Farmer Time | Experts In The Field

Exploring Drones In Agriculture

TEACHER GUIDE

Episode 2: AgTech - Drones

YEAR 7-10

This resource has been developed by:

Primary Industries Education Foundation Australia | www.primezone.edu.au primezone The place for all your food and fibre resources

Farmer Time

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 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 the impacts of drone technology on the ongoing development of agriculture in our country.

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 (~13:00 mins)**
- Episode 3 - *Drone Warrior* with Chris Warrior (~10:00 mins)

The resources have been designed as a three part series: each lesson is 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.

Lesson 1:

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

Activity 3: this post video Precision Farming activity extends students' knowledge and understanding with a case study (3a) and weed mapping (3b) activities.

Lesson 2:

Activities 4-5 highlight the innovative ways drone technology is used to improve the efficiency and precision of farming practices. Students will identify and demonstrate how drones, AI and digital consultancy have revolutionised farming practices today and will continue into the future.

Farmer Time | Experts In The Field

Exploring Drones In Agriculture

Teacher Guide

NSW Science Years 7-10 Syllabus - Stage 4	
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 animal husbandry or crop cultivation to improve yields and sustainability, or the effect of plant-cloning techniques in horticulture

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: • 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

Farmer Time | Experts In The Field

Exploring Drones In Agriculture

Teacher Guide

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: • operating unmanned aerial vehicles (UAV) • precision farming and Global Positioning System (GPS) technologies Research the required assets, infrastructure and management techniques required for plant and animal production (ACTDEK047)
Plant Production 1	**AG5-8** evaluates the impact of past and current agricultural practices on agricultural sustainability **Content** Investigate current agricultural systems and Aboriginal land management practices Explore the effect of European and Aboriginal agricultural practices on agricultural production and environmental sustainability, for example: (ACTDEK040) • the use of fire for managing the land • crop rotation Investigate technologies that assist in record-keeping and monitoring of the plant enterprise and its performance (ACTDEK047)

Farmer Time | Experts In The Field

Exploring Drones In Agriculture

Teacher Guide

NSW Agricultural Technology Years 7-10 Syllabus - Core B	
Plant Production 2	**AG5-2** explains the interactions within and between agricultural enterprises and systems **Content** Research a range of current and future employment opportunities in agriculture, for example: • operating unmanned aerial vehicles (UAV) • precision farming and Global Positioning System (GPS) technologies Research the required assets, infrastructure and management techniques required for plant and animal production (ACTDEK047) Explain the impact of current technologies on sustainability, for example: (ACTDEK041, ACTDEK044, ACTDEP051) • precision farming • Global Positioning System (GPS) technologies
Life Skills	**AGLS-7** identifies environmental effects of agricultural production **AGLS-10** uses information and communication technologies to collect, organise and present information related to an agricultural enterprise

Farmer Time | Experts In The Field

Exploring Drones In Agriculture

Teacher Guide

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**

Farmer Time | Experts In The Field

Exploring Drones In Agriculture

Teacher Guide

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**

References

AgSkilled. (n.d.). Drones in Agriculture. AgSkilled. Retrieved September 20, 2023, from https://www.agskilled.org.au/courses/drones-in-agriculture

AgSkilled. (2023, May 2). Farm mapping and data collection. AgSkilled. https://www.agskilled.org.au/courses/farm-mapping-and-data-collection

Australian Curriculum, Assessment and Reporting Authority [ACARA]. (2023). V9 Australian Curriculum. V9.Australiancurriculum.edu.au; ACARA. https://v9.australiancurriculum.edu.au/

Benjamin, C. (2021, April 15). Single family, Coonamble NSW. WeedSmart. https://www.weedsmart.org.au/content/single-family-coonamble-nsw/

Civil Aviation Safety Authority. (2019, June 21). Civil Aviation Safety Authority. Civil Aviation Safety Authority. https://www.casa.gov.au/

Google Earth. (n.d.). Screenshot, google map 1. Retrieved October 5, 2023, from https://earth.google.com/web/@-33.07014076,148.96997665,594.23697752a,9783.46642758d,35y,335.63264105h,0t,0r

Google Earth. (2023). Screenshot, Google maps 2 & 3. Google.com. https://earth.google.com/web/@-33.07179551

NESA. (2019). NSW Education Standards. Nsw.edu.au. https://educationstandards.nsw.edu.au/wps/portal/nesa/home

NSW Department of Primary Industries. (2023, March 3). Drones in agriculture. Tocal College. https://www.tocal.nsw.edu.au/courses/short-courses/drones-in-ag

NSW Education Standards Aurthority. (2023). Aviation (Remote Pilot) | NSW Education Standards. nsw.edu.au. https://educationstandards.nsw.edu.au/wps/portal/nesa/11-12/stage-6-learning-areas/vet/2022-stage-6-vet-board-endorsed-courses/aviation-remote-pilot

Primary Industries Education Foundation Australia. (2023). PIEFA Food & Fibre Education | Agriculture Education Australia. Primary Industries Education Foundation Australia. https://www.piefa.edu.au/

References

RuralBiz Training. (2023, September). 2023 AgCareers Expo. www.youtube.com. https://www.youtube.com/watch?v=xrs-PE4akZc

Safety Systems. (2016, February 16). Drones. Civil Aviation Safety Authority. https://www.casa.gov.au/drones

Simmons, B. (2023, September 8). Exploring Exciting Careers in Agriculture: Your path to success. Bralca. https://www.bralca.com/schools/exploring-exciting-careers-in-agriculture-your-path-to-success/

Single Ag, Revolutionary Weed Control. (2023). Single Shot - Australia. www.singleagriculture.com.au. https://www.singleagriculture.com.au/

Single, B. & J. (2023). Weed mapping using drones for targeted weed spraying Ben Single & John Single, Single Agriculture. In Grains Research & Development Corporation. https://grdc.com.au/__data/assets/pdf_file/0020/583103/Paper-Single-Ben-Wagga_Dubbo-2023.pdf

Single, T. (2021). Drone weed mapping for spot spraying: Know what's there before you spray - consistent weed detection driving down the weed seed bank Tony Single, Tigah Farming. In Grains Research & Development Corporation. https://grdc.com.au/__data/assets/pdf_file/0029/448760/Paper-Single-Tony-Single-Shot-August-2021.pdf

Storm And Flood Industry Recovery Program. (2023, May 31). SFIRP Program - PIEFA Food Fibre Education Resources. Primary Industries Education Foundation Australia. https://www.piefa.edu.au/sfirp

Tocal College. (2019, November 1). Home. www.tocal.nsw.edu.au. https://www.tocal.nsw.edu.au/

Watts, F. (2023, August 6). Drone assisted landscape-scale weed management control. Bralca. https://www.bralca.com/environment/drone-assisted-landscape-scale-weed-management-control/

Farmer Time | Experts In The Field

Exploring Drones In Agriculture

ATTRIBUTION, CREDIT & SHARING

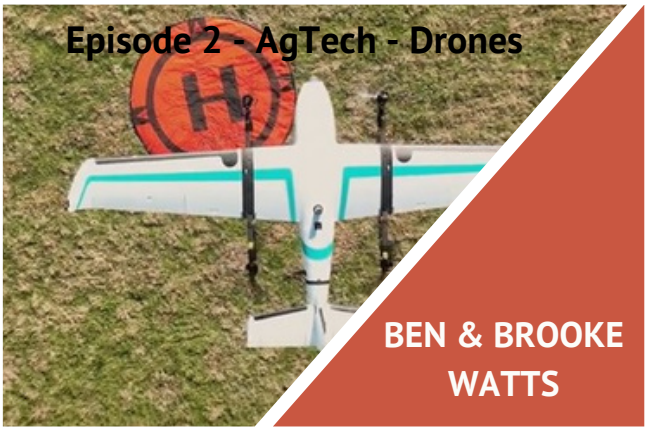
This resource was produced by Primary Industries Education Foundation Australia (PIEFA) in collaboration with **Bralca.** Primary Industries Education Foundation Australia's resources support and facilitate effective teaching and learning about Australia's food and food industries. We are grateful for 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.

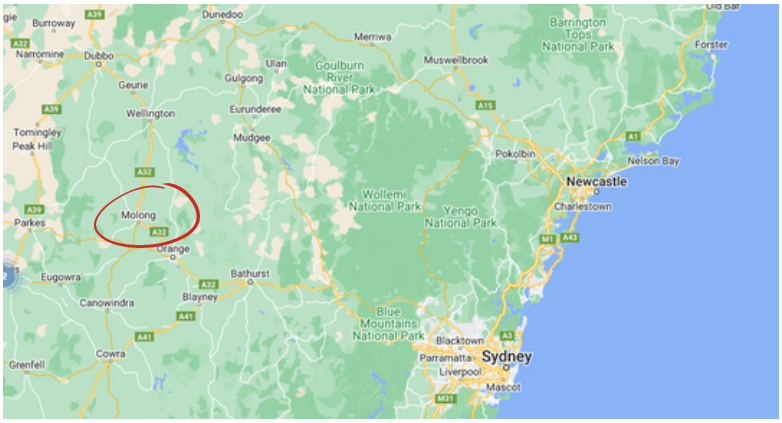
Primary Industries Education Foundation Australia

SFIRP
STORM & FLOOD INDUSTRY RECOVERY PROGRAM

Farmer Time | Experts In The Field

Exploring Drones In Agriculture





Drone technology can play a valuable role in precision farming in agriculture. Journey out to Central NSW in Episode 2 - AgTech - Drones, and catch up with Ben and Brooke Watts, from Bralca. Learn about the benefits of introducing drone technology into farm management practices.

Student Name:		Score: /50
Pre-video:	**Lesson 1:** **Activity 1:** Identify & Match The Key Terms - Students familiarise themselves with key terms relating to drone technology.	**/7**
During video:	**Activity 2:** AgTech - Drones Top Ten - Short answers on Drone Mapping, AI and Consulting. **Episode 2 - AgTech - Drones with Ben & Brooke Watts (~13:00 mins)**	**/10**
Post-video:	**Activity 3:** Precision Farming **a. Case Study:** Single Family, Coonamble NSW **b. Weed Mapping:** Field Management Activity **Lesson 2** **Activity 4:** • **a.** Note taking, viewing and reviewing: Agronomy & Digital AgTech (I) - 3 marks per section • **b.** Summary: Are drones an effective tool for agricultural practices? (I) - 5 marks **Activity 5:** Design a Drone (I)	**/8** **/20** **/5**

Farmer Time | Experts In The Field

Exploring Drones In Agriculture

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

Identify & Match The Key Terms

- **Scalability**
- **Vegetation Monitoring & Management**
- **Land Surveys and Mapping**
- **Data Collection & Analysis**
- **Cost-Effectiveness**
- **Erosion Control & Soil Analysis**
- **Safety & Environmental Considerations**

Compared to manual spraying or large-scale machinery, drones offer *improved safety* for operators. They reduce the risk of exposure to potentially harmful chemicals. Targeted spraying reduces the overall use of herbicides, *minimising environmental impact* and the risk of chemical runoff into water bodies.

Drones can cover large areas efficiently, reducing the need for extensive labour and machinery. The reduced herbicide usage and improved targeting contribute to *cost savings* in the long run.

Drones can *collect valuable data* during the spraying process, including imagery and sensor readings. This can be *analysed to monitor* the effectiveness of weed control measures, track changes in weed distribution, and make informed decisions for future management practices.

Drone-based weed spraying is highly scalable, making it suitable for both *small-scale farms and large commercial operations*. By adjusting the flight patterns and spraying rates, drones can accommodate fields of different sizes and complexities.

Drones equipped with high-resolution cameras and LiDAR sensors can capture *detailed aerial imagery* and create accurate topographic maps of land areas. These *maps provide crucial information* for land managers, including terrain elevation, vegetation distribution, water features, and infrastructure.

Drones equipped with multispectral or thermal cameras can assess *vegetation health* and detect changes over time. Drones can identify stressed or unhealthy vegetation, monitor invasive species, evaluate the effectiveness of *vegetation management practices*, and aid in reforestation efforts.

Drones can help identify areas prone to erosion or soil degradation. By conducting aerial surveys and collecting data on soil characteristics, drones assist in mapping erosion patterns, identifying soil erosion causes, and *implementing appropriate erosion control measures*.

Farmer Time | Experts In The Field

Exploring Drones In Agriculture

AgTech-Drones 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 Bralca?

3.

Brooke followed a traditional pathway into AgTech, what was it? (3)

4.

Explain how Bralca is helping traditional farmers with drone technology.

5.

In the last 12 months, how many drone courses have Bralca delivered in NSW?

6.

Identify the number of jobs there currently are for every school leaver in AgTech.

7.

What advice does Brooke give for school leavers interested in AgTech?

8.

How many stages of innovative technologies does Ben suggest with drone technology?

9.

List the stages Ben mentions.

10.

Define the drone technology terms: AI, pairing and teaming.

Exploring Drones In Agriculture

AgTech - Drones Top Ten

Activity 2: Fill in your answers

1.

2.

3.

-
-
-

4.

5.

6.

7.

8.

9.

10.

Farmer Time | Experts In The Field

Exploring Drones In Agriculture

Precision Farming, AI and Ag Consulting

Activities 3 - 5: These activities require the demonstration of knowledge and understanding focused on using drone technology in agriculture and how this transfers to further digital technologies.

Activity 3
Precision Farming

a. Case Study: Single Family, Coonamble NSW.
Click the link: Weed smart

b. Weed Mapping: Field Management Activity

Precision Farming

Activity 4
a. Note Taking - Viewing and Reviewing

Sally Poole:
Agronomist and Digital Ag Consultant

Time 20mins: 1:05:36 to 1:25:00

b. Summary

Agronomy & Digital Ag Tech

Activity 5
Design a Drone

Include:

- rotor blades
- motors
- landing gear
- camera
- compass
- antenna
- battery pack

Design a Drone

Precision Farming

Activity 3:

a. Case Study: Single Family, Coonamble NSW. Read the article and view the two videos about how the Single family uses innovative drone technology to manage farming moisture, by controlling weeds and explaining the strategies they use to get the best harvest during the seasons.

Click the link: Weed smart https://www.weedsmart.org.au/content/single-family-coonamble-nsw/

b. Weed Mapping: Field Management Activity - You are a farmer and need to manage your paddocks and prepare them for the upcoming season.

- **Use the (blank) Google Maps "Student: Weed Mapping" to create a boundary around two of your paddocks (use a coloured marker) - Imagine you have mapped your paddocks with the Single Shot drone (mark out any two paddock areas).**
- **Use two coloured markers (different to the boundary marker) to highlight *two invasive weeds identified* by the Single Shot drone.**

Example:

Google Maps 1 image reference

Example: Weed Mapping

Example: Google Maps 2 image reference

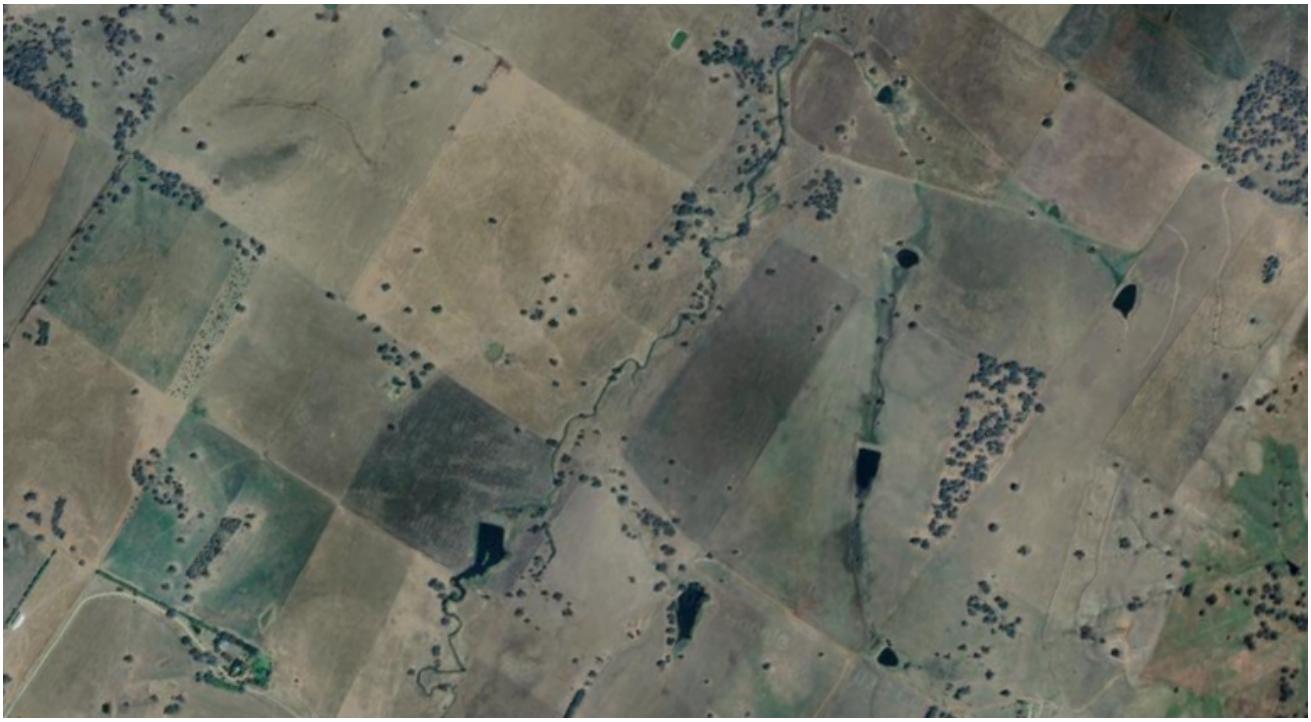
Example: Google Maps 3 image reference

Exploring Drones In Agriculture

Student: Weed Mapping

- Choose one paddock area per map (any size - see example).
- Use three different colours to mark boundaries and invasive weed species (on this page).

Google Maps 2



Google Maps 3

Exploring Drones In Agriculture

Student: Weed Mapping

Activity 3:

b. Weed Mapping: Field Management Activity - You are a farmer and need to manage your paddocks and prepare them for the upcoming season.

- **Use the Key Terms in Activity 1: Summarise them in your own words to describe how and why drone technology is used to minimise environmental impacts when collecting data. Evaluate the use of detailed imagery to help farmers and agronomists create a management plan for their crops. (Evaluate - Make a judgment based on criteria; determine the value of)**

Farmer Time | Experts In The Field

Exploring Drones In Agriculture

Agronomy & Digital AgTech

Activity 4:

a. Watch the video of Sally Poole - Agronomist & Digital AgTech Consultant (20 mins - 1:05:36 to 1:25:00). Write notes and provide answers for the following:

Agricultural Technology Revolution

List and provide examples of the technologies

Current AgTech & Digital Agriculture

List examples

What is a Digital Ag Consultant?

Exploring Drones In Agriculture

Agronomy & Digital AgTech

Activity 4:

a. (continued): Watch the video of Sally Poole - Agronomist & Digital AgTech Consultant (20 mins - 1:05:36 to 1:25:00). Write notes and provide answers for the following:

Farms of the Future

Elaborate on the points given

- Planting trees:
- Solar farm:
- Drones:
- Swarmbots (Swarm Robots):
- Circular economy:
- Genetically modified crops (GM):
- Autonomous/ remote machinery:
- Livestock management:
- Irrigation:
- Artificial Intelligence:

Careers in AgTech in the Future

List examples

Exploring Drones In Agriculture

Agronomy & Digital AgTech

Activity 4: Summary

b. Do you think drones are effective as a current tool for farmers to increase yield productivity and supporting sustainable agriculture? Justify your answer.

Farmer Time | Experts In The Field

Exploring Drones In Agriculture

Design a Drone

Activity 5: Single Agriculture *https://www.singleagriculture.com.au/single-shot* has created and designed revolutionary weed control technology. Single Shot is a highly accurate and consistent weed detection drone that maps and detects weeds through its innovative technology and creates a 'weed map'. Weed maps can be loaded into any compatible GPS section-controlled sprayer, allowing cost-effective 'spot spraying' for farmers.

- **Open the link to research information about the Single Shot weed control technology.**
- **Create a company name, design (draw) and label a weed control technology drone (Google Images will help, but do not copy).**
- **Write a brief caption (description) about your drone and how it can effectively and significantly assist farmers in the fields.**

Design a Drone

Label: rotor blades, motors, landing gear, camera, compass, antenna, battery pack

Product summary

Farmer Time | Experts In The Field

Exploring Drones In Agriculture

Industry Resources

View the following resources to extend knowledge and understanding with information provided by external organisations.

Bralca

https://www.bralca.com/environment/drone-assisted-landscape-scale-weed-management-control/

Exploring Exciting Careers In Agriculture: Your Path To Success

AgSkilled

Drones In Agriculture

Farm mapping and data collection

Single Agriculture

YouTube video

Single Shot drone based weed mapping

GRDC

Drone weed mapping for spot spraying: Know what's there before you spray - consistent weed detection driving down the weed seed bank. **Tony Single**

Weed mapping using drones for targeted weed spraying **Ben Single & John Single**

Tocal College

Tocal College

Drones in agriculture

Civil Aviation Safety Authority

CASA

Drones

SFIRP STORM & FLOOD INDUSTRY RECOVERY PROGRAM

Primary Industries Education Foundation Australia | www.primezone.edu.au primezone

Farmer Time

Farmer Time | Experts In The Field

Exploring Drones In Agriculture

Teacher Guide Answers:

Lesson Objective

In Episode 2 - Drones On Farms, students will learn and gain an understanding of how farmers can benefit by adopting the use of drone technology, digital technology, Artificial Intelligence and digital consultancy in Agriculture, Food and Fibre.

Lesson Overview

Pre-video:	**Lesson 1:** **Activity 1:** Identify & Match The Key Terms - Students familiarise themselves with key terms relating to land management and weed control practices. (Students work independently or in pairs)	**5-10 mins**	**7 marks (1 mark per correct answer)**
During video: (14 mins)	**Activity 2:** AgTech - Drones Top Ten - Short answers on Drone Mapping, AI and Consulting.	**20-25 mins**	**Activity 2: 10 marks**
Post-video:	**Activity 3:** Precision Farming • **a.** Case Study: Single Family, Coonamble NSW • **b.** Weed Mapping: Field Management Activity **Lesson 2** **Activity 4:** • **a.** Note taking, viewing and reviewing: Agronomy & Digital AgTech (I) - 3 marks per section • **b.** Summary: Are drones an effective tool for agricultural practices? **Activity 5:** Design a Drone (I) - 5 marks		**Activity 3: 8 marks** **Activity 4: a. 15 marks b. 5 marks** **Activity 5: 5 marks**
Further learning (optional)	**Industry Resources:** • These resources further extend a student's knowledge and understanding with relevant information provided by external organisations.	**N/A**	

Farmer Time | Experts In The Field

Exploring Drones In Agriculture

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

- **Scalability**
- **Vegetation Monitoring & Management**
- **Land Surveys and Mapping**
- **Data Collection & Analysis**
- **Cost-Effectiveness**
- **Erosion Control & Soil Analysis**
- **Safety & Environmental Considerations**

Safety & Environmental Considerations

Compared to manual spraying or large-scale machinery, drones offer *improved safety* for operators. They reduce the risk of exposure to potentially harmful chemicals. Targeted spraying reduces the overall use of herbicides, *minimising environmental impact* and the risk of chemical runoff into water bodies.

Cost-Effectiveness

Drones can cover large areas efficiently, reducing the need for extensive labour and machinery. The reduced herbicide usage and improved targeting contribute to *cost savings* in the long run.

Data Collection & Analysis

Drones can *collect valuable data* during the spraying process, including imagery and sensor readings. This can be *analysed to monitor* the effectiveness of weed control measures, track changes in weed distribution, and make informed decisions for future management practices.

Scalability

Drone-based weed spraying is highly scalable, making it suitable for both *small-scale farms and large commercial operations*. By adjusting the flight patterns and spraying rates, drones can accommodate fields of different sizes and complexities.

Land Surveys and Mapping

Drones equipped with high-resolution cameras and LiDAR sensors can capture *detailed aerial imagery* and create accurate topographic maps of land areas. These *maps provide crucial information* for land managers, including terrain elevation, vegetation distribution, water features, and infrastructure.

Vegetation Monitoring & Management

Drones equipped with multispectral or thermal cameras can assess *vegetation health* and detect changes over time. Drones can identify stressed or unhealthy vegetation, monitor invasive species, evaluate the effectiveness of *vegetation management practices*, and aid in reforestation efforts.

Erosion Control & Soil Analysis

Drones can help identify areas prone to erosion or soil degradation. By conducting aerial surveys and collecting data on soil characteristics, drones assist in mapping erosion patterns, identifying soil erosion causes, and *implementing appropriate erosion control measures*.

SFIRP STORM & FLOOD INDUSTRY RECOVERY PROGRAM
A project of the Primary Industries Education Foundation Australia
Primary Industries Education Foundation Australia
www.primezone.edu.au primezone The place for all your food and fibre resources
Farmer Time

Farmer Time | Experts In The Field

Exploring Drones In Agriculture

Answers - AgTech -Drones Top Ten

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

1.

Wiradjuri Country

2.

Farming Company
AgTech Company (since 2010)

3.

- Year 12 certificate
- Study University
- Full-time: Corporate Agriculture

4.

Training farmers/ training courses
Hands on learning experiences

5.

~ 45 drone courses

6.

There are ~ six (6) jobs for every school leaver

7.

- Willingness to give it a go
- Look into jobs available
- Labouring, data and analysis.
- Educational workshops and webinars
- Networking

8.

Generally, around four stages

9.

- Drone operator - data aquisition
- Data processing
- Agronomist - analyse data to create an application plan
- producing the plan to the farmer who then creates a precision plan or variable rate plan on their property

10.

Pairing and teaming the drone data with companion computers to feed directly to devices on the ground

SFIRP STORM & FLOOD INDUSTRY RECOVERY PROGRAM
A project of the Primary Industries Education Foundation Australia
Primary Industries Education Foundation Australia
www.primezone.edu.au primezone The place for all your food and fibre resources
Farmer Time

Farmer Time | Experts In The Field

Exploring Drones In Agriculture

Answers: Precision Farming

Activity 3:

a. Case Study: Single Family, Coonamble NSW. Read the article and view the two videos about how the Single family uses innovative drone technology to manage farming moisture, by controlling weeds and explaining the strategies they use to get the best harvest during the seasons.

Click the link: Weed smart https://www.weedsmart.org.au/content/single-family-coonamble-nsw/

b. Weed Mapping: Field Management Activity - You are a farmer and need to manage your paddocks and prepare them for the upcoming season.

- **Use the (blank) Google Maps "Student: Weed Mapping" to create a boundary around two of your paddocks (use a coloured marker) - Imagine you have mapped your paddocks with the Single Shot drone (mark out any two paddock areas).**
- **Use two coloured markers (different to the boundary marker) to highlight *two invasive weeds identified* by the Single Shot drone.**

Example:

Google Maps 1

Activity 3:

a. Students will gain an understanding of the Single Shot drone after watching the case study.

b. Students use three different coloured markers to identify paddocks and invasive weeds

- **boundary**
- **invasive weed 1**
- **invasive weed 2**

Farmer Time | Experts In The Field

Exploring Drones In Agriculture

Answers: Weed Mapping

Google Maps 2

Google Maps 3

Farmer Time | Experts In The Field

Exploring Drones In Agriculture

Answers: Weed Mapping

Activity 3:

b. Weed Mapping: Field Management Activity - You are a farmer and need to manage your paddocks and prepare them for the upcoming season.

- **Use the Key Terms in Activity 1: Summarise them in your own words to describe how and why drone technology is used to minimise environmental impacts when collecting data. Evaluate the use of detailed imagery to help farmers and agronomists create a management plan for their crops. (Evaluate - Make a judgment based on criteria; determine the value of)**

Students are required to demonstrate their knowledge and understanding about drone technology and how it can help farmers and agronomists. Students should include 2 of these key points in their summary (see Activity 1 for guidance with the terms).

- **Scalability**
- **Vegetation Monitoring & Management**
- **Land Surveys and Mapping**
- **Data Collection & Analysis**
- **Cost-Effectiveness**
- **Erosion Control & Soil Analysis**
- **Safety & Environmental Considerations**

Farmer Time | Experts In The Field

Exploring Drones In Agriculture

Answers: Agronomy & Digital AgTech

Activity 4:

a. Watch the video of Sally Poole - Agronomist & Digital Ag Tech Consultant (20 mins - 1:05:36 to 1:25:00). Write notes and provide answers for the following:

Agricultural Technology Revolution

List and provide examples of the technologies

- Mechanical revolution: Tractor
- Green revolution: Plant breeding, synthetic fertiliser, pesticides
- Digital agricultural revolution: Drones, Artificial Intelligence, GPS, Auto-steer, robots, computer - data collection, Swarm-bot, cameras, photogrammetry, lidar, 3D mapping, soil probes,

Current AgTech & Digital Agriculture

- drones
- artificial intelligence
- headers
- digital mapping
- GPS
- auto-steer
- robots
- computer - data collection

List examples

- Swarmbots (Swarm Robots)
- cameras
- photogrammetry
- lidar
- 3D mapping
- soil probes
- feed supplements - seaweed
- Vet-tech - Ultrasound
- ear-tagging
- weigh scale
- mobile phones

What is a Digital Ag Consultant?

- Agronomist - Field consultant
- Field work - helping farmers manage cropping systems and soils, crop recommendations, managing pests and disease
- Digital Ag consultant - collects data, analyses information to make decisions, and helps farmer production to be more sustainable and resilient.
- Artificial intelligence - creates soil maps.
- Helping farmers understand what is driving their production through - collection, data and analysis

Farmer Time | Experts In The Field

Exploring Drones In Agriculture

Answers: Agronomy & Digital AgTech

Activity 4

a. (continued): Watch the video of Sally Poole - Agronomist & Digital AgTech Consultant (20 mins - 1:05:36 to 1:25:00). Write notes and provide answers for the following:

Farms of the Future

- Planting trees: Carbon sinks, provide habitat - livestock and native animals, beneficial insects - help protect crops in the future
- Solar farm: electric machinery
- Drones: data collection, anaylsing crops, livestock (herding),
- Swarmbots (Swarm Robots): planting seeds, checking plants, planting seeds
- Circular economy: reusing, reducing and minimising waste, compost, replacing nutrition
- Genetically modified crops (GM): plant breeding, native crops, global crops, crop tolerance
- Autonomous/ remote machinery - tractors
- Livestock - digital tagging, virtual fencing, monitoring and improving soil and paddock management
- Irrigation: variable rate technology to assist with water management
- Artificial intelligence: data analysis, accuracy with information

Careers in AgTech in the Future

- Agronomists
- Vets
- Software designers
- Salespeople
- Data scientist
- Soil scientist
- Animal scientist
- Electrical engineers
- Farmers
- Drone pilots
- Animal nutritionists
- Product developers
- Project managers
- Mechanical engineers
- AI specialists
- Mechanics
- Boiler makers
- Logistics specialists
- Biological engineers
- Extension officers
- Manufacturing Experts
- ...and more

Exploring Drones In Agriculture

Answers: Agronomy & Digital AgTech

Activity 4: Summary

b. Do you think drones are effective as a current tool for farmers to increase yield productivity and supporting sustainable agriculture? Justify your answer.

Yes, it is effective - Justification and evidence for at least 2 points below.

- Increases farm productivity, efficiency and profitability.
- Accurately monitors and predicts crop yields, weather patterns and water management.
- Provides valuable data for farmers and researchers to track progress over time for informing decision making on effectiveness of farming practices.
- Precision information provided is essential for planning, marketing and optimising resources.
- Data and analysis; information provided for crop yields, soil quality, pest infestation, weed control, plant health and sustainable outcomes.

Farmer Time | Experts In The Field

Exploring Drones In Agriculture

Answers: Design a Drone

Activity 5: Single Agriculture *https://www.singleagriculture.com.au/single-shot* have created and designed revolutionary weed control technology. Single Shot is a highly accurate and consistent weed detection drone that maps and detects weeds through its innovative technology and creates a 'weed map'. Weed maps can be loaded into any compatible GPS section-controlled sprayer, allowing cost-effective 'spot spraying' for farmers.

- **Open the link to research information about the Single Shot weed control technology.**
- **Create a company name, design (draw) and label a weed control technology drone (google images will help, but do not copy).**
- **Write a brief caption (description) about your drone and how it can effectively and significantly assist farmers in the fields.**

Student designs are encouraged to be creative, however MUST include all labels (extra additions can be included).

Design a Drone

Label: rotor blades, motors, landing gear, camera, compass, antenna, battery pack

Product summary

Product caption should include details of what it does and how it will help future farming. Include: cost effectiveness, sustainability, farming efficiency, mapping, data and analyse collection etc.