

LEARNING FACILITATING MATERIALS

NATIONAL PROFICIENCY LEVEL 1

TRADE AREA: CASHEW, MANGO AND OIL PALM PRODUCTION

UNIT 5

WIND BREAK AND FIRE PROTECTION IN PLANTATION



This publication has been produced with the assistance of the Ghana Skills Development Initiative (GSDI) III, a project implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH in cooperation with the Council for Technical and Vocational Education and Training (COTVET) on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ), co-funded by the European Union (EU) and the Swiss State Secretariat for Economic Affairs (SECO). The contents of this publication are the sole responsibility of GIZ and COTVET and can in no way be taken to reflect the views of the stakeholders.



UNIT INTRODUCTION

Welcome to Unit 5 of your learning journey in cashew, mango and oil palm production. This guide explains the establishment and management of windbreaks and fire belts in plantations.

Do you already know why it is important to establish windbreaks and fire belts around your cashew, mango or oil palm plantation?

The effects of strong winds and bushfires can be devastating to your plantation. If you follow the recommended practices for establishing and managing windbreaks and fire belts, you effectively protect your farm from winds and bushfires. Apply your knowledge and skills accurately to protect your plantation and crop.



In this unit, you will learn about establishing and managing windbreaks and fire belts on plantations. The learning material covers four sub-units:

- 1) Establishing fire belts
- 2) Managing fire belts
- 3) Establishing windbreaks
- 4) Managing windbreaks

Each sub-unit contains theoretical and practical exercises. Each module includes written materials, visuals as well as self-assessments to test your knowledge and skills.

The benefit of learning this information is to protect your farm from winds, bushfires, thieves, and animals. If you follow the instructions for windbreak establishment, you can even increase your yields and the quality of your crop.

Bushfires are very common in Ghana. Protect your plantation and protect your income! 'Better be safe than sorry'.

Even though, this learning material provides essential information on windbreak and fire belt establishment for National Proficiency Level 1, you should also look out for new information, innovations and technological advances during your practical work that expand your knowledge and skills.

Are you ready to start your cashew learning journey? Let's start!

TABLE OF CONTENT

NO	CONTENT	PAGE
	Unit Introduction	3
	Icons and Abbreviations	5
	1. DEMONSTRATE SKILLS IN WIND BREAK ESTABLISHMENT	6
	a) Explain wind break in plantation	6
	b) State the importance of wind breaks in plantation	8
	c) Outline the procedure for establishing wind break	9
	d) Identify tree species that are suitable for wind break establishment	10
	e) Establish wind break on a plantation	11
	SELF ASSESSMENT	11
	2. DEMONSTRATE SKILLS IN WIND BREAK MANAGEMENT	12
	a) Explain wind break management in plantation	12
	b) State the importance of wind break management in plantation	12
	c) State the activities in wind break management	12
	d) Carry out wind break management practices	12
	SELF ASSESSMENT	13
	3. DEMONSTRATE SKILLS IN FIRE BELT CREATION	14
	a) Explain fire belt in a plantation	14
	b) State the importance of fire belt in a plantation	16
	c) State the equipment used in fire belt creation	18
	d) State methods of fire belt creation	22
	e) Outline the procedure for fire belt creation	25
	f) Create fire belt around a plantation	25
	SELF ASSESSMENT	26
	4. DEMONSTRATE SKILLS IN FIRE BELT MANAGEMENT	27
	a) Explain fire belt management in a plantation	27
	b) State the importance of fire belt management in a plantation	27
	c) State the activities in fire belt management	28
	d) Outline the procedure in fire belt management	28
	e) Carry out fire belt management in a plantation	29
	SELF ASSESSMENT	29

ICONS



LEARNING
OBJECTIVES



ATTENTION



PRACTICALS
HANDS ON



CROPPING
CALENDAR



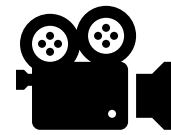
SELF ASSESSMENT



WELL DONE!



TAKE A BREAK!



WATCH VIDEO

ABBREVIATIONS

Here are some commonly used abbreviations.

GAP	Good Agricultural Practices
m	Meter (<i>1 m =100 cm</i>)

1. DEMONSTRATE SKILLS IN WIND BREAK ESTABLISHMENT

a) Explain windbreak in plantation

A windbreak consists of strips of trees, shrubs and plants that are planted in rows around your plantation to protect it against the effects of winds.

A windbreak is planted at the border of the plantation to:

- reduce wind speed
- control wind-blown soil
- establish a micro-climate on the farm (air, soil temperature and quality)
- establish a micro-environment on the farm (insects, bees, livestock)

In order to establish your windbreak, you need to know the area that requires protection from the wind.

An easy rule - Windbreaks can protect areas up to ten times the height of the tallest trees in the windbreak:

- A 5-meter-high windbreak effectively protects a distance of about 50 meters
- A 10-meter-high windbreak effectively protects a distance of about 100 meters

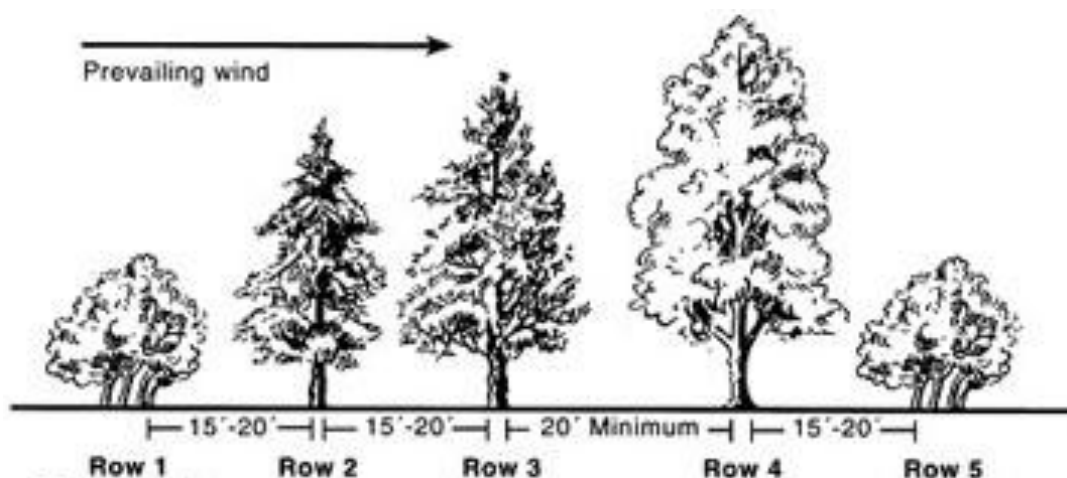
In areas with a lot of winds, plant 4 to 5 rows in your windbreak:

- 2-3 lines of large trees
- 2 lines with shorter shrubs or other plants with leaves

In areas with less winds, plant at least 2 rows in your windbreak:

- 1 line of large trees
- 1 line with shorter shrubs or other plants with leaves

Domestic trees and plants are the best choice for creating windbreaks.



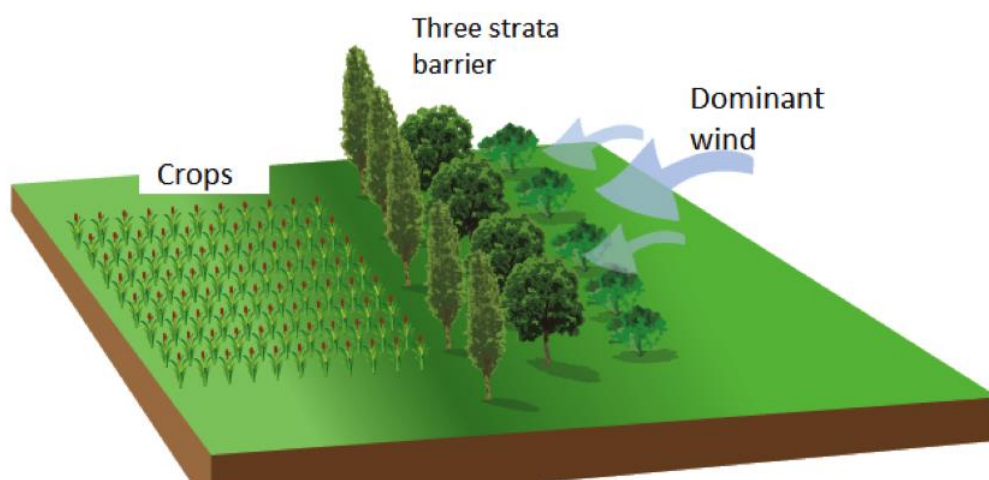
Source: <https://www.threetreecenter.com/how-to-create-windbreak/>

When you establish your windbreak, you also need to know how strong the winds blow. The density of your windbreak determines how effectively it reduces the speed of the wind.

Manage windbreak density by:

- Choice of tree, shrub and plant species
- Spacing of the trees
- Number of rows in the windbreak.

Windbreaks work best when they allow some wind to pass through.



Source: <https://www.pinterest.com/pin/375980268886455614/?lp=true>

b) State the importance of windbreaks in plantation

Windbreaks in plantation are important to:

- protect the crop
- protect livestock and provide shade for grazing animals
- protect the plantation against crop thieves
- protect rural farmhouse owners
- maintain soil quality
- conserve water
- reduce wind erosion
- increase bee pollination
- increase pesticide effectiveness
- reduce influx of pest and diseases



Windbreaks can also serve as a biological control of crop insect pests.



Plant trees that attract beneficial insects such as bees.

The results of planting windbreaks are:

- Higher yields
- Better quality crops



Windbreaks are planted as living fences to protect wind-sensitive crops. During the flowering season of fruit and nut trees, winds can damage the flowers and therefore reduce crop yields.



Strong winds can also damage newly transplanted seedlings. In severe cases, you may need to replant. Replanting increases costs of production because you have to purchase new seedlings from the nursery.

c) Outline the procedure for establishing windbreak

Use the checklist to follow steps 1 to 6 in windbreak establishment. Rate your own performance critically and honestly after you have completed each activity.



Excellent



Okay



Try Again

Activities	Rating
1. Select location for the windbreak (between plantation and fire belt)	
2. Allow 10- to 15-meters space between the border of the plantation and the windbreak	
3. Select tree, shrub and plant species suitable for your plantation site and soil types	
4. Clear and prepare the land for planting	
5. Plant seedlings in 2 to 5 rows, depending on the occurrence of heavy winds in the location of your plantation	
6. Nurture the newly planted seedlings	

Remember, the learning journey has just begun.

d) Identify tree species that are suitable for windbreak establishment

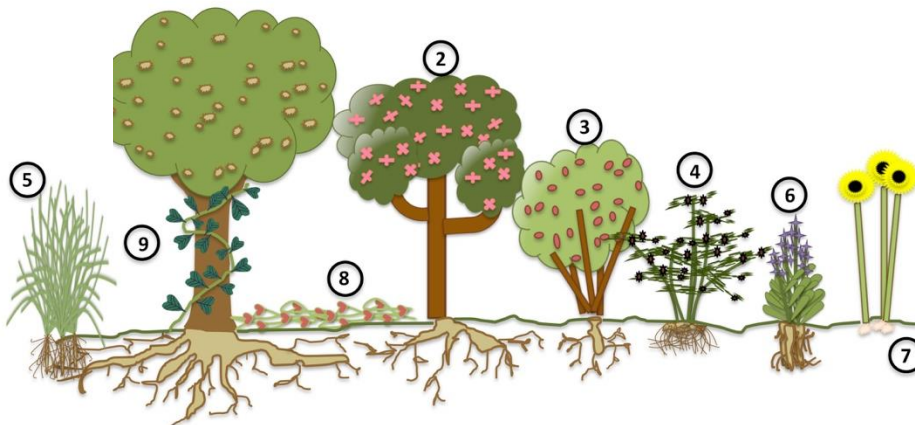
Select plant and tree species according to:

- Soil type
- Water availability
- Climate

Suitable trees for windbreaks	Suitable plants for windbreaks
<ul style="list-style-type: none"> • Fruit trees (Cashew, Mango) • Dwarf-fruit trees • Eucalyptus • Acacia trees • Banana • Coconut palm 	<ul style="list-style-type: none"> • Pawpaw • Cane grass • Lemon grass • Bamboo • Passion Fruit • Mint

The best windbreaks are multi-layered comprising various trees and plants to block wind at multiple heights:

1. Canopy
2. Sub-Canopy
3. Shrub
4. Bush
5. Grass
6. Herbs
7. Rhizosphere
8. Ground Cover
9. Climbers



Source: <https://permies.com/t/52750/Food-Forest-TreeYo-Sintra-February>



Planting of seedlings takes place from beginning of June till July after the rainfall to ensure high survival rates of the young plants.

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec

e) Establish a windbreak on a plantation



Practical Exercise: Go to the farm for your apprenticeship and establish a wind break on a plantation, considering the recommended practices that you just learned.



SELF ASSESSMENT

1. State five (5) reasons why windbreaks are important.

2. State three (3) tree, shrub or plant species suitable for windbreak creation.

3. Explain the process of establishing windbreaks.



Well done! You have completed the first set of questions. This is very encouraging. Let's proceed on your cashew learning journey.

2. DEMONSTRATE SKILLS IN WIND BREAK MANAGEMENT

a) Explain windbreak management in plantation

Windbreak management is the maintenance of trees, shrubs and plants in the windbreak, while maintaining the overall structure of the wind break as an effective wind barrier.



Windbreaks require regular maintenance from the day of windbreak establishment.

b) State the importance of windbreak management in plantation

The maintenance of wind breaks is important to:

- Ensure survival rate of trees, shrubs and plants in the wind break
- Allow allays between the trees, shrubs and plants for light wind to pass through the trees
- Reduce occurrence of pest and disease in the wind break

c) State the activities in windbreak management

Windbreak management is very similar to the management of plantations. Most of the Good Agricultural Practices (GAP) in farm management also apply to windbreak management.

Windbreak management contains the following activities:

- Nurturing of newly planted seedlings
- Watering
- Fencing newly planted seedlings to protect them from animals
- Fertilizing
- Weed control
- Pruning of young trees
- Pest and disease control
- Harvest and post-harvest handlings (in case you planted fruits trees)



Windbreaks must be maintained throughout the entire year in the same as you maintain your farm.

d) Carry out windbreak management practice



Practical Exercise: Go to the farm for your apprenticeship and carry out wind break management practices.



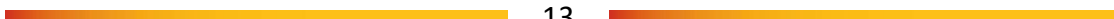
SELF ASSESSMENT

1. State three (3) reasons for the importance of windbreak management.

2. List the activities involved in windbreak management.



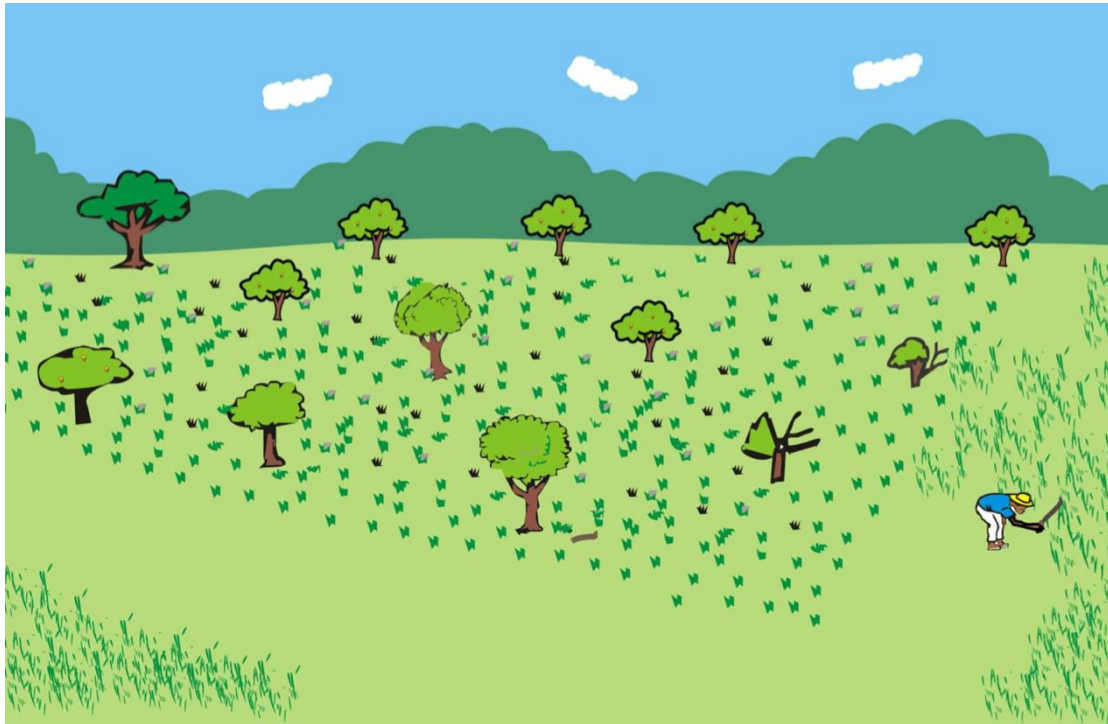
*Congratulations! You have completed the second set of questions.
Let's move on to the next chapter.*



3. DEMONSTRATE SKILLS IN FIRE BELT CREATION

a) Explain fire belt in a plantation

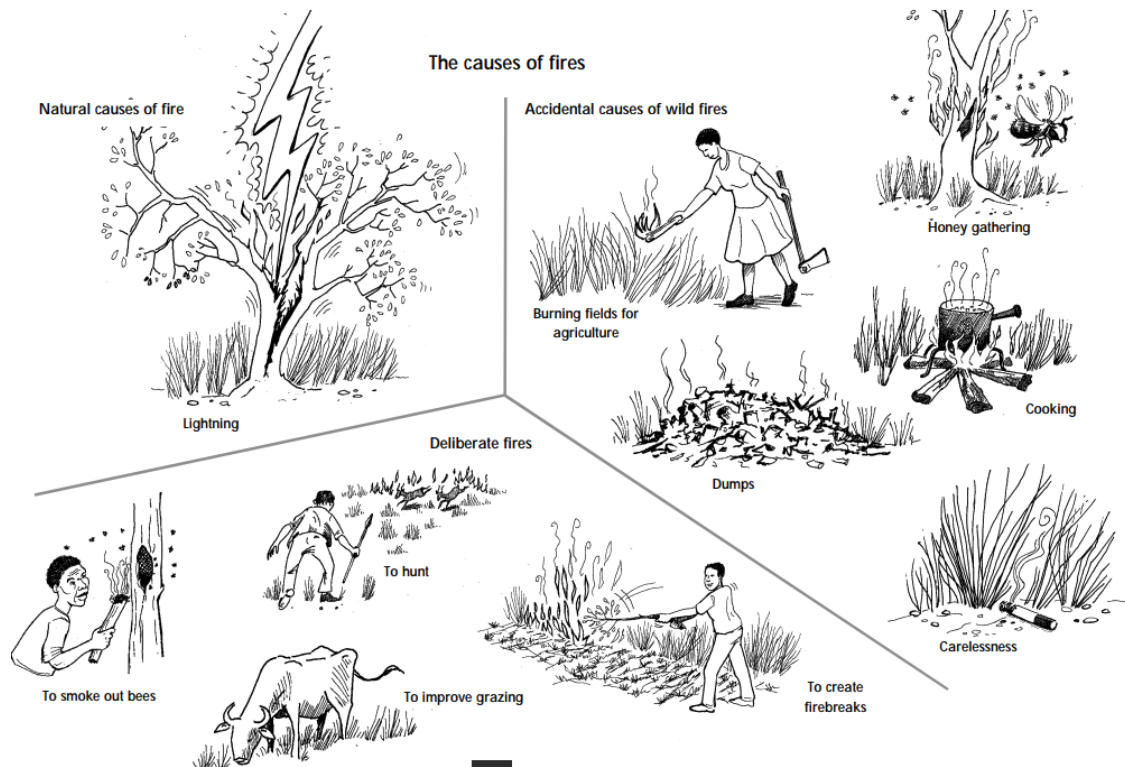
A fire belt is a space of bare soil between the boundary of your plantation and the surrounding vegetation to protect your farm against bushfires. The fire belt around your farm should be between 10 to 15 meters wide.



Source: GIZ/ComCashew – Fire belt construction

There are three (3) main causes of bushfires that can attack and destroy your farm, if you have not established a fire belt.

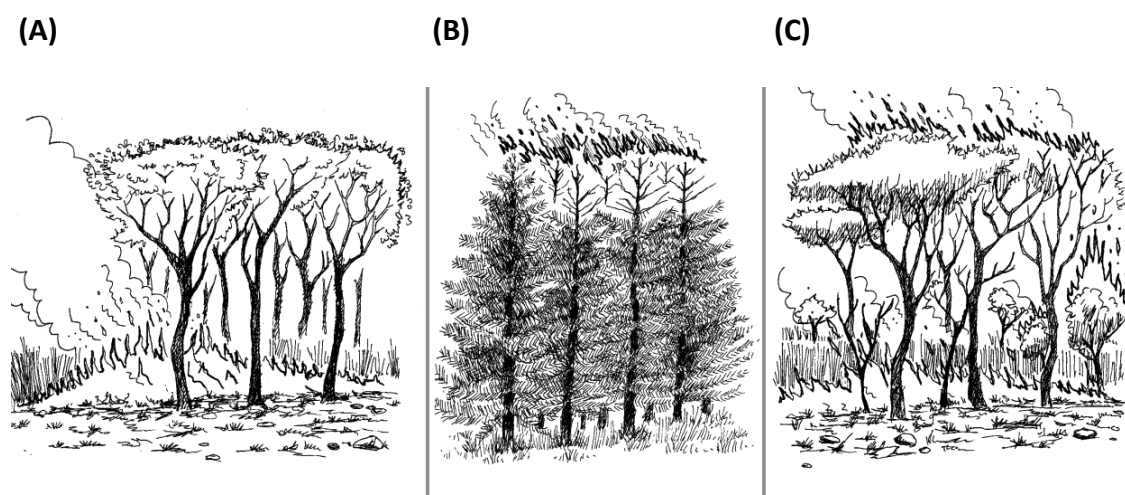
- Natural fires:
 - Lightning during the rainy season
- Accidental fires:
 - Burning of fields
 - Uncontrolled fires during honey collection
 - Uncontrolled fires during land clearing (Remember! Burning is not recommended for land clearing!)
 - Cooking on open fires overnight
 - Cigarette stubs carelessly thrown into the bush
 - Burning waste or farm rubbish
- Deliberate fires:
 - Hunting
 - Creating fire breaks
 - Making smoke to collect honey
 - Improve grazing for livestock



Source: http://d2ouvy59p0dg6k.cloudfront.net/downloads/fire_management.pdf

There are three (3) different types of bushfires:

- (A) Ground Fires
- (B) Crown Fires
- (C) A Combination of the two - Ground and Crown Fires



Source: http://d2ouvy59p0dg6k.cloudfront.net/downloads/fire_management.pdf

- (A) Ground Fires burn along the surface of the soil
- (B) Crown Fires burn the upper parts of the trees
- (C) Ground and Crown Fires burn along the surface and upper parts of the tree

b) State the importance of fire belt in a plantation

It is important to establish a fire belt around the entire farm to stop bushfires from attacking your farms, in order to protect your crop and livestock.

The fire belt also prevents the spread of fire from one plantation to another.



Source: GIZ/ComCashew – Farm attacked by bushfire



Bushfires can have devastating effects. A bushfire can destroy your plantation, crop and income for the entire year.



Bushfires are most likely to occur in the dry season from November to April.

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec

The exact occurrence of bushfires depends on the:

- past rainy season
- start of the next rainy season

Do you know why bushfires have negative effects on the environment?

Bushfires:

- change vegetation growth
- influence the distribution and productivity of wildlife populations
- destroy or damage farms, productive trees and crops
- cause soil erosion



Source: <https://www.npr.org/2015/11/05/453239276/in-the-amazons-fire-season-you-either-burn-or-you-starve?t=155965293877>



Prevent fires from attacking your farm! It will be difficult and expensive to replant the entire plantation on the burned soil. Create a fire belt around your plantation!

c) **State the equipment used in fire belt creation**

The following tools are essential for manual fire belt construction:

- Use **Cutlass** to remove weeds around your farm.



Source: <https://hosstools.com/product/farm-machete/>

- Use a **Mattock** for digging the soil, removing stumps from the field and chopping undergrowth. Use a mattock for hard and rocky soils.



Source: <http://tools-pmc.com/en/hand-tools/347-pick-mattock.html>

- Use a **Hoe** to remove weeds, shape and clear the soil of old root.



Source: <https://seymourmidwest.com/42441>

- Use a **Rake** to clear the land and remove weeds as well as all flammable materials.



Source: <https://www.krafttool.com/GG871>

- Wear **Rubber Boots** to protect your feet from cuts and bites from snakes, bush rats and lizards.



Source: <https://www.lamps2udirect.com/garden-and-outdoor-lighting/full-length-green-wellington-boots-uk-size-11-euro-size-45/143256>

- Wear **Gloves** to protect your hands from cuts and bites from snakes, bush rats and lizards.



Source: <https://pksafety.com/pip-atg-maxiflex-cut-resistant-glove-34-8743-12-pairs/>

- You can also use a **surveyor's tape** to measure the width of the fire belt. Surveyor's tape is more convenient for measuring longer distances than measuring tapes.



Source: <https://ukrigging.net/shop/all-items/10m-surveyors-tape-measure/>

d) State methods of fire belt creation

1. Fire belt

In fire belt creation, clear the land around the boundary of the farm and remove all flammable materials in the soil such as deadwoods, undergrowth and weeds.

There are three (3) methods for fire belt creation:

1. Manual
2. Mechanical
3. Chemical

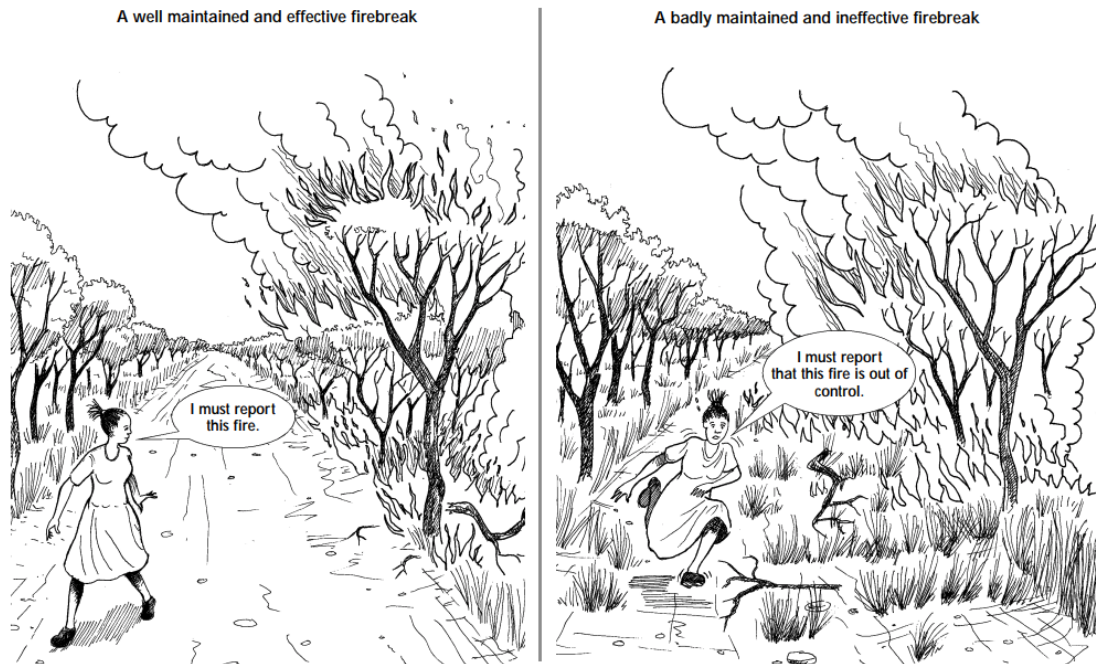


Source: GIZ/ComCashew – Fire belt construction around a plantation

1. **Manual** fire belt creation is labour-intensive and time-intensive. Create the fire belt with cutlass, hoe, rake and mattock.
2. **Mechanical** fire belt construction is less labour-intensive and faster. Create the fire belt with a grader or a tractor drawing a harrow or a mower.
3. **Chemical** fire belt creation is less labour-intensive but more expensive. You need to have a good knowledge on the use of herbicides. Create the fire belt by spraying herbicides on the weeds around your farm. Wear a whole-body protective suit, including facemask.

Consider the following factors before choosing a method:

- farm size
- availability of financial resources
- availability of farm labor
- access to tractors and chemicals
- access to protective clothing to apply chemicals



Source: http://d2ouvy59p0dg6k.cloudfront.net/downloads/fire_management.pdf

Follow the steps in fire belt creation:

- Locate the fire belt close to the boundary of your farm.
- Construct the fire belt 10 to 15 meter wide.
- Clear the land around your farm using cutlass, rake, mattock and hoes.
- Remove all flammable materials in the soil such as deadwoods, undergrowth and weeds.

The fire belt must be wide enough to reduce direct contact with the flames. If the flames reach the plants on your plantation, fire might 'hop over' the break and attack your farm.



Fire belt creation is done at the beginning of the dry season. The entire farm must also be weeded at the end of the rainy season.

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec



For more information on fire belt construction (example cashew plantation), watch video on *Cashew harvest and Post-harvest Training* from Minute 3:10 to 4:05

2. Green belt

Another method to prevent the spreading of fires is the establishment of a green belt.

Establish the green belt within the fire belt. Plant fire-resistant crops in the gap between the plantation and the surrounding vegetation.

In green belts you can plant fire-resistant plants such as:

- Banana
- Moringa
- Cassava
- Aloe Vera



Plant cash crops and food crops around your farm as an immediate source of food and additional income for you and your family.

e) Outline the procedure for fire belt creation

Use the checklist to follow steps 1 to 6 in fire / green belt creation. Rate your own performance critically and honestly after you have completed each activity.



Excellent



Okay



Try Again

Activities	Rating
1. Locate the fire belt close to the boundary of your farm.	
2. Measure and construct the fire belt 10 to 15 meters wide.	
3. Clear the land around your farm using cutlass, rake, mattock and hoes.	
4. Remove all flammable materials in the soil such as deadwoods, undergrowth and weeds.	
5. Weed your farm to reduce occurrence of bushfire in your farm.	
6. For green belt creation: Plant fire-resistant trees in the middle of the fire belt.	

Sometimes, learning new things is not easy. You are doing well!

f) Create fire belt around a plantation



Practical Exercise: Go to the farm for your apprenticeship and create a fire belt around a plantation. Follow the recommended practices.

SELF ASSESSMENT



1. Explain the need for the creation of a fire belt.

2. State three (3) negative effects of bush fires.

3. State the tools used during fire belt construction.

4. State the difference between fire belt and green belt.



You are making great progress! You have completed another set of questions. Take a break or go ahead and start with the next chapter.

4. DEMONSTRATE SKILLS IN FIRE BELT MANAGEMENT

a) Explain fire belt management in a plantation

Fire belt management refers to the maintenance of the fire belt. Firebreaks need to be maintained every year before the dry season starts.

Manage the fire belt around your farm by removing:

- weeds
- deadwoods
- undergrowth
- pruned branches from the base of tree to reduce fire risk on the farm
- thinned trees or tree stems



Manage the fire belt after the rains and before the onset of the bush fires.

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec

b) State the importance of fire belt management in a plantation

Fire belt management in a plantation is important to keep the amount of inflammatory material around the farm to a minimum.

Weeds grow quickly around the farm, especially after the rains and produce easily inflammatory material. Therefore, it is important that the fire belt is well-maintained throughout the year to protect the plantation against bushfires.

- If the gap between your farm and the surrounding vegetation has a lot of weeds, the chances are higher of a bush fire attacking your plantation.
- If the gap between your farm and the surrounding vegetation is less than 10-meters wide, the chances are higher that a bush fire ‘hops over’ the break and attacks your farm.



Ensure that the fire belt remains 10 to 15 meters wide and free of inflammatory weeds!

c) State the activities in fire belt management

The activities in fire belt management include:

- Weeding inside the fire belt.
- Pruning and removal of branches inside the fire belt and on the plantation.
- Thinning of old trees and removal of stumps and undergrowth inside the fire belt and on the plantation.
- Land clearing to bare soil inside the fire belt.

d) Outline the procedure in fire belt management

Use the checklist to follow steps 1 to 6 in fire belt management. Rate your own performance critically and honestly after you have completed each activity.



Excellent



Okay



Try Again

Activities	Rating
1. Assess the fire belt around your farm	
2. Measure the width of the fire belt between 10- to 15- meters	
3. Cut the weeds on the edges of the fire belt at a distance of 10- to 15- meters	
4. Cut the weeds inside the fire belt	
5. Remove any inflammatory materials, such as branches and stumps inside the fire belt and on the plantation	
6. Clear the land to bare soil inside the fire belt	

Failure is your opportunity to start again.

e) **Carry out fire belt management in a plantation**



Practical Exercise: Go to the farm for your apprenticeship and carry out fire belt management in a plantation.



SELF ASSESSMENT

1. State when fire belt management takes place.

2. State the importance of managing fire belts.

3. List the main activities involved in managing fire belts.



Congratulations! Well done! You have completed this unit successfully.

REFERENCES

ACi. (n.d.). *Bonne pratiques d'entretien et de gestion des vergers d'anacardiers*.

ACi. (2013). *Cashew harvest and Post-harvest Training*. Retrieved from:

https://www.youtube.com/watch?v=H_aZwayAAA8

ACi. (n.d.). *Good Practices of Management of a Cashew Farm*.

Farm Progress. (2016). *How to plan a windbreak*. Retrieved from:

<https://www.farmprogress.com/story-how-plan-windbreak-9-150600>

Natural Resource Conservation Service. (n.d.). *Windbreak Management*. Retrieved from: <https://www.ag.ndsu.edu/ndfs/documents/windbreak-management.pdf>

The Tree Center. (2015). *How to create a wind break*. Retrieved from:

<https://www.thetreecenter.com/how-to-create-windbreak/>

WWF. (2001). *Fire Management Manual*. Retrieved from:

http://d2ouvy59p0dg6k.cloudfront.net/downloads/fire_management.pdf