

## S.2 AGRICULTURE

### 2.0 LAND RECLAMATION

#### 2.1 Definition

Land reclamation refers to the practices used to regain or bring back wastelands into agricultural production.

##### 2.1.1 Examples of wastelands

- ✓ **Swamps.** These are waterlogged areas.
- ✓ **Forests.** Too many trees which make growing crops more difficult.
- ✓ **Deserts.** Water is limiting, i.e. there isn't enough rainfall for agriculture.
- ✓ **Tsetse infested areas.** This makes human settlement and livestock kept.
- ✓ **Bushes.** Thick vegetation makes farming difficult.

#### 2.2 METHODS OF RECLAIMING LAND

- ✓ **Draining.** This is used to reclaim swampy areas. Ditches are dug to lead away excess water from the land. Draining lowers the water table, increases aeration in soil which makes soil suitable for crops, e.g. horticultural crops.
- ✓ **Deforestation.** This involves clearing of forests (excess trees) to create more land for agricultural activities, especially crop growing and rearing of livestock. Deforestation can be achieved mechanically, by burning or use of chemicals called Arboricides (e.g. Tordon 155 and 2, 4, 5 Butylester).
- ✓ **Afforestation.** This is planting of trees where they never existed or grew before. Afforestation is encouraged on hills and mountain slopes to control soil erosion. Common trees recommended are Pines and Cypress.
- ✓ **Irrigation.** Involves artificial provision of water for crop use. Irrigation can be used to reclaim dry areas, e.g. deserts and semi-deserts. It can also be used to improve water supply to crops in any area receiving unreliable rainfall.
- ✓ **Terracing.** Terraces are step-like structures made on hills or mountain slopes. Terracing helps to conserve soil and water. In Uganda, terracing is practiced in Kabale district, in Mount Elgon area, and by the Tepeth in Moroto district.
- ✓ **Land clearing.** To remove excess vegetation, e.g. controlled burning.

## 2.3 LAND CLEARING

This is the process of recovering bush land for use in agriculture.

### 2.3.1 Objectives of land clearing

- ✓ To increase the amount of land available for crop production
- ✓ To allow use of machines for cultivation
- ✓ To get rid of harmful pests and parasites that affect livestock, crops and humans, e.g. tsetse flies, ticks, etc.

### 2.3.2 Methods of clearing land

- ✓ **Hand method.** This involves use of hand tools, e.g. slashers, pangas, etc. It is commonly used by peasants however, it is a slow method.
- ✓ **Mechanical method.** This involves the use of machines, e.g. motorized saws, bulldozers, etc. It is a fast method but expensive.
- ✓ **Use of chemicals** (herbicides). Chemicals may be used to clear land, e.g. Aboricides which kill trees and herbicides which kill weeds.
- ✓ **Controlled bush burning.** This is recommended in steep areas, and rocky and stony areas which are difficult to access or reach.

#### Advantages of burning

- It is quick and cheap.
- The resultant ash is a source of nutrients for plants.
- Helps control some crop and livestock pests or parasites, e.g. liverflukes and ticks.

#### Disadvantages of burning

- Fire can kill wildlife and affect the ecosystem.
  - It exposes soil to agents of soil erosion.
  - If not controlled, may affect neighborhoods and cause serious damage.
  - It leads to destruction of organic matter which in turn affects soil structure.
- ✓ **Explosives.** Explosives may be used to clear boulders and big stones which may damage mechanical equipment. Explosives have to be carefully used because they can be very dangerous to people and animals.

## **2.4 IRRIGATION**

Irrigation is an artificial method of providing water to crops to facilitate growth. Irrigation is suitable for arid, semi-arid areas and areas where rainfall is inadequate or unreliable.

### **2.4.1 Examples of irrigation schemes in Uganda**

- ✓ Kakira Sugar plantation-sprinkler or rain-gun irrigation and furrow irrigation.
- ✓ Kibimba rice scheme-flood irrigation/flooding.
- ✓ Mubuku settlement irrigation scheme- furrow irrigation, etc.

### **2.4.2 Factors that determine the type of irrigation method to use**

- ✓ Topography of land
- ✓ Soil type
- ✓ Availability of water
- ✓ Initial and maintenance costs (Capital outlay)
- ✓ Type of crop
- ✓ Economic viability of the crop
- ✓ Labour availability

### **2.4.3 Methods of irrigation**

There are three methods of irrigating land, i.e.

- ✓ Surface irrigation.
- ✓ Sprinkler (Overhead) irrigation.
- ✓ Drip (Trickle) irrigation.

#### **2.4.3.1 Surface irrigation**

This is the application of irrigation water over the surface of land. Several sub-types of irrigation are included under this method, e.g.

##### **Flood irrigation (Flooding).**

This is where is applied by flooding. It is applicable where irrigation water is abundant and the land is flat or gently sloping. Water is led to the field via a canal. However, it is disadvantageous in that it is wasteful in terms of water, may encourage soil erosion and may lead to leaching of soil nutrients.

## **Furrow irrigation**

In this method, furrows (ditches) are constructed along the contours or across slopes. Water is pumped or diverted to these ditches from where it flows gently to crops by gravity. It is suited to gently sloping soils.

### **Advantages**

- ✓ No levelling of land required.

### **Disadvantages**

- ✓ Sometimes salts tend to accumulate in the furrows.
- ✓ Crops farther away from the furrows may not receive enough water.

## **Basin irrigation**

Basin-like structures are constructed around one, two or three crops, e.g. citrus trees and water is supplied to these basins via furrows. Labour costs are low and not much water is used since more than one tree is irrigated at a go.

### **2.4.3.2 Sprinkler (overhead) irrigation.**

Water is sprayed over crops in form of rainfall. Water passes through pipes and is forced out via nozzles at high pressure to the air where it falls back as small rain-like droplets.

### **Advantages**

- ✓ Levelling of land is not necessary.
- ✓ Fertilizers and herbicides can be mixed with water and applied uniformly.
- ✓ Much water infiltrates into the soil and is absorbed by crop roots.
- ✓ Soil erosion is minimized.
- ✓ No special skill is required to operate the system.

### **Disadvantages**

- ✓ Under windy conditions, application of water may be uneven.
- ✓ It is expensive to acquire or install the system.
- ✓ Water droplets may have a hardening effect on soil.
- ✓ It is expensive in terms of labour to move and join the pipes.

### **2.4.3.3 Drip (trickle) irrigation**

Water is supplied to each row of crops through polythene pipes which have nozzles at specific intervals through which water drips to crops.

#### **Advantages**

- ✓ Water is delivered near the root zone enabling crops to get enough water.
- ✓ Controls weeds in the inter-rows since water is not applied throughout.
- ✓ Suitable for areas with severe water shortage, e.g. desert areas.

#### **Disadvantage**

- ✓ Expensive to acquire the pipes and piped water.

## **2.5 DRAINAGE**

Drainage is the removal of excess water from an area. It is a method used to reclaim waterlogged areas, e.g. swamps.

### **2.5.1 Benefits of draining land (Why drain land?)**

- ✓ To improve soil aeration, i.e. improve supply of air in the soil.
- ✓ To raise the soil temperature (to make soil warmer).
- ✓ It makes soil easier to cultivate or work on. Wet soil is heavier.
- ✓ Helps control some parasites, e.g. liverflukes in livestock and mosquitoes that transmit malaria causing organisms.
- ✓ Lowers the water table facilitating growth of crops that do not tolerate waterlogged conditions.
- ✓ Eases use of machines (e.g. tractors) on land. They rarely get stuck.
- ✓ Provide a suitable environment for root growth. Lack of oxygen leads to club-shaped roots in plants.

### **2.5.2 Methods of draining land**

These include:-

- ✓ Surface drainage
- ✓ Sub-surface drainage
- ✓ Sub-soiling
- ✓ Use of deep rooting plants

### **2.5.2.1 Surface drainage (Open ditch drainage)**

This is a method of removing excess water from the soil surface by use of open drains or ditches. They are commonly used to remove excess water from low lying areas which are flooded during the rainy season.

#### **Advantages**

- ✓ Open ditches are relatively cheap to construct.
- ✓ Any blockages in the drains are easily seen and put right.

#### **Disadvantages**

- ✓ Open ditches are prone to silting or gully erosion.
- ✓ Drains interfere with movement of machines (mechanical tillage).
- ✓ They are expensive to maintain.
- ✓ Ditches occupy land that could have been used for crop growing.

### **2.5.2.2 Sub-surface drainage (Underground drainage)**

This involves removal of excess water from waterlogged areas by use of underground drains. The drainage system is placed below the soil surface.

#### **Advantages**

- ✓ It leaves the soil surface free from obstacles.
- ✓ Does not affect movement of machines (mechanical tillage).
- ✓ Does not encourage gully erosion.

#### **Disadvantages**

- ✓ May lead to leaching of nutrients especially in areas of heavy rainfall.
- ✓ Expensive to construct and require skill to install.
- ✓ Can be blocked by roots of perennial crops or damaged by tillage machines if poorly constructed and laid.

### **2.5.2.3 Sub soiling**

This involves loosening up of the impervious sub-surface layer of the soil, called hard pan. This impervious layer may be caused by prolonged waterlogging or repeated tractor use on wet soil. It affects soil aeration, water movement and root penetration. A sub soiler is used to break the hard pan. A sub soiler is a heavy cultivator with one or two tines (spikes) which is able to break the hard sub-surface soil layer.

#### **2.5.2.4 Use of deep rooting plants**

Planting deep rooting plants helps in draining land as their roots help suck and dry out excess water from the waterlogged land. Plant roots can also penetrate the impervious sub soil leading to easy movement of water and air through the soil. Eucalyptus is a common crop used for this purpose.

#### **CHECK YOURSELF**

1. Explain the various methods used to reclaim land.
2. What is irrigation and why should we practice irrigation?
3. Give five types of irrigation schemes in Uganda.
4. Outline the factors that determine the method of irrigation adopted.
5. What are the three broad methods of irrigation?
6. What is drainage?
7. Why is it necessary to drain land?
8. Explain the various methods that can be used to drain land.

### 3.0 SEEDBED PREPARATION

A seedbed is a well prepared piece of land ready to receive seed or other planting material, facilitate its germination and subsequent growth. Seedbed preparation is also known as tillage.

#### 3.1 Objectives of seedbed preparation (Why prepare seedbeds?)

- ✓ To kill weeds by burying them or exposing their roots to be dried by the sun.
- ✓ To bury crop residues from previous crops.
- ✓ To add organic matter (OM) to the soil from the decomposing plant remains.
- ✓ To increase water infiltration by loosening the soil.
- ✓ To improve soil aeration by loosening up the soil.
- ✓ To break the hard pan (plough pan) which may be impervious to water.
- ✓ To control some crop pests and disease causing organisms.
- ✓ To ease planting, germination and subsequent growth of crops.
- ✓ Facilitate root penetration and development of an extensive root system.
- ✓ Facilitate development of underground storage organs in some crops, e.g. cassava, yams, groundnuts, etc.

#### 3.2 Disadvantages of tillage

- ✓ Exposes soil to agents of soil erosion.
- ✓ Excessive cultivation destroys the soil structure.
- ✓ Moisture loss due to evaporation is increased on cultivated land.
- ✓ Buried weed seeds may be brought to the surface and may germinate before or together with the crop.

#### 3.3 Types of seedbed preparation operations

- ✓ **Primary seedbed operations.** These are usually the first to be done and involve use of heavier implements such as disc ploughs and mouldboard ploughs. They include land clearing and initial ploughing.
- ✓ **Secondary seedbed operations.** These follow the primary operations and include harrowing, ridging and weeding. It is faster and less demanding than primary operations.

Note: The number of seedbed operations required depends on:-

- ✓ The initial condition of the land, e.g. land which is fairly weed free requires fewer cultivations to produce a good seedbed compared with bushy land.

- ✓ The type of seed/planting material to be used. Small seeds, e.g. vegetable and millet seeds require finer seedbeds compared to cassava, maize, etc.

### **3.4 Methods of preparing seedbeds**

- ✓ Hand method
- ✓ Mechanical method
- ✓ Ox-cultivation

#### **3.4.1 Hand method**

This involves the use of hand tools, e.g. hand hoes, forked hoes, cutlasses (pangas), axes, pick axes, rakes, hand forks, etc. *(Give the use(s) of each of these tools).*

##### **Disadvantages**

- ✓ Slow.
- ✓ Not suitable for large scale farming.
- ✓ Not suitable for hard soils/dry season cultivation.
- ✓ Seedbed preparation tends to be late (lack of timeliness).
- ✓ Cannot dig deep, i.e. hand tools cannot penetrate deep.
- ✓ Requires a lot of human energy/tedious

#### **3.4.2 Mechanical method**

This involves use of tractor mounted or trailed implements. For efficient use of machinery in seedbed preparation the following are important:-

- ✓ The timing of operations
- ✓ The choice of correct implement
- ✓ Correct setting of implement

##### **Advantages of mechanical seedbed preparation**

- ✓ Quick rate of work
- ✓ Better burying of weeds
- ✓ Less laborious
- ✓ Machinery can efficiently cope with difficult soil conditions
- ✓ Timeliness of farm activities is achieved, i.e. (land preparation, planting, etc.).

This leads to high yields.

##### **Disadvantages of mechanical land preparation**

- ✓ Machinery is costly to buy (expensive)
- ✓ Maintenance of machinery is costly
- ✓ Skill is needed to operate machines efficiently

### 3.4.3 Ox cultivation

Farm animals are an important source of farm power. Common animals used include oxen, bulls, donkeys, etc.

Animals can do the following farm jobs

- ✓ Transportation (using ox-carts/donkey cart)
- ✓ Seedbed preparation
- ✓ Planting
- ✓ Weeding, etc.

#### **Advantages of using animals for seedbed preparation**

- ✓ Faster than hand method.
- ✓ Animal work output is greater than human output.
- ✓ Can be used on fairly hard soils.
- ✓ Suitable for use in fragmented land.
- ✓ Suitable for areas where animals are already kept, e.g. Teso, Lango, etc.
- ✓ Cheaper to acquire animals and their implements compared to tractor.
- ✓ Maintenance costs are lower than for a tractor (e.g. feeding, treatment).
- ✓ Doesn't need much technical skill as in operating a tractor.

#### **Disadvantages (limitations) of animals as a source of power**

- ✓ Slower than tractors.
- ✓ Animals tire quickly and cannot be used for as long.
- ✓ Can be attacked by animal diseases, especially tick-borne diseases.
- ✓ Cannot work well on steep or hilly areas.
- ✓ Not practicable where there are livestock pests and diseases, e.g. ticks.
- ✓ Their range of implements is restricted (small).
- ✓ Animals need fodder, therefore a farmer must spare some land for animals to graze. This becomes a problem where land is limited.
- ✓ Health of the animal determines their ability to work and amount of work.
- ✓ Animals may damage or eat crops while pulling implements if not well restrained.

### 3.5 Types of ploughs used in seedbed preparation

- ✓ The mouldboard plough. This is used by both animals and tractor.
- ✓ The disc plough. Only used on a tractor.

[You will draw the diagrams later during your practicals].

### **Advantages of mouldboard ploughs**

- ✓ Inverts or turns the furrow slice well therefore covers vegetation quite well.
- ✓ Produces a clean seedbed (field) in a single operation.
- ✓ Operates at a uniform depth.
- ✓ Can be used for inter-row weeding.

### **Disadvantages of using mouldboard ploughs**

- ✓ Cannot penetrate hard or dry soils.
- ✓ Sometimes can cause hard pans because of ploughing at constant depth.
- ✓ Cannot be used in areas with many obstacles, e.g. stumps, stones because they do not roll like disc ploughs.
- ✓ They are prone to damage easily because of their gliding action.
- ✓ Higher maintenance costs, i.e. there is constant replacement of parts such as bolts which becomes expensive.

### **Advantages of disc ploughs**

- ✓ Can roll over obstacles, therefore works where there are stumps, stones, etc.
- ✓ Can penetrate hard or dry soils that cannot be penetrated by the mouldboard.
- ✓ Has lower maintenance costs/fewer parts require replacement.
- ✓ Can work in areas with thick vegetation.
- ✓ Can work in heavy soils, e.g. clay soils.
- ✓ Requires less power to pull compared to mouldboard of the same weight.

### **Disadvantages of using a disc plough**

- ✓ Expensive to buy.
- ✓ Produce a rougher seedbed in one operation. This may require secondary tillage before planting most crops.
- ✓ Requires skilled personnel to operate.
- ✓ Poor inversion of the furrow slice/poor burying of weeds or vegetation.

### 3.5.1 Differences between Disc and Mouldboard ploughs

#### Disc plough

- The discs roll as they plough and can roll over obstacles, e.g. stumps, stones.
- Has poor inversion of furrow slice therefore does not cover trash properly.
- Gives rough seedbed that requires secondary tillage to make it ready for planting. (NB: This is good for erosion control).
- It is best suited to virgin land because of its rolling ability.
- Requires less power to pull compared to mouldboard of the same weight.
- The plough is less broken by obstacles since it rolls over them.
- It can plough in areas with plenty of trash/vegetation because it rolls.

#### Mouldboard plough

- Glides along as it ploughs. Cannot roll over obstacles therefore usually gets stuck
- Has good inversion of furrow slice hence can cover trash well.
- Gives a fairly smooth seedbed in one operation that can be planted. (NB: Not good for erosion control).
- It is best suited to land which has been previously ploughed.
- Requires more power to pull compared to a disc plough of the same weight.
- The plough often gets stuck and is therefore easily broken.
- It cannot plough in areas with plenty of vegetation.

### 3.6 Factors limiting the use of animals and ox-drawn implements in Uganda

- ✓ Prevalence of tsetse flies in some areas which affect health of animals.
- ✓ Topography, i.e. steep/hilly areas are not suitable for ox-cultivation.
- ✓ Inadequate advisory services to educate farmers on use of animal power.
- ✓ Absence of work type animals in some parts of Uganda.
- ✓ Tall and thick vegetation in some parts of Uganda.
- ✓ Traditional beliefs that animals are not for ploughing.
- ✓ Inadequate capital to purchase animals and implements.
- ✓ Presence of heavy or sticky soils in some areas.

## CHECK YOURSELF

1. What is a seedbed and why do we prepare seedbeds?
2. What are the disadvantages of tillage?
3. Explain the different types of seedbed preparation.
4. What are the advantages and disadvantages of using a tractor to prepare seedbeds?
5. What problems are associated with use of oxen in ploughing?
6. What are the benefits of using a disc plough in seedbed preparation?
7. Why would you prefer a mouldboard plough over a disc plough?
8. Outline factors that limit use of animal drawn implements in Uganda.

### Note:

- i. These notes are for all S.2 students irrespective of your stream. We know that all of you did not stop at the same level. Find out where you stopped and start copying from there.
- ii. Please answer all those practice questions and write the answers in your book. This will be marked when you return.
- iii. Next topic: **“Agronomic practices limiting crop productivity in Uganda.”**