricting the growth of certain crops for health reasons and security e.g. Opium / Marijuana.

CLASSIFICATION OF CROPS;

Crops are classified into two main groups

a) Annual crops
b) Perennial crops

ANNUAL CROPS

These are crops which complete their life cycle within one year e.g.

i. Cereal (millet, Sorghum, Rice, Wheat, Barley, Maize, Oats, and Rye)
ii. Legumes (Beans, Soybeans, Cowpeas, Pigeon peg, G-nuts)
iii. Root Crops (Cassava, Sweet potatoes, Irish potatoes, Yams,)
iv. Vegetables (cabbages, tomatoes, onions, egg plants, amaranthus spp, carrots, dodo, spinach, pumpkins, cucumber, water, melon, garlic, pepper.)
v. Oil crops (Simsim, sunflower, cotton)
vi. Fiber crops ((cotton)
vii. Drug crops (Pyrethrum)

PERRENIAL CROPS

i. Beverages; coffee, tea, and cocoa
ii. Fruits; pawpaw, guava, avocado, jack fruit, passion fruit, pineapples, bananas,e.t.c
iii. Citrus; oranges, lemons, tangerines, e.t.c.
iv. Sugar crops; sugar cane and sugar beet
v. Spices; vanilla, ginger, clover, e.t.c.

cereals

These are commonly known as grain crops and they have a high content of carbohydrates. They are the most common food crops used all over the world.

Qn: <u>suggest reasons why cereals are the most food used in the world.</u>

1. They are easy to prepare as food for example rice and posho.
2. They are adapted to a very wide range of soil and the environmental condition.
3. They have fewer pest and disease as compared to other crops.
4. Cereals contain a high amount of carbohydrates and vitamin which are highly needed in our diet.
5. Because they contain low moisture content they are easy to store and used when needed.
6. Cereals have a short life cycle as compared to the crops and other perennials.

7. Cereals can be used as food for both man and animals.
8. Because they are less bulky hence it is easier to transport cereals from one place to another.
9. Management practices like plant, weeding, can be easily done by machines reducing Labour requirements during production.
10. They do not require special seed bed before being planted.

MAIZE - ZEA MAYS

Plant characteristics

1. Maize is an annual cereal crop which can grow up to a height of 4- 6 metres
2. Mature and growing maize has a prop root radiating from the main stem outward into the soil providing support. The depth of the root depends on number of factors e.g. soil, rainfall etc.
3. The tassel i.e. male maize inflorescence emerges at the top of the plant and shed its pollen over a period of about one week.
4. The silk i.e. female inflorescence emerges from the ear outwards towards the end of pollen shedding and remains conceptive for a period of about three weeks.
5. In good condition maize leaves are green with parallel vein and long i.e. more than 0.5m.
6. At an early stage of growth it can be plough down as green manure to provide nutrient into the soil.
7. Young maize can be used for making hay for feeding livestock however it can bring digestive problem if the maize is a mature one due to fibrous content.
8. Maize flour contain a lot of carbohydrates when eaten it can be metabolized to provide energy to support the organism.

Growth requirements

9. Maize requires a well drained soil with a good supply at nutrient
10. It cannot tolerate a slightest degree at water logging.
11. It requires enough rainfall which is equally well distributed but however, during harvesting it should be as compared to during silking where enough water is needed.
12. Maize thrives very well between temperatures of $20 – 25^0$ C. High temperature during the day is accompanied by high rate of transpiration and low temperature at night is accompanied by a high rate of respiration thus limiting yield.

Seed bed preparation

13. Seed bed preparation is done by hand roughly this in turn advantageous because weeds are killed, encourage water infiltration and resist soil erosion than in fine seed bed.
14. Secondary cultivation may not be necessary since the crop has big seeds.

Planting and spacing

15. It should be planted at the beginning of the rain because early planted maize benefit from nitrogen flush that occur when a dry soil are wetted and suffers less from fungal diseases
16. Planting is done mechanically by planter or by hand. Two seeds are planted in one hole made at 5cm deep in moist soil but in dry soil should be placed 10cm deep to prevent it germinating as a result of only a slight shower.
17. Spacing should ensure low population Atleast 90 cm X 30 cm between each plant. This is to reduce competition for basic growth requirement. However spacing can be determined by other factors like soil fertility, soil moisture, variety, e.t.c.
18. In properly spaced maize in area of reliable rainfall weed free condition need only to be maintained until the crop is 45cm high. After this height the crop suppresses weeds by itself.

Weeding and fertilizer application

19. Maize is weeded when its between 10 - 15cm and before it starts silking
20. selective herbicides can be used to control weeds like atrazine herbicide
21. Nitrogen fertilizers should be applied as top dressing when maize is at about 45 cm high.
22. Phosphates should be incorporated into the soil at the time of sowing.
23. Farm yard manure can be applied to the soil to increase its fertility owing to maize growth and development.

Pest and disease control

24. Pests that affect maize include stalk borer and army warm which its larvae may eat all the leaves until only remain midrib.
25. Few diseases like white leaf blight, maize streak caused by virus and rust caused by fungus attack the crop.
26.

Harvesting and yields

27. Harvesting maize is done mechanically by combine harvester and manually by hand.
28. Maize grain is physiologically mature at a moisture content of about 35%. when left in the field to dry it is reduced to 19 – 20% after the husks have been removed.
29. Maize is dried and stored in the crib i.e. a store with wall of wire netting.

Question.

Describe the agronomic practices carried out in the growing of rice from planting to harvesting.

- Plant characteristics.
- Ecological requirement of the crop (soil, rainfall, humidity, temp)
- Importance

- Seed bed preparation
- Planting
- Weeding (thinning, pruning)
- Fertilizers application
- Harvesting
- Yield
- Storage.

VEGETABLES

1. They are sources of income when a farmer decides to sell.
2. They are very good source of vitamin like vitamin A and C.
3. They act as appetizers for food e.g. onions and tomatoes.
4. They are a good source of minerals e.g. Iron, magnesium.
5. They heap in controlling digestive problem like constipation
6. They can be used as animal feeds like cabbages to rabbits.
7. Vegetables growing provide employment for people working as attendants in vegetable gardens.
8. Vegetables are a good source of manure since they rot fast.
9. Leguminous vegetables fix nitrogen into the soil e.g. beans
10. They can act as cover crops hence controlling soil erosion.
11. Some vegetables have medical value e.g malakwang, red amaranthus.

CLASSIFICATION OF VEGETABLES

Vegetables can be classified into two ways. i.e. according to the part eaten and family

ACCORDING TO PART EATEN.

1. **Leaf vegetables**
   - Cabbages
   - Amaranthus
   - Spinach.

2. **Fruit vegetable**
   - Egg plant
   - Tomatoes
   - Water melon
   - Cucumber
   - Pumpkin.
   - Okra

3. **Seed vegetables**
   - Cowpeas
   - G-nuts
   - Beans

- Garden pea
- Field pea

4. Root vegetables

- Onions
- Sugar beet
- Garlic
- Carrots
- Irish potato
- Turnip
- Radish

5. Flower vegetables

- Cauliflower

Family classification

Here vegetables are grouped into six families:-

1. **Leguminoseae (pulse)**

   This include

   - Beans
   - Pigeon pea
   - G-nuts
   - Garden peas
   - Cowpeas

2. **Solanaceae (Tomato family)**

   This include

   - Irish potatoes
   - Egg plant
   - Tomatoes
   - Sweet pepper

3. **Brassicaceae (cabbage family)**

   It includes

   - Cabbage
   - Cauliflower
   - Radish
   - Turnip
   - Kale

4 **Cucurbitae (gourd family)**

Includes

- Pumpkins

- Water melon
- Cucumber
- Gourds.

5. **Alliaceae**

This includes

- Onions
- Leek
- Garlic

6. **Apiaceae**

- Carrots
- Parsely
- Celety
- Carriander
- Parsely.

7. **Amaranthanceae**

- Amaranthus hybridus
- A. dubius
- A. caudatus

PROCEDURE FOLLOWED IN GROWING VEGETABLES

1. Choosing the site.

The site to be considered for growing vegetable should measure up to the following:-

a. The soil should be deep and fertile. Incase at low fertility fertilizers should be applied.
b. Availability of water, the site should have enough water supply hence the site should be close to a water source.
c. Distance from home. The site shouldn't be far from home for security reasons and easy management.
d. The area should be free from frost and the farmer to effect this should avoid valley bottom.
e. The place shouldn't be having shade since some vegetable like tomato and egg plant do not thrive well in shade.
f. Gentle slope or flat land and require for fair drainage.

2. Preparing a nursery bed.

A nursery bed is an area where seedlings are grown before they are transferred to the actual vegetable field / garden. The seeds can be planted in a seed bed, seed boxes or soil blocks.

Treatment of planting materials

- Seed dressing –coating seeds with pesticides e.g. copper Sulphate.
- Chitting or encouraging sprouting e.g. in potato seeds.
- Inoculation, usually done legumes where seeds are coated with right bacterial for nodule formation.
- Hot water treatment against viral diseases e.g in sugarcane and cassava.

Importance of a nursery bed.

- When propagating seeds which are too small to be planted directly into the soil.
- The crop seedlings are delicate and need great care
- Bulking up of planting materials is necessary like in sugarcane
- Helps in selecting healthy and strong seedlings.
- When cuttings to propagate the crop need special treatment e.g tea.

Procedure of making a nursery bed

- Remove all grasses, roots and tree stumps on the area.
- The place should be cultivated deeply to encourage proper root development.
- All large soil pieces should be broken down to encourage a fine bed.
- Incorporate manure containing phosphorous into the soil to improve fertility
- Leave the area to settle for Atleast 3 – 4 weeks before planting seeds
- Measure off the seed bed to a width of 1 metre and any length that you feel.
- Erect a shade on the prepared place to control light and water delivered to the seedlings.
- Make ridges across the bed where the seeds are to be planted.
- Place the seeds in the ridges and cover it with a thin layer of mulch to facilitate germination.
- Place a thin layer of mulch over the seeds to conserve soil moisture and control weeds.
- As soon as the seeds germinate the mulch should be removed since it may interfere with germination.
- The seeds should be watered twice each day in the morning and evening.
- After germination excess seedlings can be removed a practice called pricking out.
- At a later stage before transplanting seedlings are exposed to environmental conditions referred to as hardening off
- Transplanting should be done in the evening hour or morning to reduce the rate of water loss from the seedlings by transpiration.

3. Preparation of a seed bed.

A seed bed is a well prepared piece of land ready to receive planting materials.

- The land should be cleared of large bush, all trees and grasses
- All tree roots and stump should be removed in advance.
- The whole place should be deeply cultivated and big pieces of soil broken.
- The whole place should be measured to establish the size in accordance to the number of seedlings to be planted.
- The place should be leveled before planting seedlings.

- The whole vegetable should be along the contour of land to reduce erosion.

Nursery bed management

- Seedlings must be watered Atleast twice a day i.e in the morning and evening**.**
- Apply fertilizers to the seedlings to improve growth.
- Apply pesticides to control pests on the seedlings
- Spray fungicides on the seedlings to control fungal infections like dumping off
- Provide a good shade over the nursery bed to control damage to seedling due to harsh environmental conditions
- Remove diseased and excess seedlings from the nursery bed i.e prick out to reduce disease spread and allow proper seedling growth.
- Weed the bed to reduce competition for nutrients and control disease spread

4. Transplanting

Precautions to be taken when transplanting

- Seedlings in the nursery bed should be well watered before lifting to reduce root breaking
- Seedlings should be lifted with soil in their roots to control distorting of roots.
- Care should be taken not to damage roots as it may deter proper crop establishment and development.
- Transplanting holes should be big enough to accommodate seedlings without bending roots since it may affect root development.
- Where fertilizers are used it should be thoroughly mixed with soil for efficient utilization by the seedlings.
- Seedlings should not be planted deeper than they were in the nursery for proper establishment.
- Transplanting should be done during the cool hours to reduce wilting of seedlings through excessive loss of water by transpiration.
- Seedlings should be watered after transplanting if the soil in the field is dry to provide adequate moisture for crop establishment and growth.

Transplanting the seedlings.

1. Only healthy, strong seedlings should be selected.
2. Watering of the nursery to soften the soil to ease transplanting and reduce root damage.
3. Transplanting should be done in the evening or in cool weather.
4. Thorough preparation of the seedbed by removing all tree stamps and roots remove any other vegetation Atleast two months before transplanting.
5. Dig holes before transplanting at the required spacing

6. Fill the holes with a mixed top soil and double supper phosphate or organic manure Atleast 2 -3 weeks before planting.
7. Top soil and sub soil should not be mixed but filled to holes separately
8. Transplant at the beginning of rain for easy crop establishment.
9. Provide temporary shade to the transplanted plant (seedlings)
10. Mulch around the seedling
11. Continue watering until the plant has fully established its self.

5. Application of fertilizers.

- Vegetable require more of N, P and K which should be applied early for vigorous plant growth.

6. Weeding

Effective weed control is needed to ensure proper growth of the vegetable since they are more sensitive to competition.

7. Disease and pest control.

Vegetables are attacked by a number of fungal and bacterial diseases like dumping off, downy mildew, bacterial wilt, mosaic, dry rot, black rot, stem rot, and blight. The common pests are cut worms, termites, grasshoppers, caterpillars, mole crickets, aphids, thrips, nematodes and beetles.

8. Harvesting

Most vegetables are early maturing and are normally harvested manually after harvesting they should be kept in a cool place to that they don't go bad.

Qn: describe the growing of tomato seedlings from nursery bed prepartion to transplanting.

1. Select a good site for vegetable production
2. Remove all vegetation from the area where to prepare the seed nursery bed.
3. Cultivate deeply removing all roots from the bed.
4. Raise a nursery bed to facilitate good drainage.
5. Incorporate well rotten F.Y.M / compost or S.S.P fertilizer.
6. Level the soil by raking and remove any foreign material like stone, polyethene or glasses and break any big clods of soil.
7. Sow the seeds at 0.5cm deep and cover lightly with soil
8. Spacing should be 15cm between the rows.
9. Mulch the bed lightly and remove after seeds have germinated
10. Erect a shade over a nursery bed to protect seedlings from harsh environmental conditions.

11. Water from the top of the shade twice a day, morning and evening using a watering can.
12. When the seedlings grow up to about 2.5cm high, prick out to ensure proper spacing and growth.
13. Weeding should be carried out with a garden trowel or suitable tool
14. Spraying seedlings with copper fungicides such as ridomil and diethane M45 to control late blight and other pests should be done.
15. As seedlings near 15cm in height, reduce the shade to ensure hardening off.
16. A week before transplanting water the seedling to ensure the soil is soft to avoid breaking roots.
17. A week before transplanting, remove all the shade to ensure full hardening off.
18. Transplanting should be done in the evening or cloud cast day to reduce water loss from the seedlings.
19. At transplanting use a trowel to remove seedling with soil around the roots.
20. At transplanting use a trowel to remove seedling with soil around the roots.
21. Water immediately after transplanting.

Diseases of tomatoes

Tomato Blight-It's a fungal disease, it attacks leaves, stems and fruits causing brown – black sunken lesions

- It's very severe in humid weather.
- It can be controlled by spraying with copper fungicides such as ridomil and diethane M45.

Bacterial Wilt - Its caused by **pseudomonas solanacearum**, it causes wilting and death of growing point and upper leaves.

- Its airborne and controlling its spread is difficult. However the following control measures are recommended:-
  - Remove and burn all infected plants.
  - Crop rotation
  - Use resistant varieties
  - Sterilize the soil by burning grass on top or apply formalin or boil
  - By fallowing

Tomato Mosaic -This is a rival disease, which causes curling and molting of leaves thus reducing the area of photosynthesis.

- It may be transmitted from tobacco shred or a smoker's hand

Its controlled by

- planting resistant healthy seeds
- burning all affected plants and planting healthy seeds
- smokers should wash their hands before touching tomato plants.

Pruning tomatoes

- One or two stems are left per plant.
- Remove lateral shoot weekly
- When 6 – 8 trusses of flowers pinch out the growing it this pruning will encourage the growth of good size marketable tomato.
- Remove leaves close to the ground to prevent the entry of blight.

Importance of pruning tomatoes

1. Improves the quality of fruits by exposing each to enough light.
2. Improve yields by ensuring big fruits due a reduced competition for nutrients between various branches
3. Makes spraying against disease more easy
4. Removes a micro climate that can encourage pests.
5. Harvesting becomes easier since fruits are properly exposed
6. Makes movement with in the garden simpler.

Staking tomatoes

There are several methods of staking tomato the common method includes:-

- Single staking
- Cross staking using a wire cross poles.

Importance of staking tomatoes

1. Controls fungal diseases that can attack tomato fruits especially soil borne diseases.
2. Improves the quality of fruits by preventing contact between soil and fruits.
3. Prevents pest attack of tomatoes by crawling pests
4. Exposes fruits to adequate air and light which improves quality.
5. Reduces wastage of pesticides by exposing fruits for easy spraying.
6. Make movement with in the garden easy.

LEGUMES

These are plants with root nodules which are able to fix nitrogen into the soil.

IMPORTANCE OF LEGUMES.

1. They are good sources of protein for human and other animals e.g. soybeans, with a protein content of 38 – 40%
2. In pasture they provide protein for grazing animals
3. Symbolic bacteria in the root nodules of legumes fix atmospheric nitrogen into the soil.

4. Fast growing leafy legumes are good for making green manure.
5. Legumes grow and cover the ground very quickly hence can be used as cover crops.
6. They are deep rooted hence help in recycling nutrient and opening up the soil thus increasing ration and infiltration.
7. In any dry area legume shrub provide fodder for animals.
8. Legumes regenerate faster and produce more nutritious vegetative parts hence can be continually grazed by animals.
9. Some legumes are used in the manufacture of medicine and dyes
10. Industrial products made from legumes such as ground nuts cake are fed to livestock.

CHARACTERISTICS OF LEGUMES

- They have trifoliate net vein leaves.
- Most legumes have root nodules which contain nitrogen fixing bacteria\
- They bear pods which contain seeds.
- They have a tap root system.

BEANS(Phaseolus vulgaris)

Beans are low growing annual crops. They are mainly cultivated for their seeds which are boiled and eaten

Bean varieties

- Bush type(determinate);These stop growing at the onset of flowering e.g k20,banja2 etc
- Climbing type(indeterminate);These continue to grow after flowering e.g k121,mcm2001,Tanganyika black,mutike4 etc
- Semi climbing beans e.g mexico142, Tanganyika black,mutike4.

Growth requirements of beans

- The soil should be well drained and fertile
- Requires a lot of rainfall during growing period of about 625mm per annum and relatively dry spell as they flower and form pods
- Medium to low temperature,High temperatures cause poor fruit set
- Altitude;900-2100m above see level.beans do not grow well at an altitude below 600m

Land preparation

- A rough seedbed is required because beans have large seeds
- Planting should be done at the beginning of rains.Hand planting is normally done by dibbling(2-3)seeds per hole
- Spacing depends on the planting method and growth habiti.e hand planting of 60cm by 15cm,mechanical method 66 by 5.5cm
- Weeding,1-2wks early weedings are done and weeding at flowering leads to dropping of flowers.It can be done manually using a forked hoe,hand hoe.
- Staking can be done using elephant grass and leguminous tree branches and hard tree branches
- Fertilizer application;it is not economical but however beansrespond to phosphate and nitrogenous fertilizers.phosphate fertilizers enhance nitrogen fixation

- Harvesting;Growth period is 2-3 months, harvesting depends on the intended use.They are normally left in the field to dry and are then uprooted,threshed,winowed and stored

PESTS OF BEANS

Field pests

1. Bean aphids(Aphis tabae)

These are found in clusters especially on growing plants

Damage

- Suck the plant sap and prevent normal growth
- Under severe infestation,the plants become dessicated and die
- Their feeding results in stunted growth
- They transmit bean mosaic virus

Control

- Spray with recommended pesticides like ambush
- Early planting

2. Bean fly(Ophiomya spp)

Damage

- The larvae enter the stem at the base of the plants and pupate from there.This causes the base of the stem to split
- They cause yellowing of seedling which later die
- Weak and stunted plant growth

CONTROL

- Removal of crop residues
- Ealy planting
- Seed dressing
- Crop rotation
- Growing resistant varieties
- Destruction of volunteer crops

3. American boll worm(Helicoverpa armigera)

Damage

- The caterpillars eat young leaves and flowers
- Feed on pods making them to wilt

Storage pests

1Bean bruchid;These attack beans in the field,the larvae bore into the seeds,feeds and pupates there

Control

- Properdrying of theseeds
- Dusting the seeds with recommended pesticides before storage
- Early harvesting

Diseases of beans

- ❖ Bean anthracnose;it is a fungal disease caused by Colletotricum lindemuthanum and spread by insects,rain etc

Symptoms

- Brown,sunken,water shoked lesions on the pods
- The lesions cause the seeds and pods to rot

Control

- Use of resistant crop varieties
- Use of clean seeds
- Croprotation
- ❖ Bean rust;it is a fungal disease caused by uromyces appendiculates and transmitted by wind currents and rain splash

Symptoms

- Small reddish brown patches on the under surface of the leaves and sometimes on the upper surface
- Severe infestation may cause pre mature defoliation

control

- Use of resistant crop varieties
- Crop rotation
- Destruction of infected crops
- Use of recommended chemicals
- ❖ Angular leaf spot;It is a fungal seed borne disease transmitted by wind blown spores and rain splash

Symtoms

- Grey spots which later turn brown
- Angular lesions appear on the upper leaf surface
- Reddish brown lesions on stems,pods surrounded by a dark coloured border

Control

- use of resistant crop varieties such as k131,k120,k132
- use of clean seeds
- croprotation
- use of recommended chemicals
- ❖
- ❖ Bean mosaic

It is a viral disease transmitted by bean aphids

Symptoms

- Downward curling of leaf margins
- Stunted growth
- Distortion of flowers and small pods

Qn: suggest reasons why the growing root crops is popular?

1. They grow in a variety of soil and can be good source of food for most of the areas.
2. They require little labour and attention hence cheap to produce
3. The tuber can lie in the ground until required and therefore available throughout the year.
4. Most root crops are resistant to drought hence can be produced in area of little rainfall.

5. Root crops are attacked by few pest and diseases as compared to other crops.
6. They are able to give high yield even in poor soil hence solving the problem of hunger.
7. Compared to cereals and legumes, root crops require little processing before they are eaten.

Qn: state the limitations of root crops growing.

- They are bulky and therefore difficult and expensive to transport
- They have a high moisture content hence difficult to store.
- They are low in protein, fat, vitamin, and minerals hence needs supplementation.
- They are propagated vegetatively therefore the planting material is difficult to transport.

CASSAVA(Manihot esculentum)

Importance of cassava

The cassava tubers may be boiled and eaten
The tubers may be sliced, dried and ground into flour
Tubers are sold locally for cash either fresh, sliced or dried
The leaves can be used as vegetables which provide vitamin c
It is used for extraction of starch used in textile industry
The tubers can be used as livestock feeds.
The stems are used as firewood when dry
Wet flour is sticky and can be used as a building material like cement

Plant x-tics

- Cassava is a shrubby, biennial crop
- It grows to a height of btn 1.2-1.5m
- The tubers are swollen lateral roots and cylindrical
- The number of tubers per plant varies from 5-10
- The leaves vary from leaf size and colour
- Leaves are attached on to the stem by a long petiole

Varieties of cassava

- Bitter varieties; these have a high concentration of cynogenic glycoside
- Sweet varieties

Other cassava mosaic resistant clones include;Nase1,Nase2,migyera

Growth requirements

- Well drained deep fertile soils that can yield fairly but can yield well in areas of low fertility as well as well drained
- Rainfall:it is a fairly dry resistant crop and its cultivation is possible even only 500mm in some tropical areas.optimum of 1000-2000mm per annum
- Altitude: it grows well below 1500m

Field preparation

The field is prepared to a rough tilth to prevent soil erosion.The bush must be cleared and deep cultivation done for better root development

Planting

Propagation is done using cuttings:The cuttings can be placed at an angle normally 60^0c horizontally or vertically and covered to a depth of 10cm

The cuttings should be 24-40cm thick and 30-40cm long and be got from a free mosaic plant

Planting should be done at the beginning of the main rain

Holes should be 7.5-10cm deep

Spacing

1.5 by 0.9m for pure stands,1.2 by 1.2m for short term varieties,1.8 by 1.8m for long term varieties

Weed control

Cassava can be interplanted with short term cover crops because of its wide spacing and because it is slow to develop the canopy

Weeding should be done in the early stages and 2-3 weedings give a better weed control

Further weeding is not necessary because the dense canopy suppresses weed growth

Fertilizer application

This is not recommended as it is economical but in general it responds well to farm yard manure

Harvesting

It takes 6-36 months to be ready for harvesting depending on the variety. it should be done before the roots become too hard and fibrous

Roots can be removed by hand in light soils or by use of hoes, pangas in heavy soils.

An average of yields of about 10-20 tones per hectare is normally attained,30 tones in fertile soils

Qn: suggest the importance of growing perennial crops in an agriculture system.

1. The cost of establishing is spread over a number of gear hence can lower than that of annual.
2. Harvesting is continuous after establishment which reduces Labour.
3. They may be used as security in acquiring loans from the bank.
4. They increase value of land whenever planted.
5. The cost of controlling pest and disease is generally lower than that of annual.

Qn: state the limitations of perennial crop production

1. Require a lot of land to be grown because of their wide spacing.
2. Perennial take long time to mature therefore waste long which could have been used for short term profitable crop.
3. Some of the perennial require irrigation so a permanent water source may be necessary.

4. Some perennial crops do not have seeds and therefore must be vegetatively propagated which is a bit expensive.
5. The processing of these crops may have to be done on the farm reducing the land area that could be used for crops.
6. The average yield for most perennials is low.
7. Perennials are very difficult to improve because breeding programmes are at a long term nature and very expensive.

The perennials are also grouped into families e.g.

1. Rubiaceae - Coffee
2. Theacede - Tea
3. Sterculiaceae - Cocoa
4. Anacardiaceae - Cashew nut -- Mango
5. Agavaceae - Sisal
6. Graminae - Sugar cane
7. Rutaceae - Citrus fruits
8. Caricaceae - Papaw (*Carica papaya*)
9. Musaceae - Banana
10. Bromeliaceae. - Ananas comosus (pineapple)

COFFEE

It belongs to the family rudiaceae.Mainly Arabica coffee (highlands) and Robusta coffee (lowlands)

Importance of coffee

- It is a non alcoholic beverage crop/contains caffeine
- Coffee husks are used as litter in the deep litter system of poultry keeping
- It is used to manufacture explosives/ammunitions

Plant characteristics

- It is a woody plant
- It has a tap root system and a dense network of feeder roots within the top soil
- The shoot grows horizontally and vertically
- Branches(primaries/laterals) arise in pairs from the nodes on the trunk
- White flowers are produced in clusters at the nodes on all branches
- Flowering usually occurs in a flush and is stimulated by the onset of rains after a dry spell
- Arabica coffee is mainly self pollinated and a fruit is formed that ripen within 8-9 weeks

Growth requirements

- Rainfall: requires evenly distributed rainfall throughout the year within the range of 1500-2250mm
- A dry spell of 2-3 months is needed to stimulate flowering
- Temperature and altitude: Arabica (1300-2300m) where temperatures are cool. Robusta at(1200-1500) where temperatures are warmer. At low altitude, Arabica coffee is attacked by coffee is attacked by coffee leaf rust disease
- Soils: deep fertile and well drained volcanic soils

- PH of 4.2-6.2

Qn: <u>Describe the agronomic practices of growing coffee from nursery to harvesting</u>

1. Choose a suitable site with a good depth, well drained fertile soil and away from any shade.
2. Plough the area to a depth of 0.6m to a fine tilth i.e. deep ploughing
3. Remove all plants roots, stones, weeds and break all big clods then level the soil using a rake.
4. Incorporate manure i.e. compost manure or SSP.
5. Sow/ plant seeds at a depth of 2.5m in a nursery bed at a spacing of 15cm by 15cm or 20cm x 20xm.
6. Mulch and water thoroughly using watering can, mulches are removed immediately after germination.
7. Erect a shade to last at least for one month.
8. water regularly nursery life last for 1 ½ year
9. weeding, thinning, pricking out should be done to avoid competition
10. control pest and disease
11. Hardening of the seedling before transplanting this is done by reducing water interval, reducing the shade.
12. Only healthy, strong seedlings should be selected.
13. Watering of the nursery to soften the soil to ease transplanting and reduce root damage.
14. Transplanting should be done in the evening or in cool weather to reduce water from the seedlings.
15. Thorough preparation of the seedbed by removing all tree stamps and roots or any other vegetation at least two months before transplanting.
16. Dig a hole two months before transplanting at a spacing of 2.7m x 2.7m and 60cm deep and 60cm wide.
17. Fill the holes with a mixture of top soil and double supper phosphate or organic manure at least 2 -3 weeks before planting.
18. Top soil and sub soil should not be mixed but filled to holes separately
19. Transplant at the beginning of rain after 1 ½ year when the plant is ready to leave the garden.
20. Provide temporary shade to the transplanted plant (seedlings)
21. Mulch around the seedling
22. Continue watering until the plant has fully emerged.

<u>Examples of coffee diseases.</u>

1. **Coffee berry disease**.

It's caused by a fungus, which causes brown sunken spot on the berries making them difficult to pulp.

Dark irregular shaped necrotic lesions on leaves and branches

2. **Coffee rust**; it is caused by a fungus

Symptoms

- Orange yellow lesions(spots) on the underside of the leaves
- Leaves drop pre maturely

Control

- Spray with fungicides
- Pruning
- Planting resistant varieties

The above pest can be controlled by spraying with dieldrin.

Pests of coffee

1. **Antestia bugs**;
   - This suck berries and cause zebra strips, they also feed on terminal bud and causes pan braking.
   - Feed on berries, flower buds and growing points
   - Blackening of buds
   - Beans drop off immaturely
   - Rotten beans in mature berries

2. **Coffee berry borers**; These make round holes near the apex of green and or ripe berries

Other pests include:-

- Mealy bugs
- Coffee thrips
- Lace bugs
- Scale insect.

Control is by spraying with parathion and open pruning

Qn: What are the advantages of pruning coffee.

1. It increases quality of berries by controlling over bearing.

2. Make harvesting easier.
3. destroys micro-climate for certain pest and disease by reducing over crowding
4. making weeding and spraying easier
5. It increases the yields.
6. keeps plants health and more vigorous
7. Facilitates the use of the available nutrients by the desired parts of the plant
8. Increases free circulation of air