UNIT 5

Land Preparation

LEARNING / FACILITATING MATERIALS

CITRUS PRODUCTION
NATIONAL CERTIFICATE I

COTVET

CAADP

NEPAD
TRANSFORMING AFRICA

german cooperation
DEUTSCHE ZUSAMMENARBEIT

Implemented by:
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Introduction

Welcome to the start of your career in land preparation in citrus production.

A career in land preparation for citrus production has never been as popular as it is now; competition is strong and the standards are getting high. So you must aim higher, particularly if you see citrus industry as opportunity to build up your lifelong career.

Many career options are also available within the land preparation for citrus production.

This unit will look at land preparation, lining and pegging and farmland design. While training, you should make an effort on improving your personal habits, skill and knowledge to get along well with the working industry. All these aspects are essential to achieving success in the world of work.

Congratulations for making the decision to study land preparation for citrus production. You have taken the first step towards a very interesting and satisfying career.

This learning material covers all the Learning Outcomes for land preparation requirements for the **Certificate I programme.**

Table of **Contents**

LEARNING OUTCOME 1

Demonstrate understanding of land clearing

In this LO, you will learn to identify tools and equipment, demonstrate the various methods and apply safety measures in land clearing.
Before seedlings can be planted, the land must be cleared. Land clearing involves:

- Removal of vegetation that may compete with the growth of young trees.
- Access of machinery.
- Removal of debris.
- In some cases, cultivation of the land.

Below are details of some approaches for clearing farmland.

i. Pick up rocks and stones from the farmland and place the rocks in a trailer for later removal. Larger rocks may be unearthed and removed from the farmland with the help of a tractor and heavy-duty chains.

ii. Back-fill with top soil any holes left from the boulders that you have cleared. Tamp down the fresh dirt in the hole to ensure that enough new soil has been added into the depression.

iii. Cut down the trees in your selected farming area, using a chainsaw. Firewood may be cut from the felled trees at this time. The firewood can then be removed from the area and stacked in a suitable location for future use. The resulting tree stumps are removed by digging around each stump, attaching a heavy-duty chain around the entire stump and using a tractor to uproot it. The stumps are then dragged away for fuel or furniture making.

iv. Remove with a brush machine any dense vegetation and thickets on the farmland. Organic debris piles left over from the brush work may be shredded and composted.

v. Plough the surface vegetation of the cleared land to enrich the soil with organic matter to provide future crops with added nutrients. Avoid ploughing near drainage areas and gullies, where the natural growth of weeds and grasses should be encouraged to prevent further soil erosion.

PC (a) Identify tools and equipment used for land clearing.

The tools and equipment for land clearing depends on the type of vegetation and financial status of the farmer. The tools and equipment could be manual or mechanical. The manual ones include hoe, cutlass, pickaxe, rake, mattock, earth chisel and wheel barrow.

Pickaxe

To remove large stones and rocks from a landscape to clear the area, use a pickaxe to break up these hard materials. Containing a large chisel head constructed out of metal, the pickaxe also features a 12-inch wooden handle used for gripping the tool easily while bringing down the tool's large metal chisel onto the stone's surface. Since the pickaxe is designed in a compact and powerful fashion, this tool is good for smashing apart rocks to take them out of the ground fairly easily

Pickaxe

Heavy-duty Rake

Since certain landscapes that require clearing can contain small rocks, large sections of dead grass, tree branches and twigs that are buried into the soil itself, a heavy-duty rake is a good tool to use to get rid of this debris.

Modern hand rakes are made out of steel, and the long tines used to dig up the unwanted debris from the landscape are attached to a 2-foot wooden handle that the user grips while bringing down the sharpened tines into the earth's soil. As the user runs the rake into the land, he can loosen the rocks, grass and branches stuck in the soil enough to easily remove them.

Rake

Mechanical tools

Digging a garden to plant some seeds could be done easily with some hand tools. Yet these small and minor tools for working on the ground would not be adequate if you have a bigger area of ground to dig. The more appropriate tools to be used in this instance are bigger equipment and machineries to effectively clear the land and excavate the earth.

These heavy tools and equipment are called in many names like engineering vehicles, construction equipment, earth movers or earth-moving equipment. These are complex and compound machineries comprised of up to five machines. One good thing about them is that aside from ground excavation, they are also used for other functions. These equipment may be leased from companies.

There are many types of tools and equipment for excavation and earth moving. One example is a backhoe. It has a bucket component which is attached at its rear. The backhoe is used mainly for earth digging.

The hydraulic hammer is used in clearing the area especially if what need to be removed are hard rocks and solid structures. The feller buncher is also another tool used in earth moving. If there are trees that need to be cut or logged, this is the right equipment to use. It can effectively cut trees without damaging or affecting other structures in the site. When pushing immense quantities of debris, rocks, rubble, soil, construction materials and more, the bulldozer is utilized. The bulldozer is composed mainly of a tractor and dozer blade.


Bulldozer Stump Cutter

The stump cutter is used to remove small and large tree stumps from any type of landscape. Used primarily for commercial land clearing construction jobs, the stump cutter has an average height of about 58 inches and is outfitted with a large saw blade at its front section that cuts into the tree stump as the user holds the motorized saw blade in place. As the blade cuts into the stump, the wood chips are sucked through the attached exhaust tube and are thrown into the


Stump Cutter chop

PC (b) Methods of land clearing

Land clearing is principally accomplished by three methods;

- Mechanical, through the use of land tools and heavy equipment
- Chemically, through the use of herbicides.
- Manual, the use of simple hand tools (cutlass, mattock etc.)
  In most cases a combination of techniques is used to obtain the best results.

Herbicide Spraying

Herbicides are used to provide vegetation-free land ready for planting or mechanical clearing. Key factors to be considered for herbicide spraying are:

Spraying

- Planning – to ensure the right chemicals are used with the appropriate equipment in a safe manner.
- Target species – to ensure that appropriate herbicide is used for a particular species of vegetation. The correct rate of application must also be considered.
- Topography – this will determine the type of application (hand, ground based or aerial, depending upon the land's steepness).
- Climate – spraying is only conducted during calm conditions, as overspray caused by wind drift may affect nearby plantation crops or adjoining vegetation.
- Proximity – to dwellings and crops. Allowance is made for the proximity of water ways, streams and stream life, and of non-targeted species.

Mechanical clearing

A range of mechanical operations are employed to prepare and clear land of vegetation and debris. Key factors to be considered for mechanical clearing are:

Topography – consideration is made for the lie of the land. Various mechanical applications are best suited for particular site conditions.

Vegetation – the size and species of vegetation will influence the most practical mechanical means to employ.

Availability of trained personnel – this is extremely important as the competence

and attitudes of all involved will lead to a successful operation and safe practices.

Climate – wet clay soils may risk compaction by heavy machinery, therefore making planting difficult and affecting seedling root growth.

Impact of soil erosion, soil type and water quality – intensive soil disturbance during a clearing operation may cause a reduction in site productivity. This may be caused by the erosion of soil from the site. Eroded material may discharge into, or block nearby waterways. The loss of vegetation will increase water run-off which will continue until the forest cover re-establishes.This can be reduced through installing cutoffs to cleared tracks.

Ground cover – undisturbed strips of ground cover can be left (to trap eroded soil sediment) beside waterways and wetlands to filter run-off material.
The choice of mechanical land preparation – it is extremely important to ensure the best mechanical application is chosen for site. An incorrect choice could have a serious impact in many of the situations set out above, and prove costly for the forest owner.

The types of operations used in land clearing are:

- Hand clearing
- Discing
- Root raking/Line raking
- Line dozing
- Gravity rolling
- Tractor crushing
- Towed rolling
- Ripping
- V-Blading
- Tracking and side casting to obtain access.

Most of these operations involve crawler tractor units of varying capacities and capability, fitted with a cultivator. Well planned land preparation will:

- Clear land of scrub or vegetation of varying size and density
- Reduce sediment erosion and soil runoff
- Provide access for planting
- Prepare the ground for planting.

Burning Operations

Large scale burning operations are now rarely used to clear land for forestry in New Zealand and many other countries. Herbicides and mechanical methods are preferred. Burning must be managed and carefully planned by trained and experienced people, as many risks are involved.

Burning

Burning is, however, the quickest and cheapest way to remove branches and other debris left after harvesting or initial clearing of large areas. A combination of mechanical operations and herbicides is commonly used to reduce vegetation to a state where it will burn.

Burning operations are sometimes used on steep landscapes where machinery cannot get access, to remove logging debris and other vegetation. Careful planning is essential to avoid the possibility of an adjoining forest or plantation catching fire. This is why fire breaks are needed.

A fire belt is formed by using machinery to remove vegetation, producing a clear strip that completely surrounds the burning site. It is designed to contain the fire within a restricted area.

A burning operation ('burn off') can be started deliberately by:

- **Manual ignition** – an operator equipped with a flame thrower can be used to start the burn. Safety is the main concern. Most burn offs are supported by crawler tractors, water tanks and fire control crews.

- **Helicopter ignition** – a helicopter can also be used to start the burn by dropping burning flammable jelly or firelighters. This quickly starts many small fires in a line. This means the burn can be managed and maneuvered evenly. Risk to the operator is reduced but safety is still extremely important.

Key factors to be considered in a burning operation are:

Topography: Operators need to know the type of terrain they are working on. Such factors as:

- land features
- steepness
- light to heavy vegetation
- location of water ways, catchments
- location and type of adjacent vegetation **p**roximity of dwellings and roads.

Weather: Weather conditions are extremely important. Less fierce burns are obviously more desirable. Factors to be considered are:

- Wind direction away from dwellings and adjoining stands
- Burns during early raining season when fire hazard is reduced
- Burns in late afternoon to early evening when temperatures are down.

Ground cover: It is important to know the quantity of material being burnt as this controls factors such as burn time, intensity of fire and control requirements. Other factors such as the moisture content present in the ground cover must be known for the same reasons.

Fire belt: Careful thought must be given to fire breaks – are they big enough and in the right places? Also, creating fire breaks may increase sedimentation and runoff that may enter waterways. The type of soil will determine the type of measures taken to prevent soil erosion. Cut-offs on hill country is commonly used to control sedimentation runoff.

PC (c) Safety measures in land clearing

Safety measures are activities and precautions taken to improve safety, i.e. reduce risk related to human health.

- Wear protective equipment where the situation requires it: goggles, gloves, veterinary gloves, ear defenders, a facemask or respirator.
- Atmospheres with mould, dust or fumes are injurious to health. Where these arise, ventilate the area thoroughly. A facemask (EN 149 Type P2) gives a high level of protection against dust and spores.
- Adopt high standards of hygiene and cover all cuts and wounds with waterproof plasters. Keep a first aid box and attend a first aid course.

Tools and equipment

- Ensure that all machinery and equipment are in safe working order. Consult the operator's manual. Keep all safety guards in place.
- Make sure that all operators are competent and work in a safe manner.
- Always stop the engine before attempting to free a blockage. Watch out for bystanders.

Farm Fires

- Ensure that combustible materials such as hay, straw, fuel/oils are separated from livestock buildings and dwelling houses. Hay/straw should be stored 18 metres or more from other buildings.
- To allow access for a fire brigade, entrances and gates should be at least 3.0 metres wide. A fire brigade may have only 2,000 litres (400 gallons) of water aboard. Check that a farm water supply is available to fight a fire.
- Ensure that all emergency phone numbers are in view at the phone. Have suitable fire extinguishers on the farm and in the home. Additionally, smoke alarms and a fire blanket should be fitted in the home.

Lifting and Carrying

- Prevent back injuries by using mechanical methods of lifting, e.g. loaders, hydraulic jacks, trolleys, wheels under heavy farmyard gates.
- Before lifting - assess the load. Use the correct technique by having a well-balanced stance, bend your knees, keep your back straight and keep the load close to your body.
- Ensure that heavy weights are well secured and that proper stacking takes place.

Self-assessment

PC (a)

1. Sketch and label the main parts of the following tools used for land clearing

I. Cutlass
ii. Mattock
iii. Pickaxe

PC (b)

1. Clear an area in your school farm using any of the land clearing methods. **Note:** seek advice from your instructor (farm shop and mechanization) when using any of the mechanical equipment.

PC (c)

2. Visit a nearby farm and report on how safety is observed on the farm during land clearing

.....

.....

.....

LEARNING OUTCOME **2**

Demonstrate understanding of lining and pegging

In this LO, you will learn about the materials and tools used for lining and pegging, explain the importance of lining and pegging ,demonstrate the method of lining and pegging and apply safety measures for lining and pegging.
Lining and pegging

After the land is well cleared, the next step is to line and peg out the places to plant the seedlings. The square system of layout is commonly followed for planting the citrus plant. In order to facilitate orchard management practices economically and efficiently, the trees should be planted in straight rows.

Pits of ½m x ½ m x ½ m size may be dug at required distances 3-4 weeks prior to planting. But where the soils are shallow or under laid with hard pan, pits of 1mx1mx1m may be dug to facilitate better root penetration. While digging pits, it is preferable to keep the soil and the sub-soil separately in two separate heaps.

Spacing in citrus ranges from 5.5m x 5.5m to 7m x 7m. Rectangular spacing is also possible when one wants to make full use of all available sun energy. Spacing also depends on the rainfall of the area. In high rainfall areas the minimum spacing requirement is 6.10m X 6.10m. In lower rainfall areas the spacing can be reduced.

Dusting of 10% BHC or Aldrex on the inner sides of the pit and also mixing 100g of Aldrex or Benzene Hexachloride (BHC) dust in the soil prevents white ant (termite) infestation. Sometimes brushwood is burnt in the pits before filling them both to sterilize the soil and also to destroy termites and other pests. Each pit should be filled with only topsoil mixed with 50 kg of well-decomposed cattle manure and 1-2 kg of super-phosphate. The pit should be watered after filling so that the soil mixture settles down.

PC (a) Materials and tools used for lining and pegging

Tools and materials used for lining and pegging include peg, rope, mallet, ranging pole and measuring tape. Measuring tape is used to measure distances between the pegs. The number of pegs to be used depends on the area of land in consideration and desired spacing.

Peg

Rope

Measuring tape

PC (b) Importance of lining and pegging

Lining and pegging have several importance. Below are some of them:

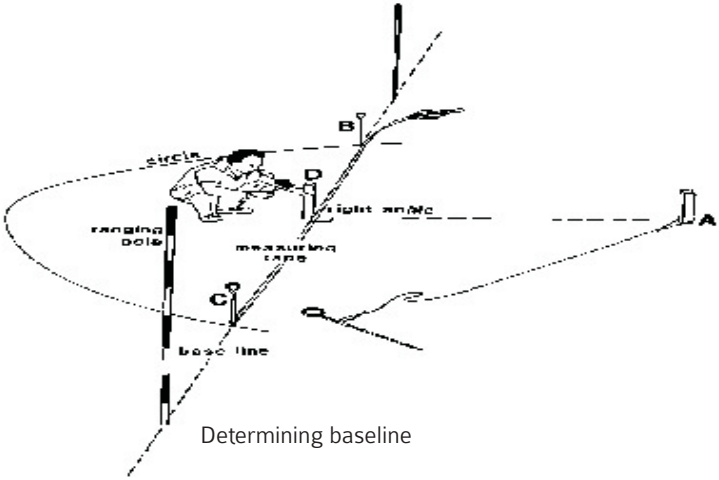
- Well spacing of crops to reduce competition for nutrients and water
- Farm machines can work through with little damage to plants during pesticide use and fertilizer application
- improve aeration of planted citrus farm
- Encourage quick and easy harvesting of matured fruits due to easy movement

PC (c) Demonstrate the method of lining and pegging

Procedure for lining and pegging of citrus farm

Steps

i. Establish the baseline by either using 3,4,5 or square method
ii. Put a garden line and sight a straight line
iii. Mark out the planting distance
iv. Peg the planting spots



Determining baseline

Self-assessment

PC (a)

1. State one (1) function each of the following tools used for lining and pegging:

i. Pegs
ii. Measuring tape
iii. Range pole
iv. Rope
v. Mallet

PC (b)

1. State two (2) benefits to be derived from lining and pegging citrus farms.

.....

.....

PC (c)

1. Select the appropriate tools and demonstrate how you will line and peg an area of land in your school farm

PC (d)

1. Using the table below, state two (2) safety measures to be observed each when lining and pegging:

Personal	Tools	Others

LEARNING OUTCOME **3**

Demonstrate the understanding of farmland design

At the end of this LO, the learner will be able to measure size of farm land, explain the importance of farm land design, design a farm layout and indicate fire belt, wind break and access road on the design.

PC (a) Measure size of farm land

An idea about the size of your farm land is very important. It gives an indication of how much crops to be planted. The standard unit of measuring land is the hectare.

Measuring a land

Hectare

This is a large land size and is the standard measure used in the country.
A hectare (ha) is an area equal to a square that is 100 meters on each side.
So a hectare has 100 m × 100 m = 10,000 m^2 (square meters).

The estimate method could be used to calculate the size of a farm since most farm areas are not simple shape like a square or rectangle. Measure the total number of full acres that can be obtained from the area and then measure and count the total

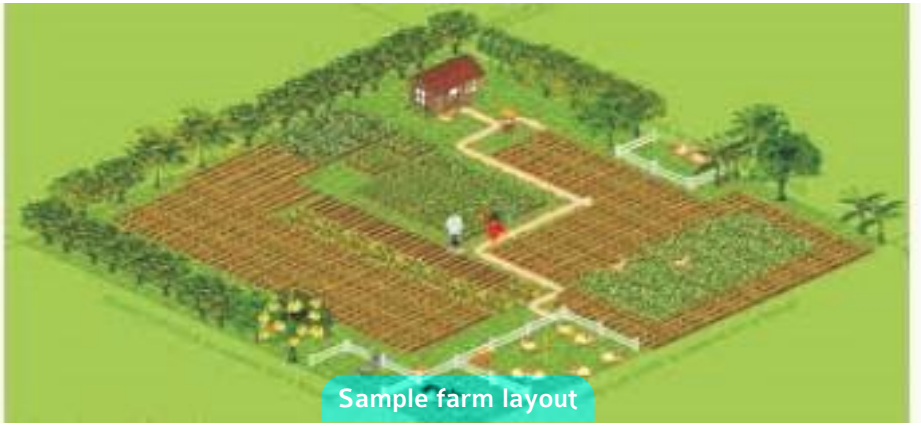
number of partial or half acres obtained. The number of half acres is then divided by two and the result is added to the total number of full acres to get the total estimated size of the area.

PC (b) Importance of farmland design

- Easy accessibility
- Helps the layout
- Helps to site farm project structures
- Promotes economical use of land
- Promotes optimal use of land

PC (c) Design a farm layout

A farm layout is the planning out of the farm. That is the arranging of the farm into different sections to know where places in the farm are, example to know where the nursery is located. Designing a farm layout is part of the farm planning.



Sample farm layout

Farm planning is an on-going process, a work in progress. The design should have components such as nursery site, production site, compost pit, water source and a shed.

PC (d) Construct fire belt, wind break and access road

For safety purposes a design of a farm must also have fire belt, wind break and access road. Fire-belt means a strip of land, which is set aside and maintained for the purpose of preventing the spread of forest fires.

A windbreak or shelterbelt is a plantation usually made up of one or more rows of trees or shrubs planted in such a manner as to provide shelter from the wind and to protect soil from erosion. They are commonly planted around the edges of fields on farms. Other benefits include providing habitat for wildlife and in some regions the trees are harvested for wood products. Field windbreaks are typically planted in multiple rows perpendicular to prevailing winds. On the downwind side of a well-established windbreak, wind is generally slowed for a distance of 10 times the height of the trees. Old field windbreaks may need renovation to function properly, including removal and replacement of selected trees/shrubs.

Procedure for creating fire-belts/windbreaks

i. Identify the legal boundary
ii. Line and peg the boundary
iii. Measure a distance (3m around the plot depending on the plot size) from the boundary inside the plot
iv. Peg the inside measure
v. Clear the 3m spacing
vi. Use the boundary pegs to plant the windbreaks

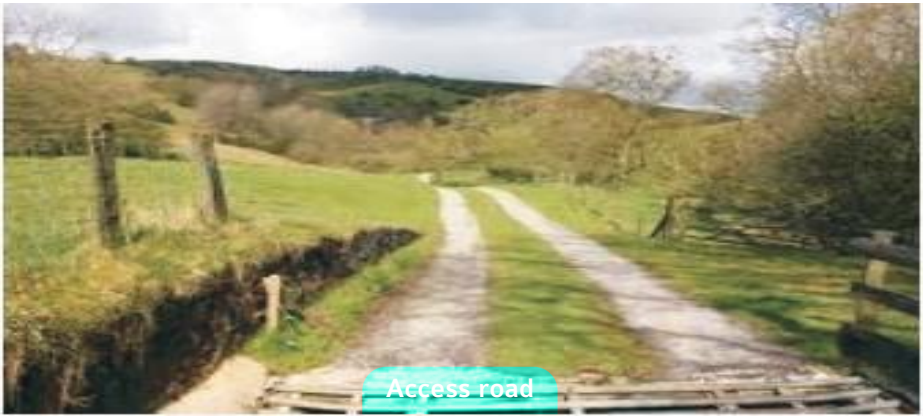
Benefits of windbreaks

- Protects crops and farm structures from wind damage
- Improves irrigation efficiency
- Provides opportunities for additional income from salable tree/shrub products such as nuts, berries and decorative floral material
- Adds scenic interest to fields.

Example of windbreak increase property values

Access road

It is a road that provides access to a collection point on a citrus farm to a main road. Construction of access roads will vary depending on the required specification and use. For tracks it is less restricted, the ground is prepared to line, level and compacted.



Self-assessment

PC (a)

1. Measure the size of your school farm and submit the report to your instructor.

PC (b)

1a. Explain a farmland design

1b. Explain the three (3) reasons why you will design a farmland.

.....

.....

.....

PC (c)

Using the appropriate materials and tools, design a farmland layout indicating the following

- Farm hut
- Storage facility
- Toilet facility

PC (d)

1. Indicate the following on the farmland layout designed the following

- Access road
- Fire-belt
- Wind break

Design and Print **Qualitype Limited** 0277484612