

# Avondale Discovery Farm

## Secondary Worksheets

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### Glossary

The following words are all used in these worksheets (they have been made in **bold** where they appear in the worksheets). Before your visit to Avondale Discovery Farm, work in groups to develop a definition of each word. If you like, create a powerpoint presentation or another type of creative production to explain the meaning of each term, using definitions and photos.

annual	crop	degrade
ecosystem	erosion	fertile
fodder	grazing	groundwater
pasture	perennial	rehabilitation
revegetation	ripping	salinity
seeding	stock (also known as livestock)	sustainable agriculture



Department of Agriculture  
Government of Western Australia



# Worksheet 1 - Revegetation

## Outcome:

Students understand how trees are planted and appreciate the economic cost of tree planting in an agricultural context.

## Background:

**Tree planting** is becoming an increasingly refined exercise in respect to methods and selecting species for specific sites. This is resulting in greater survival rates and better growth. This is in part due to spin offs from the work done by large mining companies, such as Alcoa, in **rehabilitating** mine sites.

Trees have been planted along the farm tour route. A wide range of species has been planted.

Take a walk away from the bus to the area where the trees have been planted. Using your observations, complete the following description plan of the area:

How have the trees been planted (in rows/single file etc)?

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What is the approximate distance between each tree (in metres or centimetres)?

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Describe the protection the trees have from **grazing stock**.

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There are many different types of trees planted. Describe or draw the features of as many different trees as you can (consider features such as bark, leaves, shape of plant etc).

When you get back to school, use books or the internet to try and find the names of the trees you've described.

Description	Name

Why should farmers plant trees on farms? While you are at this site, write down your ideas in the table below.

What do you think are the good things about planting trees on farms?	Are there any bad things about planting trees on farms?

When you get back to school, use the whiteboard to brainstorm all your ideas.

Each of the good and bad things above can be put into one or more of the following categories:

- social reasons (affect people or the community)
- economic reasons (affect the farmer's or the community's finances)
- environmental reasons (affect the natural environment)

Together, these three categories are called the 'Triple Bottom Line'. It is generally agreed that all of these three categories should be considered before any decisions or plans are made. If one of these categories is not considered, the decision could cause problems for that aspect.

You probably consider the 'Triple Bottom Line' in your own daily life without realising it. For example, when you go out shopping you might consider:

- Should I go to my local shopping centre where I might see my friends and where I'm supporting my local community, or to the City for more choice but where I'm unlikely to see people I know? (Social)
- How much can I afford to spend and what should I spend my money on? (Economic)
- Should I cycle, take the bus or get a lift in the car? Should I take a shopping bag or basket or use plastic bags for the things I buy? (Environmental)

Divide the class into three groups - Social, Economic and Environmental. Each group should consider the class list from above and select all the 'good things' and 'bad things' that fit their category.

Once you've done this, re-form into groups of three people, so each group has an expert on each category group. Take it in turns to describe all the issues that the farmer would have to consider for your category. On balance, is planting trees a good thing or a bad thing for your category?

Write down your group's conclusions:

For social reasons, tree planting is \_\_\_\_\_

For economic reasons, tree planting is \_\_\_\_\_

For environmental reasons, tree planting is \_\_\_\_\_

The social and environmental aspects of a plan can be very hard to put numbers against. Is protecting an endangered species better or worse than providing jobs for people in a small country town?

However, the economic aspects of a decision can be more easily considered. This exercise will help you determine the cost to the farmer of planting trees on his or her property.

To successfully plant trees the following process must be carried out:

1. Weed control must be undertaken so that weeds don't choke the new plants.  
Cost of weed control = \$40 per hectare
2. The area to be planted must be 'deep ripped' in advance. (**Ripping** allows a lot of water to be stored in the soil; this assists the future growth of the tree.)  
Cost of deep ripping = \$175 per kilometre (covers 5m width)
3. **Stock** proof fences need to be built on both sides of the area to be planted.  
Cost of fencing (materials only) = \$2200/km
4. Seedlings must be planted - one seedling per square metre.  
Cost of seedling and its planting = \$0.50 per seedling.
5. 1080 bait must be laid to keep rabbits out of the area. 1080 (pronounced "Ten Eighty") is a poison made from a chemical found in native West Australian plants from the genus *Gastrolobium* and *Oxylobium*. Because it is made from native plants it is non toxic to Australian native animals at the levels used for baiting.  
Cost of 1080 trails for rabbits = \$50 per kilometre (covers 5m width)

Use the above figures to complete the following investigation problem:

You are a farmer and you have decided to revegetate an area of your property. You'll need to use the information in the table to calculate the cost of this **revegetation** program. As this is the first time you have done this on your farm, you are going to test it first on a strip of land 100 metres (0.1km) long and 5m wide.

What would be the costs in planting trees on this 100 metre long strip of farm land?

ITEM	COST for 100m x 5m
Weed Control (\$40/ha)	
Ripping (\$175/km)	
Fencing (both sides of the land, \$2200/km)	
Seedlings (1 seedling per square metre @ \$0.50 each)	
1080 rabbit trails (\$50/km)	
<b>Total Cost</b>	

**Extension activity:**

Stage a class debate on the topic "Our taxes should be used to pay for revegetation".

Alternatively, design a poster or a community service announcement for TV or radio to encourage farmers to revegetate areas of their properties.

# Worksheet 2a - Land-use Planning

## Objective

Students will understand the importance of treating each land management unit in respect to its individual land capability.

## What's this site about?

The division of the farm into land management units enables the farmer to manage each unit according to its land capability. This is a fundamental aspect of the process of 'whole farm planning'.

From this site a variety of land management units is visible. Land management units are defined as areas which have similar slope, soil type, land **degradation** potential and management practices.

Having identified these similar units, farmers will try to fence them so a single land management unit is contained in a single paddock. This makes management more simple as each paddock will respond in the same way to treatment by the farmer.

As you look out across the farm, at least three land management units are visible.

The most prominent is the land management unit occupied by the Avondale Reserve (Unit A). This land management unit is characterised by steep slopes, a rocky surface, high degradation potential and shallow soils.

The second land management unit is the flat land in front and to the right of the reserve (Unit B). This is an example of the most productive land management unit on the farm. It is flat, and hence has lower land degradation potential. The soil is **fertile** and the most productive on the farm.

The third land management unit, which is closest to the gazebo you are in, is the steeper, cleared land (Unit C). This land management unit is characterised by its gentle slopes, fair quality soil and a medium to high land degradation potential. The soil is **fertile** and can be farmed, provided the farmer ensures that it doesn't **degrade**.

## WHAT WOULD YOU DO?

If you farmed these three paddocks, what sort of management practices would you use? Consider the types of **stock**, **crops** and land management techniques you have been learning about.

Before you get started, write a short description of each of the keywords below, then use these words to fill in your plan on the next page.

## KEY WORDS:

*contour banks* \_\_\_\_\_

*ground cover* \_\_\_\_\_

*pasture* \_\_\_\_\_

*clover* \_\_\_\_\_

*revegetation* \_\_\_\_\_

*fencing* \_\_\_\_\_

*alley farming* \_\_\_\_\_

*remnant vegetation* \_\_\_\_\_

*crop rotation* \_\_\_\_\_

## **Land Use Plan**

Describe or draw (map) your plan for the three different land management units.

**UNIT A:** *(How would you manage this area of land? Consider the surface, soil and plants)*

**UNIT B:** *(What would you do in this very fertile paddock, keeping in mind land degradation?)*

**UNIT C:** *(How would you manage this paddock closest to the gazebo?)*

# Worksheet 2b - Rotations

## Outcome

Students develop an appreciation of the benefits of rotations.

## Background

The process of rotating crops and stock is highly variable, being dependent on an individual farmer's land capability, stock numbers, disease and weed control, market forces, labour requirements and seasonal variations. There are no fixed rules for rotations and farmers are always looking to improve their individual systems.

Leguminous plants grown in a crop rotation is one way of helping the soil to remain healthy and productive.

A bacterium called Rhizobium lives in the nodules on the roots of legumes. It does the chemical work in changing the nitrogen from the air into a form that other plants can use in the soil. Nitrogen is a nutrient essential for plant growth.

As you look over the farm you will notice a variety of activities. Some paddocks have sheep grazing on **pastures**, other have a cereal **crop** growing. You may also notice a legume **crop**.

When all these components are considered as a whole, this is what is known as a 'farming system'. All of these components are managed so as to have a positive effect on each other. Many of the activities on the farm have the potential to complement each other.

Leguminous plants (legumes) have nitrogen-fixing bacteria in their root nodules. In return for simple sugars supplied by the plant, the bacteria fix nitrogen from the air and the plant uses this nitrogen to form proteins essential to its growth.

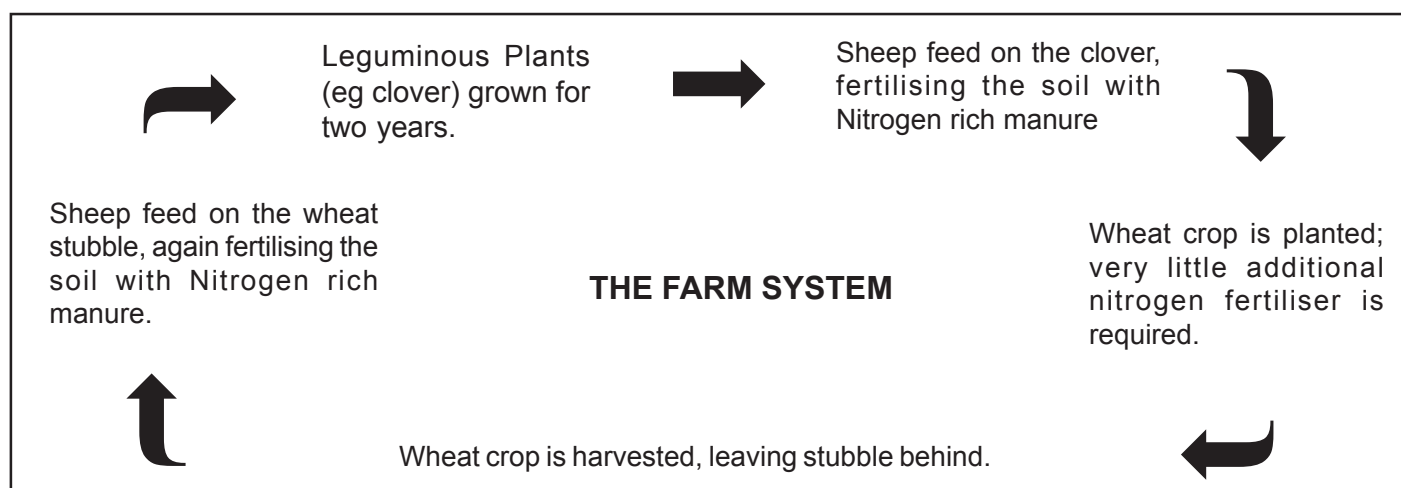
When the plant dies and decomposes, this nitrogen is returned to the soil. If the plant is eaten by another organism, the nitrogen is returned to the soil as manure, in the form of urea.

Some **pasture** species such as clover are leguminous plants. This means that a farmer can have a pasture that is feeding the sheep while at the same time fertilising the soil with nitrogen.

After two successive years under a clover **pasture**, the paddock is ready to produce a **crop** of wheat. The nitrogen obtained from the clover **pasture** means that less nitrogen fertiliser has to be applied by the farmer.

When the wheat is harvested in around seven months, the farmer only takes the top of the plant, which contains the grain. The rest of the wheat plant is left standing in the paddock. These remains are called stubble. Sheep are allowed back in to the paddock to graze the stubble in preparation for turning the paddock back to **pasture**.

While this is a simplified chain of events, you can begin to appreciate how the farmer can ensure that components of the farm complement each other. This cycle of events is called a rotation.



## Explanation Plan

Write down some notes in each section after reading the fact sheet on crop rotation.

**TOPIC:** *Crop Rotation*

**DEFINITION:**

*What is crop rotation? Write down three or four sentences in your own words that define crop rotation.*

**COMPONENTS/PARTS:**

*Describe some features of crop rotation. What is needed for crop rotation?*

**OPERATIONS:**

*Describe the process of crop rotation. Write a few sentences that describe how crop rotation works.*

**APPLICATIONS:**

*When is crop rotation an important process for farmers? Why use crop rotation?*

# Worksheet 3 - Erosion

## Outcomes

Students will understand the need for specific management practices to prevent erosion.

## Background

One of the benefits of the whole farm approach that we studied in worksheet 2a is that once land management units are isolated, each can be accurately assessed for its erosion potential and managed to minimise its impact.

At this site consider the slope of the land and its relationship with water **erosion**.

The paddocks at the northern farm boundary are steep. When there is a lot of rain there will be considerable runoff. The steep land means water will flow quickly, thus increasing the potential for **erosion**.

Look at the landscape and write down your observations to the following questions about the paddocks.

How have farmers managed the land to lessen the effect of water **erosion**?

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Why does positioning the contour banks around the hill control the speed at which water travels? Explain your reasons carefully.

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If the banks were closer together, how would this affect the **erosion** potential of runoff water?

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Walk about 50 metres into the paddock. Examine the ground, looking for machinery marks left during the most recent **cropping** program. Describe the direction of the marks (are they parallel to the contour banks, etc?).

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What advice would you give a farmer to reduce the possibility of water **erosion**?

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# Worksheet 4a - Remnant Vegetation

## Objective

Students learn the role and value of remnant vegetation.

## Background

Remnant vegetation has become increasingly rare as private land is cleared for agriculture. Over 93% of natural vegetation has been cleared from the Central Wheatbelt.

This remnant vegetation was fenced in 1978 after 140 years of grazing. The reserve plays an important role in the preservation of native flora and fauna.

Give two or three reasons why the fence has been of great importance to the preservation of the area. (Consider the flora and fauna of the area.)

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What could the reserve provide for:

Native mammals?

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Birds?

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What role do birds play on a farm, in general?

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How could you attract more birds to the reserve?

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How could the reserve be used to assist with native plant propagation?

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# Worksheet 4b - Feral Animals

## Objective

Students understand the major impact feral animals have on the natural ecosystems.

## Background

Feral animals have had a devastating effect on native flora and particularly on our native fauna. Many species of small native mammals are either extinct or on the brink of extinction as a result of predation by foxes and cats. The vermin-proof fence around Avondale Reserve reduces the impact of feral animals on the reserve.

The reserve provides homes for more than just the native animals. Feral animals are also occasionally found in the reserve.

Dr. David Patton of the University of Adelaide has done research into the impact of non-native predators upon small native animals. Through his research, he has found that a feral cat needs 300g of meat a day to survive (equivalent to a medium steak per day).

The Avondale Reserve contains brown honeyeaters (a bird weighing approximately 10g) and singing honeyeaters (approx 25g) along with a variety of other birds.

### PROBLEM:

If one feral cat needs 300g of meat a day, how many of each bird would the cat need to catch and eat?

Brown honeyeater (10g) \_\_\_\_\_

Singing honeyeater (25g) \_\_\_\_\_

Feral cats are domestic cats that have gone wild. Suburban cats also have a significant impact on native animal populations. The average domestic house cat kills eight birds per year (the data takes into account cats that wear bells).

### PROBLEM

If half your class has a cat at home, work out how many birds these cats kill per year.

## CONSERVATION

What sort of solutions can you think of to protect native animals against feral animals?

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Although Avondale Reserve is not grazed by livestock, rabbits are herbivores and will graze heavily, as well as dig holes.

What would be the impact of rabbits in an area like Avondale Reserve?

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What sort of vegetation (plants) would be depleted by an uncontrolled rabbit population?

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Avondale Reserve is considered unique because of its size and range of resident plant species. Do you consider the reserve to be of any value? Give reasons for your answer.

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# Worksheet 5 - Riparian Vegetation

## Objective

Students learn the importance of riparian vegetation (trees, shrubs, grasses growing along the banks of rivers, streams and gullies).

## Background

Riparian vegetation performs a number of important functions. The vegetation acts as a filter for water entering the creek, thus maintaining water quality; it reduces erosion of creek banks and performs a role as a corridor for native animals.

This creekline is one of many being **revegetated** in the Western Australian wheatbelt. Until recently most waterways were readily accessed by livestock, which cause problems such as erosion, loss of vegetation and water pollution. More than 100 landcare groups in the Avon Valley are working to address this problem.

In Worksheet 1 you were given the figure for planting a tree on a property (approx \$0.50 per tree). If you were to plant one tree per metre, calculate the cost of revegetating 400km of creekline (don't forget to plant on both sides of the creek!)

length of creekline in metres x cost of one tree = cost of planting one side of the creek

Look out to the creekline. Give two or three reasons why you think this creekline has been revegetated.

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Describe the types of plants along the creekline:

Understorey (low lying plants):

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Upperstorey (trees and tall plants):

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How would the creekline help the native animals that live along and around it?

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# Worksheet 6a - New Ideas

## Objective

Students understand the potential for increased productivity through incorporating new ideas into the farming system.

## Background

While the concept of fodder shrubs is not new, the search for new varieties is opening up areas of grazing that were once not feasible. As a result, the productivity of once marginal land management units is being significantly increased.

Research Stations like Avondale improve the efficiency and productivity of farming activities by testing new research. Both scientists and farmers can then decide the viability of a project before adopting the new practices.

Here a wide variety of **fodder shrubs** have been planted to assess their potential. Fodder shrubs are deep rooted **perennials** that can be grazed by **stock**. Tagasaste (pronounced "TAG-a-sassty"), a popular fodder shrub, grows well on deep, dry sands and can turn low-value land into productive paddocks.

What would be some of the characteristics that would be useful when deciding on the type of fodder shrubs to use? Think about the environment that the plants have to grow in, and what the fodder shrubs will be used for.

During autumn, farmers without fodder shrubs may hand feed stock when **grazing** is poor. At this time of year, farmers are also very busy preparing for **seeding**.

What are some of the advantages of fodder shrubs in situations like this?

# Worksheet 6b - Integrated Landcare

## Objective

Students understand the benefits of integrating landcare with the farming system.

## Background

The future of sustainable farming is to address the causes of **degradation** on the farm while still being economically viable. Fodder shrubs fill both these criteria and are a step toward a sustainable farming system.

Fodder shrubs make a useful contribution to **sustainable agriculture**. The farming system must more closely mimic the natural **ecosystem** as it was before clearing to restore balance in the natural system. The current imbalance has caused **erosion**, rising **groundwater** and **salinity**.

At the same time the farm is a business that must be profitable. The challenge is to create a system which is sustainable and profitable. Fodder shrubs are an example of integrating the needs of production and conservation.

What role could fodder shrubs play in the prevention of **erosion**?

What effect would fodder shrubs have on the groundwater (remember that fodder shrubs are **perennials** with deep root systems)?

In terms of **sustainable agriculture**, how do **annual** grasses compare with fodder shrubs?