



AN EDUCATIONAL UNIT FOR JUNIOR SECONDARY SCHOOLS



Investigating Australian approaches to producing fish, seafood and meat

YEARS 7 & 8

Design and Technologies,
Science and Geography

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The material in this Unit of Work is made available for the purpose of providing access to general information about food and fibre production and primary industries in Australia.



As content of the websites used in this unit is updated or moved, hyperlinks may not always function.

Introduction

Rationale

This resource material aims to help teachers and students in primary schools investigate and understand more about primary industries in Australia.

The objectives of the educational resources are to:

- Support Primary Industries Education Foundation Australia and its members in expanding awareness about primary industries in Australia by engaging and informing teachers and students about the role and importance of primary industries in the Australian economy, environment and wider community.
- Provide resources which help build leadership skills amongst teachers and students in communicating about food and fibre production and primary industries in Australia.
- Develop educational resources that can be used across Australia to provide encouragement, information and practical teaching advice that will support efforts to teach about food and fibre production and the primary industries sector.
- Educate school students on ways food and animals are raised and grown.
- Demonstrate to students that everyone can consider careers in primary industries and along the supply chain of food and fibre products.
- Assist school students to spread this message to their families and the broader community.
- Develop engaging learning programs using an inquiry process aligned with the Australian Curriculum.
- Develop in school communities, an integrated primary industries education program that emphasises the relationship between food and fibre industries, individuals, communities, the environment and our economy.

These educational resources are an effort to provide practical support to teachers and students learning about food and fibre production and primary industries in schools.

An integrated primary industries education program that emphasises the relationship between food and fibre industries, individuals, communities, the environment and our economy.

The approach used, is the inquiry approach through five phases: Engage, Explore, Explain, Elaborate and Evaluate.

Several key principles underpin the theoretical and practical application to this unit.

In providing an *integrated framework for inquiry*, complemented by rich explorations of texts that are, in turn, supported by an emphasis on undertaking a challenge or task, the unit requires students to:

- Search for information using both digital and non-digital means
- Use research techniques and strategies
- Use thinking and analysis techniques
- Present findings to a real audience, and
- Reflect both on the product created and the process undertaken.

Rather than seeing knowledge as something that *is taught* the emphasis in this unit is on knowledge and understanding that *is learned*.

The unit involves students in:

- Working from a basis of their prior knowledge and experience
- Seeing a real task or purpose for their learning
- Being directly involved in gathering information firsthand
- Constructing their knowledge in different ways
- Presenting their learning to a real audience
- Reflecting on their learning.

The approach used, is the inquiry approach through five phases: **Engage, Explore, Explain, Elaborate** and **Evaluate**. The phases of the model are based on the 5Es instructional model (Bybee, 1997). This unit of work containing student activities assists students to raise questions, gather and process data, make conclusions and take action. These phases are:

- **Engage:** The 'Engage' phase begins with lessons that mentally engage students with an activity or question. It captures their interest, provides an opportunity for them to express what they know about the concept or skill being developed, and helps them to make connections between what they know and the new ideas.
- **Explore:** The 'Explore' phase includes activities in which they can explore the concept or skill. They grapple with the problem or phenomenon and describe it in their own words. This phase allows students to acquire a common set of experiences that they can use to help each other make sense of the new concept or skill.
- **Explain:** The 'Explain' phase enables students to develop explanations for the phenomenon they have experienced. The significant aspect of this phase is that explanation follows experience.
- **Elaborate:** The 'Elaborate' phase provides opportunities for students to apply what they have learned to new situations and so develop a deeper understanding of the concept or greater use of the skill. It is important for students to discuss and compare their ideas with each other during this phase.
- **Evaluate:** The 'Evaluate' phase provides an opportunity for students to review and reflect on their own learning and new understanding and skills. It is also when students provide evidence for changes to their understanding, beliefs and skills.

Source: *Primary Connections* <http://www.primaryconnections.org.au/about/teaching>

Resource description

This is a unit with five inquiry teaching sequences about how food and fibre is produced, processed and brought to consumers.

This unit encourages students to investigate new and existing practices used to produce meat, seafood and fish. Students are given an insight into ways primary producers in the fisheries, beef and lamb, pork and chicken industries produce, process and bring their products to consumers.

It includes sections on food production – what it is, what it comprises, what it affects, its potential impacts on living things in a variety of ecosystems, and who and what produces the food that feeds people in Australian and overseas.

The unit introduces possible scenarios for Australia and factors that have contributed to our changing understanding of the environment and sustainable living.

It invites students to consider the sustainability of food production systems in relation to food supplies and the provision of adequate nutrition over time; the environmental quality of farms and ecosystems affected by food production; the cultural integrity of farming communities; and food quality, diversity, safety and security.

It contains a unit of work with a variety of activities selected as vehicles to help students:

- Investigate where and how primary producers farm meat, seafood and fish.
- Investigate how different systems and practices are used to produce meat, seafood and fish.
- Investigate concepts and ideas about land, water and waste management; revegetation; sustainable farming; sustainable fishing; climate adaptation and sustainability.
- Assess how meat, seafood and fish were produced in the past, and how production methods and systems have been influenced by increases in scientific knowledge and developments in technology.
- Select ideas and undertake an inquiry into a meat, seafood or fish industry, by collecting and recording information about their production and processing methods, how they bring the product to consumers, and their management practices.
- Reflect on and evaluate the different production systems used to produce meat, seafood and fish.

Year levels: 7 and 8

Based on Australian Curriculum, Assessment and Reporting Authority (ACARA) materials downloaded from the Australian Curriculum website in February 2015. ACARA does not endorse any changes that have been made to the Australian Curriculum.

Investigate food production – what it is, what it comprises, what it affects, its potential impacts on living things... and who and what produces food that feeds people in Australia and overseas.

Australian Curriculum content descriptions

Design and Technologies

Strand: Design and Technologies knowledge and understanding

Analyse how food and fibre are produced when designing managed environments and how these can become more sustainable [ACTDEK032](#)

Science

Strand: Science as a Human Endeavour: Use and influence of science

Science understanding influences the development of practices in areas of human activity such as industry, agriculture and marine and terrestrial resource management [ACSHE136](#)

Strand: Science Understanding: Biological sciences

Interactions between organisms can be described in terms of food chains and food webs; human activity can affect these interactions [ACSSU112](#)

Geography

Strand: Geographical knowledge and understanding

The classification of environmental resources and the forms that water takes as a resource [ACHGK037](#)

Cross Curriculum Priorities

Sustainability

- OI.2:** All life forms, including human life, are connected through ecosystems on which they depend for their wellbeing and survival.
- OI.3:** Sustainable patterns of living rely on the interdependence of healthy social, economic and ecological systems.
- O1.4** World views that recognise the dependence of living things on healthy ecosystems, and value diversity and social justice are essential for achieving sustainability.
- OI 6:** The sustainability of ecological, social and economic systems is achieved through informed individual and community action that values local and global equity and fairness across generations into the future.
- OI.8:** Designing action for sustainability requires an evaluation of past practices, the assessment of scientific and technological developments, and balanced judgments based on projected future economic, social and environmental impacts.

Source: Australian Curriculum, Assessment and Reporting Authority (ACARA), downloaded from the Australian Curriculum website in February 2015.

Implementing the unit and activities in the classroom

Using the unit

The unit can be used in a number of ways. It will be of most benefit to teachers who wish to implement a sustained sequence of activities following the inquiry stages identified in the **About the approach** section of this unit and content descriptions in Years 7 and 8 in Design and Technologies, Science and Geography as stated in the Australian Curriculum.

Selecting activities

At each stage several activities are suggested from which you are encouraged to select the most appropriate for your purposes. Not all activities in each stage of the unit need to be used. Alternatively, you may add to or complement the suggested activities with ideas of your own.

It is suggested that teachers create a hyperlinked unit. Organise the digital resources for your class's use on a website or wiki or provide them on your interactive whiteboard.

Resourcing the unit

The resources suggested are on the whole, general rather than specific. Schools and the contexts in which they exist vary widely as does the availability of some resources – particularly in remote areas. There is a strong emphasis in the unit on gathering information and data; research and observations also feature strongly as these methods develop important skills and ensure that the exploration of the topics are grounded in a relevant context.




Some YouTube and online videos in addition to Internet based resources are suggested in the unit. You will need to investigate what is available in your school.

Adapting the unit

The unit is targeted at Years 7 and 8 students. This is a suggested age range only and teachers are encouraged to modify activities to suit the needs of the students with whom they are working.

The unit's topics are based on content descriptions of the Australian Curriculum and on the key cross curriculum priority of sustainability. They embrace content that we believe is of relevance and significance to all students. We encourage you to explore ways in which the content can be adjusted to the context in which you are working.

Many of the activities contain the following icons offering a suggestion on how many students should be involved:

-  Suggested for individuals
-  Suggested for pairs or small groups
-  Suggested for larger groups or entire classes

Resource sheets are provided for some activities. Most are for photocopying and distribution to students. They are identified within units in bold italic: **Resource 1.1**

The resource sheets are designed to assist teachers to facilitate learning without having to access a range of other resources.

What about assessment?

Rather than being a task carried out at the end of the unit, assessment is viewed as integral to the entire unit sequence. Each activity should be regarded as a context for assessment of student learning.

When planning and implementing the unit of work make clear decisions on what you will focus on in assessing learning. The unit provides an opportunity for a range of skills and understandings to be observed. We encourage you to devise an assessment plan or assessment rubric that features areas to be assessed over subsequent lessons.

In planning for assessment, student learning in the following areas can be considered:

- Understandings about the topic
- Development of skills
- Exploration and clarification of values
- Use of language in relation to content
- Ability to use and critically analyse a range of texts
- Ability to analyse and solve problems
- Ability to interpret information, perceive its meaning and significance, and use it to complete real-world tasks
- Ability to work cooperatively with others
- Approach to learning (independence, confidence, participation and enthusiasm)

For this unit, the following understandings are provided to assist teachers in planning for assessment.

Assessment strategies

Each stage in the inquiry sequence provides information about student learning. There are, however, two stages in the unit that are central to assessment: the **Engage** stage and the **Evaluate** stage. Work that is undertaken in these stages can assist teachers to monitor growth and observe concrete examples of the way student ideas have been refined or have changed through the unit sequence. Work samples should be retained for this purpose.

This unit contains a 'Student Task' which is well suited for assessment, as it is the summation of the work undertaken by the students in the unit.

Some questions and possible answers

Should I do all the activities?

At each stage of a unit, a number of activities are listed. You would not be expected to do them all. Instead, the unit is designed so that a selection of activities can be made at each stage. You should select the activities according to the needs and interests of your students and the time, relevance to the existing school curriculum and resources available to you.

While you are encouraged to follow the suggested inquiry sequence for each unit, it is quite possible to pick and choose from the range of activity ideas throughout the unit. It may also be used in conjunction with other programs you use.

How do these units fit into my weekly program?

Although the unit integrates a range of key subject areas, it is not designed to be a total program. It is assumed that regular routines that operate in your classroom will continue to run alongside your unit of work. For example, you may have regular times for use of the library, for maths, physical education etc. These things don't change – although student's writing topics or choice of topics to research in the library or in Information and Communication Technology classes may be influenced by this unit.

How long should the unit run?

This will of course depend on your particular circumstances but generally, a few weeks to a term are suggested.

I don't know much about food production myself – will I be able to teach it effectively?

Yes! The unit is designed in such a way that you, as the teacher are a co-learner, and you are therefore provided with teacher notes, plus readily available resources that are mainly web-based. Most importantly, you will find that you learn with the students and make discoveries with them.

Fast facts about Australian agriculture

National Farmers' Federation Farm Facts 2012



In 2011, there were 157,000 farmers in Australia.



The gross value of Australian farm production in 2011–12 was \$46.7 billion.

This page provides basic food and fibre production information that may be helpful when you interact with the school students.

- Agriculture plays a vital role in Australia, contributing to our social, economic and environmental sustainability.
- In 2011, there were 157,000 farmers in Australia. Around half of these were mixed crop and livestock farmers (22 percent), beef cattle farmers (20 percent) or dairy farmers (8 percent).

Sources: Australian Bureau of Statistics, 2010-11 Agricultural Census; Australian Bureau of Statistics, Australian Social Trends, Australian Farming and Farmers, December 2012, Catalogue No. 4102.0.

- These farmers own or manage Australia's 135,000 farm businesses – 99 percent of which are Australian owned.

Sources: Australian Bureau of Statistics, 2010–11 Agricultural Census; Australian Bureau of Statistics, Agricultural Land and Water Ownership, December 2010, Catalogue No. 7127.0.

- Each Australian farmer produces enough food to feed 600 people, 150 at home and 450 overseas. Australian farmers produce 93 percent of Australia's daily domestic food supply.

Sources: Keogh M, Australian Farm Institute, 2009, "Australia's response to world food security concerns", Address to the 1st National Farmers' Federation Annual Congress – Prime Minister's Science, Engineering and Innovation Council (2010); Australia and Food Security in a Changing World. The Prime Minister's Science, Engineering and Innovation Council, Canberra, Australia.

- The average Australian farmer is male (72 percent), 53 years old (compared with 40 years old for people in other occupations), and a self-employed owner manager (56 percent).

Sources: Australian Bureau of Statistics, 2010–11 Agricultural Census; Australian Bureau of Statistics, Australian Social Trends, Australian Farming and Farmers, December 2012, Catalogue No. 4102.0.

- As of June 2012, there were 290,000 people employed in Australian agriculture. The complete agricultural supply chain, including the affiliated food and fibre industries, provide over 1.6 million jobs to the Australian economy.

Sources: Australian Bureau of Agricultural & Resource Economics and Sciences (ABARES), Australian Commodity Statistics, 2012; Australia's Farm Dependent Economy: Analysis of the role of Agriculture in the Australian Economy. Modelling undertaken by Econtech.

- The agricultural sector, at farm-gate, contributes 2.4 percent to Australia's total gross domestic product. The gross value of Australian farm production in 2011–12 was \$46.7 billion.

Sources: Australian Bureau of Statistics, Value of Agricultural Commodities Produced, 2011–12, Catalogue No. 7503.0; Australian Bureau of Statistics, 2010–11, Australian System of National Accounts, Catalogue No. 5204.0; ABARES, Australian Commodity Statistics, 2012.

- Australian farmers are environmental stewards, owning, managing and caring for 59 percent of Australia's land mass.

Sources: Australian Government Department of Agriculture, Fisheries and Forestry, At a Glance, 2012.

- Farmers are at the frontline of delivering environmental outcomes on behalf of the Australian community, with 94 percent of Australian farmers actively undertaking natural resource management.

Source: Australian Bureau of Statistics, Natural Resource Management on Australian Farms 2006–07.

- Australia's primary industries have led the nation in reducing greenhouse gas emissions: a massive 40 percent reduction between 1990 and 2006.

Source: Australian Government Department of Climate Change, National Inventory by Economic Sector 2006.

Source: National Farmers' Federation Farm Facts 2012 at <http://www.nff.org.au/farm-facts.html>

Meat and Livestock Industry

- Australia's national cattle herd stands at 28.5 million head with the beef industry accounting for 57 percent of all farms with agricultural activity.
- Australia produced around 2.2 million tonnes of beef and veal in 2012–13 directly contributing to 1 percent of Australia's gross domestic product.
- Australia's national sheep flock is 74.7 million head with the sheep industry accounting for 32 percent of all farms with agricultural activity.
- Australia produces approximately 6 percent of the world's lamb and mutton supply and in 2012–13 exported 51 percent of all lamb and 96 percent of all mutton produced.
- Australia's beef and lamb industry employs approximately 200,000 workers across farm, processing and retail.
- Australian cattle and sheep farmers are the custodians of almost half of Australia's land.
- Australia's beef and lamb industry is committed to ensuring a sustainable food supply for future generations with ongoing research and development projects relating to water, soil, biodiversity, animal welfare, energy, emissions and more.

Source: *Meat and Livestock Australia* <http://mla.com.au>

Fishing and Aquaculture Industry

Australia's marine domain, our Exclusive Economic Zone, is one of the largest in the world, covering around 10 million square kilometres. This is larger than mainland Australia (7.69 million square kilometres). Despite the size of this zone Australia ranks 46th in the world for seafood production.

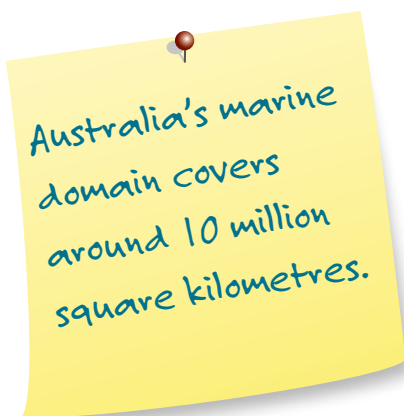
Australia has progressively adopted a more ecosystem-based approach to fisheries management which looks at the effect of fishing practices not just on the target species, but also on the environment and other related species. Fisheries managers monitor both stock and fishing levels as well as a range of other environmental factors to ensure the amount of seafood harvested every year does not deplete stocks. In addition, government observers travel regularly on fishing boats to ensure compliance to quotas, bycatch limits and other regulations.

Source: *Fisheries Research and Development Corporation, 2013* <http://frdc.com.au/>

During 2011–12 in Australia:

- There were 6,991 people directly employed in the commercial fishing, hunting and trapping sector, and 3,642 in aquaculture enterprises.
- The sector comprises approximately 120 wild catch fisheries and 70 aquaculture species.
- The gross value of Australian commercial seafood and products (e.g. pearls) was valued at \$2.3 billion, an increase of 3 percent on the previous year.
- Australian imports of fisheries products increased by 5 percent.
- The value of production for the wild-catch sector declined by 1 percent to \$1.3 billion and production volume decreased by 4 percent to 157,505 tonnes. While the gross value of aquaculture production rose by 10 percent (\$100 million) to \$1.1 billion.
- The largest contributor to Australian aquaculture production in 2011–12 was salmonids, which make up 52 percent of the total aquaculture production volume and 49 percent of the value.
- Tasmania accounted for the largest share of gross value of production (30 percent), followed by South Australia (19 percent) and Western Australia (17 percent). Commonwealth fisheries accounted for 13 percent of the gross value of production.

Source: *ABARES, 2013* http://data.daff.gov.au/data/warehouse/9aam/afstad9aamd003/2012/AustFishStats_2012_v1.0.0.pdf



Cotton Industry

Australia's cotton growers produce yields almost three times the world average.

40% less water is needed to grow one tonne of cotton lint compared to 2003.

- Every year cotton farmers make an important social and economic contribution to the nation creating jobs for 8,000 people (in Northern New South Wales and Southern Queensland alone), support for more than 4,000 businesses and over \$2 billion for the national economy in export earnings.
Sources: Cotton Australia Pocket Guide to Cotton, Judith Stubbs and Associates Report 2011.
- In 2013, there were 1,181 cotton farms. 63 percent were in New South Wales and 37 percent were in Queensland. Of those farms cotton makes up 17 percent of land area on farm.
Source: Cotton Annual 2014.
- Australia's cotton growers produce enough cotton to provide jeans, socks, underwear and a shirt for 450 million people. The overall yield in 2012 was 10.37 bales per hectare – the first time in history that average yields have exceeded 10 bales per hectare. Australia's cotton growers produce yields almost three times the world average.
Sources: Cotton Australia tables (compilation of industry sources), ABARES Crop Report, December 2012, Pocket Guide to Cotton 2014.
- The average Australian cotton farmer is 39 years old, has a family owned and operated farm, employs on average six or more people, grows other crops like sorghum, soybeans, wheat and canola, has 496 hectares of cotton and is not only a farmer but also a builder, mechanic meteorologist, agronomist, conservationist, scientist and marketer.
Sources: Pocket Guide to Cotton 2014, Monsanto audited numbers 20.12.13, 2013 Cotton Practices Grower Survey, Cotton Research and Development Corporation.
- The Australian cotton crop was worth almost \$2.3 billion at the farm gate.
Source: Cotton Australia tables (compilation of industry sources), Cotton Compass.
- The Australian cotton industry has achieved a 40 percent increase in water productivity over the last decade i.e. 40 percent less water is now needed to grow one tonne of cotton lint, compared to 2003.
Source: The Australian Cotton Water Story 2011.
- The ratio of dryland cotton (rain grown) to irrigated cotton varies depending on the market and conditions. Of the 2011–12 crop 5 percent was dryland and 95 percent irrigated. Favourable grain and sorghum prices meant many dryland farmers opted not to plant cotton at that time.
Sources: Cotton Australia tables (compilation of industry sources), ABARES Crop Report December 2012.
- Australian cotton growers have reduced their insecticide use by 95 percent over the past 15 years. *Source: Monsanto Audited numbers 20.12.2013.*
- Cotton growers are good environmental stewards, owning and caring for native vegetation equivalent to 40 percent of the area of their cotton farms, on average. *Source: 2011 Cotton Grower Survey (Cotton Research and Development Corporation and Cotton Catchment Communities Co-operative Research Centre).*

Source: Cotton Australia <http://www.cottonaustralia.com.au>

Pork Industry



Australia's pig herd is one of the cleanest in the world.

- Australia is the first nation in the world to introduce the voluntary phase-out of gestation stalls.
- Pork accounts for approximately 0.4 percent of the national greenhouse gas emissions – significantly lower than other agricultural sectors, including beef at 11.2 percent, sheep at 3.4 percent, and cattle at 2.7 percent.

Source: Garnaut, R. 2008, *The Garnaut climate change review – final report*, available at: <http://www.garnautreview.org.au/index.htm>

- Whether housed indoors or outdoors, a pig spends more time resting than any other domestic animal.
- Australia's pig herd health is one of the cleanest in the world, free from many detrimental diseases found in most other pig producing countries
- The feed component (mainly grains such as wheat, barley and sorghum) makes up about 60 percent of the total cost of producing pork.
- Pigs have a very wide angle of vision (310°) and are therefore easily distracted.
- On average, a sow will produce 10–12 piglets per litter.
- The average growth rate of Australian pigs is around 600–650 grams a day from birth to sale.
- Pigs have colour vision but they can't focus both eyes on the same spot.
- Pigs are unable to perspire and they lose heat through their mouths. Their ideal growing temperature is 20–22°C.

Source: Australian Pork Limited <http://www.australianpork.com.au>

Forestry Industry

Australia has 125 million hectares of forest, equivalent to 16% of its land area.

Forests protect soil and water resources as well as storing carbon.

- Forestry plays a vital role in Australia, contributing to our social, economic and environmental sustainability.
- Forests are also the foundation for a broad range of cultural and spiritual experiences for diverse groups of people. They are a major tourist attraction for Australian and overseas visitors, providing for a vast array of recreational and educational activities.
- In 2010–11, the total turnover of Australia’s forest product industries was more than \$24 billion.
- Australia has 125 million hectares of forest, equivalent to 16 percent of Australia’s land area. Australia has about 3 percent of the world’s forest area, and the seventh largest reported forest area of any country worldwide.
- Australia’s 123 million hectares of native forests are dominated by eucalypt forests and acacia forests.
- 32 percent of all Australia’s native forests (private and public land) are protected for biodiversity conservation. With 73 percent of Australia’s identified old growth forests in formal or informal nature conservation reserves.
- 9 percent (36.6 million hectares) of the native forests were available and suitable for commercial wood production in 2010–11 comprising 7.5 million hectares of multiple-use public forests and 29.1 million hectares of leasehold and private forests.
- Forests protect soil and water resources and are increasingly being recognised for their carbon storage and sequestration capability. The total carbon stored in forests, wood and wood products and paper products was in the order of 400 million tonnes in 2010.
- Australia’s native and plantation forests provide the majority of the timber and a significant proportion of the paper products used by Australians.
- On average, each year, every Australian consumes the equivalent of about 1 cubic metre of harvested log in the form of timber products, including timber for home building, joinery and furniture and paper products.
- Australia’s forest management is among the best in the world in terms of conservation reserves and codes of practice for production forests.
- Australia has two forestry certification schemes that enable users of wood and wooden products to know the source of the wood.
- The sector directly employs 73,267 people in the forest and wood products industry in Australia (2011). This includes full and part time employees with 1.5 percent of all employees being Indigenous.

Sources: <http://www.agriculture.gov.au/forestry>
<http://au.fsc.org/>
<http://www.forestrystandard.org.au/>
<http://www.naturallybetter.com.au/>
<http://www.forestlearning.edu.au/>



Step 1: Engage with the topic

Getting started

Purpose

To provide students with opportunities to:

- gather information about their prior knowledge of food production
- pool ideas and share with others
- consider possible scenarios for Australia
- view and listen to stories from other cultures about access and availability of food
- develop their understanding of food systems
- organise the ideas they have about food production systems
- develop skills in making connections between ideas
- set directions for an investigation
- collate data for assessment purposes.

An overview of food production

Ask students to develop a concept map describing what they know about food production in Australia – what it is, what it comprises, what it affects, potential impacts on different ecosystems, and who is involved and what produces food that feed people in Australian and overseas. Share with students some facts about food production in Australia as is currently understood.



SEE National Farmers' Federation Farm Facts 2012 at:

<http://www.nff.org.au/farm-facts.html>

Australian Government Department of Agriculture

http://www.youtube.com/watch?feature=player_embedded&v=OSLNi8in2iU#

If questions emerge from this activity, record these and display them for reference throughout the unit.



IMAGINE

Ask students to imagine that they were born today. In 20 years time, when they have grown into adulthood, many of the world's ecosystems may have changed.

Consider the following scenarios:

SCENARIO ONE

Many agricultural practices have remained the same. It is based on the assumption that things worked reasonably well in the past and will therefore continue to do so in the future. Similar issues are occurring in the way food and fibres are produced, processed, distributed, retailed, consumed and disposed of and these issues being dealt with in similar ways as to today.

SCENARIO TWO

Many agricultural practices have been informed by breakthroughs in science and technology. Investments in genetic engineering, artificial intelligence, pollution control, waste management, energy reduction, and greenhouse gas emissions for example are bringing changes to the ways our food and fibres are produced, processed, distributed, retailed, consumed and disposed of.

SCENARIO THREE

Many agricultural practices are experiencing major changes. They are based on the assumption that caring for the environment, other people, and future generations also brings better quality of life in the present. Producers are multi-cropping and inter-cropping where plants, bushes, trees and animals co-exist and interact to give high yields while still maintaining soil nutrients. We understand much better now the ways in which our agricultural practices and our health depend on agriculture and the natural world. Informed producers and consumers are influencing the ways our food and fibres are produced, processed, distributed, retailed, consumed and disposed of.



Focus on the range of people in different countries facing food security issues.



Support students to **REFLECT** on how agricultural practices have changed over time. Also, consider what factors have contributed to our understanding of the environment and sustainable living.



Ask students to **DISCUSS** the differences between the three scenarios. Which would they prefer? What factors need to be considered for each to be realistic? Ask them to draft a fourth scenario based on what they believe is a realistic outlook for Australia agriculture in the future.

Reflect using a global perspective

World Food Day is acknowledged each year on October 16.



VIEW the video at:

<https://www.un.org/apps/news//story.asp?NewsID=46269&Cr=Food+Security&Cr1> and reflect on the situations depicted in other countries where many people experience a reality like 'scenario one'.



TALK about the countries where not all of the population has enough food to eat. **REFLECT** on the people depicted who do not have sufficient quantities of food available on a consistent basis and those who do not have sufficient resources to obtain foods.



READ about food security on the Global Education and World Health Organisation websites.

See <http://www.globaleducation.edu.au/global-issues/gi-food-security.html> and <http://www.who.int/trade/glossary/story028/en/>



As a class, **FOCUS** on the range of people in different countries facing food security issues and **DISCUSS**:



- Which food group was missing from nearly every person's diet.
- What they consider to be the main problems or issues for people living in these areas.
- What other countries can do about these problems.
- What scientists, organisations and industries could do about these problems.

Food systems



TALK with students about the meaning of 'food systems'.

The theme for World Food Day in 2013 was 'Sustainable Food Systems for Food Security and Nutrition.'

The United Nations describe food systems as;
'A food system is made up of the environment, people, institutions and processes by which agricultural products are produced, processed and brought to consumers. Every aspect of the food system has an effect on the final availability and accessibility of diverse, nutritious foods – and therefore on consumers' ability to choose healthy diets.'

Source: <https://www.un.org/apps/news//story.asp?NewsID=46269&Cr=Food+Security&Cr1>



Invite students to **RESEARCH** other meanings of food systems and food production systems. **RECORD** all ideas.



Step 1: Engage with the topic

During the unit, the students will ask many questions. Answers can be found in several different places.



DISCUSS the types of source material that presents a good understanding of food systems and food production systems.

Discuss how the students can evaluate their sources. They might ask:

- Who is the source's author?
- Where did they get their information from?
- Why might they be writing this source?
- What language are they using (i.e., is it emotional or informative?)

Learning log



Begin a learning log where students **RECORD** their understanding. This could form part of an assessment plan.

Introduce the learning log and **MODEL** a procedure for maintaining it. The whole class could **CONSTRUCT** the first entry together. Students can then make individual entries based on the activities they undertake and the questions they come up with.



Initial focus **QUESTIONS** could include:

- What impact does my perception of food production have on the foods I choose to purchase and/or eat?
- What food production systems do I know of? Local/regional? National? Global?
- What food systems do we need to feed the world?
- If we know about food production systems that lead to the long-term health of populations, ecosystems and environmental quality, why don't we use them in all instances?
- Are we going to rely on sustainable food systems more or less in the future?
- How do we meet the challenge of ensuring food production systems are efficient, well managed and sustainable?



Ask students to **RECORD** questions they hope to have answered by the end of the unit in their log.

If we know about food production systems that lead to the long-term health of populations, ecosystems and environmental quality, why don't we use them in all instances?



“A food system is made up of the environment, people, institutions and processes by which agricultural products are produced, processed and brought to consumers.”

Use song lyrics



READ an extract from a song titled ‘The Seventh Generation’ by Sue Doessel and reflect on the writer’s perspective on the importance of sustainability.

The Seventh Generation

“Will it benefit the seventh generation?”
Was the question that the Hopi dwelt on.
“Will it help the future people who will walk on this Earth
Long after you and I are dead and gone?”
And if the Hopi saw that the answer was “No”
They would drop that new idea.
They thought not only of themselves
But future generations as well.
I speak now for that seventh generation,
For the seventh generation from now on.
I speak for the people who will walk upon this Earth
Long after you and I are dead and gone.
Will they reap a bitter harvest from the things that we have done?
Will they thank us for the healing that in our time has begun?
Will there even still be people seven generations on?
For I fear for the seventh generation.

Author: Sue Doessel © Sue Doessel



TALK with students about what needs to be done to ensure the sustainability of food systems in relation to: food supplies and the provision of adequate nutrition over time; the environmental quality of farms and ecosystems affected by food production; the cultural integrity of farming communities; and food quality, diversity, safety and security?

Invite students to **RECORD** ideas and understanding in their learning log.

Understanding terms



As a class **IDENTIFY** and define terms that students are uncertain of. Once defined, ask students to **EXPLAIN** the meaning of the term to others.

At the end of the activities make a class list of students’ comments and questions using a table like the sample one below:

What we know	What we’re not sure about	What we want to know



Step 1: Engage with the topic

Setting the task

Note this is an assessment task.

What makes food production systems interesting to study is their diversity around the world. Some are dominated by cash crops for export; others are devoted to staple crops for domestic consumption, and some are small crops used for family consumption and to meet regional or local demands.



EXPLAIN to the class that they will be using a range of activities and websites containing information about food production systems to develop an understanding of:

- Where our meat, seafood and fish comes from.
- How primary producers produce meat, seafood and fish.
- How different systems and technologies are used to produce meat, seafood and fish.
- How the physical conditions of the environments and management practices used might impact on or influence the design of food production systems for meat, seafood or fish.

REMINDE students that 'A food system is made up of the environment, people, institutions and processes by which agricultural (including fish and seafood) products are produced, processed and brought to consumers'.



Inform the students that after **INVESTIGATING** the current practices, they will also be encouraged to **SUGGEST** ways to improve the design of production practices so that they become more sustainable.



EXPLAIN to the class that working in groups, their task is to **SELECT** either a meat, seafood or fish food system and to **RESEARCH** and **RECORD** information about it including technologies and management practices used to produce, process and bring the product to consumers.

They are also to generate ideas and explore options for making production techniques more sustainable. They are encouraged to:



- **SKETCH** a design of the production processes
- **GENERATE** ideas and explore options for making a change to the production processes and add these to the design, and



- **PRODUCE** an annotated concept sketch using technical terms, scale, symbols, pictorial and aerial views to draw environments and a production drawing to explain design ideas.



What makes food production systems interesting to study is their diversity around the world.



Step 2: Explore how meat, seafood or fish are produced

Explore a sector

Purpose

To provide students with opportunities to develop their understanding of:

- where our meat, seafood or fish comes from
- the different production methods of Australian primary producers
- the difference between global, national, regional and local food production systems
- methods primary producers have used to produce food and how their actions are influenced by increases in scientific knowledge and developments in technology
- how to feed the global population
- the subject matter in order to develop a focus for the forthcoming experiences in the 'Explain' stage of the inquiry.

The physical conditions of the environments and management practices used can impact on or influence the design of food production systems.

RESEARCH TASK: PART 1

Investigate the options

Class discussion



RE-STATE to the class that they will be using a range of activities and websites containing information about food production systems to develop an understanding of:

- Where our meat, seafood and fish comes from?
- How primary producers and fishers produce meat, seafood and fish.
- How different systems and technologies are used to produce meat, seafood and fish.
- How the physical conditions of the environments and management practices used can impact on or influence the design of food production systems for meat, seafood or fish.

INFORM the students that after investigating the current production practices, they will also be encouraged to suggest ways to improve their design so that they become more sustainable.



Explain to the class that working in groups, their task is to **SELECT** either a meat, seafood or fish food system and to research and **RECORD** information about it including technologies and management practices used to produce, process and bring the product to consumers.

They are also to generate ideas and explore options for making production techniques more sustainable. They are encouraged to:



- **SKETCH** a design of the production processes
- **GENERATE** ideas and explore options for making a change to the production processes and add these to the design, and



- **PRODUCE** an annotated concept sketch using technical terms, scale, symbols, pictorial and aerial views to draw environments and a production drawing to explain design ideas.



Step 2: Explore how meat, seafood or fish are produced

RESEARCH TASK: PART 2

Begin research



EXPLAIN to the students that their task is to begin their research.

Invite students in pairs to select an industry to **INVESTIGATE** and **REVIEW** the relevant resources below to explain:

- Where the meat, seafood or fish species comes from.
- Production methods used.
- Technologies and systems used to process and distribute the products before they reach our plates.



Ask students to **RECORD** information about each source used.

See **Resource 1.1** to support student investigations or use a Bibliography Framework at:

http://www.globaleducation.edu.au/verve/resources/bibliography_frame.pdf

Ask pairs to consider the following resources as a starting point and **RECORD** information for each one.

Sources for fish production:

- **The Status of Key Australian Fish Stocks 2014**

This report brings together available biological, catch and effort information to determine the status of Australia's key wild catch fish stocks to inform the general public, policy makers and industry on the sustainability of stocks. It includes sections on molluscs; crustaceans; sharks and finfish. Each section includes text, maps, photographs and graphs of the species; their stock status; location; biology; fisheries statistics and features; and sustainable use and management. It also includes a section on fishing methods including information, photos and graphics about nets; hook and line; traps and pots; dredges; diving; hand-held implements; and bycatch reduction devices.

Link: <http://fish.gov.au/Pages/default.aspx>

For specific fishing methods see: http://fish.gov.au/fishing_methods/Pages/default.aspx

- **Fish Files YouTube Channel**

This is a YouTube Channel containing videos about fish and seafood. It contains playlists of chefs who cook with seafood, the fishing and aquaculture industry, and those who work within it.

Link: <http://www.youtube.com/user/FRDCFishfiles>

- **Fisheries Research and Development Corporation YouTube Channel**

This is a YouTube Channel containing videos about a range of fisheries related topics. It contains playlists on the fishing industry; aquaculture; management and conservation; climate change; a marine discovery centre; fish and seafood species including their life cycles, how they are grown, fished and farmed.

Link: <http://www.youtube.com/user/FisheriesResearchAU>

Research technologies and systems used to process and distribute the products before they reach our plates.



Where do oysters, prawns, calamari, salmon, barramundi and abalone come from?

Sources for seafood production:

- **The Fish Files website materials**

This is a website containing information about seafood. It contains sections on seafood species; buying and choosing species; handling seafood; cooking with seafood; and seafood health science. The section on knowing seafood species includes stories, videos, events and links to more information. The section on buying and choosing seafood includes quality assessment criteria; information about fresh, frozen, chilled or live sources; different cuts of fish; cooking ideas and a seasonality calendar. The section on handling includes seafood safety; killing seafood; storage of seafood; thawing seafood; cleaning seafood; preparing seafood and preserving seafood. The section on cooking includes information about cooking methods; recipes; videos and links to experts. The section on wellbeing includes radio interviews; recipes; seafood health science and useful links.
Link: <http://www.fishfiles.com.au/Pages/default.aspx>

- **Fish Files YouTube Channel**

This is a YouTube Channel containing videos about fish and seafood. It contains playlists on chefs who cook with seafood; the fishing and aquaculture industry and the people who work within it.
Link: <http://www.youtube.com/user/FRDCFishfiles>

- **FRDC YouTube Channel**

This is a YouTube Channel containing videos about a range of fisheries related topics. It contains playlists on the fishing industry; aquaculture; management and conservation; climate change; a marine discovery centre; fish and seafood species including their life cycles, how they are grown, fished and farmed.
Link: <http://www.youtube.com/user/FisheriesResearchAU>

- **Oysters Australia**

This is an online resource about oysters, oyster growing, oyster farming and the oyster industry.
Link: <http://www.oystersaustralia.org.au/farming>

- **Mussel Aquaculture**

This is a YouTube video about growing mussels in Tasmania
Link: <http://www.youtube.com/watch?v=m3LYw9i-SvU&list=PLC8B09244EFAEE63A>

- **Salmon Farming**

This is a YouTube video about salmon farming in Tasmania.
Link: <http://www.youtube.com/watch?v=hVcqdfBBrAU&list=PLC8B09244EFAEE63A>

- **Southern Bluefin Tuna Aquaculture**

This is a YouTube video about tuna aquaculture in South Australia.
Link: <http://www.youtube.com/watch?v=LHHqIDnfm3g&feature=c4-overview-vl&list=PLF00C116929C7ADB5>



Step 2: Explore how meat, seafood or fish are produced

Sources for pork production:

- **Australian Pork Industry Fact Sheet**
Link: <http://australianpork.com.au/facts-figures/faqsindustry-overview/>
- **Aussie pig farmers: Types of farming – indoor intensive housing**
This video gives details of how one family produces pigs indoors in a dynamic and environmentally conscious system. It includes sections on pig production; effluent management and: the health and welfare of the animals and staff working to produce high quality products.
Link: <http://www.aussiepigfarmers.com.au/types-of-farming/indoor-intensive-housing/>
- **Aussie pig farmers: Types of farming – Eco Housing**
This video is about how pigs are housed and produced outdoors as per free range standards. It includes sections on the housing system used for pregnant sows; growing pigs and piglets; the requirements of sows; pig welfare standards; quality assurance; inputs and outputs in the production system; animal welfare; and sow housing research. The section on sow housing research highlights the importance of animal welfare standards and sustainable resource management.
Link: <http://www.aussiepigfarmers.com.au/types-of-farming/barn-reared-eco-housing/>
- **Aussie pig farmers: Types of farming – free range**
This video is about how pigs are produced free range in outdoor paddocks. It includes sections on rooting areas, wallows and huts for shelter. The section on huts describes how the animals use them for protection in extreme weather events and how they protect piglets in their early stages of life. It includes sections on how animals can be raised on an organic farm; daily activities on the farm; pig's shelter and food requirements; rotational grazing systems; and markets requiring certified organic pork products.
Link: <http://www.aussiepigfarmers.com.au/types-of-farming/free-range>
- **Aussie pig farmers: Housing pigs – the welfare debate**
This video is about pig production and the housing of pigs. It includes sections on animal welfare; pig production; methods of raising pigs; bullying by sows; technologies to protect sows; and the rights of sows and piglets. It also describes outdoor; free range and loose housing.
Link: <http://www.aussiepigfarmers.com.au/our-pigs/>
- **Aussie pig farmers: Looking after the environment**
This video is about how one Australian pork farmer is demonstrating their environmental responsibility and stewardship by using pig manure or biomass to create electricity. It includes sections on how the decomposing manure creates methane, which is captured, transported and used to generate electricity at the farm. The electricity provides thermal comfort and appropriate conditions for baby piglets. It also highlights how food waste is used to feed the pigs and the associated packaging waste is recycled.
Link: <http://www.aussiepigfarmers.com.au/looking-after-the-environment/>

What changes to the production system and technologies used could science influence?



Step 2: Explore how meat, seafood or fish are produced

How are places affected by seasons or climate, lack of water, water quality issues, pests and weeds, bushfires, floods, cyclones and storms?

Sources for beef and lamb production:

- **Target 100 farmer stories**

This website contains a range of stories about Australian cattle and sheep producers committed to sustainable production and farm management.

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

- **Target 100 - 100 initiatives**

This website contains research and development projects commissioned by the cattle and sheep industry and undertaken by Australian universities and research organisations to find more efficient and environmentally beneficial practices across the supply chain.

The 100 initiatives, both big and small, tackle the issues of biodiversity, water management, reducing emissions and promoting soil health, to ensure we continue to lead the way in sustainable production of some of the world's best beef and lamb.

Link: <http://www.target100.com.au/Initiatives>

- **Where does our lamb come from?**

This is a YouTube video about prime lamb production.

Link: <http://www.youtube.com/watch?v=8bPc8zLVaH0>

- **Sheep meat processing**

This is a YouTube video about the processing of sheep meat for consumption.

Link: <http://www.youtube.com/watch?v=j6W17d5EjtQ>



Step 2: Explore how meat, seafood or fish are produced

Framing questions and actions

Encourage the students to **REFINE** their questions and clarify how their investigations will be conducted. For example:

Formulate possible lines of inquiry or investigation by:

- **LISTING** and **CATEGORISING** all information related to their investigation under the headings – where meat, seafood and fish comes from; how primary producers produce meat, seafood or fish; previous ways in which primary producers have produced meat, seafood or fish; the different technologies, systems and practices used to produce meat, seafood and fish.
- Preparing a table to **OUTLINE** information that needs to be gathered, who is responsible, where they will seek information, and how it will be gathered.



ASK questions like:

- Where do pork, lamb and beef come from?
- Where do oysters, prawns, calamari, salmon, barramundi and abalone come from?
- What is happening in these places?
- Could these places be anywhere else?
- How are pigs, sheep, cattle, seafood types and fish species produced here?
- What different technologies and systems are used?
- How are these places affected by seasons or climate? By lack of water? By water quality issues? By pests and weeds? By bushfires, floods, cyclones, storms?
- How are primary producers adapting the production systems and technologies used to the issues and changes being experienced?
- What changes to the production system and technologies used could science influence?



RECORD all information for later use. **REFLECT** on what has been learned in the student's learning log.

How are primary producers adapting the production systems and technologies used to the issues and changes being experienced?



“...every aspect of the food system has an effect on the final availability and accessibility of diverse, nutritious foods...”

RESEARCH TASK: PART 3

Global, national, regional and local food production systems

REVISIT the meaning of the term ‘food systems’ with students.

The United Nations describe food systems as:

‘A food system is made up of the environment, people, institutions and processes by which agricultural products are produced, processed and brought to consumers. Every aspect of the food system has an effect on the final availability and accessibility of diverse, nutritious foods – and therefore on consumers’ ability to choose healthy diets.’



ASK who has been able to collect and record information about the system and technologies used to produce, process and bring the product to consumers; and their chosen industry’s management practices. Invite those students to share preliminary findings with the class.



As a class **DRAW** flow charts to describe the processes used. See: http://www.globaleducation.edu.au/verve/_resources/flow_chart.pdf for a flowchart template.

Small and large scale farming

Much has been written about both small-scale and large-scale farming systems.



Invite students to **CONSIDER** both in their chosen sector and ask questions like:

- What food systems do we need to feed the world?
- If we know about food production systems that lead to the long-term health of populations, ecosystems and environmental quality, why don’t we use them in all instances?
- Are we going to rely on sustainable food systems more or less in the future?
- How do we meet the challenge of having efficient, well managed and sustainable food production systems?



TALK with students about the fact that our global population is rising at a fast rate and that by 2050 we will need to feed a global population of 9.6 billion people. Read more at: <https://www.un.org/apps/news/story.asp?NewsID=46647&Cr=Food+Security&Cr1#UqUoek24bIU>

TALK with the students about how we can achieve the goal of feeding so many people worldwide and where efforts should be directed.

TALK about whether efforts should be directed at both small-scale farming systems that primarily meet local and regional demands; and large-scale systems that meet global and national demands.



Step 2: Explore how meat, seafood or fish are produced



VIEW and read case studies about how many global communities are improving their food security, with aid support.



See Aquaculture in Thailand:

<http://www.globaleducation.edu.au/case-studies/aquaculture-in-thailand.html>

and Sweet potato biodiversity in PNG:

<http://www.globaleducation.edu.au/case-studies/sweet-potato-diversity-in-papua-new-guinea.html>

For American examples see the Sustainable Table website at:

<http://www.sustainabletable.org/870/food-processing-distribution>

Individual work - Learning logs



Students **RECORD** their understanding of both small-scale farming systems that primarily meet local and regional demands and large-scale systems that meet global and national demands in their learning logs.

Small-scale farming systems that primarily meet local and regional demands and large-scale systems that meet global and national demands.

Step 3: Explain different production systems and their effects

Purpose

To provide students with opportunities to:

- describe existing methods and technologies used to produce meat, seafood and fish
- explore the consequences of production systems and technologies used by primary producers
- explore the concept of food miles
- develop the skills of discussion, negotiation, critical thinking and analysis of multimedia material
- create a number of consequence wheels
- write a narrative
- construct a storyboard.

Approaches to producing meat, seafood and fish

Invite students to **DEVELOP** a 'consequence wheel' to explore the consequences of decisions and choices primary producers make relating to their production methods.



Ask students to **FOCUS** on the methods and technologies used. For example, if researching meat production, develop a consequence wheel about either pasture fed cattle or sheep for extensive production, or grain fed production of cattle or sheep for lot feeding.

LEARN more about what happens to cattle on feedlots at: http://www.feedlots.com.au/index.php?option=com_content&view=article&id=89&Itemid=118



WATCH videos about different methods used to produce cattle and sheep at: <http://www.target100.com.au/Home>

If researching **wild catch fishing** practices and technologies used, develop a consequence wheel about either the use of nets; hook and line; traps and pots; dredges; diving; or hand held implements that are used to catch and produce different fish species for consumers.



LEARN more about what fishing method is used for different fish at: http://fish.gov.au/fishing_methods/Pages/default.aspx and use the fishing methods drop down tab to explore deeply into the different methods used for specific catches.

If researching **aquaculture** or **fish farming**, develop a consequence wheel about the methods used to farm different species and the technologies involved. For example, marine/freshwater; on-land (ponds/tanks) and offshore farms (e.g. salmon cage culture).



LEARN more about aquaculture developments at: <http://www.youtube.com/watch?v=4eAXwk2orY0>

If researching **pork production**, **DEVELOP** a consequence wheel about either indoor conventional, free range or outdoor bred piggeries and the technologies involved.



LEARN more about the national guidelines for the environmental management of piggeries at: <http://australianpork.com.au/wp-content/uploads/2013/10/National-Environmental-Guidelines-for-Piggeries.pdf>



Before developing the consequence wheel, as a class **BRAINSTORM** the issues associated with the technologies used or not used in meat, seafood and fish production.



CONSIDER issues like:

- Water management
- Animal welfare
- Management of soils and groundcovers
- Ethical farming and fishing
- Use of by-catch reduction devices
- Fishing limits
- Seasonal closures for fishing
- Waste/manure management
- Use of fertilisers and pesticides
- Food miles



Step 3: Explain different production systems and their effects



READ more about the issues affecting the sheep and cattle industry at: <http://www.target100.com.au/The-Issues> These issues also affect other primary producers too.



To **DEVELOP** a consequence wheel see **Resource 1.2**. The issue is written in the centre circle. The first question asked is “What are the immediate consequences?” Ask groups to discuss this and write them around the first circle. Ask groups to link each statement to the central point by a single line. Next, students **DISCUSS** what consequences may follow on from



the first ones. Following on, third and fourth order consequences can be explored and marked in a similar way.



Share consequence wheels and **EXPLORE** the difference between intended and unintended consequences for a range of issues.

ENCOURAGE the students to ask critical questions of one another’s work. For example:

- What do you feel, hope and fear in relation to this particular issue?
- Do you think everybody agrees?
- Why might other people think and feel differently?
- How did the issue come about?
- Who do you think influenced your opinions?
- Who gains and who loses?
- Who has power in this situation and how do they use it?
- Is it used to the advantage of some and to the disadvantage of others?
- How do you feel students in schools should respond to such issues?
- What values can we use to guide our choices of the way animals and fish are farmed, fished, housed, used, managed and produced?
- What are the possible courses of action open to primary producers?
- What are the technologies available to primary producers?
- What are others already doing?
- How could the industries work together?
- Whose help might they need?
- How do we measure their success?

(Adapted from ‘Education For The Future – a practical classroom guide’, D. Hicks, World Wildlife Fund, 1994, p.10)

What values can we use to guide our choices in the way the animals and fish are farmed or fished, housed, used, managed and produced?



Imagine the foods journey from birth to the moment it is placed into a person’s pantry, freezer or refrigerator.

Learn more about the food miles 



Ask students to **THINK** of the food type they are researching. Explain that they are to **WRITE** a narrative that describes what they **IMAGINE** the foods journey from birth to the moment it is placed into a person’s pantry, freezer or refrigerator. This narrative should include an estimation of how long the process would take, e.g. ‘From the farm (fish farm or wharf) to the processing plant, the trip would take two days by road’.



LEARN about food miles. Read this *Catalyst* transcript at: <http://www.abc.net.au/catalyst/stories/s2091104.htm>



DISCUSS the concept of ‘food miles’. Use this article from *Choice* as a reference: <http://www.choice.com.au/reviews-and-tests/food-and-health/labelling-and-advertising/sustainability/food-miles.aspx>



Point out that food energy comprises of more than just ingredients, it must also **CONSIDER**:

- Where is animal, fish, seafood (or plant) is grown?
- What inputs might be needed to grow it?
- Harvesting methods.
- Transportation and storage.
- How it is processed, cooked or prepared?
- Any packaging or preserving required.
- How the products are displayed (e.g. on a shelf or in a fridge).
- How the packaging is handled after use.

Decide on what to present and how to do so 

Note this is an assessment task.

Invite students to begin visualising their own work sample. This should include a **DESIGN** of the production processes, inclusive of the student’s own ideas and options for making a change to the production processes that enhance its sustainability. Students are to produce an annotated concept sketch or drawing using technical terms, scale, symbols, pictorial and aerial views to draw environments and a production drawing to explain design ideas.

For example:

High Tech: Students can use 3D modelling software to produce the concept sketch.

Low Tech: Students can use graphics and photo-editing software to produce the concept sketch.

No Tech: Students can draw graphics and paste images from the Internet on a poster board.



BRAINSTORM the Web 2.0 tools available today that might assist. Check out:

- Google SketchUp <http://sketchup.google.com/download> a 3D modelling software.



Step 3: Explain different production systems and their effects

- Flickr www.flickr.com a database for images and videos.
- PicArtia www.makeuseof.com/dir/picartia where you can create photo mosaics.
- Google Earth <http://earth.google.com> where you can locate places.
- Google Maps <http://maps.google.com> where you can find places of interest.
- Glogster www.glogster.com where you can mash up media.
- Voice Thread <http://voicethread.com> where you can upload video, record audio, add still images and create a digital story.



Re-state the purposes of the investigation and ask students to **CONSIDER** how they are going to bring their information together and **PRESENT** it so that the main points come across clearly. **MODEL** the construction of the storyboard genre. Students now use the information they have gathered to construct a storyboard for the research being undertaken.



See: <http://www.slideshare.net/slayas/storyboard-genre-ideas> for ideas.

Bringing it all together

Focus student's attention on:

- What we know
- What we want to find out
- What the class now knows
- What other things we would like to find out.

Use 'What we know' as a source for class, small group discussion and use the other prompts in the list above to plan the way forward.

See: <http://office.microsoft.com/en-au/templates/kwlh-chart-TC101887896.aspx>



Step 4: Elaborate on concepts and ideas

Going further in understanding production systems

Purpose

To provide students with opportunities to:

- explore approaches that primary producers are taking to improve food production systems
- research how primary producers have produced food and how their actions are influenced by increases in scientific knowledge and developments in technology
- identify the environmental, social, economic and political factors that influence the ways that primary industry's production practices impact on or affect the farm or fishery, its food products, budgets and consumer's perceptions
- apply what they have learned and plan how to communicate the food production system to an audience
- plan their presentation about their chosen food production system
- share investigation findings.

The challenge ahead

The challenge for the 21st Century is to continue to develop food production systems in a way that will support rural communities, enhance yields, utilise inputs effectively (especially water and any added nutrients), minimise environmental impacts and provide healthy diets for people.



Explain to the students that they will be **EXPLORING** approaches that primary producers are taking to improve food production systems, environmental impacts, sustainability, animal welfare and; adapting to climate change in the next sequence of activities.

New approaches

Invite students to **SEARCH** through electronic and print media such as YouTube videos, the web, newspapers and magazines for contemporary information that includes ideas about how primary producers in their chosen industry are required to or have developed new approaches to manage environmental impacts, utilise inputs effectively, enhance yield, manage pests and diseases, or manage climate related risks.



Ask students to **SEARCH** online including:

- CSIRO's *Ecos* magazine at: <http://www.ecosmagazine.com/>
- Target 100's Farmer stories at: <http://www.target100.com.au/100-Initiatives>
- Aussie Pig Farmer stories at: <http://www.aussiepigfarmers.com.au/>
- Fisheries Research and Development Corporation videos at: <http://www.youtube.com/watch?v=V2ZHabeg3kw&list=PLC8B09244EFAEE63A&index=7>
- Young Farming Champions videos at: <http://www.art4agriculture.com.au/yfc/yfc2013.html>
- Reef Guardian fishers information and videos at: <http://www.gbrmpa.gov.au/our-partners/reef-guardians/reef-guardian-fishers>
- Reef Guardian farmers information and videos at: <http://www.gbrmpa.gov.au/our-partners/reef-guardians/reef-guardian-farmers-and-graziers>
- Braidwood farmers carrying out sustainability improvements on video at: <http://www.youtube.com/watch?v=W6ilho4aYY&list=UU7JiYqky3cUgBg06dPmOYbQ>
- Monaro graziers adopting sustainable ways of grazing sheep and cattle on their properties on video at: <https://www.youtube.com/watch?v=tb4gGypBoFw>



Ask students to **SEARCH** through the sources they selected for their chosen sector, looking for one or two key messages that summarise the angle of the item. **DISCUSS** whether they think the sources reflect a positive theme (i.e. beneficial approaches, discoveries, communities coming together) or a negative theme (i.e. drought, environmental degradation, increasing costs).



Step 4: Elaborate on concepts and ideas



Ask students to **ADDRESS** the following points about their source(s):

- Who are the people involved?
- What impacts – environmental, social, economic, cultural, and political – might result from the story in the source material?
- How might those impacts affect meat, seafood and fish products in the future?

Compass rose

Note this is an assessment task

TALK with the students about how all ideas, approaches, methods, processes and actions, or lack of them, carry a range of implications. Some can affect places/ environment, people/society, economies and policies.



Then, **DRAW** a compass in the centre of the class's board, use **Resource 1.3** or access compass images from: <https://www.google.com.au/search?q=compass+rose+worksheet&hl=en&prmd=imvns&tbn=isch&tbo=u&source=univ&sa=X&ei=p1BzUKa7LMitiAeH4YCYAQ&sqi=2&ved=0CC0QsAQ&biw=1270&bih=544> or http://www.globaleducation.edu.au/verve/_resources/dev-compassrose.pdf

Instead of naming the four compass points north, south, east and west use:

- **N**atural environment/ecological questions.
- **S**ocial and cultural questions.
- **E**conomic questions.
- **W**ho decides? Who benefits? i.e. political questions.

Note: *Diagonal points represent relationships between the four main points. For example, North East depicts ideas and questions about how economic considerations might impact on natural environments; South East depicts ideas and questions about economic considerations and people's lives.*



In nominated groups use the compass rose to **IDENTIFY** the environmental, social, economic and political factors that influence how the production practices of the group's chosen primary industry might impact or affect the farm or fishery, its food products, budgets and consumer's perceptions.



Alternatively use a flow chart to **LIST** a series of events that might happen, sequentially as a result of the production practice. Other boxes could be added to show related events.

See: http://www.globaleducation.edu.au/verve/_resources/flow_chart.pdf for a template to use.

Identify the environmental, social, economic and political factors that influence how the production practices.



There have been many changes in farming and fishing methods due to increases in scientific knowledge and developments in technology.

MAIN RESEARCH TASK: PART 4

Remind students that part of their research is to **SUGGEST** ways to improve the production practices or operations so that they are more sustainable.

There have been many changes in farming and fishing methods due to increases in scientific knowledge and developments in technology. Ask students to **REFLECT** on the sources read or viewed, and reflect on whether any increases in scientific knowledge and developments in technology were highlighted.

Reflect on research



Ask students to **CONSIDER** how they are going to bring their information together and **PRESENT** it so that the food production system including producing, processing and bringing their chosen food to consumers, can be communicated to an audience at the school, within the local community, or via social media outlets, such as YouTube.



As a class **LIST** the main processes involved and the main messages to be given about meat, seafood or fish production and their food production system.



Ask students to **DECIDE** on a way of representing the processes and main messages, data and **RESEARCH** collected from their investigations about food production systems.

Going further with the preparation of the presentation



Invite students to confirm the idea planned for their presentation that includes a **DESIGN** of the production processes used, inclusive of the student's own ideas and options for making a change to the production processes that enhance its sustainability. In small groups, **DISCUSS** the possible ways to present the chosen food production system in an interesting and engaging format.



Ask students to complete their presentation. Remind students to **DOCUMENT** their key messages, create an image bank and, collate references and acknowledgements for their work sample. Invite them to summarise these and the learning achieved in their learning log.

Review and submit

Note this is an assessment task.



Invite students to **REVISE** and **FINE-TUNE** their presentation. **CONSIDER** hosting a series of student presentations to showcase the students' work to the school community and beyond.



Step 4: Elaborate on concepts and ideas

Edward de Bono's Six Thinking Hats

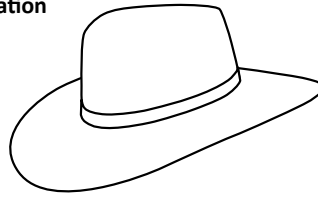
Students **EXPLORE** issues raised using de Bono's "Six Thinking Hats" technique to explore the issue of food production systems in more depth, in particular, ways meat, seafood and fish are produced, processed and brought to consumers. Students, in five groups, each with a different hat, discuss and document the issues according to their given perspectives and come together at the end to share their ideas.

Red Hat Feelings



What are the emotions and feelings associated with food and fibre production practices?
How do you feel?

White Hat Information



List the facts that you know about present a food production systems and how it affects the environment.

Blue Hat What thinking is needed?



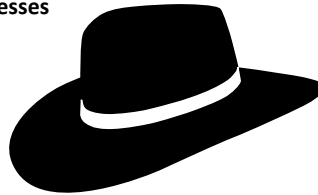
What has happened so far?
What should happen next?
What questions should we consider?

Green Hat New ideas



How could the problems related to the impact of climate on production be solved?
What needs to be done?

Black Hat Weaknesses



What are some of the negative aspects and outcomes of seeking new food production systems?

Yellow Hat Strengths



What are some of the positive aspects and outcomes of food and fibre production practices?

Share investigations

Encourage students to **SHARE** their investigation with other classes or **CREATE** a display of findings within the school or a community venue.



Step 5: Evaluating

Think back and evaluate

Purpose

To provide students with opportunities to:

- reflect on their own learning
- collate data for assessment.

To provide teachers with:

- insights into students' understanding and attitudes, as well as their perceptions of their own strengths and weaknesses.

Learning log

PROVIDE students with a set of focus questions for their writing:

- Write about something new that you learnt in this unit about how primary producers produce meat, seafood and fish.
- What is one thing I have learned about my own values when it comes to producing meat, seafood or fish?
- How can I help others learn about how the meat, seafood and fish industries are producing food using systems that are reducing impacts for the benefit of their animals, seafood species, fish and the environment?
- What have I learned about technologies, innovation and sustainable food production systems?
- What have I learned about food miles?
- What have I learned about the increases in scientific knowledge and developments in technology in meat, seafood and fish production methods?
- What would I still like to find out about the how meat, seafood and fish are produced, processed and brought to consumers?
- How well did I/we participate in any group/class learning activities?
- What questions do you have about the topic at the moment?
- What piece of work am I most satisfied with?

References

- Australian Academy of Science (2005) *Primary Connections*, Canberra, Australia.
- Cecil, N. (1995) *The Art of Inquiry: questioning strategies for K-6 classrooms*, Peguis, Canada.
- Cross, J. (1994) *Long Ago and Far Away: Activities for using stories for history and geography at Key Stage 1*, Development Education Centre, Birmingham.
- De Bono, E. (1992) *Six Thinking Hats for Schools, Books 1 & 2*, Hawker Brownlow Educational.
- Doessel, S. (1995) *The Seventh Generation*, Brisbane, Australia.
- Gardner, H. (1985) *Frames of Mind: the theory of multiple intelligences*, Basic Books, New York.
- Hamston, J. and Murdock, K. (1996) *Integrating Socially: units of work for social education*, Eleanor Curtin, Melbourne.
- Hicks, D. (1994) *Education For The Future – a practical classroom guide*, World Wildlife Fund.
- Hill, S. and Hill, T. (1990) *The Collaborative Classroom*, Eleanor Curtin, Melbourne.
- The Gap (1994) Issue 5, Global Education Centre, Adelaide.
- Wilks, S. (1992) *Critical and Creative Thinking: strategies for classroom inquiry*, Eleanor Curtin, Melbourne.

Websites (viewed February 2015)

This is a list of websites used in this unit for teacher use. As content of the websites used in this unit is updated or moved, hyperlinks may not always function.

Art4Agriculture. The 2013 Young Farming Champions

<http://www.art4agriculture.com.au/yfc/yfc2013.html>

Australian Broadcasting Corporation

<http://www.abc.net.au/catalyst/stories/s2091104.htm>

Australian Curriculum, Assessment and Reporting Authority. Australian Curriculum

<http://www.australiancurriculum.edu.au>

Australian Forestry Standard

<http://www.forestrystandard.org.au/>

Australian Government Department of Agriculture

<http://www.agriculture.gov.au/forestry>

http://data.daff.gov.au/data/warehouse/9aam/afstad9aamd003/2012/AustFishStats_2012_v1.0.0.pdf

Australian Lot Feeders Association. What happens on a cattle feedlot

http://www.feedlots.com.au/index.php?option=com_content&view=article&id=89&Itemid=118

Australian Pork Limited

<http://www.australianpork.com.au/>

<http://australianpork.com.au/facts-figures/faqsindustry-overview/>

<http://australianpork.com.au/wp-content/uploads/2013/10/National-Environmental-Guidelines-for-Piggeries.pdf>

Australian Pork Limited. Industry Fact Sheets, Aussie Pig Farmers

<http://www.aussiepigfarmers.com.au/types-of-farming/indoor-intensive-housing/>

<http://www.aussiepigfarmers.com.au/types-of-farming/barn-reared-eco-housing/>

<http://www.aussiepigfarmers.com.au/types-of-farming/free-range>

<http://www.aussiepigfarmers.com.au/our-pigs/>

<http://www.aussiepigfarmers.com.au/looking-after-the-environment/>

Choice Magazine. Food miles

<http://www.choice.com.au/reviews-and-tests/food-and-health/labelling-and-advertising/sustainability/food-miles.aspx>

Commonwealth of Australia Global Education

<http://www.globaleducation.edu.au/global-issues/gi-food-security.html>

http://www.globaleducation.edu.au/verve/_resources/bibliography_frame.pdf

<http://www.globaleducation.edu.au/case-studies/aquaculture-in-thailand.html>

<http://www.globaleducation.edu.au/case-studies/sweet-potato-diversity-in-papua-new-guinea.html>

http://www.globaleducation.edu.au/verve/_resources/dev-compassrose.pdf

http://www.globaleducation.edu.au/verve/_resources/flow_chart.pdf

Cotton Australia

<http://www.cottonaustralia.com.au>

Creative Commons

<http://creativecommons.org/licenses/by/3.0/au/deed.en>

References

CSIRO, Ecos magazine

<http://www.ecosmagazine.com>

Fisheries Research and Development Corporation

<http://frdc.com.au/>

<http://fish.gov.au/Pages/default.aspx>

<http://www.fishfiles.com.au/Pages/default.aspx>

http://fish.gov.au/fishing_methods/Pages/default.aspx

Flickr

www.flickr.com

Forest Stewardship Council

<http://au.fsc.org/>

Garnaut climate change review – final report

<http://www.garnautreview.org.au/index.htm>

Glogster

<http://www.glogster.com>

Google Images

<https://www.google.com.au/search?q=compass+rose+worksheet&hl=en&prmd=imvns&tbn=isch&tbo=u&source=univ&sa=X&ei=pIBzUKa7LMitiAeH4YCYAQ&sqi=2&ved=0CC0QsAQ&biw=1270&bih=544>

Google Earth

<http://earth.google.com>

Google Maps

<http://maps.google.com>

Grace Communications Foundation. Sustainable Table

<http://www.sustainable.org/870/food-processing-distribution>

Great Barrier Reef Marine Park Authority. Reef Guardian fishers

<http://www.gbrmpa.gov.au/our-partners/reef-guardians/reef-guardian-fishers>

<http://www.gbrmpa.gov.au/our-partners/reef-guardians/reef-guardian-farmers-and-graziers>

Meat and Livestock Australia

<http://mla.com.au>

Microsoft

<http://office.microsoft.com/en-au/templates/kwlh-chart-TC101887896.aspx>

National Farmers' Federation. Farm Facts 2012

<http://www.nff.org.au/farm-facts.html>

Oysters Australia. Oyster farming

<http://www.oystersaustralia.org.au/farming>

PicArtia

www.makeuseof.com/dir/picartia

Primary Connections

<https://primaryconnections.org.au/about/teaching>

Slideshare

<http://www.slideshare.net/slayas/storyboard-genre-ideas>

SketchUp

<http://sketchup.google.com/>

Target 100

<http://www.target100.com.au>

Target 100 - Farmer stories – <http://www.target100.com.au/Farmer-stories>

Target 100 - The Issues – <http://www.target100.com.au/The-Issues>

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

References

United Nations News Centre

<https://www.un.org/apps/news//story.asp?NewsID=46269&Cr=Food+Security&Cr1>

<https://www.un.org/apps/news/story.asp?NewsID=46647&Cr=Food+Security&Cr1#.UqUoek24bIU>

Voice Thread

<http://voicethread.com>

Wood, Naturally Better

<http://www.naturallybetter.com.au/>

World Health Organisation

<http://www.who.int/trade/glossary/story028/en/>

YouTube videos:

Australian Government Department of Agriculture. Farming for the Future http://www.youtube.com/watch?feature=player_embedded&v=OSLNi8in2iU#

Fisheries Research and Development Corporation Fish Files. Australian Seafood All Access Chef and Hospitality Tutorial – Oysters <http://www.youtube.com/user/FRDCFishfiles>

Fisheries Research and Development Corporation Australia channel <http://www.youtube.com/user/FisheriesResearchAU>

Fisheries Research and Development Corporation Australia channel. Bluefin Tuna Aquaculture

<http://www.youtube.com/watch?v=LHHqIDnfm3g&feature=c4-overview-vl&list=PLF00C116929C7ADB5>

Fisheries Research and Development Corporation Australia channel. By-catch Reduction Devices – Episode 8

<http://www.youtube.com/watch?v=V2ZHabeg3kw&list=PLC8B09244EFAEE63A&index=7>

Fisheries Research and Development Corporation Australia channel. Huon Salmon - Episode 15

<http://www.youtube.com/watch?v=hVcqdFBBrAU&list=PLC8B09244EFAEE63A>

Fisheries Research and Development Corporation Australia channel. Mussel Aquaculture - Episode 9

<http://www.youtube.com/watch?v=m3LYw9i-SvU&list=PLC8B09244EFAEE63A>

Food and Agriculture Organisation of the United Nations. Turning points in modern aquaculture

<http://www.youtube.com/watch?v=4eAXwk2orY0>

Meat & Livestock Australia. About Australian Red Meat (Sheep processing) <http://www.youtube.com/watch?v=j6W17d5EjtQ>

New South Wales Department of Primary Industries. Where does our food come from? Lamb <http://www.youtube.com/watch?v=8bPc8zLVaH0>

Southern Rivers Catchment Management Authority. Braidwood farmers in for the long haul

http://www.youtube.com/watch?v=W6ilho4_aYY&list=UU7JiYqky3cUgBg06dPmOYbQ

Southern Rivers Catchment Management Authority. Monaro graziers protecting native grasslands

<https://www.youtube.com/watch?v=tb4gGypBoFw>

Resource 1.1

The research process

In science, researching what other people have communicated about a concept is called a 'review'. Undertake your review of the resources used in this unit.

To do a review, go through the following steps:

- **DEFINE** the topic.
- **DEFINE** key words that might be associated with that topic.
- **LIST** the places that information has been found on that topic, and decide how to search through them.
- **SEARCH** for the key words and decide whether the resource is useful or not. Keep a **RECORD** of the text, including: author's name, the name of the resource, the year it was produced, the name of the publisher and the sections you found most useful.
- **WRITE OUT** the information you think is important.

A sample resource record is shown below:

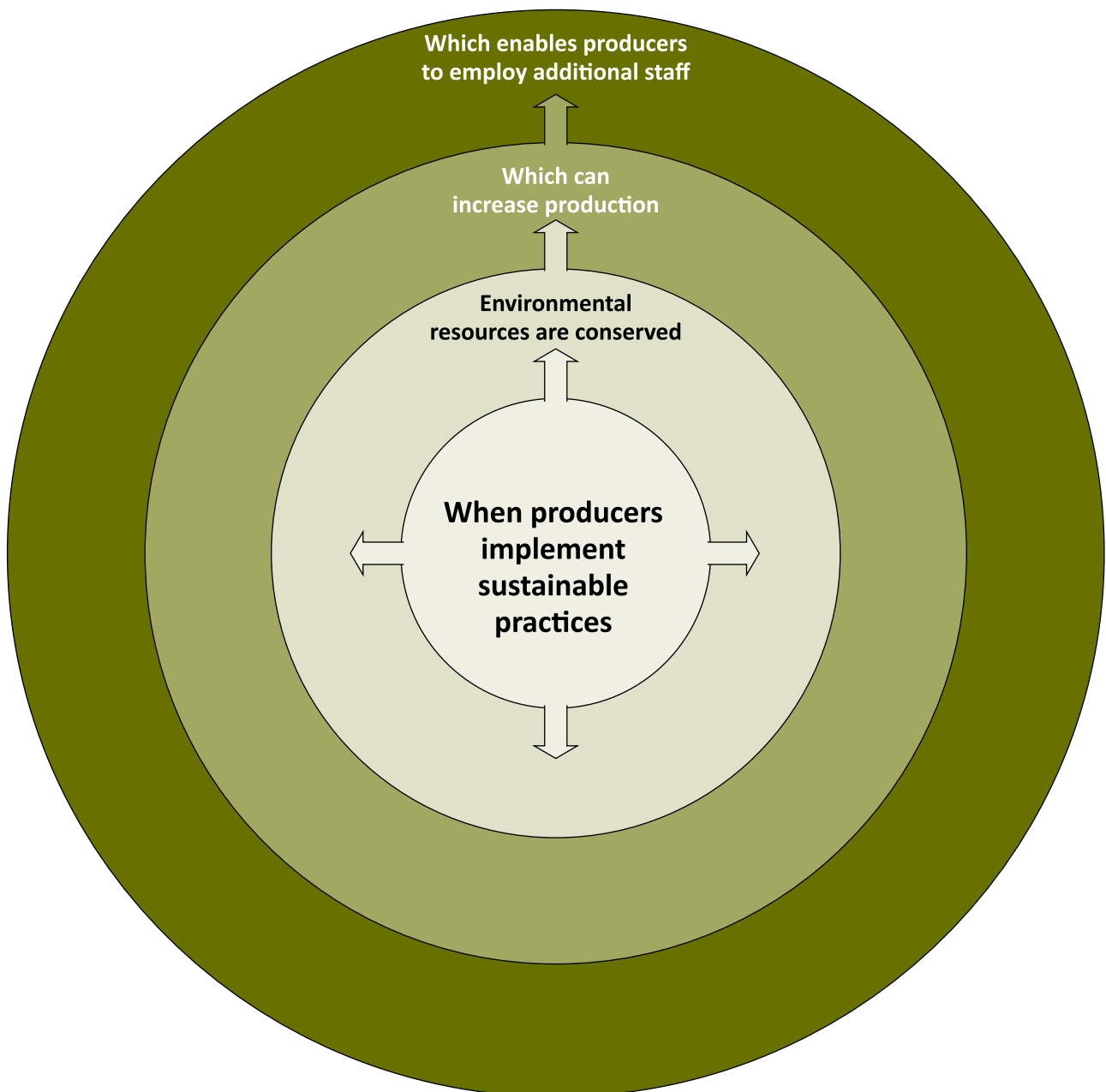
My topic:
Key words:
List of resources:
Author's name: The name of the resource: The year it was produced: The name of the publisher: The sections found most useful:
Important information:

Resource 1.2

Consequence wheel

Consequence wheels are used to explore wide ranging consequences that can follow from actions, issues or trends in the present.

LOOK at the example below.

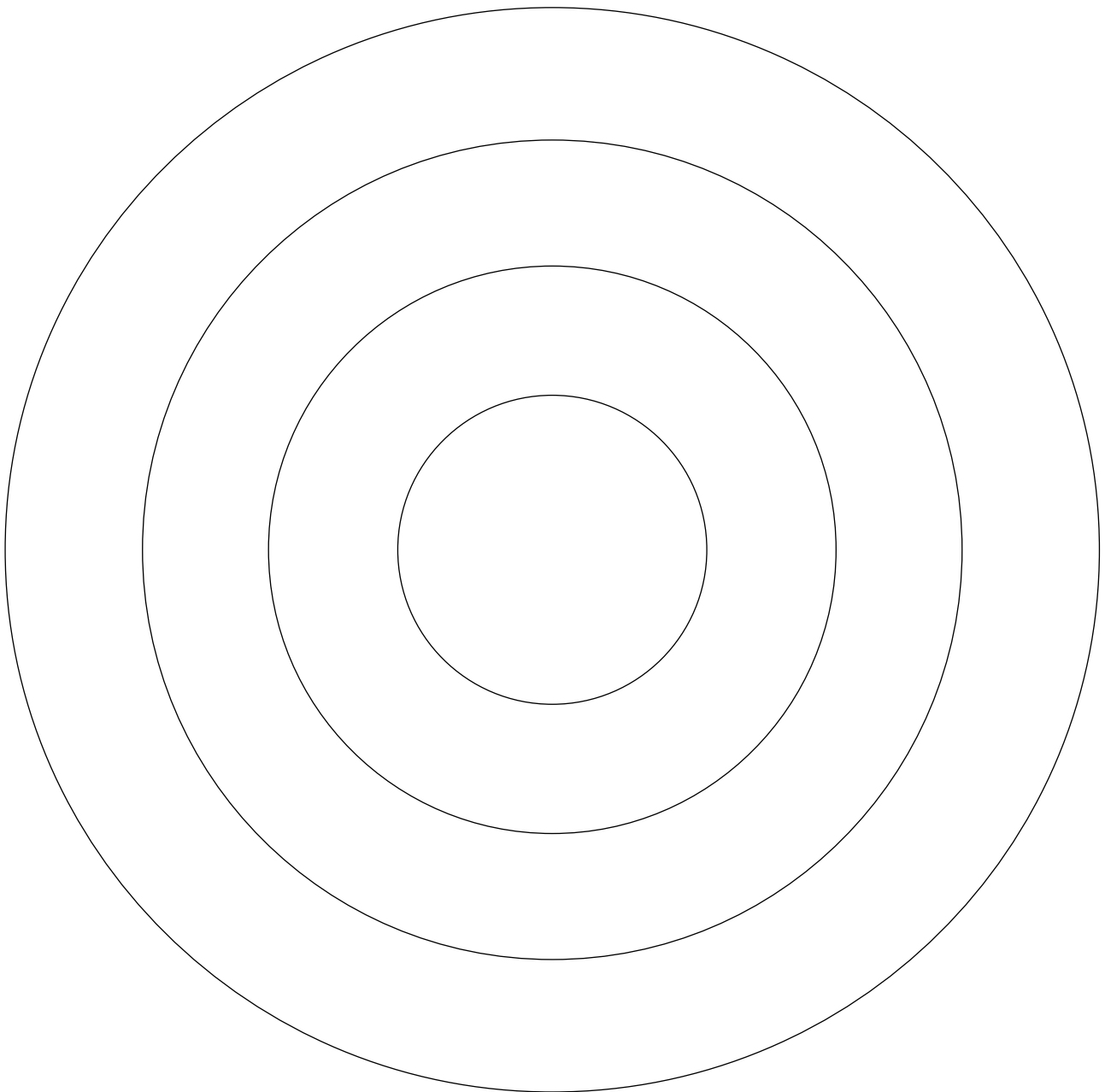


DECIDE on an issue that affects changes to the land or sea caused by the production of food. **PLACE** the focus in the centre of the consequence wheel. Then, **EXPLORE** the focus by asking the question "What are the immediate consequences?"

WRITE the immediate consequences in the inner ring around the main idea.

LINK each consequence to the main idea with a single line. This indicates that they are first order consequences. **CONTINUE** exploring second, third and fourth order consequences using the outer circles.

Use the four concentric circles below to **EXPLORE** the consequences of an action, issue or trend relevant to the way meat, seafood or fish are produced.



Resource 1.3

Compass rose

Use the compass rose to examine your chosen primary industry and its use of sustainable production practices from a variety of perspectives — the 'natural', 'economic', 'social' and 'who decides (power)'.

The diagram features a central compass rose with four main directions labeled: *N* (North), *E* (East), *S* (South), and *W* (West). The rose includes a circular scale with degree markings and a central needle. Surrounding the compass rose are eight rectangular boxes, each representing a different perspective:

- Top:** A box labeled "Natural".
- Right:** A box labeled "Economic".
- Bottom:** A box labeled "Social".
- Left:** A box labeled "Who decides?".
- Other four positions (top-left, top-right, bottom-left, bottom-right):** Empty boxes for additional notes.



primezone
The place for all your primary industry resources
www.primetimezone.edu.au