



# Human Interactions in Food Chains and Food Webs

## TEACHER GUIDE

YEAR 7 & 9

This resource has been developed by:



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## LEARNING AREAS

**Science (Year 7)**

**Geography (Year 9)**

## NSW CURRICULUM CONTENT

### STAGE 4: Science

A student relates the structure and function of living things to their classification, survival and reproduction (**SC4-14LW**)

A student explains how new biological evidence changes people's understanding of the world (**SC4-15LW**)

Science and technology contribute to finding solutions to conserving and managing sustainable ecosystems (**LW5**):

- a. construct and interpret food chains and food webs, including examples from Australian ecosystems
- b. describe interactions between organisms in food chains and food webs, including producers, consumers and decomposers
- c. predict how human activities can affect interactions in food chains and food webs, including examples from Australian land or marine ecosystems

### STAGE 5: Geography

A student explains processes and influences that form and transform places and environments (**GE5-2**)

A student assesses management strategies for places and environments for their sustainability (**GE5-5**)

## AUSTRALIAN CURRICULUM CONTENT

Use models, including food webs, to represent matter and energy flow in ecosystems and predict the impact of changing abiotic and biotic factors on populations (**AC9S7U02**)

Examine how proposed scientific responses to contemporary issues may impact on society and explore ethical, environmental, social and economic considerations (**AC9S7H03**)

Analyse and make judgements on the ethical, secure and sustainable production and marketing of food and fibre enterprise (**AC9TE8K04**)

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## ▶ LESSON OBJECTIVE

Students will learn about food chains and food webs and how human activities can affect the interactions within these systems. Students will design a food chain and food web based on the ecological interactions on Banyula farm. An overarching theme of sustainable ecosystems will be embedded throughout the lesson, along with the influence of science on agricultural practices and the management of environments.

## ▶ LESSON OVERVIEW

**ACTIVITY 1 - Investigate a Soil Food Chain and Food Web (10 mins)**

**ACTIVITY 2 - Construction of a Food Web (40 mins)**

**ACTIVITY 3 - Human Effects on Farming Interactions (10 mins)**

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## Resources and Equipment

### ▶ **ACTIVITY 1 - Investigate a Soil Food Chain and Food Web**

1. Optional: **Soils For Life Documentary**
2. Computer/digital device access
3. **Worksheet 1 - Matching Definitions** (Literacy Activity).

### ▶ **ACTIVITY 2 - Construction of a Food Web**

1. Computer/digital device access
2. **Worksheet 2 - Food Web Cards** (Hands-on activity)

### ▶ **ACTIVITY 3 - Human Effects on Farming Interactions**

1. Computer/digital device access
2. **Worksheet 3 - Human Effects on Farming Interactions** (Research and written activity)
3. **Banyula Saratini Farms | Reforestation | Clunes**

### ▶ **ADDITIONAL READING/RESOURCES**

**Investigating and Managing Soils Yrs 7/8 | Agriculture Lessons** ([primezone.edu.au](http://primezone.edu.au))

**Macadamia plant protection guide 2018** ([horticulture.com.au](http://horticulture.com.au))

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## Lesson Guide

### Background Information

A **food chain** shows a single pathway by which energy and matter flow through an ecosystem (Biology Libretexts, 2016).

A **food web** shows many pathways through which energy and matter flow through an ecosystem. It includes many intersecting food chains. Food webs demonstrate that most organisms eat and are eaten by more than one species. (Biology Libretexts, 2016).

A **producer** is an organism that produces food for themselves and other organisms. They use energy and simple inorganic molecules to make organic compounds. Producers are also called autotrophs.

A **consumer** depends on other organisms for food. They include all animals, fungi and many bacteria. Consumers are also called heterotrophs.

A **decomposer** breaks down the remains of organisms and waste and then releases simple inorganic molecules back to the environment.

**Insectary plants** are grown to attract, feed, and shelter insect parasites (parasitoids) and predators to enhance biological pest control.

According to Banyula Saratini Farms, “Banyula is a family-owned business managed by locals. We see it as our responsibility to conserve and manage nature’s resources. We implement highly adaptable regenerative agricultural practices that collectively make for happier and healthier soil, food, humans, farmers and planet. Partnering with experienced regenerative stakeholders, we draw on the natural capital of our land and farm it with purpose. Part of our holistic farm management is to ensure biodiversity is valued, conserved, stored and wisely used.”

### ▶ ACTIVITY 1 - Investigate a Soil Food Chain and Food Web

Students will utilise their learning in Stage 4 to match up key terminology in food chains and food webs.

1. Introduce food chains and food webs to students by posing a series of enquiry questions such as:
  - What is a food web?
  - What is a food chain? How is it different from a food web?
  - What food chain do you know of in an ocean/forest/desert etc?
  - Define the terms: producer, consumer, decomposer, predator and prey.

**Suggested answers page 15**  Summarise students’ responses in a central area, such as a whiteboard.

2. Present one example of a food chain and web on the board (this could be electronic or diagrammatic). Identify and define the producers and discuss their role (e.g. make energy from the sun using photosynthesis), eat producers (herbivores), eat other animals (first-order consumers) etc. Select one food chain from the web, and record this in a separate area for students to copy.
3. Ask students if they know of any organisms that live in the soil and record these in a central area. Introduce the soil food web as an ecosystem of organisms that we don’t often think about yet are essential to all life on Earth. If further information is required, review **Soils For Life Documentary**
4. As a class, complete **Worksheet 1 - Matching Definitions**, where students write in the correct term next to its definition.

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## ACTIVITY 2 - Construction of a Food Web

Students will learn about the interaction of organisms and the effect that human interactions can have on the food webs at Banyula Farm.

1. Provide students with a printed copy or online access to **Worksheet 2 - Food Web Cards** (hands-on activity). Explain to students that they will use the organisms cards on the worksheet to create a food web for Banyula Farm. Students read the information on each card and highlight the feeding relationship described. Students then cut out the cards and follow the directions on the worksheet to make a food web. Students will draw arrows to show the feeding relationships for each organism.

**Suggested answers page 16** 

2. Ask students questions as they are building the food web to make sure that they understand the significance of the arrow (flow of energy and matter) and can identify and understand the terms producer, consumer, decomposer, predator, prey etc.

*Note: Answers will vary. Students should quickly realise that the number of feeding relationships in the food web is large. They may require an A3 sheet of paper or utilise multiple pages in their workbook.*

*For extension: Students may wish to research additional organisms found at Banyula Farm and include them in their food web.*

## ACTIVITY 3 - Human Effects on Farming Interactions

Students will learn about regenerative agricultural practices at Banyula Farm to show positive human interactions in the ecosystem.

1. Provide students with a printed copy or online access to **Worksheet 3 - Human Effects on Farming Interactions** (Research and written activity).
2. Explain to students that they will firstly be thinking about a hypothetical farm. Please inform students that the scenario is NOT based on Banyula Farm. Students read through the scenario and related food web to answer the questions provided.
3. Students research **Banyula Farm Banyula Saratini Farms | Reforestation | Clunes** to gather information about its regenerative agricultural practices. Students complete the table on **Worksheet 3** to outline and predict the effects of Banyula Farm utilising cover crops and insectaries and minimising machine use.

*Discuss the definition of insectary plants with students, if needed.*

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## WORKSHEET 1:

## Soil Food Chains And Food Webs

Use the terms below to write in the box next to the correct definitions.

**Ecosystem Interdependence, Soil Food Chain, Biotic, Food Web, Trophic Level, Abiotic, Saprophytes**

## DEFINITIONS

## TERMS

A sequence of organisms in the soil, each of which serves as a source of food or energy for the next.

Any organism that breaks down decomposing bits of organic matter.

The relationship between trophic levels in a food chain or food web is one of interdependence, where each level depends on the level below it for energy and nutrients.

A system of interlocking and interdependent food chains.

Any living component that affects another organism and the functioning of ecosystems.

Non-living chemical and physical parts of the environment that affects living organisms and the functioning of ecosystems.

A position in a food chain or food web that describes the organism's feeding status or nutritional level.

Soil fungi and bacteria involved in the processing of decayed organic matter.

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## WORKSHEET 2:

## Banyula Farm Food Web

Use these cards to make a food web that displays the organisms found at Banyula Farm.

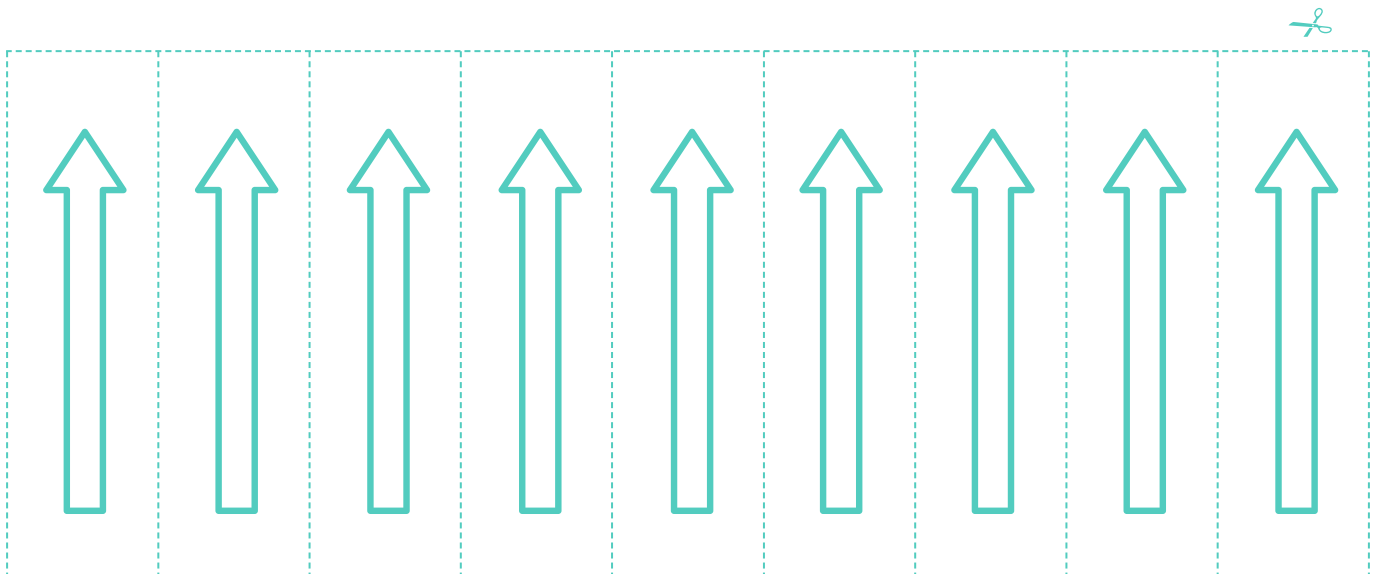
### Instructions:

1. Read the information on each card and **highlight** the **feeding relationship** described.
2. Cut out each card using scissors.
3. Follow your teacher's directions and use the cards to complete food chains and/or food webs.

### Making a food web:

Food webs are multiple food chains joined together to show the more complex relationships in an ecosystem.

1. Identify the producer card and place it down on a flat surface.
2. Locate a card that shows an organism that feeds on the producer and place it above the producer card.
3. Draw in arrows or use arrows provided to show the direction of matter and energy flow (who eats whom).
4. Locate another organism that feeds on the producer and repeat steps 2 and 3.
5. Continue to add organisms and arrows to show the feeding relationships until no more organism cards can be added and the food web is complete.



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## WORKSHEET 2:

## Banyula Farm Food Web



## Banyula Farm Food Web



Construct a food web by cutting out each of the boxes. Add arrows to show the feeding relationships.

## Ambrosia Beetle



Feed on fungus and attack sick or dying trees.

## Black Cockatoo



Eat Eucalyptus and Grevillea seeds.

## Parasitoid Wasp



Lay their eggs on or in the bodies of arthropods. An effective biocontrol against Nut Borer.

## Macadamia Nut Borer



Biocontrol with parasitoid wasps.  
Photo Source:  
NSW Department of Industry

## Silky Oak Forest



Makes its own food by photosynthesis.  
Absorbs water from the soil and nutrients from organic matter in the soil through its roots.

## WORKSHEET 2:

## Banyula Farm Food Web



## Cattle



Eats grass and biodiverse pastures. Brahman cross cattle are more resilient to difficult environmental conditions such as drought.

## Davidson's Plum Tree



Produces a sour fruit that is used in jam, wine, ice-cream and sauces.

## Macadamia Tree



Produces macadamia nuts, which may be eaten by Nut Borer.

## Worms and Decomposers



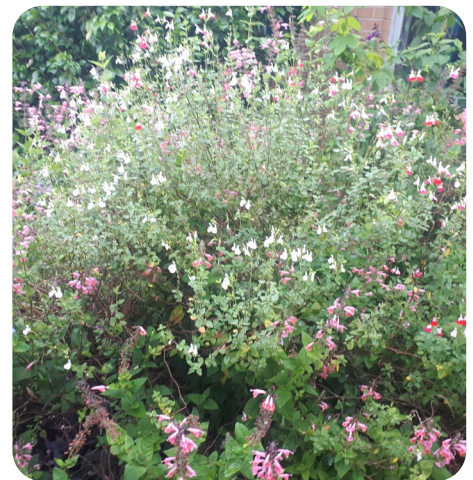
Chemically breaks down organic matter into nutrients such as Nitrogen, Phosphorus, and Potassium. The nutrients are used by plants growing in the soil.

## Organic Matter



Contains decomposing bodies and wastes of animals, plants and microorganisms. It improves the ability of soil to hold water and nutrients, which plants absorb through their roots.

## Insectary Species



Pollinator habitat. Makes energy from sun. Pollen and nectar eaten by pollinators; herbivore insects eat leaves.

WORKSHEET 2:

# Banyula Farm Food Web



## European Honey Bee



Eats nectar and pollen on macadamias and is eaten by birds and spiders.

## Firetailed Resin Bee



Eats nectar and pollen. Uses resin from macadamia sap to seal hive/nest. Eaten by birds and spiders.

## Common Black Rat



Eats seeds, fruit, stems, leaves, fungi, invertebrates and vertebrates.

## Carpet Snake



Eats small mammals, birds and lizards.



## WORKSHEET 3:

## Human Effects on Farming Interactions

- a) Read the following scenario about a hypothetical farm and predict how human activities affect interactions within the food web. Write your responses in the spaces provided (*please note this is not Banyula Farm*).

### Scenario 1 Hypothetical Farm

This farm practices monoculture, growing only macadamia trees with conventional farm practices and farm management techniques, such as a reliance upon pesticides, slashing and pruning.

**Food Web:** Macadamia trees > Herbivorous insects > Insect-eating birds

Predicted Impact on Food Web:

- Low plant diversity could **increase** / **decrease** (select one) the diversity of herbivorous insects.  
increase      decrease
- A decrease in the diversity of food for insect eating birds may cause poor health and nutrition, which could lead to an **increase** / **decrease** (select one) in their population.  
increase      decrease
- How might the changes in the insect population affect the health and productivity of macadamia trees?

- An outbreak of pest species in this orchard is managed with an insecticide treatment across the orchard. Use this video as a stimulus to answer this question. **Integrated pest management in protected cropping**

Suggest any new strategies farmers use to prevent or control a pest species in a horticultural enterprise.

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**b) Banyula Farm’s positive human interactions**

Refer to <https://www.banyula.com.au/regenerativeagriculture> to research their regenerative agricultural practices. Outline and predict the effects of Banyula Farm implementing the following:

	<b>OUTLINE</b> <i>(sketch in general terms;                      indicate the main features of)</i>	<b>PREDICT</b> <i>(suggest what may happen based                      on available information)</i>
<b>REGENERATIVE AGRICULTURAL PRACTICE AT BANYULA FARM</b>  Regenerative agriculture aims to create the right conditions for life to flourish through conservation and rehabilitation techniques.		
<b>COVER CROPS AND INSECTARIES</b>  Insectary plants are those grown to attract, feed, and shelter insect parasites (parasitoids) and predators to enhance biological pest control.		

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## Answers

### ▶ ACTIVITY 1 - Investigate a Soil Food Chain and Food Web

#### WORKSHEET 1:

DEFINITION	TERM
A sequence of organisms in soil, each of which serves as a source of food or energy for the next.	<i>SOIL FOOD CHAIN</i>
Any organism that breaks down decomposing bits of organic matter.	<i>DECOMPOSER</i>
The relationship between trophic levels in a food chain or food web is one of interdependence, where each level depends on the level below it for energy and nutrients.	<i>ECOSYSTEM INTERDEPENDENCE</i>
A system of interlocking and interdependent food chains.	<i>FOOD WEB</i>
Any living component that affects another organism and the functioning of ecosystems.	<i>BIOTIC</i>
Non-living chemical and physical parts of the environment that affect living organisms and the functioning of ecosystems.	<i>ABIOTIC</i>
A position in a food chain or food web that describes the organism's feeding status or nutritional level.	<i>TROPHIC LEVEL</i>
Soil fungi and bacteria are involved in processing decayed organic matter.	<i>SAPROPHYTE</i>

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➤ **ACTIVITY 2 - Construction of a Food Web**

**WORKSHEET 2:**

Students may have a range of arrows. The direction of the arrow is important to show the flow of energy.



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## ACTIVITY 3 - Human Effects on Farming Interactions

### WORKSHEET 3:

- a.
1. Decrease
  2. Decrease
  3. Responses may include:
    - reduced numbers of macadamia trees, reduced crop output of macadamia nuts, increased numbers of Nut Borers which will lead to a decreased quality of nuts and reduce grower payments by processors.
  4. Strategies could include:
    - Cultural control (involves plant selection) so choosing plant varieties which are resistant to pests
    - Biological controls which are using naturally occurring organisms to help control.
    - Inundation.
    - Only targeting a specific pest if it is present and using a selective herbicide to minimise impacts on other species.

b. REGENERATIVE AGRICULTURAL PRACTICE at Banyula Farm	OUTLINE <i>(sketch in general terms; indicate the main features of)</i>	PREDICT <i>(suggest what may happen based on available information)</i>
<ul style="list-style-type: none"> <li>• Cover crops and insectaries (Insectary plants are those grown to attract, feed, and shelter insect parasites (parasitoids) and predators to enhance biological pest control).</li> </ul>	<ul style="list-style-type: none"> <li>• Planted in rows between Macadamia Trees and other species such as the Davidson's Plum.</li> <li>• Creates a pollinator habitat.</li> <li>• Attracts bees</li> <li>• Provide a home to Parasitoid Wasps and other beneficials.</li> </ul>	<ul style="list-style-type: none"> <li>• Higher output of Macadamia nuts and quality, leading to increased monetary returns at harvest for sustainable economics of farm management.</li> <li>• Macadamia Trees become more resistant and healthier due to fewer parasites and pests. <i>E.g. Nut borer is eaten by Parasitoid Wasps, reducing populations of pests.</i></li> <li>• Higher output of Davidson Plums</li> <li>• Less use of pesticides</li> </ul>

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