

Year 7-8

Design and Technologies



Agriculture in Education:
an educational resource for Year 7- 8 Design and Technologies

Sustainable Agriculture – Regenerating the Family Farm



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AGRIFOOD
SKILLS AUSTRALIA



Sustainable Agriculture – Regenerating the Family Farm

Year 7- 8 Design and Technologies

Content Description

Analyse how food and fibre are produced when designing managed environments and how these can become more sustainable ACTDEK032

Independently develop criteria for success to evaluate design ideas, processes and solutions and their sustainability ACTDEP038

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Learning Outcomes

At the end of the unit, students have a greater understanding of:

- The Australian sheep industry;
- The role of research in promoting sustainable livestock management practices;
- The elements of sustainable agriculture and their application in sheep and cattle raising;
- The economic, environmental and social components of sustainability;
- The consequences of ill-informed land and water management practices;
- The impact of riparian buffer revegetation and wildlife corridors; and
- Sustainable livestock raising farm management and production systems.

Description

This unit enables students to investigate sustainable farming methods used by livestock farmers in Australia today. It draws on the views and experiences of Australian farmers raising sheep for wool and/or meat, as they explain the measures they are taking to ensure the sustainability of their farm management and production systems.

The accompanying video: – *Low Impact Sustainable Agriculture – Regenerating the Family Farm* (<https://youtu.be/4b26zrkwlPU>) provides a case study of a mixed farming operation in Southern Victoria – Yan Yan Gurt West farm. Since the early 1990s, members of the Stewart family have transformed their degraded and eroded sheep farm, which has been in the family for over 100 years, into a sustainable agricultural enterprise, in harmony with its surrounding environment.

The principles of sustainable agriculture investigated in this unit, are being applied throughout Australia today across all agricultural contexts and in all environmental conditions. Teachers are advised to use this unit as one of a number of examples of sustainable food and fibre production across a range of Australian environments and agricultural commodity contexts.

Activities are sequenced, enabling students to build on existing knowledge and to apply new information and skills within different contexts. Activities are supported by teacher and student background information.

Activity 1: Sheep Facts

Activity 2: Sheep and Sustainability – Target 100

Activity 3: Yan Yan Gurt West Farm – a case study in regenerative agriculture

Activity 4: Yan Yan Gurt West farm – Photo interpretation 1 & 2 + Assessment

Activity 5: Turning problems into solutions on Yan Yan Gurt West farm

Activity 6: Design Solutions for Sustainable Agriculture + Assessment

Extension Activity: Design and Cob House

Teacher Background Information

Overview of the Australian sheep industry

Sheep raising for meat and wool is one of Australia's oldest and most successful agricultural industries. Today,

Australia is one of the world's leading producers of lamb and mutton and is the world's second largest lamb exporter.

Australian wool is regarded as among the world's best and Australian farmers produce around 25 per cent of all the greasy wool (straight off the sheep after shearing) sold on the world market. Australia is also a leading producer and exporter of sheep meat. Australian lamb highly sought after in local and overseas markets.

Key facts:

- There are about 70 million sheep in Australia today - almost three times as many sheep as people.
- Australian livestock farmers are the caretakers of 47% of the nation's land.
- Wool is Australia's 3rd largest agricultural commodity export after beef and wheat.
- Lamb is Australia's 6th largest agricultural commodity export after barley and wine.
- Estimated value of wool exports in 2015-16 - \$3.4b.*
- Estimated value of lamb exports in 2015-16 - \$1.6b.*

* Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES).

Mistakes from the past: In Australia from the 1800s to the middle of the 1990s, government-mandated land clearing for agriculture triggered a chain of consequences which resulted in a serious decline in biodiversity and a reduction in the productive capacity of the land. With the removal of native vegetation, animal habitat declined and there was a loss in biodiversity. Inappropriate land management strategies lead to increased runoff and soil erosion, a decline in soil fertility, weed infestations and the spread of feral animals.

Farming today: The situation is very different. With the benefit of experience, many years of research and a greater understanding of the natural environment, farmers have changed the way they farm and care for the land. They are committed land managers. Livestock farmers know that healthy, diverse and productive ecosystems underpin their ability to make a living from the land and provide high-quality products to local and overseas markets.

Australian livestock farmers are increasingly demonstrating their ability to create sustainable farming systems - managing seasonal and longer term climatic changes, soil, water and pasture quality, biodiversity, livestock health and welfare and market demands. As caretakers of the land, farmers are improving efficiencies, reducing their resource use and passing the land on in an improved condition.

Farmers and others working across all stages of the agricultural industry supply chain, have embraced the responsibility to produce food and fibre sustainably.

Agriculture industry research

Years of research and development lie behind advances in agricultural production, environmental management, food processing and export of agricultural products, especially wool and meat. The agriculture industry invests heavily in research.

CSIRO: Research is carried out across a broad range of industry sectors. Examples of the research related to Australia's agricultural industries can be accessed as follows.

Agriculture - <http://www.csiro.au/en/Research/AF>

Animals and Plants - <http://www.csiro.au/en/Research>

Farming and Food Production - <http://www.csiro.au/en/Research/Farming-food>

Food and Nutrition - <http://www.csiro.au/en/Research/FNF>

Health and Biosecurity - <http://www.csiro.au/en/Research/BF>

Land and Water - <http://www.csiro.au/en/Research/LWF>

Meat and Livestock Australia (MLA): MLA is involved in on-farm and off-farm research and development projects with a wide range of project partners, including producer groups, peak industry councils, the CSIRO, leading Australian universities and international research centres.

<http://www.mla.com.au/Research-and-development>

Target 100: This project supports 100 active research, development and extension projects that focus on animal welfare and environmental sustainability within the context of profitable farming systems. Target 100 projects are led by research groups including universities, the CSIRO, government departments and agencies.

<http://www.target100.com.au/100-Initiatives/Current-Initiatives>

With the benefit of experience, cutting edge research and a greater understanding of the natural environment, farmers in Australia have changed the way they farm and care for the land.



discuss

Setting the Scene

Livestock farmers in Australia place a priority on improved environmental management through balancing the needs of their animals, their pastures and the environment. For Australia's livestock industries to be sustainable, they must be profitable, have a strong and efficient workforce and be part of viable rural communities. Continued improvement in environmental management and animal welfare, is dependent upon the entire supply chain being profitable, from the farm gate to the processor.

Introduce the unit by watching and discussing key messages in the short video below in which four livestock farmers provide a comment on what sustainable farming means to them.

Introducing Target 100 - <http://www.target100.com.au/Home>

"To me, sustainable farming is adding and improving the environment rather than just maintaining it and certainly not degrading it." Stuart Barrett, Drumburie, Thangool Queensland.

"We are caretakers over a fair part of Australia and therefore we certainly need to leave it in a better position than when we found it." Ken Baldry, Wallendbeen NSW

"What we are doing is not just for the human species, that we are actually trying to look after future generations of plants, birds, animals and birds because we all have to live here together." Pip Job, Cumnock NSW.

"Because we're so isolated, it is really important that we are able to tell our story. We've got a great story to tell – it's a story about sustainability, a story about caring for our animals and a great lifestyle that we are passionate about." Jane Sale, Yougawalla WA.

Discussion starters:

- What was the common underlying message from these four farmers from different parts of Australia?
- Ask students to suggest the percentage of the land surface of Australia devoted to livestock raising and what are the major livestock raising activities in Australia?
- Students may be surprised to learn that the answer is 47%. Make sure they understand that in extensive grazing not all of this land is occupied by grazing animals at the same time. Sheep and cattle are the major animals grazed. Others include goats, deer and alpacas.
- Determine student's existing knowledge of concepts such as rotational grazing and stocking rates.
- It is estimated that every Australian farmer produces enough food to feed 600 people, 150 at home and 450 overseas. Australian farmers produce almost 93 percent of Australia's daily domestic food supply.



Student Activity 1: Sheep facts

Did you know? There are about 70 million sheep in Australia today - almost three times as many sheep as people.

Key facts:

- Wool is Australia's 3rd largest agricultural commodity export after beef and wheat.
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* Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES).

Working in pairs, undertake a quick fact finding mission from the Meat and Livestock Australia (MLA) website to discover more about the importance of Australia's sheep industry today.

Class Question: What is Meat and Livestock Australia? Who does it represent? What is its role?
<http://www.mla.com.au/About-MLA>

Fact Finding Mission1: Sheepmeat fast facts 2015 Meat and Livestock Australia (MLA)

<http://www.mla.com.au/Prices-markets/Trends-analysis/Fast-Facts>

1. How does Australia rank as a world producer and exporter of lamb, mutton and live sheep?
2. What are Australia's three largest export markets for mutton and live sheep?
3. Where is most of Australia's prime lamb produced? Rank each state from highest to lowest. Why is this?
4. How much lamb is consumed per person in Australia per year? Comparison with other countries?
5. Does Australia produce more lamb for export or for the domestic market? What evidence can you find?

Follow up class discussion: There has been a lot of discussion in Australia about exporting live sheep? Why do some countries prefer to import live sheep rather than buying the slaughtered and processed meat product?

Research Task 2: Cuts of Australian lamb Meat and Livestock Australia (MLA)

http://www.australian-meat.com/Foodservice/Proteins/Lamb/Why_Australian_Lamb/

1. What is meant by the term Australian Lamb retail cuts and what are its six defining qualities?
2. In what way are these 'retail cuts' a more sustainable method of meat preparation?
3. What are Australian sheep fed? What are the benefits of this method of raising sheep?
4. Which part of the sheep does a lamb chop come from? Identify the nine different cuts of lamb shown.
5. List three of the key nutritional values of lamb.

Follow up class discussion: What are the stages of sheep meat production – from the farm to the table. Why is meat safety such an important issue – both for the local market and Australia's export sales?



Student Activity 2: Sheep and sustainability - Target 100

Livestock farmers in Australia place a priority on improved environmental management through balancing the needs of their animals, the pasture and the environment. However, in order to do so, all stages of production, from the farm gate to the processor, need to be profitable and carried out by an efficient and capable workforce.

Past agricultural practices in Australia, such as clearing the vegetation, regularly ploughing the land, and introducing animals and plants from overseas, resulted in many unintended but undesirable consequences. Examples being:

- soil erosion and the loss of soil nutrients;
- decline in biodiversity;
- weed infestations and the spread of feral animals.

Sheep farmers today are applying scientific research and technological innovation to monitor and manage their livestock more efficiently. This is enabling them to:

- enhance sheep quality through selective breeding;
- improve the health and welfare of livestock;
- meet local consumer demands for safe and high quality lean meat: and
- meet the preferences and requirements of overseas customers.

Target 100 is an initiative of Australia's sheep and cattle industries in which Australian universities and research organisations are researching and developing more efficient and environmentally beneficial practices across the supply chain. There are 100 projects underway at any one time – when one finishes, another starts. All are focused on ensuring that Australia continues as a sustainable producer of the world's best lamb and beef.

Working in groups, access the Target 100 website to investigate one of the following four aspects of farming sustainably <http://www.target100.com.au/Environment>. Read the farmers' stories for your chosen topic.

1. Soil and Groundcover
2. Biodiversity
3. Pests
4. Weeds

Record your initial findings under the following categories. These notes will form part of your further research. Create a glossary for new terms you come across. Remember to verify your sources.

Issues	Facts and Impacts	Action	Definitions
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As a class, discuss your findings from each of the four areas investigated. Suggest aspects you would like to investigate further. Reflect on the stories you have read about.

Yan Yan Gurt West farm: A case study in regenerative farming

Teacher background notes

Supporting video - *Low Impact Sustainable Agriculture – Regenerating the Family Farm* (<https://youtu.be/4b26zrkwlPU>)

Overview: From the 1870s, pioneer settlers removed most of the native vegetation leaving patches of remnant vegetation and isolated regrowth areas. The farming landscape began to show signs of salinity after the network of water holes along the watercourse of the Yan Yan Gurt Creek was drained.

Yan Yan Gurt West farm provides a case study in sustainable production – balancing the needs of the animals, the pastures and the environment along with the health of those who live and work there.

History: Indigenous people lived in the area prior to European settlement. In the 1870s, European settlers moved into the area and commenced clearing the vegetation, growing crops and raising animals. The Stewart family settled there over 100 years ago and the owner's three daughters are the 5th generation living on and earning a livelihood from the property.

From the 1870s, the pioneer settlers removed most of the native vegetation leaving only a few patches of remnant vegetation and some isolated areas of regrowth scrub. The farming landscape began to show signs of salinity after the network of water holes along the natural low lying watercourse of the Yan Yan Gurt Creek was drained. Serious gully erosion, stream bank erosion and waterlogging developed along the artificially created drainage channel. With just 3.5% of the property under trees, there was minimal shade and shelter for the sheep and cattle. The few fenced paddocks were too large for effective grazing management. The farm system and the catchment were not sustainable.

Today: The property has been transformed. Since the early 1990s, close on 40,000 trees and shrubs have been established and 3.5 hectares of remnant vegetation maintained. In addition to raising sheep for both prime lamb and wool production and cattle, 30 hectares of tree plantations are now managed for commercial timber production.

The integration of farm forestry with Landcare has generated further income through on-site tours for local and international study groups. Integrating multipurpose trees into the farm landscape, has reduced risk and turned time into an opportunity. Land management problems are now solutions, increasing farm productivity in the short to medium term and providing a timber resource (timber, seed, carbon, aesthetics, other tree products and services) for long term future harvesting.

The land and livestock are better protected, biodiversity has increased, productivity is enhanced and the farm provides a more aesthetic and pleasant living and working environment.

Economic consequences

- Stocking rates have been maintained despite more land being fenced off for tree corridors.
- Prime lamb production, marketing options and profitability have increased.
- Smaller paddock size enables improved livestock monitoring and control.
- Improved lambing rate - pregnant ewes are scanned and those bearing twins are placed in the most sheltered paddocks with alpacas to protect new born lambs from foxes.
- Animal health and safety is increased. Fences along creeks and drainage lines keep stock away from more disease prone wet and boggy areas.
- Increased property value from the bio-diverse vegetation.
- Arboriculture is becoming an increasingly valuable income and employment earning opportunity.

Environmental consequences

- Tree cover increased from 3.5% in 1992, to over 17% today.
- Enhanced protection of soils from water and wind erosion as a result of increased vegetation cover.
- Smaller sized paddocks reflect varying land class and facilitate rotational grazing.
- Established and fenced network of tree corridors provide a habitat for native animals.
- Tree plantings reduce evapotranspiration from hot north westerly winds enhanced growing conditions for deep rooted, perennial herb summer fodder crops such as chicory and plantain.
- Commercial tree planting and re-vegetation in low lying wetter areas, further increasing soil nutrients and protection for tree seedlings.
- Reduced waterlogging - the property is now more trafficable and healthy.
- Reduction in stream bank and gully erosion through the re-vegetation of the riparian zones.
- The transformation of a large salt scalded area into a sheltered safe haven for newly shorn sheep.
- Bird species, including ibis, have increased. Ibis help keep grasshopper numbers down.
- Increased biodiversity has increased the numbers of predatory spiders that prey on the red legged earth mite. This mite devastates legume crops such as clover. Parasitic wasps may also be reducing cock-chaffer grubs, which can also destroy pastures. More research is being done into this.
- Active engagement with Landcare including demonstrations of farm forestry through on-site tours for local and international study groups.

Social consequences

- The farm provides a more aesthetic and pleasant living and working environment.
- The farm will be passed on to the next generation in an improved condition.
- Adult family members want to live and work on the farm.
- Diversified on-farm employment through the sale of timber, seed and conducting farm tours for students, farmers, government agencies and international groups.
- Materials sourced onsite for building the cob house.

Definitions

Agroforestry - a method and system of land management involving the simultaneous cultivation of farm crops and trees; agriculture incorporating the growing of trees.

Arboriculture - the cultivation of tree and shrubs

Hydrology - the scientific study of the movement, distribution, and quality of water on Earth

Riparian zone - the interface between land and a river or stream. Riparian vegetation refers to plant habitats and communities along river margins and banks. Riparian one of the fifteen terrestrial biomes of the earth

Gully Erosion - One of the most visible and severe forms of water erosion. Gullies are steep-sided watercourses which experience water flows during heavy or extended rainfall. Most are less than two metres deep, but in deep soils, such as on Yan Yan Gurt West farm, they can reach depths of up to 15 metres.

Streambank erosion - a natural process that the degradation of riparian vegetation causing excess sediment in waterways and damage to floodplain land and infrastructure.

The key to the management of erosion on grazing lands is control of grazing pressures. On all agricultural land, soil management increases organic matter. Promoting greater water infiltration and evapotranspiration by plants is vital to the management of soils degraded through erosion.

Teacher preparation

For the following two activities, students will need to be provided with copies of:

- Student Information sheet. Yan Yan Gurt West farm - case study in regenerative agriculture
- Activity 3: Yan Yan Gurt West farm - case study in regenerative agriculture
- Activity 4: Yan Yan Gurt West farm - Photo interpretation 1
- Activity 4: Yan Yan Gurt West farm - Photo interpretation 2

Students watch the accompanying video *Low Impact Sustainable Agriculture – Regenerating the Family Farm* (<https://youtu.be/4b26zrkwlPU>)

A short assessment task is suggested at the end of the Activity 4.

Yan Yan Gurt West farm - case study in regenerative agriculture

Student information sheet

A study of Yan Yan Gurt West farm reveals how former unsustainable land management practices have been overcome. The implementation of regenerative agricultural practices has transformed this sheep grazing property from a degraded farming landscape into a more productive and diversified farming operation.

Previous inappropriate land and water management practices are highlighted in the video *Low Impact Sustainable Agriculture – Regenerating the Family Farm* (<https://youtu.be/4b26zrkwlPU>). These practices resulted in reduced farm productivity through stock losses, severe soil erosion, a degraded and exposed landscape and poor quality pastures.

Situation in 1992:

- Much of the native vegetation on the farm had been removed and native animal habitats destroyed.
- The natural meandering flow of the watercourse – Yan Yan Gurt West Creek had been changed.
- The banks of the creek were eroded and the creek had cut a deep channel down to the bedrock.
- Low lying areas were often waterlogged and salt had built up in the soil.
- There was very little shade and shelter for livestock.
- Paddocks were too big for effective grazing management.
- A more sustainable farming, land and water management system was needed.

The East Otway Landcare Group developed a plan to manage the surrounding Yan Yan Gurt Creek catchment area. This encouraged landowners in the area to implement a variety of landcare, water quality, landscape, habitat and animal productivity initiatives.

The whole-of-farm plan for Yan Yan Gurt West farm involved integrating farm forestry into the regeneration process as the basis for improving soil and water quality, increasing groundcover, pasture and biodiversity and improving the overall productivity and sustainability of the farming operation.

Situation today:

- Fences along creeks and drainage lines now keep the stock out of the wet and boggy areas. This has improved water quality and also reduced the risk of disease for the livestock.
- Both commercial and non-commercial timber species have been planted in the low lying areas. Here there is greater moisture and soil nutrients, seedlings are better protected and biodiversity is increasing.
- Wildlife corridors are now linked within these fenced and revegetated areas.
- Waterlogging has been reduced, enabling livestock and vehicles to move about the property more easily and safely.
- Tree corridors now provide protection from hot north westerly winds in summer, allowing the establishment of deep rooted summer fodder crops. These provide a valuable source of feed for livestock during the hot dry months and have considerably improved the prime lamb production.
- A dryland salinity area that was a large bare scar on the landscape has been revegetated and is now a safe and sheltered place for newly shorn sheep and an attractive haven for birds.
- Arboriculture is an increasingly valuable income earning and employment opportunity.



task

Student Activity 3: Yan Yan Gurt West farm – a case study in regenerative agriculture

Yan Yan Gurt West Farm is a 230 ha mixed farm, located in the northeastern foothills of the Otway Ranges in Southern Victoria. The farm supports mainly sheep for meat and wool, with some cattle, horses, alpacas and chickens.

- On average, 1600 prime lambs and over 80 calves are raised each year;
- Perennial summer crops such as lucerne and plantain are managed for livestock feed;
- Rotational grazing is practised;
- Remaining areas of native vegetation (3.5 hectares) are managed along with 30 hectares of tree plantings, over half of which have the potential to be used for commercial timber;
- Bush foods and banksias are grown on a formerly degraded and eroded area and sold locally.

Yan Yan Gurt West farm is a case study in sustainable agriculture - balancing the needs of animals, pastures and the environment along with the health and lifestyle of those who live and work on the farm.

As a class, discuss the following after viewing the video

[Low Impact Sustainable Agriculture – Regenerating the Family Farm \(https://youtu.be/4b26zrkwlPU\)](https://youtu.be/4b26zrkwlPU)

1. What is the meaning of Yan Yan Gurt? Why might the family have adopted the name and do you think it is appropriate? Discuss your reasons.
2. Andrew mentions that the hydrology of the farm was changed when previous generations of the family made changes to the natural watercourse. Why might this have been done?
3. What is the meaning of the term **hydrology**. Find a definition and add it to your glossary.
4. What is your overall impression of the farm? What are the major income earning activities?
5. 40,000 trees have been planted on this predominantly sheep grazing property since the early 1990s. Suggest reasons why there has been such an emphasis on planting and nurturing trees on the property?
6. How might this affect the main income earning activity on the farm?
7. Andrew and Jill are members of the East Otway Landcare Group. What is Landcare Australia and why might they play such an active role in it?
<http://www.landcareonline.com.au/>
8. Explain the three elements of sustainability mentioned by Kristy in the video – [Low Impact Sustainable Agriculture – Regenerating the Family Farm \(https://youtu.be/4b26zrkwlPU\)](https://youtu.be/4b26zrkwlPU)
Record how these apply within a food and fibre context.
 - Environmental Sustainability
 - Ecological Sustainability
 - Social Sustainability

Your class may decide to watch the video again to reinforce some of the aspects raised in the discussions above.



Student Activity 4: Yan Yan Gurt West farm – Photo interpretation 1

Working with a partner, examine the following photos taken over a period of 20 years.

1994 - Artificially created drainage channel on Yan Yan Gurt West Farm



1999: Same view after five years





task

Student Activity 4: Yan Yan Gurt West farm – Photo interpretation 1 2013 – Same view after a further 14 years



Once you have considered the following, share your observations with the class.

1. What evidence is there that these photos were taken from the same place?
2. What can you see in the 1994 photo? Would livestock have been able to access this area for drinking water? How would this area have looked after a lot of rain?
3. What types of vegetation can be seen in the 1999 photo? Would livestock have been able to access this area at that time? What evidence is there?
4. 2013 - what obvious comparisons can you make with one or both of the previous photos? What changes would you expect here in regard to soil quality and native animal habitat? What benefits would this area bring to the livestock in the adjacent paddocks? Why?
5. This part of the farm can be described as a riparian zone. Conduct some research on riparian zones and riparian vegetation. Write a definition for each. Identify the reference source you used for these definitions.



assess

Students are to prepare a short report explaining the changes that have resulted from the rehabilitation of the riparian areas and the establishment of tree corridors. Consider aspects such as:

- a. the benefits to livestock;
- b. increased biodiversity; and
- c. income earning opportunities.



task

Student Activity 5: Turning problems into solutions on Yan Yan Gurt West farm

"We look to turn our current land management problems into solutions which address environmental issues and increase farm productivity in the short medium term whilst, at the same time, developing a resource (timber, seed, carbon, aesthetics or other tree products and services) that we, as a family, can farm in the future".

Andrew Stewart - Yan Yan Gurt West farm.

1. A number of significant land management decisions have been taken to address the environmental issues on Yan Yan Gurt West farm and to establish a sustainable farming system. Carry out an initial class brainstorming exercise to identify the issues raised. Using the template below, list these in the left hand column.

Yan Yan Gurt West farm

Issue	Action	Results

Copy new terms and their meanings into your glossary.



task

Student Activity 5: Turning problems into solutions on Yan Yan Gurt West farm (cont.)

2. As a class, look at the list of issues. Rank these from most important to least by penciling in a number in the second column beside each issue.
3. Next, work down through your issues list, starting with the issue that most people judged as the most important. Discuss the actions, then working on your own, fill in the results box for that action.
4. Continue to do this - issue by issue, as a class. Discuss each action then record the consequence(s) of that action. If an issue has a number of actions, create an additional row.
5. Once the class has finished recording the results for each issue, check that the main issues have been covered.
6. Next, think about how these actions have created new opportunities for the longer term viability and sustainability of the farm.

Consolidate your findings.

Working by yourself, write down your own responses to the questions below.

- In what ways has the regenerative work undertaken within the riparian zones on Yan Yan Gurt West farm improved the livestock management system?
- Some farmers prefer the term regeneration to sustainability. In the context of livestock raising in Australia, explain the difference. Provide some examples.
- Explain the benefits that have resulted from the restoration of the degraded dam site and the extensive planting of banksias and other native grasses and herbs, has created both an environmental and economic solution.
- The riparian zone of the property and riparian vegetation have been the focus of much of the regenerative work undertaken on Yan Yan Gurt West farm. Find definitions for these terms and add them to your glossary. Why have livestock been removed from these areas?
- 40,000 trees and shrubs have been planted since the early 1990s. They are being integrated into the farm management system and are providing a source of income. Define the terms arboriculture and agroforestry. Explain how this has created a long term solution to a problem.

Activity 6: Design solutions for sustainable agriculture

Teacher preparation

To undertake the following assessment task, students are required to gather some further information about the livestock production and management systems of sheep farmers to add to and reinforce what they have discovered so far in this unit.

Their task is to look for further examples of these sustainable agriculture practices, how they are being implemented and the benefits they are delivering. They can select the format in which to present their findings.

Students should be able to explain the key underlying principles of sustainable agriculture and provide relevant examples both from Yan Yan Gurt West farm and from other farms they have investigated that demonstrate the benefits these practices are now delivering - both to the environment and the productivity of the farming system.

It would be expected that students are able to demonstrate their understanding of the underpinning concept, namely the vital role that livestock farmers play in protecting and improving the environment to ensure the long term profitability and sustainability of their farm resource.

They should also be able to use appropriate terminology in their explanations and discuss at least four or five of the following elements:

- increasing and maintaining biodiversity and increasing soil nutrients to enable greater efficiencies in grazing systems;
- revegetation strategies - improving soils and groundcover
- efficient water use
- managing pest and weeds and feral animals
- ensuring adequate pastures and groundcover to minimise runoff and prevent loss of soil through erosion;
- ensuring the health and welfare of their animals;
- rotational grazing - understanding the limitations of their own farm environment and adjusting the frequency and intensity of grazing in response to these limitations and seasonal fluctuations; and
- Landcare activities

Ideally, they will also explain how the integration of economic, environmental and social sustainability underpins the success of farming systems.



task

Student Activity 6: Design solutions for sustainable agriculture

“Cattle and sheep farmers recognise that healthy, diverse and productive ecosystems are vital to the viability of their livelihoods and their ability to continue providing high-quality beef and lamb to Australian and international consumers. The multitude of positive steps cattle and sheep farmers are undertaking to reduce environmental impacts and boost biodiversity on their farms ensures the sustainability of this vitally important industry”.

Target 100 Education –Biodiversity - Protecting the Environment

With the above quote in mind, gather further information about the livestock production and management systems of sheep farmers to add to and reinforce what you have discovered so far in this unit.

Some suggestions to consider:

- increasing and maintaining biodiversity and increasing soil nutrients to enable greater efficiencies in grazing systems.
- revegetation strategies - improving soils and groundcover.
- efficient water use.
- managing pest and weeds and feral animals.
- ensuring adequate pastures and groundcover to minimise runoff and prevent loss of soil through erosion;
- ensuring the health and welfare of their animals.
- rotational grazing - understanding the limitations of their own farm environment and adjusting the frequency and intensity of grazing in response to these limitations and seasonal fluctuations.
- Landcare activities.

There are a number of online resource that can assist you.

Target 100. Farmers stories

<http://www.target100.com.au/Farmer-stories/John-Blunt>

<http://www.target100.com.au/Farmer-stories/Bruce-Roz-Liam-Ella-Hannah-Maynard>

<http://www.target100.com.au/Farmer-stories/David-Worsley>

<http://www.target100.com.au/Farmer-stories/Charles-de-Fegely>

Virtual farm – Iona. A mixed farm in central NSW <http://virtualfarm.mla.com.au/>



assess

Your task is to explain the principles of sustainable agriculture. Provide examples of how Australian sheep farmers are implementing them and the benefits being delivered in the production of food and fibre.

Select an appropriate way to present your findings. It could be in the form of a short article, promotional poster, powerpoint or short video.



Optional extension activity: Design a sustainable cob house

Designing a Cob House

The cob house on Yan Yan Gurt West Farm has been built almost entirely from materials sourced from the farm – including the wool for the roof, chosen for its availability and insulation qualities.

A cob house is made from rammed earth. Rammed earth houses go by a number of names throughout the world. They are relatively simple to construct and have many desirable qualities. Like any house, they need to be maintained.

Undertake further research to discover:

- The properties of cob and the appropriate quantities of soil types;
- How they are built;
- What additional materials are sometimes required and why this is so;
- Its environmental benefits; and
- Maintenance requirements.

From what you saw on the video, think about the location of the cob house and the design elements.

Working in pairs or small groups, your task is to design another cob house for Yan Yan Gurt West farm. Your house needs to be in harmony with the surrounding environment and you will need to consider, determine and justify your design decisions.

- A suitable location on the Yan Yan Gurt West farm.
- Its aspect – namely which way it faces and why.
- The size and shape of the house.
- Construction materials - walls, roof and floor.
- Design features for energy efficiency.
- Design elements protecting structural features from water damage.
- The internal layout – location of various amenities.
- Access to power and water.
- Safety considerations.

Construct your design as an annotated diagram. Share your design solutions.

Online teacher support resources

- *Low Impact Sustainable Agriculture – Regenerating the Family Farm* (<https://youtu.be/4b26zrkwlPU>)
- Australian Lamb – Sustainability - Meat and Livestock Australia
http://www.australian-meat.com/Foodservice/About_Us/Environment_and_Sustainability/
- Australian Sheep Breeds - Meat and Livestock Australia
http://www.australian-meat.com/uploadedImages/Foodservice/Proteins/Lamb/Lamb_Grid.jpg
- Farm Facts - National Farmers Federation
<http://www.nff.org.au/farm-facts.html>
- Grazing strategies – Meat and Livestock Australia
<http://www.mla.com.au/Research-and-development/Grazing-pasture-management/Improved-pasture/Grazing-management/Grazing-strategies>
- Landcare Australia
<http://www.landcareonline.com.au/>
- Producing Cattle and Sheep - Primary Industries Education Foundation of Australia
<http://www.piefa.edu.au/units/cattlesheepbeeflamb.pdf>
- Production of Australian Lamb - Meat and Livestock Australia
http://www.australian-meat.com/Foodservice/Proteins/Lamb/Production_of_Australian_Lamb/
- Rotational Grazing - Meat and Livestock Australia
<http://www.mla.com.au/CustomControls/PaymentGateway/ViewFile.aspx?7Ega9cW04+iBxjDB/Yi6dxgcD85NYv//ga5VD0Pm5VGn7zSTFe8ObfOZEe6kk473EYMKKAfsht7d1Tnt3BqiA==>
- Rural Industries Research and Development Commission (RIRDC)
<http://www.rirdc.gov.au/>
- Sheepmeat Fast Facts 2015 - Meat and Livestock Australia
<http://www.mla.com.au/Prices-markets/Trends-analysis/Fast-Facts>
- Stream Bank Erosion Queensland Department of Natural Resources and Water
<http://www.qld.gov.au/dsiti/assets/soil/what-causes-bank-erosion.pdf>
- Target 100. Study Guides – High School: Water, Biodiversity and Greener Farming
<http://www.target100.com.au/Hungry-for-Info/Education/National-Curriculum-Study-Guides>
- Target 100. Farmers stories
<http://www.target100.com.au/Farmer-stories/John-Blunt>
<http://www.target100.com.au/Farmer-stories/Bruce-Roz-Liam-Ella-Hannah-Maynard>
<http://www.target100.com.au/Farmer-stories/David-Worsley>
<http://www.target100.com.au/Farmer-stories/Charles-de-Fegely>
- Cob material -
https://en.wikipedia.org/wiki/Cob_%28material%29
- Building with Cob – reprint from Permaculture International Journal
http://www.rainforestinfo.org.au/good_wood/cob.htm

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Cover images



Yan Yan Gurt West farm - by Andrew Stewart, for AgriFood Skills Australia



Ewes in tree corridor protected paddock - by Andrew Stewart, for AgriFood Skills Australia



Cattle on Yan Yan Gurt West farm- by Andrew Stewart, for AgriFood Skills Australia
