

 **DEPARTMENT OF AGRICULTURE AND ENVIRONMENTAL STUDIES**

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**CROP PRODUCTION (NOTES)**

**TOPIC 1: INTRODUCTION TO CROP PRODUCTION/AGRICULTURE**

**Agriculture** means cultivation of the land for the purpose of producing crops and management of livestock.

-It also involves the storage, processing and marketing of agricultural products.

- There are some disciplines that are directly or indirectly allied (related) to agriculture.

- Entomology (insects pests)

- Pathology (diseases)

- Agricultural engineering

- Agriculture economics

- Soil science etc

**ROLES OF AGRICULTURE**

a) **Provision of food –** A well fed nation is a healthy one. Agriculture therefore provides virtually all the food required to feed the population except in prolonged drought.

b) **Provision of employment**. Agriculture provides employment directly e.g. workers in ranches, coffee, tea, sisal estates, and on small farms.

In Kenya Agriculture and Agriculture related sectors employ large number of people e.g. food processing industries e.g. Kenya canners, textile manufacturing industries, mean canning, grains, milk et.c.

We also have field extension workers, scientist, Transporters, traders e.t.c.

c) **Foreign exchange earning.** The greatest percentage of exports from East Africa consists of Agricultural commodities. The foreign exchange earnings is important for the purchasing of other goods e.g. machines like tractors, fertilizers, oil from foreign countries.

d) **Revenue generation for the country** Agriculture earns the government much of its revenue from taxes imposed on the sale and exports of Agricultural products.

- This revenue can be used by the government to provide such services as medical services, schools, roads etc. for the public

e) **Provide raw materials for industries** Most Agriculture products needs some processing before they are eventually utilized e.g. cotton, sisal coffee, tea hides etc

**PROBLEMS FACING AGRICULTURE**

1. **Poor crop animal husbandry** – Due to low level of education the conservative farmers do not practice the recommended husbandly practices. They thus plant late, fail to control pests, plant poor seeds and as a result yields obtained are very low compared to the yield obtained in developed countries.

2. **Poor marketing facilities**- Sometimes the transport system is inefficient or unavailable thereby leading to spoilage of produce due to delay in delivery to the market. Some times the middlemen involved in marketing of the farmers produce take too large profit. As a result the farmer receives too low prices for his produce hence he has no incentive to produce more.

3. **Lack of capital-**Every farmer requires capital to invest in the development of his farming e.g. installment of piped water in the farm, buying fencing materials, fertilizers etc.

Mostly farmers obtain capital or loans. Source of these loans include Commercial bank or AFC which is a government credit agent.

Security is required for one to get a loan and mast farmers don’t have security hence the level of investment in their farms is low.

4. **Psychological and sociological factors:** poor Attitude towards Agriculture as an occupation has seen many people migrate in urban areas in search of white color jobs leaving behind the old and the less educated to attend to the land.

5. **Poor tools** – In most rural areas the farmers still use the traditional hand tools e.g. fork, pangas etc which are rather inefficient consequently critical operation such as seedbed operation and planting are often completed late and the quality of the same is poor. This leads to low yields and poor income to the farmer.

6. **Pest and disease:** The tropical climate in Central Africa encourages a wide range of pests and disease.

- The pests and diseases multiply much more rapidly here than in the cooler temperature countries hence farming is a constant battle between the farmer and the pest and diseases.

7. **Fluctuations of commodity prices:** Due to the change in supply and demand prices of most Agricultural products keep on changing from time to time with the unsettling effects on farming.

8. **Aridity:** - Large trucks of land receive very little rainfall per annum and are therefore either marginal for economical farming or are semi-deserts.

9. **Land tenure:** This is the state of ownership of land and conditions governing that ownership. The land tenure problem facing East Africa is that most of the land is owned either by a community or by a clan and therefore an individual has no real incentive to look after such land.

10. **Poor storage: -** Thi**s** is a common problem amongst small scale farmers. Much spoilage is experienced via pest damage which results to considerable waste.

**SOLUTION TO IMPROVE AGRICULTURE**

**1. Adoption of irrigated agriculture:** Rather than depending on rain this will help overcome the problem of aridity hence boast agriculture even in marginal areas.

**2. Diseases and pest control measures:** If pests and diseases are keenly controlled the yields lost through attack by pest and diseases can be recovered and overall output increased.

**3. Implementation of new technology:** Moving from the old ways of farming practices to modern technology can highly boast the yields e.g. green house farming.

**4. Crop rotation: This** is an important crop husbandry practice since it can minimize build up of disease and pest of a given farm. Nutrients are also optimally utilized without extremely depleting the soil of particular nutrients.

**5. Investment in Agricultural Research:** - Research can be done to come up with crop varieties that are resistant to particular pests and diseases.

**6. Farmers trainings/Agriculture education and extension to farmers:** – farmers can be trained on matters of importance

**7. Good land policies/land tenure system:** – Systems that can motivate or encourage land construction measures as well as soil and water conservation are important e.g. individual owner operation system.

**8. Establishment of marketing agencies: –** Which are to research for good market and commodity prices.

**9. Timeliness of activities: -** Avoid late planting, late weeding and late harvesting as these can adversely affect crop output.

**TOPIC 2: FARMING SYSTEMS**

 **-** Refers to the decision and function that farmers make to utilize land in raising crops and livestock to produce food and other necessities not only for themselves but for the country as a whole.

**DECISION FARMER MUST MAKE IN ADOPTING A FARMING SYSTEM**

1. What to produce among the many alternatives available e.g. grow crops, keep livestock or grow both crops and keep livestock.

2. What method to be used e.g. settled, shifting/nomadic mechanized, intensive or extensive. A pastoralist may be settled or nomadic while the Arable farming may be mechanized or use traditional tools.

3. What will be the scale of operation e.g. may be small or largescale?

**A. Shifting Cultivation**

– This is a method of raising crops by pioneer farmers in large scarcely populated area. Here the farmer can occupy any piece of land without causing any undue land shortage to his neighbours

- The farmers rarely need to manure his farm because land which has been formerly under forest is usually fertile.

- When there is a sign of soil exhaustion indicated by a drop in yields the farmers shifts to another area to develop a new farm.

- The previous land is left fallow for some time and returns to bush that may be cleared several years later.

- As the population increases the farmers finds no option of new land to cultivate.

- In such case the farmer claims all the plots he uses though not simultaneously.

- The land which is resting is said to be fallow and remains so only for a few seasons.

**Advantages of shifting cultivation**

a) The farmer does not incur cost of maintaining land fertility.

b) Cropping is always done on a fertile ground.

c) Land deterioration is rare.

**Disadvantages of shifting cultivation**

a) The farmer has no permanent settlement

b) Production is normally on a very small scale.

c) Only practicable where the population is very low

**B. PASTROLISM AND NOMADISM**

**Pastoralism-** Involves raring of livestock by the pastoral community without growing of crops.

**Nomadism** Is the leading of unsettled way of life.

**Nomadic pastrolism** is therefore a term used to describe livestock keeping communities who move from place to place looking for pastures and water for their cattle, sheep, goats etc.

- These people occupy the drier parts of the country and depend mainly on the products of their livestock for food, clothing and shelter.

- Nomadic pastoralists are subsistence farmers in that although they may have large herds the level of production is very low. This is due to poor pastures, drought, poor breeding poor parasite control, and land deterioration due to over stocking.

- Where water sources, schools hospitals, administration centers and other necessities have been installed this farmers may form co-operative ranches and become settled farmers.

- This has been encouraged by the government in recent years. In this way the advisory services can reach the farmer more easily and livestock improvement is possible.

**C. ARABLE FARMING AND PLANTATION**

(a) **Arable farming: -** is the growing of crops where farmers may practice **Monocropping (monoculture)** in which they specialized in production of only one crop or **mixedcropping** where more than one crop is produced.

- Mixedcropping involves diversifying production and is preferred by some formers to specialization as a way of reducing risks where some crops may be more susceptible to severe ecological factors than others.

(b) **Plantation** - involve large scale farmers growing cash crops e.g. tea, coffee etc.

The plantation may have processing factories for the crop on the same farm e.g. tea estates or low fibre processing.

**D. MIXED FARMING**

**-**Involves growing crops and keeping livestock on the same farm. This farming system is common in high potential areas.

**NB: I**f a farmer grows fodder e.g. Napier grass, Lucerne or maize for livestock feed he is a livestock farmer and not a mixed farmer.

**Advantages**

a) Mutual benefit between crops and animals i.e. crops supply feed to animals while animals supply manure to crops.

b) Insurance against total lose by the farmer since if one enterprise fails the farmer will benefit from the other.

c) Proper utilization of labour throughout the year.

d) Better soil conservation

e) Permits all-round the year harvesting

**Disadvantages**

(a) High initial capital investment

(b) Lack of specialization

(c) Requires high level of management skill for both enterprises

(d) Cannot be practicable where land is limited

(e) Only practiced in areas with high production potential.

**E. LIVESTOCK FARMING**

Livestock farming in East Africa is carried out in either of two system; subsistence system and commercial farming.

**Subsistence system**

-Under this method livestock keeping is a way of live and animals are kept to meet the basic needs of food and shelter.

-Management practices aimed at the survival of the animals.

**Commercial farming**

-The aim of this farming system is to produce animal products in sufficient quantities for sale locally and overseas market.

-Under commercial farming animals are kept in small or large well managed farm. In these farms there is considerable capital investment.

-As a result, yields are considerably high.

-The products are marketed through organization such as K.C.C., K.M.C. and the Upland Bacon Factory.

-There is also ranching and dairy farming.

-Ranching involves improved pastoral-nomadic system because movement is restricted.

**F. ORGANIC FARMING**

-This involves farming without use of Agro Chemicals i.e. crops grown in a natural environment.

-This method of farming is environment friendly and products do not have any inorganic residue.

-Naturally occurring materials e.g. medicinal plants are used instead of chemicals.

-Organic manure is used to replenish soil nutrients.

-Soil structure is improved and soil water infiltration as well as aeration is enhanced.

-These farming also provide food for soil microbes which help is releasing minerals for crop nutrition.

-Mulching can also be done using organic material.

-Crop rotation is also used to enhance organic farming.

**Advantages**

a) It is cheap and cost effective

b) Makes use of locally available materials

c) Helps soil structure.

d) No environmental pollution

e) Enhances H20 retention by the soil

**Disadvantages**

a) Low overall output.

b) Control of pests and disease is not easy. Since there is no use of Agrochemical.

c) It is laborious

**G. EXTENSIVE FARMING SYSTEM**

-Is a system that requires large tracts of land, low capital investment and low labour per unit area

-It is characterized by low yield per unit area.

**H. INTENSIVE SYSTEM**

-It is a system that requires high capital and high labour investment per unit area

-It is characterized by high yield per unit area

-It is both extensive and intensive and can be large scale or small scale.

**i. Large Scale**

- Involves use of large tracts of land

-Requires heavy capital investment

-Skilled labour

-High level management

-Mostly carried out for commercial purposes

-Operation costs per unit of production are low because it makes use economy of scale.

**ii. Small Scale**

**-** Practiced in a small piece of land

-Productivity depends on land potentiality

-Production can be on subsistence or commercial scale

-Surplus can be sold for cash benefit

-No heavy capital investment

**I. CROP ROTATION**

-This is the growing of different crops on the same field in an ordered sequence.

-In this practice the field is demarcated into a number of units, the main objective being to make maximum use of the soil by growing a variety of crops with different growth habits and nutrient requirement.

**Guidelines to crop rotation**

1. Crops with high nutrients requirement should come first in a newly cultivated land.

2. Deep rooted crops should alternate with shallow rooted crops.

3. A grass break should be incorporated in the rotation in order to rebuild soil structure.

4. Crops which are easy to weed should alternate with crops which are not so easy to weed.

5. Crops having similar pests and diseases should not succeed one another during rotation.

**Advantages**

-There is maximum use of soil resources by growing plant with different growth habits.

-There is efficient control of pests by breaking the life cycle of the pests.

-Efficient disease control i.e. life cycle of disease organism is interrupted.

-Parasitic weeds such as striga species which are specific to cereals can be controlled by planting non cereal crops for a period of time.

-Nitrogen content of the soil may be enhanced by including a legume in the rotation

**TOPIC 3: PRINCIPLES OF CROP PRODUCTION**

**ECOLOGY**- This is the study of how both plants and animals live and interact with each other and the environment. This interaction benefits each entity in the relationship. Plant ecology involves the interaction of plants/ crops with the environment. Environmental factors such as water, nutrients, warmth, and light determine the growth and yielding of the plant.

**FACTORS INFLUENCING CROP PRODUCTION / AGRICULTURE**

**A. SOCIO–ECONOMIC FACTOR/HUMAN FACTORS:**

1. **Market force –** Supply and demand forces affect Agriculture in a free market economy. prices for goods are influenced by supply and demand forces.

- When supply is high, prices are low and demand subsequently increases.

**2. Cultural practices, taboos, religious beliefs**

This affects what people produce and consume, some pastoral communities rely on meat and milk while other communities rely on crop.

**3. Transport and communication**

- These allow agricultural products to move from production point to consumption point.

- All weather roads are necessary to avoid rotting of produce in farms since these affects their income.

- Road, railways and airways are important.

- Use of computers for communication has developed and these media helps access wider market.

**4. Level of education and technology**

- High level of education helps in hastening development in all farming activities e.g. use of improved methods, knowing why when or what should be done under certain conditions, accuracy of applying inputs and Assessing results. Generally decisions are made properly.

**5. Health HIV/AIDs**

- Some qualities such as Vigor, Strength, vision and determination are required for successful farming and can only be found in healthy people.

- increases in cases of HIV/AIDS have negative effects on Agriculture production

- As a result much government and NGO resources are channeled towards caring for the sick. Effect of HIV/AIDS in healthy Agriculture

 Shortage of farm labour

 Increasing the cost of living of patients and their relatives.

 Low food production and poverty in general has increased criminal activities

 Low living standards lead to despondency, helplessness and lack of motivation to invest in agriculture

 The government and NGO’s use a lot of time and resource in controlling the pandemic. This resource could be used in development of Agriculture.

**6. Government policy**

These are enactment of laws which govern production marketing and distribution.

**The government regulates the amount of imported good by**

(i) Heavy taxation of imports in order to protect local industries

(ii) Subsidizing the price of locally produced commodities

(iii) Quality control

(iv) Conservation of natural resources

(v) Stepping up the control of diseases of parasites that affect crop. Such regulations as quarantine, licensing of quality products and vaccination of animal against infectious and contagious diseases are followed wisely.

**7. Economy**

- Collapse of co-operative movement and factories have affected the sale of farm produce such as milk, sugar and cotton

- Rehabilitation of Kenyan and world trade has led to dumping of cheaply produced and cheaply imported goods that have flooded local market.

- This has forced prices of agricultural goods to drop resulting in low income for farmers.

**B. BIOTIC FACTORS**

- These are living organisms that affect Agricultural production

(i) **Pests** – Effects of pests. Pests feed on the whole or part of the plant.

These pests feed on leaves and reduce photosynthetic surface which further lowers quantity and quality of produce.

They transmit crop disease

Some pest injure the plant parts which they feed on and expose the plant to secondary infection Pests increase the cost of producing crops in terms of money used in their control.

**(ii) Parasites**

- Parasites leaving on plants are plant parasites. Those living inside animals are endo- parasites e.g. round worms, tape warms etc. they absorb food substances from the digestive track of the animal

- Those leaving on the animal are called ecto-parasites. They suck blood from the animal cause irritation by biting on their skin.

**(iii) Decomposers**

- Are very important and they include large and small (micro) organisms which decompose organic remains from animals and plants hence producing nutrients.

**(iv) Pathogens**

Are microorganisms that transmit diseases. These can cause death. They also reduce both quality and quantity of agricultural products. They include Bacteria, viruses and fungi.

(v) **Predators** An animal that kills and feed on the animals. Those that feed on pest are beneficial to farmers as they reduce pest population.

(vi) **Pollinators –** Can be insects or birds. They transfer pollen grain from the stamen to the pistil of the flower causing cross pollination e.g. bee.

- Cross pollination helps in production of new and improved varieties of crops for the future generation.

**(vii) Nitrogen fixing bacteria**

- Useful in leguminous plants. They are found in nodules of the roots. They covert nitrogen from the air into nitrates. When these bacteria die, they release nitrates to the soil which helps other plants in the next season

**(viii) Weeds**

They compete with the crop plants for moisture, nutrients space, sunlight etc. They can also act as alternate host of disease-causing microorganism, vectors and also pests.

**C. CLIMATIC FACTORS**

**Weather** is the atmospheric condition of a place over a given short period of time **Climate is** weather condition observed and recorded for a long period e.g. 30 – 40 years.

**1. Rainfall:**

- Is the main source of water required by all life processes.

- It must be adequate to sustain both animal and plant life.

**Aspects of rainfall important in Agriculture**

**1. Rainfall reliability**

- Depending on meteorological timing of the onset of rainfall. I.e. long rains begin around March- April of every year and continue for around 3 months.

- Short rains begin in October to November.

- Reliability determines the time for land preparation and planting.

- When rains fail to follow this expected patterns massive crop failure occur and sometimes domestic animals die due to lack of food and water.

**ii. Rainfall quantity**

- This is the amount of rain that falls in a given area within a given year measured in mm

- It determines the type of crop to be grown and the type of livestock to be reared in an area.

iii. **Rainfall** **distribution**

- Is the number of wet months in a year.

- It influences the choice of crop varieties growing in a given area.

**iv. Rainfall intensity**

- this is the amount of rain that falls in an area with a period of one hour and is measured in mm/hour

- High rainfall intensity damage crops and causes soil erosion. It may also lead to destruction of soil structures.

**2. Temperature**

- This is the degree of hotness or coldness of a place measured in (C0)

**i. Cardinal temperature**

-Is the temperature in which plants grow and thrive well.

**ii. Optimum Temperature**

Is temperature which has a narrow range within the cardinal range which allows the plant to thrive best and produce well.

Effects of temperature on crop production

**Low Temperature**

 Slow growth rate of crop as the process of photosynthesis is slowed.

 Increases incidences of disease infection to crop e.g. C.B.D. in coffee.

 Quality of crops such as tea and pyrethrum improves with lowering of temperatures.

**High temperatures**

-Increases evaporation leading to wilting of crops

Increases the rate of growth and hastens the maturity of crop Improves the quality of crops such as Pineapples and oranges Increases incidences of plant pests and diseases e.g. Aphids, Leaf rust.

 Wind

**Effects of Strong Wind on Agriculture**

o Increases evaporation leading to wilting of crops.

o Causing lodging of crops and damage to plants.

o Acting as an agent of soil erosion

o Blowing away or bring rain bearing clouds.

o Increasing the rate of evapotranspiration.

o Destroying farm structures

o Areas with high humidity tend to be hotter but when wind takes away atmospheric water a cooling effect occurs.

**4. Relative Humidity**

- Is the amount of water vapor held by air at a given temperature compared to what it would held when saturated.

- It affects the rate of evaporation and transpiration.

- At high relative humidity the rate of evapotranspiration is low.

**5. Light**

- It provides the energy required for photosynthesis.

**Aspects of light important to crop growth**

**1. Light intensity**

-Is the strength with which the light is harnessed by chloroplasts for the purpose of photosynthesis.

-The amount of light harnessed can be increased by pruning, thinning, weeding or wider spacing.

**2. Light duration**

- is the period during which light is available to plants per day.

- Plant varieties can be classified as long, short, or day neutral depending on the hours of light required for proper growth.

**Short day plants** – Require less than 12 hours of day light e.g. tobacco, rice, soya beans e.t.c.

**Long day plants** – Require more than 12 hours of day light e.g wheat varieties.

**Day neutral plants -** Require 12 hours of day light e.g. coffee, maize beans e.t.c.

**3. Light Wave length**

- Chlorophyll absorbs certain wave lengths of light which are not present in artificial light unless in case of U.v. or infra- red rays.

- This makes natural light more suitable for plant growth than artificial light.

**D. EDAPHIC FACTORS OR SOIL FACTORS**

 Soil formation

 Soil profile

 Soil structure

 Soil texture

 Soil constituent

**ECOLOGICAL ZONES**

**(1) TROPICAL ALPHINE**

(c) Found at the pick of high mountains e.g. Mt Kenya my Elgon etc.

(d) Found at an altitude of 3000m above sea level.

(e) Temperatures are low or below 10oc

(f) Has moorland vegetation i.e. short grass and no trees

(g) Have two sub-zones.

Tropical Alpine (I) TA1 and TA2

**Tropical alpine (1) (TA1)**

-Natural pasture utilized by cattle is found.

-The area is alienated with game parks.

-Soil erosion in experienced e.g. Areas near Mount Kenya.

**Tropical alpine (2) TA2**

-Annual rainfall is lower than in TA1 and drier than TA1.

- soil erosion is experienced

-Good for wood production

-Livestock pasture found here

-Good for crop production

**(2) UPPER HIGH LAND ZONES (UH)**

- Altitude falls at 2200 – 3000m above sea level.

-Temperature range is between 10 – 170C

-Frost is experience

-Subdivided into four major sub-zones

**UH1**

Good for keeping sheep, goat and dairy farming. Pastures are available there is negligible dry season. e.g. upper parts of Nyandarua and Nyahururu.

**UH2**

-Pyrethrum and wheat zone

-No enough rainfall e.g. upper parts of Timau

-Temperatures are not optimum.

**UH3**

- Wheat, berry zone

-Low production of pyrethrum

**UH4**

-Ranching zone

-Rain can’t support dairy farming e.g. Laikipia

**Lower Highland**

-Relatively wide area compared to UH

-Altitude of 1500 – 1800m above sea level

-Has five (5) Sub-zones

**(1) Lower highland one (LH1)**

-Good pastures for livestock

-Suitable for mixed enterprises

-Cool and humid areas

-Dominated by tea production e.g. Kericho

**Lower high land (LH2)**

-Wheat, maize, pyrethrum zone

-Small scale maize production

-Climate is cool e.g. Bomet

**Lower highland (LH3)**

-Wheat zone – maize is not very suitable.

-Sometimes we have crop failure due to drought e.g. Mweiga/Timau

**Lower highland (LH4)**

-Cattle and berry zone

-Drought escaping plants are grown

**Lower Highland (LH5)**

-Low Rainfall

-Not suitable for crop production

-Low grazing intensity

-E.g. Samburu

**Upper Mid-land (UM)**

-1300 – 1900m Above sea level.

- Temp 13 – 210C

-Supports coffee livestock keeping

-Have 5 sub-zones.

**Upper mid-land 1(UM1)**

-Tea, Coffee zone

-Mixed farming can be practiced

-Thin and transitional e.g. Kiambu and Nyeri

**Upper mid-land 2 (UM2)**

-Coffee zone

-Dairy and zero grazing is practiced

-Food crops grown e.g. maize, cabbages and tomatoes

**Upper mid-land 3(UM3)**

**-** Marginal coffee zone

-Established pastures for livestock

-Coffee grown under irrigation. Drought escaping crop can be grown e.g. Makuyu, Mbeere and Tigania

-Irrigation is necessary for this region.

**Upper mid-land 4(UM4)**

-Sunflower zone

-Rainfall is insufficient thus drought resistant crops are grown.

**Upper mid-land 5 (UM5)**

-Millet is grown

-Livestock and sorghum zones

**Lower –mid lands (LM)**

-Altitude 800-1300m above sea level

-Average temp 240C e.g. Western Kenya

-Has six sub-zones.

**Lower mid-land (LM 1)**

-Sugar cane zone

-High and reliable rainfall. E.g. South Nyanza

-Maize can also do well

**Lower mid-land (LM 2)**

-Marginal sugar cane zone

-Maize and tomatoes do well e.g. Miwani in Mohoroni

**Lower mid-land (LM 3)**

-Cotton zone

-Maize planted depending on the type of soil.

**Lower mid-land (LM 4)**

-Marginal cotton zone

-Maize growing is also practiced.

-The place is warm and very transitional e.g. lake Victoria Mbita.

**Lower mid-land (LM 5)**

-Livestock/Millet zone

-Sorghum sisal pigeon peas and cow peas are also grown.

-Low stocking rates e.g Lusinga island in Lake Victoria.

**Lower mid-land (LM 6)**

-Ranching zone warm and semi-arid

-Unreliable rainfall

-Lower parts of Tigania

**Lowlands (LL)**

-Found in coastal areas

-Altitude 0 – 1800m above sea level.

-Has seven sub-zones.

**Low land 1(LL 1)**

-Does not exist in Kenya

**Low land 2(LL 2)**

-Sugar cane zone cassava, maize, coconuts and citrus fruits are grown. Hot humid area e.g. Mombasa town and Kilifi

**Low land 3(LL 3)**

-Coconut and cassava zone e.g. Kilifi and Kaloleni

**Low land 4(LL 4)**

Cashew Nut, cassava zone. Cotton also grown but not well spread.

-Composite varieties of Maize “Katumani”

**Low land 5 (LL 5)**

-Livestock, millet zone

Cow peas, green grams and sisal e.g. Magarini Central scheme in Lamu

**Low land 6(LL 6)**

-Ranching zone, hot and semiarid, no crop exists. rainfall unpredictable.

**Low land 7 (LL 7)**

-Nomadism zone e.g. Eastern Kenya except Marsabit

-60% meat comes from the area

-Hot and arid areas