Farmer Time | Experts In The Field

Exploring Drones In Agriculture

TEACHER GUIDE

Episode 3: Drone Warrior

YEAR 7-10

This resource has been developed by:

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Farmer Time

SFIRP STORM & FLOOD INDUSTRY RECOVERY PROGRAM

Farmer Time | Experts In The Field

Exploring Drones In Agriculture

Teacher Guide

Overview

The Farmer Time | Experts In The Field three part series - *Exploring Drones In Agriculture* provides an excellent opportunity for students and teachers to engage with four experts and how they use emerging drone technology in agriculture.

Students will have the opportunity to engage with the experts focusing on the innovative ways drone technology in agriculture is used to improve efficiency, sustainability and precision farming practices.

The Farmer Time | Experts In The Field project focuses on developing students' knowledge and appreciation of Australian agricultural production and how drone technology is driving the agricultural industry into the 21st century.

The four *Experts In The Field* highlight the influences of current and emerging technologies on local environments, fostering responsible decision-making and judgment in adopting sustainable management practices.

Teaching Resource Options

Farmer Time | Experts In The Field three part series - *Exploring Drones In Agriculture*.

- Episode 1 - *Drones On Farms* with Pat McCutcheon (~12:00 mins)
- Episode 2 - *AgTech - Drones* with Ben & Brooke Watts (~14:00 mins)
- **Episode 3 - *Drone Warrior* with Chris Warrior (~11:00 mins)**

The resources have been designed as a three-part series with each lesson approximately 50-60 mins in duration. Teachers can adapt the lessons to deliver the content that is suitable to their student's learning styles and needs. Student workbooks can be printed prior to lessons.

Activities 1 & 2 Align with the Farmer Time | Experts In The Field videos. Suggested viewing options:

- Whole Class (WC): Classroom smartboard - WC view together
- Individual (I): Student's view on personal devices and work independently

Activities 3 & 4 Students will identify, discuss and evaluate the innovative ways agricultural technology has evolved to improve the efficiency and sustainability of regenerative farming practices, and how First Nations cultural knowledge is being used in decisions to care for country and place.

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NSW Science Years 7-10 Syllabus - Stage 4	
Earth & Space	**Content** **ES4** Science understanding influences the development of practices in areas of human activity such as industry, agriculture and marine and terrestrial resource management. (ACSHE121, ACSHE136) Students: • research how Aboriginal and Torres Strait Islander peoples' knowledge is being used in decisions to care for country and place, eg terrestrial and aquatic resource management.
Living World	**Content** **LW5** Science and technology contribute to finding solutions to conserving and managing sustainable ecosystems. Students: • describe how scientific knowledge has influenced the development of practices in agriculture, eg. crop cultivation to improve yields and sustainability.

NSW Science Years 7-10 Syllabus - Stage 5	
Living World	**Content** **LW2** Conserving and maintaining the quality and sustainability of the environment requires scientific understanding of interactions within, the cycling of matter and the flow of energy through ecosystems. Students: • assess ways that Aboriginal and Torres Strait Islander peoples' cultural practices and knowledge of the environment contribute to the conservation and management of sustainable ecosystems • evaluate some examples in ecosystems, of strategies used to balance conserving, protecting and maintaining the quality and sustainability of the environment with human activities and needs.

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NSW Agricultural Technology Years 7-10 Syllabus - Core A	
Introduction to Agriculture	**AG5-2** explains the interactions within and between agricultural enterprises and systems. Research a range of current and future employment opportunities in agriculture, for example: • agricultural practices employing Aboriginal knowledge • operating unmanned aerial vehicles (UAV) • precision farming and Global Positioning System (GPS) technologies. Identify the impact of a range of cultures, including those of Aboriginal and/or Torres Strait Islander peoples, on Australian agricultural production, for example: (ACTDEK040) • Aboriginal land management

NSW Agricultural Technology Years 7-10 Syllabus - Core A + B	
Plant Production 1 & 2 **Animal Production 1**	**AG5-8** evaluates the impact of past and current agricultural practices on agricultural sustainability Explore the effect of European and Aboriginal agricultural practices on agricultural production and environmental sustainability, for example: (ACTDEK040) • crop rotation Explore Aboriginal land management practices, for example: (ACTDEK040) • social and cultural practices that contribute to land management eg kinship responsibilities to Country • the use of Aboriginal knowledge as solutions **AG5-9** evaluates management practices in terms of profitability, technology, sustainability, social issues and ethics Evaluate the impact of current technologies on sustainability, for example: (ACTDEK041, ACTDEK044, ACTDEP051) • precision farming • Global Positioning System (GPS) technologies

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NSW Agricultural Technology Years 7-10 Syllabus - Core B	
Agricultural Systems and Management	**AG5-2** explains the interactions within and between agricultural enterprises and systems **Content** Identify opportunities provided by the agricultural sector, both as an employer and as a user of products
Life Skills	**AGLS-2** investigates environmental factors that affect plant and animal production **AGLS-7** identifies environmental effects of agricultural production

Australian Curriculum: Science F-10 V9.0 - Year 7-8	
Science as a human endeavour	**Nature and development of science** Explain how new evidence or different perspectives can lead to changes in scientific knowledge **AC9S7H01, AC9S8H01** **Use and influence of science** Examine how proposed scientific responses to contemporary issues may impact on society and explore ethical, environmental, social and economic considerations **AC9S7H03, AC9S8H03**

Australian Curriculum: Science F-10 V9.0 - Year 9-10	
Science as a human endeavour	**Nature and development of science** Investigate how advances in technologies enable advances in science, and how science has contributed to developments in technologies and engineering **AC9S9H02, AC9S10H02**
Science as a human endeavour	**Use and influence of science** Analyse the key factors that contribute to science knowledge and practices being adopted more broadly by society **AC9S9H03, AC9S10H03**

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Australian Curriculum: Design and Technologies F-10 V9.0 - Year 7-8	
Knowledge and understanding	**Technologies and society** Analyse how people in design and technologies occupations consider ethical and sustainability factors to design and produce products, services and environments **AC9TDE8K01** Analyse the impact of innovation and the development of technologies on designed solutions for global preferred futures **AC9TDE8K02**
	Food and fibre production Analyse how food and fibre are produced in managed environments and how these can become sustainable **AC9TDE8K04**

Australian Curriculum: Design and Technologies F-10 V9.0 - Year 9-10	
Knowledge and understanding	**Technologies and society** Analyse how people in design and technologies occupations consider ethical, security and sustainability factors to innovate and improve products, services and environments **AC9TDE10K01** Analyse the impact of innovation, enterprise and emerging technologies on designed solutions for global preferred futures **AC9TDE10K02**
	Food and fibre production Analyse and make judgements on the ethical, secure and sustainable production and marketing of food and fibre enterprises **AC9TDE10K04**

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ATTRIBUTION, CREDIT & SHARING

This resource was produced by Primary Industries Education Foundation Australia (PIEFA) in collaboration with **Chris Warrior, Wiru Drone Solutions.** Primary Industries Education Foundation Australia's resources support and facilitate effective teaching and learning about Australia's food and food industries. We are grateful for the support of our industry and member organisations for assisting in our research efforts and providing industry-specific information and imagery to benefit the development and accuracy of this educational resource.

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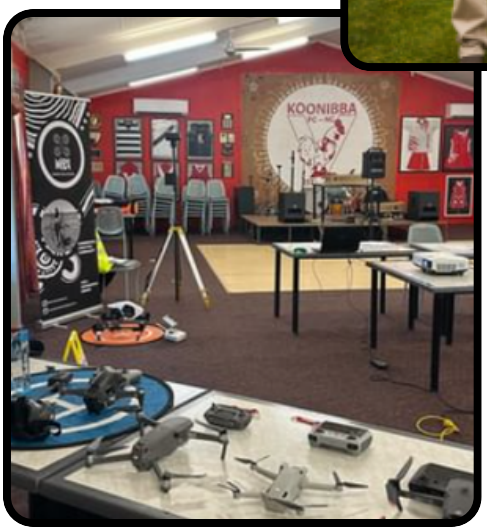

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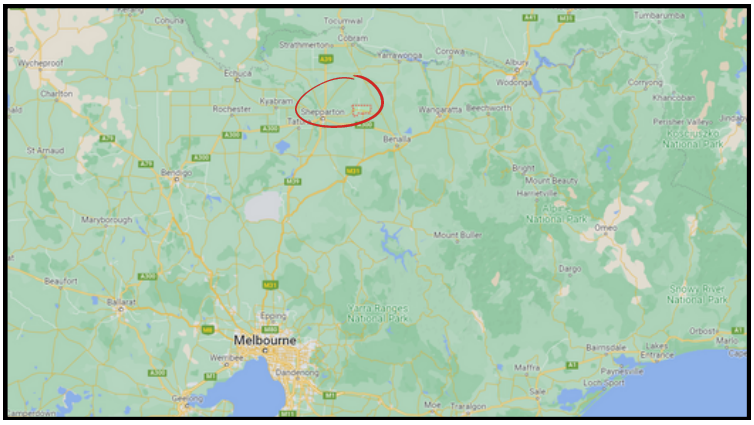

Drone technology can play a valuable role in supporting agroforestry practices in agriculture. In Episode 3 - Drone Warrior, we journey to Dookie, Victoria, and catch up with Chris to learn about the benefits of using drones to support sustainable land management techniques with First Nations peoples.

Student Name:		**Marks:** /40
Pre-video:	**Activity 1:** Identify & Match the Key Terms - Students familiarise themselves with key terms relating to drone technology and agroforestry and regenerative farming practices.	/9
During video:	**Activity 2:** Drone Warrior Top Ten - Q1-Q9 short answers, Q10 class discussion. **Episode 3 - Drone Warrior with Chris Warrior (~11:00mins)**	/10
Post-video:	**Activity 3:** What is *Regenerative Agriculture*? - Students watch the short video and complete the three short activities. **Activity 4:** Sustainable Table - Students read the article - *Kristy Stewart on Enabling The Next Generation of Leadership*. Identify the key points in each sub-topic, and paraphrase (in own words) the messages in the article.	/9 /12

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Activity 1: Prior to viewing the Farmer Time | Experts In The Field video, complete the following activity.

Identify & Match The Key Terms

Precision Agriculture	**Regenerative Farming**	**Lidar**
Mavic 3	**Photogrammetry**	**Agroforestry**
Biodiversity	**Tillage**	**Geographic Information System (GIS)**

Light **d**etection **a**nd **r**anging uses eye-safe laser beams to survey the environment accurately using 3D technology.

A computer system for capturing, storing, checking and displaying data related to positions on the Earth's surface. *It can include information about the landscape*, such as the location of streams, types of vegetation and types of soil.

A drone equipped with a Hasselblad camera to facilitate professional-level imagery that *captures high-resolution aerial imagery* of fields throughout the growing season.

The *integration of trees and shrubs* into farming landscapes for conservation and profit. The practice of producers using trees to improve the environmental, social and economic values of their land.

An agricultural method of soil preparation using mechanical agitation of various types, such as digging, deep ploughing, stirring and overturning.

A farming method that uses a number of enabling technologies to observe, understand and manage crops or livestock. The *method also helps manage sustainability* issues by optimising profitability, along with conserving the biodiversity of the landscape.

Biodiversity is the *variety of all life forms on earth* - the different plants, animals and micro-organisms and the ecosystems of which they are a part (Australian Government Department of Climate Change, Energy, the Environment and Water, 2022).

A three-dimensional *coordinate measuring technique* that uses two dimensional photographs to *create precise measurements* of three-dimensional objects and terrain features.

The *conservation and regenerative approach* to food and fibre production by increasing biodiversity, improving the water cycle and *focusing on topsoil regeneration.*

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Drone Warrior Top Ten

Activity 2: View the Farmer Time | Experts In The Field video, and complete the following questions.

1.

Name the Aboriginal country Farmer Time| *Experts In The Field* was filmed on.

2.

What is the name of the award that Chris received?

3.

What is the name of Chris' drone company?

4.

Chris delivered a STEM drone workshop to which foundation?

5.

Follow on, Q4... Which audience did it cater to?

6.

What knowledge and skills is Chris teaching First Nations peoples with drones? (3 dot-points)

7.

What advice does Chris give for students interested in drone technology?

8.

How can a drone help with sustainable practices using drone technology?

9.

What management strategies are First Nations people using to restore and create sustainable environments?

10.

Class discussion: See next page.

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Drone Warrior Top Ten

Activity 2: Following the Farmer Time | Experts In The Field video, as a class discuss the following question.

10.

Make a judgment about (evaluate/assess) the benefits of combining First Nation's knowledge and drone technology to improve sustainability (in both managed environments and natural ecosystems). Provide examples from the *Drone Warrior* video.

10a.

Our class recognises the value and significance of First Nations knowledge and that it is very important because...

10b.

Our class believes there is significant value in using drone technology as it...

10c.

There are many important benefits to production systems when technology is integrated with First Nations people's knowledge. These include:

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What Is Regenerative Agriculture?

Activity 3: "What is Regenerative Agriculture?" Access the video link below. Complete the following QUESTION, then LABEL and DRAW the seven layers of the Food Forest.

1. What are the three types of regenerative farming?

2. Food Forest

Label the 7 layers

3. Food Forest

7 Layers - Diagram

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Sustainable Table

Activity 4: Read the article - Kristy Stewart on Enabling The Next Generation of Leadership. Identify the key points in each sub-topic, and paraphrase (in your own words) the messages in the article.

Introduction:

Leaning into leadership:

Leading for the future:

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PIEFA/SFIRP Resources

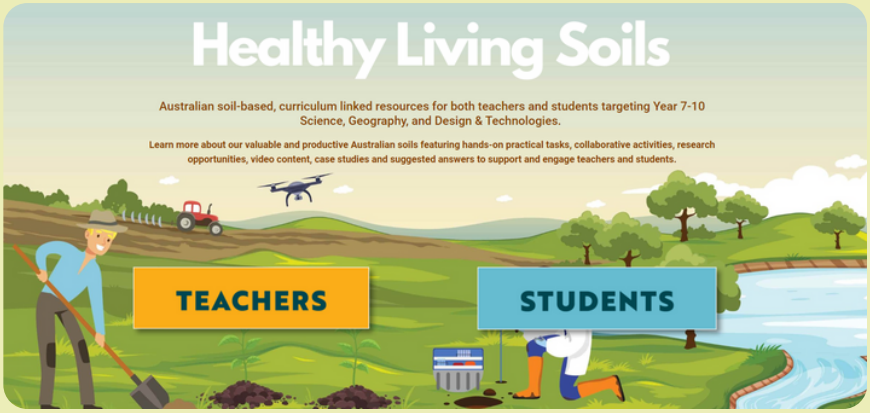
Teacher and student resources: Whole class (WC) or individual (I) additional learning resources.

Farming a Sustainable Future | KinetiKit STEM Kit Worksheet

Click the images

Healthy Living Soils | Years 7-10

Click the images



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Industry Resources

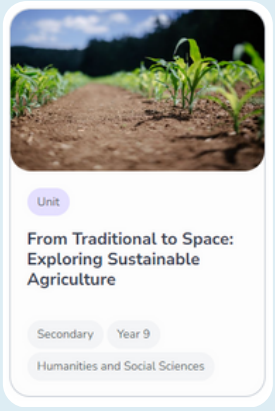
Teacher and student resources: Regenerative Farming (click the underlined titles for the links). Whole class (WC) or individual (I) additional learning resources.

Regenerators

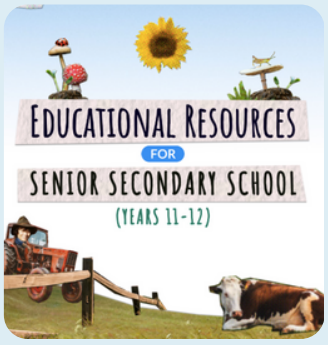
The Regeneration Movement

Rachel's Farm

Primary & Secondary Resources



Senior Secondary



Tertiary

Charles Massey

Call of the Reed Warbler - Australian Story

For five generations, Charles Massy's family rode on the sheep's back and nearly destroyed their land in the process. When drought in the 80s and 90s almost sent him broke, the Cooma farmer switched to regenerative agriculture and watched his overgrazed land recover. In his mid-50s, Charles Massy started a PhD, visiting 80 top regenerative farmers to see what they were doing differently (University of Queensland Press, 2020).

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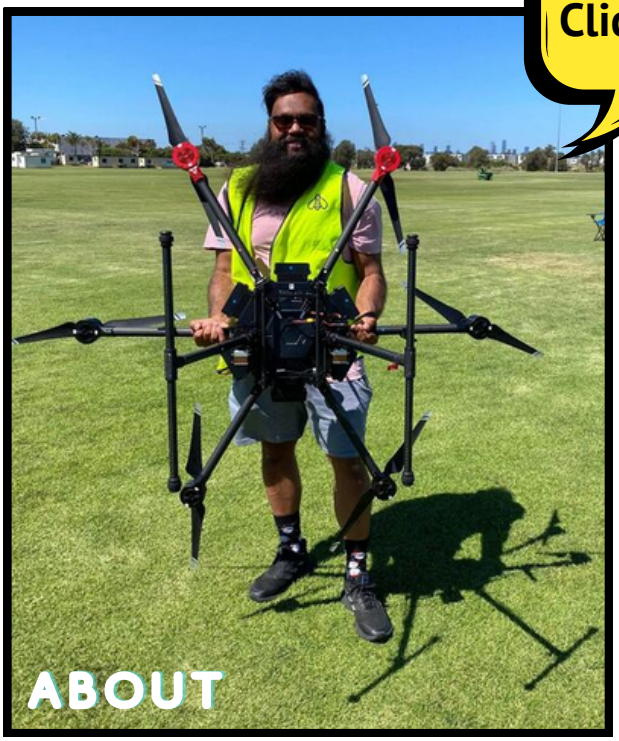
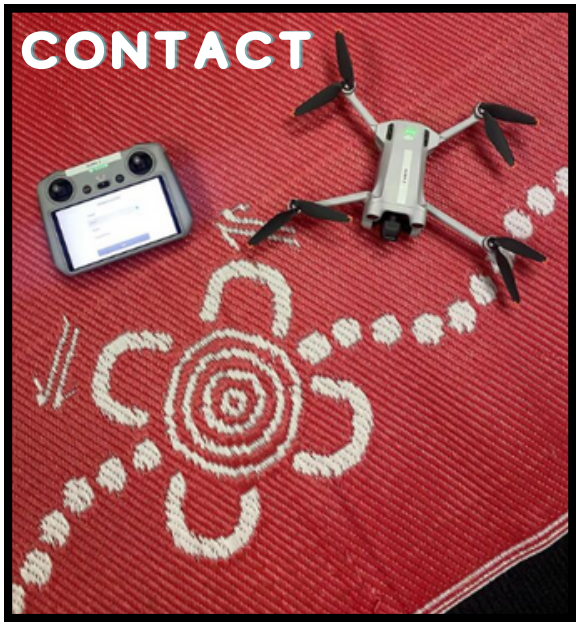
Industry Resources

Teacher and student resources: Click on the images to find out more about Chris Warrior and Wiru Drone Solutions.

Click the images





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Industry Resources

These resources further extend a student's knowledge and understanding with relevant information provided by external organisations.

Tocal College

Drones in agriculture

Tocal College

Field mapping and Data collection

She Maps

Drones In Forestry

Beginner's Complete Guide to DroneBlocks STEM Curriculum

Agroforestry in Australia

Trees on farms for shelter, conservation & profit.

Map Gear

Why LiDAR should be part of your aerial viewing solution

Regeneration International

Why Regenerative Agriculture?

No-Till

Precision Agriculture

Brochure Library

Kiss the Ground *for regeneration*

Free resources

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Teacher Guide Answers:

Lesson Objective

In *Episode 3 - Drone Warrior,* students will learn and gain an understanding about the benefits of using drone technology to view support First Nations sustainable land management technique.

Lesson Overview

Pre-video:	**Activity 1:** Activity 1: Identify & Match the Key Terms - Students familiarise themselves with key terms relating to drone technology and agroforestry and regenerative farming practices. (Students work independently or in pairs)	**5-10 mins**	**9 marks (1 mark per correct answer)**
During video: (~10 mins)	**Activity 2:** Drone Warrior Top Ten - Q1-Q9 short answers, Q10 class discussion **Episode 3 - Drone Warrior with Chris Warrior (~11:00 mins)**	**20-25 mins**	**10 marks**
Post-video:	**Activity 3:** What is *Regenerative Agriculture*? - Students watch the short video and complete the three short activities. **Activity 4:** Sustainable Table - Students read the article - *Kristy Stewart on Enabling The Next Generation of Leadership*. Identify the key points in each sub-topic, and paraphrase (in own words) the messages in the article.	**15-20 mins**	**9 marks (3/3/3)** **12 marks (4/4/4)**
Further learning (optional)	**Industry Resources:** These resources further extend a student's knowledge and understanding with relevant information provided by PIEFA/ SFIRP and other external organisations.	**N/A**	

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Answers: Identify & Match The Key Terms

Activity 1: Prior to viewing the Farmer Time | Experts In The Field video, complete the following activity.

Identify & Match The Key Terms

Precision Agriculture	**Regenerative Farming**	**Lidar**
Mavic 3	**Photogrammetry**	**Agroforestry**
Biodiversity	**Tillage**	**Geographic Information System (GIS)**

Lidar	**Li**ght **d**etection **a**nd **r**anging uses eye-safe laser beams to survey the environment accurately using 3D technology .
Geographic Information System (GIS)	A computer system for capturing, storing, checking, and displaying data related to positions on Earth's surface. It can include information about the landscape, such as the location of streams, different kinds of vegetation, and different kinds of soil.
Mavic 3	A drone equipped with a Hasselblad camera to facilitate professional -level imagery, that capture high-resolution aerial imagery of fields throughout the growing season.
Agroforestry	The integration of trees and shrubs into farming landscapes for conservation and profit. It's all about farmers using trees to improve the environmental, social and economic values of their land.
Tillage	An agricultural method of soil preparation, using mechanical agitation of various types, such as digging, deep ploughing, stirring and overturning.
Precision Agriculture	A farming method that uses a number of enabling technologies to observe, understand and manage crops or livestock. The method also helps manage sustainability issues by optimising profitability, along with conserving the biodiversity of the landscape.
Biodiversity	Biodiversity is the variety of all life forms on earth - the different plants, animals and micro-organisms and the ecosystems of which they are a part (Australian Government Department of Climate Change, Energy, the Environment and Water, 2022).
Photogrammetry	A three-dimensional coordinate measuring technique that uses two dimensional photographs to create precise measurements of three-dimensional objects and terrain features.
Regenerative Farming	The conservation and regenerative approach to food and fibre production by increasing biodiversity, improving the water cycle and focusing on topsoil regeneration.

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Answers - Drone Warrior Top Ten

Activity 2: Fill in your answers

1.

Dookie,
Yorta Yorta Country

2.

AAUS Industry Champion
DIVERSITY AND INCLUSION
Winner 2023

3.

WIRU Drone Solutions

4.

The Adelaide Crows Foundation, Adelaide SA

5.

Indigenous females

6.

- Land management
- Managing and preserving cultural heritage sites
- Photogrammetry skills - 2D to 3D imagery

7.

- Drone workshop involvement

8.

- Capturing data through photogrammetry
- Map land - cultural sites and farms
- Capturing accurate data, analyse data to manage land
- Preservation of invasive species

9.

- Creating ecosystems and new habitats
- Using drone technology and photogrammetry data
- Replanting flora in certain areas, to provide protection for fauna
- Management of feral animals

10.

Suggested answers: See following pages

- 10a
- 10b
- 10c

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Answers - Drone Warrior Top Ten

Activity 2: Following the Farmer Time | Experts In The Field video, as a class discuss the following question.

Make a judgment about (evaluate/assess) the benefits of combining First Nation's knowledge and drone technology to improve sustainability (in both managed environments and natural ecosystems). Provide examples from the Drone Warrior video.

SUGGESTED ANSWERS:

10a.

- It provides insight into the concept of 'country' and the intricate balance within an ecosystem.
- It plays a pivotal role in educating people about the value, management and preservation of culturally significant areas that are near production areas. This fosters a sense of appreciation for these areas and emphasises their sustainable use and preservation.
- It provides an understanding of the balance between the ecosystem and the impacts of pest and disease in the specific area. This insight is vital for implementing effective strategies to mitigate the adverse effects of these factors and maintain the ecological health of the region.
- It delivers a deep understanding of how the environment can positively work in balance with productive agricultural systems over long periods of time

10b.

- Provides valuable quantitative data regarding the productivity and characteristics of an area. This data-driven approach enhances the understanding of the landscape and aids in making informed decisions.
- Can provide extensive imaging that not only educates but also guides management decisions about an area. This contributes significantly to informed and strategic planning, ensuring effective resource utilisation.
- Has the capability to produce before and after images to assess the value and impact of management strategies. This visual documentation allows for a comprehensive evaluation of the effectiveness of implemented measures, aiding in refining and optimising future approaches.
- It allows efficient data to be collected and viewed by a large group. This aspect promotes collaboration and ensures that data is accessible to a broad spectrum of stakeholders, fostering transparency and collective decision-making.
- It can allow for extensive and diverse data to be collected, mapped and analysed to ensure collective decision-making.

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Answers - Drone Warrior Top Ten

Activity 2: Following the Farmer Time | Experts In The Field video, as a class discuss the following question.

Make a judgment about (evaluate/assess) the benefits of combining First Nation's knowledge and drone technology to improve sustainability (in both managed environments and natural ecosystems). Provide examples from the Drone Warrior video.

SUGGESTED ANSWERS:

10c.

- Combining management strategies such as drone technology and First Nation people's knowledge can improve the ability to manage and control invasive species.
- Using imagery and data to develop informed decisions about the management of native vegetation, preserving culturally significant areas within agricultural productive areas.
- Using data and imagery to facilitate a balance between the economic sustainability of an area and the social and environmental considerations.
- Provides employment opportunities for people with skills and knowledge in traditional land management and drone technology skills to educate and consult with other stakeholders in agriculture.
- Utilising advantageous management strategies from the past and combining them with new innovations and technologies allows for the development of improved strategies to meet present challenges.

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Exploring Drones In Agriculture

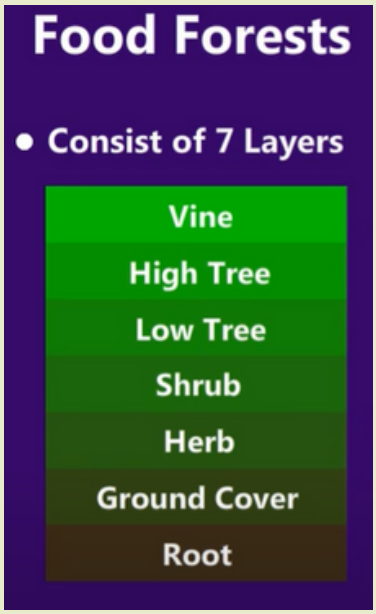
Answers - What is Regenerative Farming?

Activity 3: "What is Regenerative Agriculture?" Access the video link below. Complete the following QUESTION, then LABEL and DRAW the seven layers of the Food Forest.

What are the three types of regenerative farming?

- No-Till Farming
- Regenerative Grazing
- Agro-Forestry

Food Forest
7 Layers



Food Forest
7 Layers - Diagram

Farmer Time | Experts In The Field

Exploring Drones In Agriculture

Answers: Sustainable Table

Activity 4: Read the article - Kristy Stewart on Enabling The Next Generation of Leadership. Identify the key points in each sub-topic, and paraphrase (in your own words) the messages in the article.

Introduction:

- Kristy Stewart lives with her family at Yan Yan Gurt West Farm, South-East Australia.
- Approximately 1300 breeding ewes, the farm produces between 1500-1800 prime lambs per year.
- Landscape is a combination of vegetation and wildlife corridors designed to integrate livestock and land.
- Trees complement prime lamb production by providing shade, shelter, integrated pest management, wildlife habitat and countless subtle services that support the wider ecology.
- Over the last 30 years, they've used agroforestry – to take the landscape from 3% to 18% woody vegetation. Their farm is carbon neutral.

- The 575-acre Yan Yan Gurt West farm is an active example of what a diverse and resilient community of land managers can accomplish.
- Kristy has committed to continue stewarding the land with her family into the future.

Leaning into Leadership:

- Kristy attributes her experiences connecting and learning from First Nations people on Country as pivotal to her journey of regeneration.
- She was exposed to immersive models of leadership that prioritise Country, community and culture.
- Included relational ways of thinking, teaching and leading that embrace a greater collaborative approach and facilitating spaces where a diverse range of opinions were encouraged.
- Kristy spoke of a profound admiration of First Nations people's cultures and healing processes.
- The interwoven aspect of self and land in many First Nations cultures is a way of being that Western culture struggles to understand.
- Acknowledging that there are a diversity of ways to engage the wisdom and knowledge from those in the industry.
- Kristy believes we need more women and First Nations people in our conversations and the regeneration space if we are going to in order to heal our communities and societal disconnections to nature.

Leading for the future:

- Kristy is an example of the emerging generation of stewards that can see the evolving demands of our future leadership.
- Kristy openly admits that her knowledge and perspective of what it means to be in connection with Country, community and industry is constantly shifting.
- This emergent approach is a reflection of exactly what regeneration is and the qualities we need in the future of our leadership in agriculture.
- We need leaders who can ensure that curiosity and openness sit at the heart of our conversations at every dinner table across Australia.