

# An Educational Unit for Junior Secondary Schools

Changing conditions in the pig industry



## Acknowledgements

This educational resource was produced by Australian Pork Limited (APL).

The resource is designed to introduce young people to pork production in Australia. Whilst not an exhaustive educational resource, it is intended to raise the awareness of school-aged students about the sustainable resource management practices in pork production in Australia and it supports investigations of the past and present and includes investigating a range of futures for intensive livestock industries, like pig farmers.

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The materials in this educational resource have been developed by Angela Colliver from Angela Colliver Consulting Services Pty Ltd.

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**‘EDUCATION IS NOT  
THE FILLING OF A  
BUCKET BUT THE  
LIGHTING OF A FIRE.’**

(W.B. Yeats)

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# Introduction

## Rationale

This resource material aims to help teachers and students in junior secondary schools explore new and existing methods and technologies involved on Australian pig farms to house, produce pigs, manage resources sustainably and adapt to changes in animal welfare standards, temperature, extreme weather events, variable rainfall distribution.

Students are given an insight into ways farmers care for their animals and are designing housing systems using a variety of housing regimes, designed with improving yields, environmental stewardship principles and animal welfare standards in mind. The objectives of the educational resources are to:

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

These educational resources are an effort to provide practical support to teachers and students learning about pork production in schools.

## About the approach

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
- 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). 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.

# Teacher notes

## Resource description

This unit encourages students to examine aspects of pork production and the things that farmers are doing to produce and house their animals ethically, comfortably and more sustainably.

Students explore new and existing designs, methods and technologies involved on Australian pig farms to house and produce pigs, manage resources sustainably and adapt to changing conditions. Students are given an insight into ways farmers care for their animals and are designing housing systems using a variety of housing regimes, designed with social and environmental stewardship principles and animal welfare standards in mind. The unit also explores the idea that our primary industries can be part of a future for managing resources sustainably, improving sustainability in farm practices, adapting to climate change and producing quality food products.

As the unit progresses, the emphasis shifts to investigating how increases in scientific knowledge and developments in technology are changing farming methods and techniques to improve yields and sustainability. Through integrating increases in scientific knowledge and developments in technology into teaching and learning students are encouraged to consider actual conditions experienced by pig farmers, and be part of the process of understanding, documenting and communicating the industry's opportunities and challenges.

Having explored some of increases in scientific knowledge and developments in technology in the present, students then introduced to the challenges of a changing climate and they investigate potential climate change adaptation options for the pig industry.

They think about how a changing climate and sustainability will demand improvements in current technologies in order to reduce reliance on non-renewable and non-recyclable resources and in turn generate ideas and explore options suggested by others as being needed to produce pigs in the future.

Many of the activities are designed to investigate an action or farm that is making a change in the pig industry. The types of actions that could be undertaken are examined through a number of videos of pig farmers actively involved in housing and producing pigs sustainably and producing low emission energy for onsite generation of electricity and through several structured critical thinking and research activities.

Finally, the students are encouraged to communicate solutions for improved yields and sustainability in the pig industry.

## Year levels: Year 7 and 8

## Curriculum focus

It contains a unit of work in Technologies and Science with a variety of student activities selected as vehicles to help students:

- Investigate and explore new and existing methods, designs and technologies involved on Australian pig farms to house and produce pigs
- Assess places where and the ways in which people have grown pigs and produced food and how their actions are influenced by increases in scientific knowledge and developments in technology
- Investigate concepts and ideas relating to how concerns about animal welfare has influenced the designs
- Investigate concepts and ideas about land management, sustainable farming, climate adaptation and sustainability and how these influence the designs
- Select ideas and undertake an inquiry
- Reflect and evaluate the success of the action pig farmers are taking for improving yields, comfort standards for their pigs, social sustainability considerations of their sows, sustainable resource management practices and adapting to climate change by producing low emission energy and producing quality pigs.

Teachers will find, as they examine this unit and its student activities that there are some learning areas which are more strongly represented than others. This is a consequence of the subject matter with which students are dealing. Sustainability is the dominant cross curriculum priority, and Technologies and Science learning areas feature strongly in the unit as the topics deal with pigs and their behaviours and adaptations, factors that shape the housing systems used in pig production, characteristics of these systems and structures, and change. English and the critical and creative thinking, particularly in design and technologies processes are featured strongly throughout the activities.

Deep understanding takes time – achieving it is a gradual process that evolves throughout the unit and is facilitated by reflection. This unit invites students to think beyond the information and data they gather and the texts they read and view – to step back from their investigations and do some big picture thinking for improved animal comfort and sustainability and reduced animal impacts, for example reduced energy use, or improved waste avoidance/resource recovery and reduced piglet deaths on farms. In many activities, it is suggested the teachers 'reflect aloud' and thereby model to students the kinds of questions, language and thinking associated with this task.

# Australian curriculum content descriptions

## Technologies

**Strand: Design and Technologies knowledge and understanding: Food and fibre production**

**Entry:** Analyse how food and fibre are produced when designing managed environments and how these can become more sustainable (ACTDEK032)

**ID:** [www.australiancurriculum.edu.au/technologies/design-and-technologies/Curriculum/F-10](http://www.australiancurriculum.edu.au/technologies/design-and-technologies/Curriculum/F-10)  
– see Years 7 and 8 (ACTDEK032)

## Science

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

**Entry:** Science understanding influences the development of practices in areas of human activity such as agriculture and resource management (ACSHEI21)

**ID:** [www.australiancurriculum.edu.au/Elements/ACSHEI21](http://www.australiancurriculum.edu.au/Elements/ACSHEI21)

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

**Entry:** Science and technology contribute to finding solutions to a range of contemporary issues; these solutions may impact on other areas of society and involve ethical considerations (ACSHEI20)

**ID:** [www.australiancurriculum.edu.au/Elements/ACSHEI20](http://www.australiancurriculum.edu.au/Elements/ACSHEI20)

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

**Entry:** Science understandings influence the development of practices in areas of human activity such as industry, agriculture and terrestrial resource management (ACSHEI36)

**ID:** [www.australiancurriculum.edu.au/Elements/ACSHEI36](http://www.australiancurriculum.edu.au/Elements/ACSHEI36)

## 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.

**OI.7:** Actions for a more sustainable future reflect values of care, respect and responsibility, and require us to explore and understand environments.

**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.

# 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 on page 4 in Year 7/8 in Technologies and in Science 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, and research and observations 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 Year 7 and 8 students. This is a suggested age range only and teachers are encouraged to modify activities to suit the needs of their students with whom they are working.

The unit's topics are based on content descriptions of the Australian Curriculum, on the key perspective of education for sustainability and 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 by the following icon: **Resource 1.2.**

The resource sheets are designed to assist teachers to facilitate learning without necessarily having access to many 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.

By the end of this unit, students should understand:

- How food (pigs) are produced in managed systems and how these systems can become more sustainable (ACTDEK032)
- Science understanding influences the development of practices in areas of human activity such as agriculture and resource management (ACSHE121)
- Science and technology contribute to finding solutions to a range of contemporary issues; these solutions may impact on other areas of society and involve ethical considerations (ACSHE120)
- Science understandings influence the development of practices in areas of human activity such as industry, agriculture and terrestrial resource management (ACSHE136).

## 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 see concrete examples of the way student ideas have been refined or changed through the unit sequence. Work samples should be retained for this purpose.

## 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 ICT 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 is suggested.

### I don't know much about pork 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 provided with teacher notes, plus the resources are mainly web-based and are readily available. Most importantly, you will find that you learn with the students and make discoveries with them.

# Teacher fact sheet: facts and figures about the Australian pork industry

This page gives some basic food production information that may be helpful when you interact with the school students.

## Pigs and the environment

The Australian pork industry is serious about environmental stewardship. The industry believes it has a duty to ensure that Australian pork is produced and distributed responsibly, while also remaining competitive and sustainable. The Australian pork industry has taken proactive steps to help ensure its producers carefully manage the nation's precious environment and resources. In efforts to reduce the industry's environmental footprint, ongoing industry research and development is focused on the continuous improvement of overall productivity, waste minimisation, pollution prevention and beneficial reuse of wastes.

Environmental issues pose both a challenge and opportunity for the Australian pork industry. The industry has tackled this challenge head-on and is making important progress in addressing these issues—especially in acknowledging and addressing greenhouse gas (GHG) emissions. The industry has become the first in Australia to have developed and approved a methodology for the government's Carbon Farming Initiative (CFI).

GHG emissions produced by the pork industry are significantly lower than other agricultural sectors, such as beef cattle, dairy cattle and sheep. Currently, the industry's emissions and potential mitigation options puts us in the position to have a low, if not the lowest, global warming potential for pork production worldwide. But we, as an industry, are striving to reduce this even further by setting an industry goal of **1 kg CO<sub>2</sub> equ per kg of pork produced**. Fortunately, most of the industry's GHG relate to emissions from effluent ponds. This provides us with a fantastic opportunity for emissions capture, destruction or use. Progressive industry research is developing innovative new technologies and management systems to mitigate and utilise these GHG emissions. Current research shows that a 500-sow piggery has the potential to produce enough energy to power 3.1 million 100 watt globes for one hour, or produce electricity to run 62 houses for one year. And if combusted and destroyed, it would eliminate the equivalent of the fossil fuel GHG emissions from 458 Toyota Corollas travelling 20,000km/per year burning 7L/100km.

As well as GHG emissions, the industry is also proactively addressing many other environmental issues, such as nutrient management, by-product reuse, alternative waste management and soil health.

## Pigs and food safety

The health of the Australian pig herd is free from many serious diseases afflicting other pork producing countries. This is why product integrity continues to be one of the most important aspects of Australian pork production. The industry has quickly responded to growing consumer demand for top quality produce that is safe to eat. The Australian Pork Industry Quality Assurance Program (APIQ<sup>✓</sup><sup>®</sup>) is an on-farm quality assurance program that allows producers to demonstrate good farming practice using the principles of Hazard Analysis and managing Critical Control Points for management, food safety, animal welfare, biosecurity and traceability. Rapid uptake of APIQ<sup>✓</sup><sup>®</sup> by producers throughout Australia has reached 86% of the national herd, and is increasing.

Australia's pork industry is also leading the world to ensure its pork products are fully traced from paddock to plate. This has been realised through traceability systems (PigPass National Vendor Declaration—NVD). The PigPass NVD provides key information that can be used to trace pigs or pork back to the property of origin in the event of an emergency, such as an animal disease outbreak or a food safety incident.

## Looking after our pigs – we're leading the world

Australian pig producers have the same concerns you do when it comes to taking care of their pigs. To demonstrate that they are listening to consumer sentiment, in November 2010 the industry announced the voluntary phase-out of sow stalls by 2017. Australia's pork farmers are the first in the world to make such a voluntary commitment.

Producers understand more than anyone that providing excellent care results in a contented animal that provides a high quality product—pig producers' livelihoods depend on it. The industry invests millions of dollars each year to research new technologies and practices to improve pig welfare, and provide valuable education and training to stock people throughout Australia.

The *Model Code of Practice for Welfare of Animals (Pigs)*—(the Model Code)—is a guide that has been developed in consultation with all levels of industry, regulators, RSPCA and scientists to detail the acceptable practice for the management of pigs. It outlines all responsibilities involved in caring for pigs—including their housing, food, water and special needs. Standards in the Model Code have been incorporated into APIQ<sup>✓</sup><sup>®</sup> and are independently audited each year to ensure producers comply.

## How pigs are farmed

All pigs grown for pig meat are housed in different sized groups depending on their age and weight.

A sow raised for breeding will have her first litter when she's about one-year-old. The gestation period (the time from conception to birth) for a sow is between 15 and 17 weeks. She can have up to two litters each year and usually has between 9–10 piglets weaned per litter. The piglets feed from their mother for three to four weeks before being weaned and grouped with other pigs the same age in a weaner or grower facility.

Pigs are handfed on mostly grains and continue to grow until they reach between 24–55 kg and are sold as 'porkers'. Pigs that grow larger than 55 kg are sold as 'baconers'/'finishers'.

There are three main types of pig farming methods used in Australia—indoor housing, deep litter housing and outdoor bred/free range systems.

**Indoor housing systems** are for pigs from birth to weaning and for lactating and weaned sows. This system allows pigs of similar ages to be kept together. Group pens and individual pens are often used indoors.

**Deep litter housing systems** are usually large open-sided sheds or hoop-like structures with deep litter flooring (rice hulls, straw, sawdust). These systems are used extensively for growing pigs and for group housing of dry sows.

**Outdoor bred/free range systems** consist of outdoor paddocks, including rooting areas, wallows and shelter huts. The weaners, grower pigs and sows have access to paddocks at all times throughout their lives.

**Gestation stalls:** In November 2010, the industry overwhelmingly agreed that Australia would be the first nation in the world to voluntarily phase-out the use of sow stalls by 2017. This means sows and gilts must be kept in loose housing from five days after mating until one week before farrowing.

The reason producers have used sow stalls in the past is because pigs can be extremely aggressive animals, especially during the early stage of pregnancy. The best and safest way to ensure sows get enough food and aren't bullied, bitten and injured has been to protect them in individual stalls. Australian producers are now transitioning to a sow stall free status. To see the industry's progress go to [www.australianpork.com.au](http://www.australianpork.com.au)

**Farrowing stalls:** The average sow weighs between 120–200 kg (equivalent to three standard fridges), and after farrowing, her new piglets are at serious risk of being crushed to death. A farrowing stall allows a sow to stand up, lie down and stretch out, while keeping her piglets safe and warm in a separate section. The temporary use of a farrowing stall during the piglets' most vulnerable weeks plays a vital role in their protection. In the wild sows build nests which don't allow the piglet to leave until they are big and strong enough which protect the piglets in a similar way to farrowing stalls. It's estimated that the use of farrowing stalls saves over a million piglets each year.

## How to make sure you're buying Australian pork

All fresh pork sold in Australia is 100% Australian grown. However, 65% of processed pork (ham, bacon and smallgoods products) is made from frozen boneless pork imported from places like Denmark, Canada and the United States.

When buying Australian pork, look for one of three things:

- the packet label states 'Product of Australia'
- the bright pink Australian PorkMark logo
- the green Australian Grown kangaroo logo.

Or visit the Australian pork consumer website: [www.pork.com.au](http://www.pork.com.au) and look for a butcher near you that sells Australian grown pork to make ham, bacon and smallgoods products.



## Nutrients

| Nutrition Information:<br>Trimmed Lean Pork *         | Quantity per 200g<br>serving size | % Daily Intake<br>per serving ** |
|---|-----------------------------------|----------------------------------|
| Energy (kJ)   | 930                               | 11%                              |
| Protein (g)   | 46.6                              | 93%                              |
| Total fat (g)   | 3.70                              | 5%                               |
| % Recommended Dietary Intake<br>(Aust/NZ) per serving |                                   |                                  |
| Thiamine (mg)   | 1.95                              | 178%                             |
| Niacin (mg)   | 18.5                              | 185%                             |
| Vitamin B6 (mg)                                       | 1.01                              | 63%                              |
| Vitamin B12 (µg)                                      | 0.69                              | 35%                              |
| <b>Zn</b> Zinc (mg)                                   | 3.69                              | 31%                              |
| <b>Fe</b> Iron (mg)                                   | 1.44                              | 12%                              |
| <b>Se</b> Selenium (µg)                               | 42.4                              | 61%                              |

### DATA SOURCED FROM:

H. Greenfield, J. Arcot, J.A. Barnes, J. Cunningham, P. Adorno, T. Stobaus, R.K. Tume, S.L. Beilken, W.J. Muller. 2009. Nutrient composition of Australian retail pork cuts 2005/2006. *Food Chemistry* 117, 721–730.

A.J. Sinclair, S. Barone, T. Stobaus, R. Tume, S. Beilken, W. Müller, J. Cunningham, J.A. Barnes, H. Greenfield. 2010. Lipid composition of Australian pork cuts 2005/2006. *Food Chemistry* 121, 672–681.

\* Trimmed Lean Pork is calculated using the numerical average of raw trimmed lean pork cuts (Loin Steak, Fillet, Rump Steak, Round Steak, Topside Steak, Silverside Steak, Diced Pork, Pork Strips, Loin Roast, Round Mini Roast and Loin Chop)

\*\* Percentage Daily Intakes are based on an average adult diet of 8700 kJ. Your daily intakes may be higher or lower depending on your energy needs.

## Bringing home the bacon

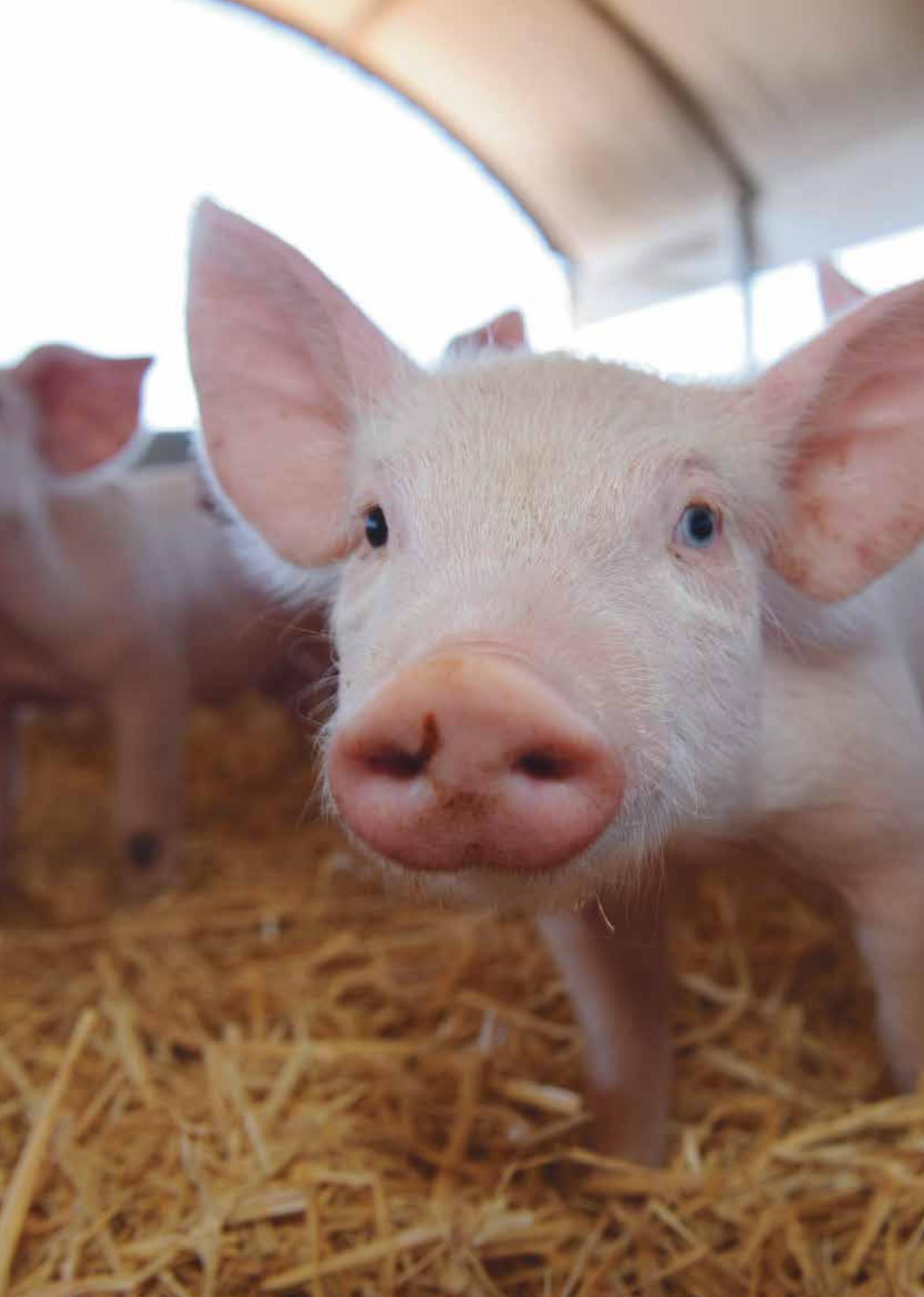
Did you know that pork is the most widely consumed meat in the world?

- Australia produces around 344,000 tonnes of pig meat every year. A little over 10% is exported to countries like Singapore, New Zealand and Hong Kong, and 25% is sold through restaurants and other food service outlets in Australia.
- Each year Australians consume around 23.5 kg of pork per person—this is made up of 8.5 kg of fresh pork and 15 kg of processed ham products such as bacon and smallgoods.
- During 2010–11, pork products accounted for around 10% of Australia's total fresh meat retail consumption and had a gross value of production (GVP) of more than \$882 million. (Source: Australian Bureau of Agriculture and Resource Economics, ABARE 2012)
- Australian farmers produce around 4.75 million pigs (forecast number of pigs produced to the end of June 2012) from a sow herd of around 261,000.
- The APL PigPass NVD Traceability database in March 2012 had over 2,200 pig producer registrants. However just over 1,500 producers could claim they derive an income from growing pigs.
- The main source of food for Australian pigs is grains such as wheat, barley and sorghum, resulting in a white fat around the outside of the meat. In contrast, corn or maize fed pigs grown in the northern hemisphere will produce a yellow coloured fat around the outside of the meat.



## Crackling facts!

- Australia is the first nation in the world to introduce the voluntary phase-out of gestation stalls.
- Pork accounts for approximately 0.4% of the national greenhouse gas emissions – significantly lower than other agricultural sectors, including beef cattle at 11.2%, sheep at 3.4%, and dairy cattle at 2.7%. (Source: Garnaut, R 2008, The Garnaut climate change review— final report, available at: [www.garnautreview.org.au/index.htm](http://www.garnautreview.org.au/index.htm))
- Whether housed indoors or outdoors, a pig spends more time resting than any other domestic animal.
- Most pig producers use the manure and effluent on their farms as an organic fertiliser to improve crops and pasture, or to capture methane gases to convert to energy.
- 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% of the total cost of producing pork.
- Pigs have a very wide angle of vision (310 degrees) 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 g a day from birth to sale.
- Pigs have colour vision but they can't focus both eyes on the same spot.
- Pigs are considered to be smarter than dogs and are easy to train. This characteristic helps producers develop safe handling routines.
- Grower pigs eat the equivalent of about 3% of their body weight and drink about 10% of their body weight, daily.
- Pigs are unable to perspire as they have no sweat glands and lose heat through their mouths. Their ideal growing temperature is 20–22°C.
- A pig which has nursed a litter is called a sow; a pig which has not nursed a litter is called a gilt.



# Step 1: Engage with the topic

## Getting started

### Purpose

To provide students with opportunities to:

- Gather information about student's prior knowledge about pig farming
- Pool ideas and share with others
- Assist students to organise the ideas they have about pig farming
- Develop skills in making connections between ideas
- Help set directions for an investigation
- Provide data for assessment purposes.

## Pig farming and production



Pig farming and production occurs in approximately 2800 farms spread across all states of Australia, with the highest proportion of producers located around the grain, sorghum or maize growing regions.

Brainstorm what is known about pig farming and production. Consider questions like:

- 'What do we understand about pig farming and production?'
- 'Is pig farming a primary industry?'
- 'What have we heard about pig farming in the media or from scientists, friends or family members?'

Display brainstorm lists around the classroom. If questions emerge from this activity, record these and display them for reference throughout the unit.

Talk about where students think pig farms are located in Australia. Check out a range of agricultural maps.

**See:** <http://bit.ly/S0noNE>

Using **Resource 1.1** at the rear of the unit find places where pigs are farmed.

Talk about Australia's distinct climatic zones: the summer – rainfall dominant subtropics to the north; the Mediterranean climates to the south-west and mid-south; the arid and semi – arid regions in most of the inner continent; and temperate areas of high to medium rainfall on most coastal fringes and in the rangelands of the east of mainland Australia and Tasmania. See the Bureau of Meteorology's Climate Classification Maps at [www.bom.gov.au/iwk/climate\\_zones](http://www.bom.gov.au/iwk/climate_zones)

Talk about Australia's diverse agricultural sector and how under this regionally different climate farmers have developed farming systems that have had to adapt to these climates.

Consider questions like:

- Could there be a relationship between where pigs are farmed in Australia and the climatic conditions of those regions?
- What other factors might be considered?
- Where else in the world are pigs farmed? What is their climate like?
- Could there be a relationship between the types of pig farming methods used in Australia and our climatic conditions?

Climate change is likely to lead to an increase in variability and in the occurrence of extreme events such as the exposure to prolonged high temperatures, severe storms and dry conditions.

In the CSIRO book 'Adapting Agriculture to Climate Change', the authors' state:

'Climate change, including changes in the intensity and frequency of extreme weather events, will challenge traditional livestock farming systems. Warmer and drier conditions are projected for most livestock-producing regions, raising the likelihood and incidence of heat stress in stock.'

Talk with the students about how the climate change impacts will vary between regions. Discuss how some impacts may pose threats to the viability of pig farming in some regions, while in other regions changes in climate may improve viability or create new farming opportunities.

## An overview of some facts and myths



Ask students to develop a concept map or visual map describing what they know about pigs, pig farming and production, the ways Australian pig farmers raise their animals and how they are housed. Share with students some facts about pig farming as is currently understood.

Refer to reference books and websites for support material.

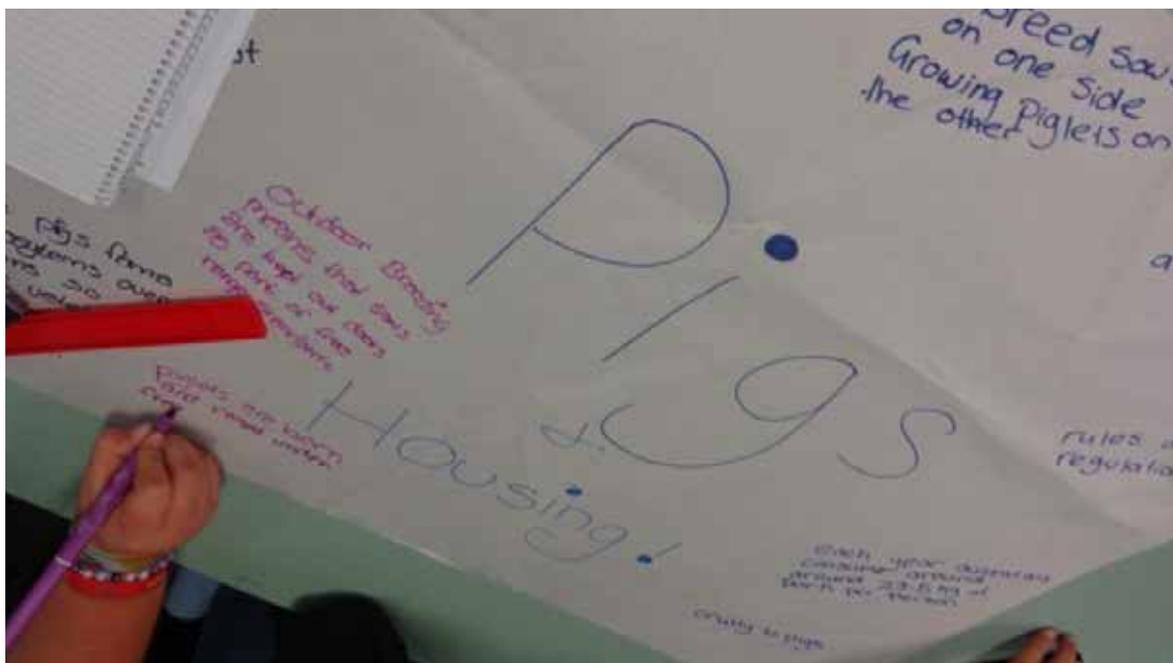
**See:** [www.aussiepigfarmers.com.au/bigquestions](http://www.aussiepigfarmers.com.au/bigquestions)

Also refer to the facts on pages 12–17 of this resource.

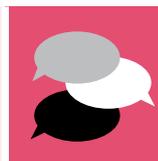
Use Simple Mapper at <http://simplemapper.org/?gclid=CLeDr8uA1bICFctDpgod6BsABg> or [www.globaleducation.edu.au/verve/\\_resources/webmap.pdf](http://www.globaleducation.edu.au/verve/_resources/webmap.pdf) to develop a concept map describing what you know about pig farming, what it is, what it comprises, what it affects, its potential impacts on the pigs, on environments and their natural resources.

### Assessment note

Concept maps are useful for assessment purposes. Students could complete one at the beginning of the unit and then reconstruct it during and at the end of the unit to demonstrate their changed understandings.



## In the news



Ask students to bring in news clippings, YouTube Videos or Pod Casts or notes from a news broadcast that mention pig farming, the housing of pigs and ways a changing climate might impact on the industry and their farming systems. Ask them what they understand about the story, including what aspects of pig farming it discusses, its effects and future consequences with respect to themselves and others in the world.

**View:** [www.aussiepigfarmers.com.au](http://www.aussiepigfarmers.com.au) as a class.

This is a video about pig production and animal welfare. It includes sections on how pigs are produced; pig raising standards; the raising of piglets; and technologies designed for the welfare of piglets. Talk with the students about the story, how it's portrayed and its main messages.

List their ideas on a chart or whiteboard. Invite students to talk about the collection of news features found. Ask students if they think their news stories are accurate. Discuss the language being used. Is it positive or negative? Encourage students to think, reflect and share ideas with others.

## Rate the resource



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

Discuss the types of people who might present a good understanding of pig farming issues. They might include industry representatives, government officers, farmers, teachers, librarians, researchers, parents and authors of books or web sites about pig farming. Of course, each of these people would have different sources for their own information. Sources could include magazines, science journals, web sites, personal experiences (anecdotes), newspaper articles, internet sites and television programs.

Discuss how the students might 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?)

Ask students to produce a rating system, such as a 1–5 star rating, to describe how reliable or useful the source found [www.aussiepigfarmers.com.au](http://www.aussiepigfarmers.com.au) is.

## Questions, questions...



Use the following 'Question Grid' to encourage students to devise additional angles to their questions during this unit.

|             |                       |              |            |            |            |
|-------------|-----------------------|--------------|------------|------------|------------|
| What is?    | Where/<br>when is?    | Which is?    | Who is?    | Why is?    | How is?    |
| What did?   | Where/<br>when did?   | Which did?   | Who did?   | Why did?   | How did?   |
| What can?   | Where/<br>when can?   | Which can?   | Who Can?   | Why can?   | How can?   |
| What would? | Where/<br>when could? | Which could? | Who would? | Why would? | How would? |
| What will?  | Where/<br>when will?  | Which will?  | Who will?  | Why will?  | How will?  |
| What might? | Where/<br>when might? | Which might? | Who might? | Why might? | How might? |

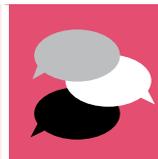
For example:

- Who is researching pig farming in Australia?
- Why is knowing about the treatment of pigs on farms important?
- How is what we know about pig farming changing?
- How might understanding the ways in which pigs are housed and produced (i.e. clean and green) be a differentiator in ways people select to buy pork products?
- What did scientists most recently report on?
- What did animal welfare groups most recently report on? What did the industry most recently report on?

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

| What we know | What we're not sure about | What we want to know |
|--------------|---------------------------|----------------------|
|              |                           |                      |

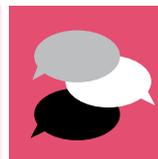
## Housing of pigs



Intensive piggeries usually house their animals in specialised sheds for the duration of their life. For example, 50% of Australia's pigs are raised in deep litter housing systems. These sheds tend to use passive end-to-end ventilation systems, with some having cross-flow ventilation options. Free range piggeries run their animals in paddocks that have rooting areas, wallows, and huts for shelter. Climatic and soil conditions limit the suitability of many areas for free range farming, as ambient temperatures cannot be kept below 27 degrees.

Find out what students might already know about the types of housing used for pigs on Australian farms.

## Setting the task



Explain to the class that they will be using a range of activities and a website containing five videos about pig farms to develop an understanding of:

- Where pigs live
- Where our pork meat comes from
- How Australian pig farmers raise and house their animals in different ways
- How different housing designs, systems and technologies are used to raise pigs
- How the physical conditions of the farm environment and farm management practices used might impact on the production of pork
- How a changing climate might impact on pig farming systems.

Inform the students that they will also be encouraged to suggest ways to improve the farm practices or operations so that there might be a lesser impact on the environment and on the pigs in a changing climate.

Explain to the class that their task is to work in pairs to collect and record information about the pig farms; their farm family's use of technologies and science knowledge to house pigs and produce pork, house pigs, manage the farm; and their farm management practices.

## Step 2: Explore how pigs are housed

### Explore five farms

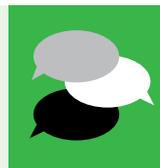
#### Purpose

To provide students with opportunities to develop their understanding of:

- Where pigs are raised/grown
- How Australian pig farmers raise and house their animals in different ways
- How different housing designs, systems and technologies are used to raise pigs
- The ways in which people have grown pigs and produced food and how their actions are influenced by increases in scientific knowledge and developments in technology
- How the physical conditions of the farm environment and farm management practices used might impact on the production of pork
- A focus for the forthcoming experiences in the 'Explain' stage of the inquiry.

Introduce students to the concepts about ways Australian farmers raise and house their pigs.

### **Research Task:** **Part 1: Investigate the options**



Re-state to the class that they will be using a range of activities and a website containing five videos about pig farms to develop an understanding of:

- Where pigs are raised/grown
- How Australian pig farmers raise and house their animals in different ways
- How different housing designs, systems and technologies are used to raise pigs
- How the physical conditions of the farm environment and farm management practices used might impact on the production of pork.

Inform the students that they will also be encouraged to suggest ways to improve the farms practices or operations so that there might be a lesser impact on the environment and on the pigs in a changing climate. Students are also encouraged to consider the positive, negative and interesting repercussions of these improvements.

Explain to the class that their task is to work in pairs to record and collect information about the pig farms; their farm family's use of technologies and science knowledge to house pigs and produce pork, manage the farm; and their farm management practices.

## View videos



Explain to the students that their task is to start researching. Invite students in pairs to initiate their research and view five videos explaining how pig farmers produce pigs and the systems they use. Ask students to record information about each source used, together with a rating system describing how useful the systems used by the pig farmers might be.

See **Resource 1.2** to support student investigations.

Ask pairs to view the following videos and record information for each one.

### Video 1

**Title:** Aussie Farmers – Types of Farming – Indoor Intensive Housing

This is a video explaining 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.

**See:** [www.aussiepigfarmers.com.au/types-of-farming/indoor-intensive-housing](http://www.aussiepigfarmers.com.au/types-of-farming/indoor-intensive-housing)



### Video 2

**Title:** Aussie Farmers – Types of Farming – Eco Housing

**Abstract:** This is a video explaining 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 personal 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.

**See:** [www.aussiepigfarmers.com.au/types-of-farming/barn-reared-eco-housing](http://www.aussiepigfarmers.com.au/types-of-farming/barn-reared-eco-housing)

### Video 3

**Title:** Aussie Pig Farmers – Types of Farming – Free Range

**Abstract:** This is a video explaining how pigs are produced free range in outdoor paddocks. It includes sections on rooting areas, wallows and huts for shelter. The section on the huts describes how the animals use these for protection in extreme weather events and how young piglets are protected 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.

**See:** [www.aussiepigfarmers.com.au/types-of-farming/free-range](http://www.aussiepigfarmers.com.au/types-of-farming/free-range)

### Video 4

**Title:** Aussie Pig Farmers – Housing Pigs – The Welfare Debate

**Abstract:** This is a video 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. The section on the housing of pigs includes outdoor housing; free range housing and loose housing.

**See:** [www.aussiepigfarmers.com.au/our-pigs](http://www.aussiepigfarmers.com.au/our-pigs)

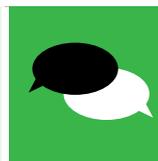
### Video 5

**Title:** Looking After the Environment

**Abstract:** This is a video explaining 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; how the methane is captured, transported and used to generate electricity at the farm to provide thermal comfort and appropriate conditions for baby piglets. It also highlights how food and packaging waste from other sources is recycled and reused as food for the pigs.

**See:** [www.aussiepigfarmers.com.au/looking-after-the-environment](http://www.aussiepigfarmers.com.au/looking-after-the-environment)

## Framing questions and actions



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

In pairs, formulate possible lines of inquiry or investigation by:

- Listing and categorising all information related to their investigation and the pig housing issue under headings – housing types; actions pig farmers take; probable and possible futures; solutions available today; possible innovations/inventions
- Preparing a table to outline information that needs to be gathered, who is responsible, and where they will seek information, how it will be gathered.

Ask questions like:

- What is this pig farm and its pig housing type like?
- What is happening in this place?
- Could this place be anywhere else?
- How are pigs housed here?
- How are the pigs being affected by the methods of housing?
- How is this place affected by seasons or climate?
- How are people adapting the housing system to the seasons and changes being experienced?
- What changes to the housing system could science influence?
- What changes to the housing system could climate change influence?

## Explore changing conditions



Talk with students about how the climate determines the growing conditions for all agriculture, and explain how climatologists predict that Australia's climate will continue to become warmer, with changes to rainfall patterns, less snow, more extreme weather events and more fires.

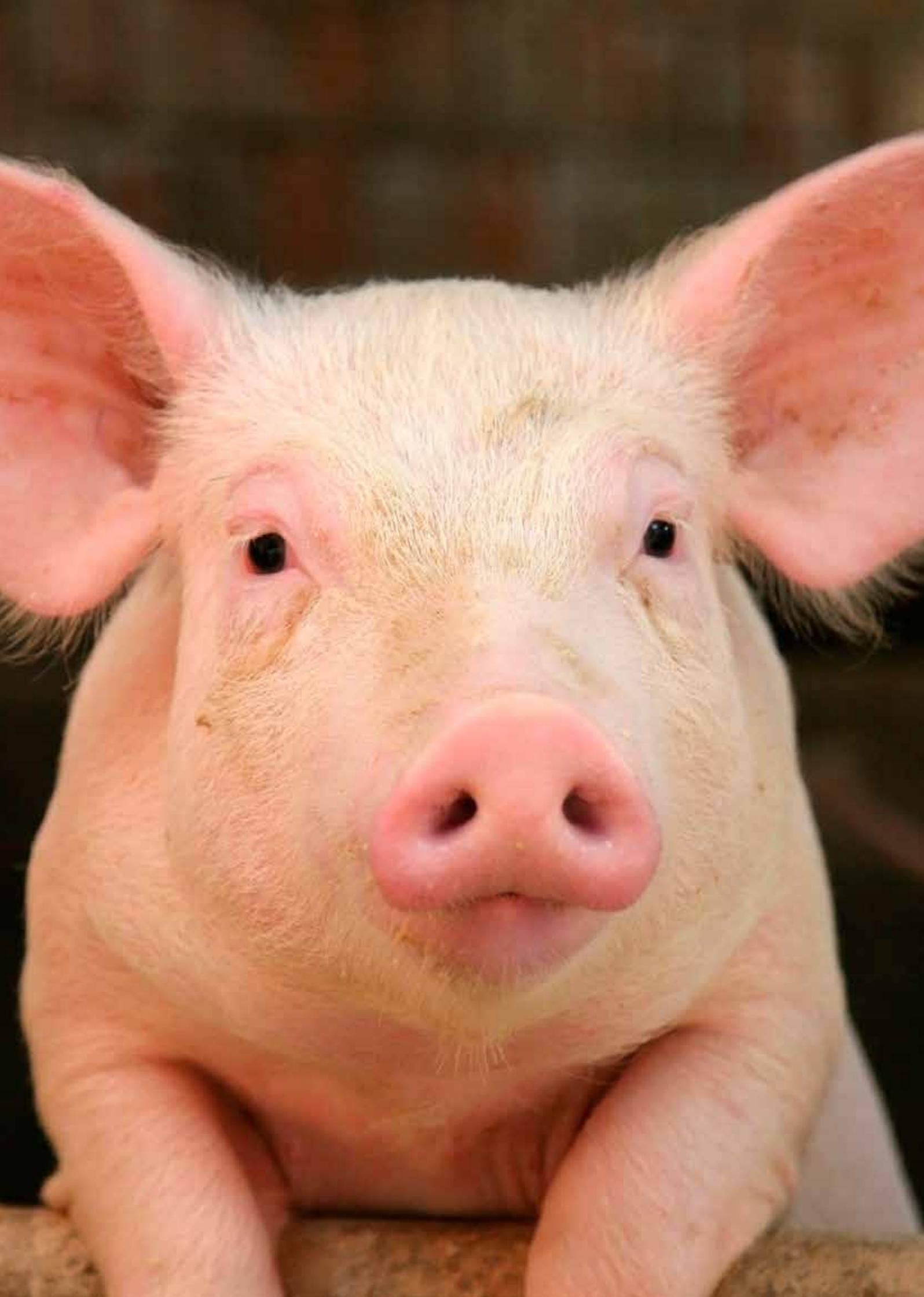
Play for the class:

- The video clip at [www.csiro.au/multimedia/climate-adaptation-video.html](http://www.csiro.au/multimedia/climate-adaptation-video.html)
- The podcast [www.csiro.au/multimedia/adaptation-plan-for-agriculture.html](http://www.csiro.au/multimedia/adaptation-plan-for-agriculture.html)
- The podcast [www.csiro.au/multimedia/Adapting-agriculture-to-climate-change-how-to.html](http://www.csiro.au/multimedia/Adapting-agriculture-to-climate-change-how-to.html)

which discuss Australia's adaptation to the impact of climate change. Ask the students to list the variety of ways adaptation responses are needed in the pork industry, which could include:

- Redesigning buildings
- Protecting pig stock from sun and heat
- Better water management including preparing the soil to catch every drop of water; drip irrigation systems instead of overhead systems and controlling weeds and pests that take moisture out of the soil
- Early warning systems for notifying pig farmers of impending heat stress conditions with an email or phone text alert system
- Growing valuable pigs under shade-cloth.

Ask students to record these ideas for future reference.



## Step 3: Explain different pig housing options and their effects

### Purpose

To provide students with opportunities to:

- Describe existing methods and technologies involved on Australian pig farms to house and produce pigs
- Explore the consequences of decisions and choices pig farmers make relating to the housing of their pigs
- Develop the skills of discussion, negotiation, critical thinking and analysis of multimedia material
- Create a number of consequence wheels
- Think about changing conditions that are changing farming practices
- Construct a storyboard.

### Approaches to housing pigs



Invite students to develop a 'consequence wheel' to explore the consequences of decisions and choices pig farmers featured in the videos made relating to the housing of their pigs.

The issue is written in the centre of a sheet of paper and a series of concentric circles are then drawn lightly around it. The first question asked is "What are the immediate consequences?" See **Resource 1.3** for an example.

Ask pairs or small groups to discuss what the repercussions might be and briefly write them around the first circle. Ask pairs or small 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 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 in the way the pigs are farmed, housed, used, managed and produced?
- What are the possible courses of action open to pig farmers?
- What are others already doing?
- How might the pig industry 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,WWF, 1994, p.10).

As a variation, invite students to describe a climate change issue they believe is significant to the intensive livestock/pork sector in Australia. It might involve changes to animal housing to protect stock from sun and heat, climate-controlled production sheds, utilizing water-based cooling mechanisms such as misting, redesigning buildings with passive heating and cooling or generating power onsite.

Instruct them to identify first, second and third order effects of the issue.

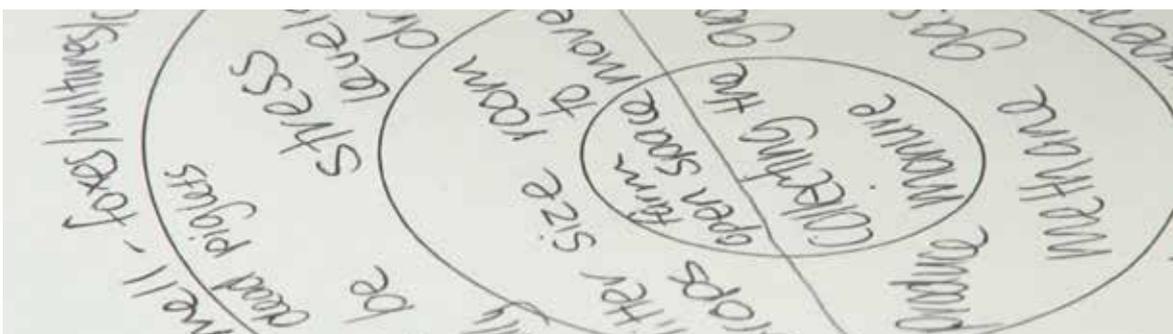
Create a consequence wheel using **Resource 1.3** to help students consider the various impacts of climate change on pig farming and then discuss the opportunities and challenges the sector faces.

The steps in creating a cause and effect wheel are given below:

**Step 1:** A key concept (problem or issue) is placed in the centre of the diagram – as the hub of a wheel. This is called the **cause**.

**Step 2:** A number of possible consequences or implications, arising from the cause given on the hub, form a ring (as in a wheel) around the initial cause. These consequences or implications (real or potential) are called **effects**.

**Step 3:** The wheel created in **Step 2** can be further extended, because each effect can be looked on as a new cause, with more consequences (effects) flowing from it. Thus, an extra ring is added to the wheel.



## Decide on what to present and how to do so



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:** [www.slideshare.net/slayas/storyboard-genre-ideas](http://www.slideshare.net/slayas/storyboard-genre-ideas) for ideas.

## Bringing it all together

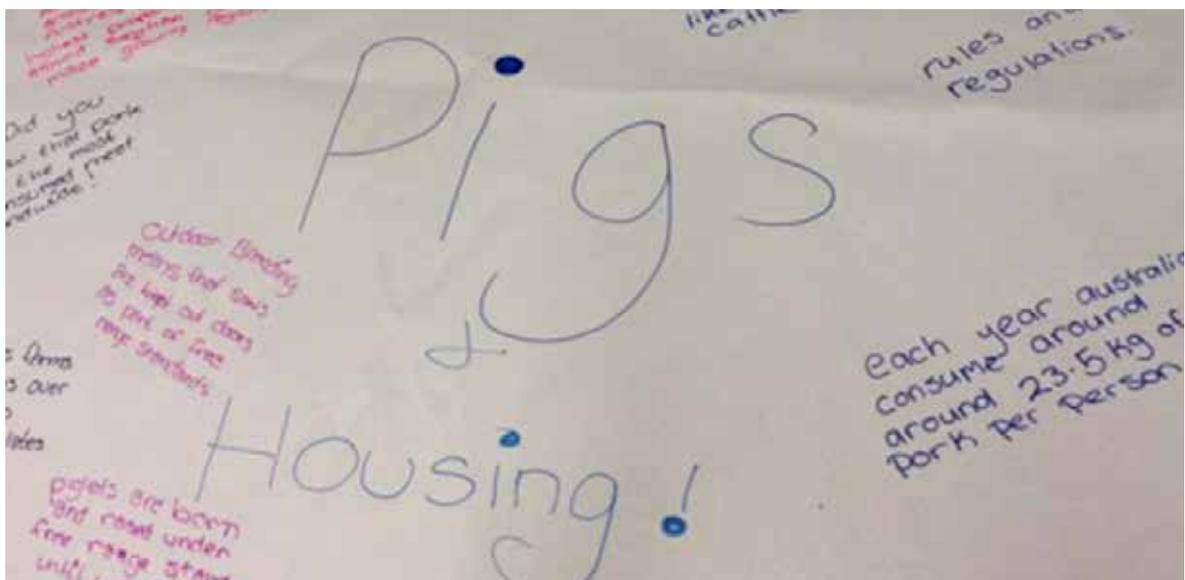


Focus students' attention on:

- 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 other prompts to plan the way forward.

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



## Farm factors



Discuss with students what they have discovered about farm practices that are changing in response to changing conditions in the unit. Draw a table on the board with two headings:

| Changing farming practices | Predicted climate influence |
|----------------------------|-----------------------------|
|                            |                             |

Ask them to suggest ways each farm practice is a response to predicted climate changes in each column, with an explanation of their reasoning. For example, drip-irrigation is being used in some parts of the world rather than overhead sprinklers to water pastures, which can cause a large amount of water to evaporate before the plants absorb it. In drought conditions, this farming practice can conserve water. Ask students to document their ideas.

## Step 4: Elaborate on concepts and ideas

### Presentation planning

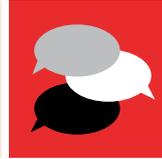
#### Purpose

To provide students with opportunities to:

- Explore actions pig farmers are taking for improving comfort standards for their pigs, sustainable management of resources, and adapting to climate change by producing low emission energy and producing quality pigs
- Apply what they have learned and communicate the design principles of a 'Sustainable Innovation'
- Plan their presentation about their chosen "Sustainable Innovation"
- Critically and creatively think about ways the pig industry can reduce greenhouse gas emissions
- Share investigation findings.



## Changing farming practices and methods due to increases in scientific knowledge and developments in technology



Animal welfare and sustainable resource management were seen to demand improvements in pig farmers current systems and designs of housing their pigs. Climate change too, may be a consideration as the intensity and frequency of extreme weather events have been predicted to challenge traditional intensive pig farming systems.

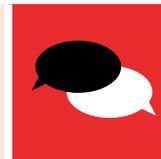
Ask students to reflect on the researchers or scientists featured in the 5 videos and reflect on how increases in scientific knowledge and developments in technology changed the pig farmers' methods and designs of housing their pigs.

Use a "PMI" technique to identify different directions students' conclusions could be taken. Ask them to discuss their key findings in terms of the benefits they could provide, the costs or risks involved and any new questions that the conclusions have given rise to.

'PMI' stands for 'Plus, Minus, Interesting', and is a useful way of exploring an issue in terms of its positive and negative aspects and those which provoke deeper thought. See **Resource 1.4** for a PMI Chart.

| Plus | Minus | Interesting |
|------|-------|-------------|
|      |       |             |
|      |       |             |
|      |       |             |

## Delve deeper



Engage students in reviewing video 5 again. This video shows a pig farmer developing and using technologies to protect their pigs, house them sustainably, manage waste/effluent sustainably and produce methane using the pig's manure to produce electricity to keep the baby piglets warm.

**See:** [www.aussiepigfarmers.com.au/looking-after-the-environment](http://www.aussiepigfarmers.com.au/looking-after-the-environment)

Ask students to review the video and investigate how this farmer is using science knowledge and developments in technologies to generate electricity onsite.

Talk about how sugar cane farmers, like this farmer, consider that they can be in the business of producing energy and how this change in mindset has enabled them to create new business models of production and income generation.

Invite students individually or in pairs to choose a topic and define their investigation as a type of innovative/ workable/ environmentally appropriate and socially acceptable technology, creation or action that could be considered in changing times on pig farms. Explain to them that they are to research a topic of their choice and engage in a scientific investigation that is related to their topic.

Their investigation might relate to one of the following fields:

- Investigate and communicate the design of a more energy-efficient pig housing environment
- Investigate and communicate the design a renewable energy resource that can be used in pig farming
- Investigate and communicate the design a way to provide shade and shelter for pigs through infrastructure or tree planting and protection
- Investigate and communicate the design a way to generate onsite power on a pig farm.

Once they have a clear idea of their topic, encourage them to form a hypothesis one which they can base their investigation. Discuss with them the technology, creation or action they wish to investigate and to find an element they might be able to practically evaluate and communicate.

Assist them in devising the details of their investigation. Ask them how they expect to come to a conclusion and communicate their findings clearly and efficiently.

Encourage students to think creatively. They might draw a design demonstrating the principles that are at work on the pig farm; re-enact the processes and practices in a role play, podcast or video; communicate the practices using an interview format.

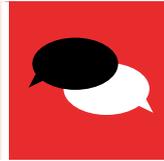
If designing, try Google SketchUp <http://google-sketchup.en.softonic.com> to create a 3D design.

If creating a video try VoiceThread at <http://voicethread.com>

If creating a podcast try using Audacity at <http://audacity.sourceforge.net>

Alternatively, mash up various media, tying together video, audio, still images and text and create a Glog at [www.glogster.com](http://www.glogster.com)

## Going further with the planning of the presentation



Invite students to confirm the idea planned for their presentation.

In small groups, discuss the possible ways to present the big idea in an interesting and engaging format.

Ask students to create a final plan for completing the presentation. Students may need 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 a journal log or reflection.

## Review and submit



Invite students to revise and fine-tune their presentation of the innovative/ workable/ environmentally appropriate and socially acceptable technology, creation or action that could be considered in changing times on pig farms.

Consider hosting a 'Community Forum' to showcase the students' work to the school community and beyond.

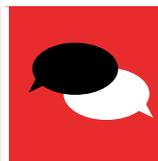
## De Bono's six hat thinking



Students explore issues raised using de Bono's "Six Thinking Hats" technique to explore the issue of innovations and technologies in pig farming where effluent can produce methane for the onsite generation of electricity in more depth. 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.

|  |   |
|--|---|
| <p><b>Red Hat</b></p> <p><b>Feelings</b></p> <p><i>What are the emotions and feelings associated with ways electricity can be generated? How do you feel?</i></p>        | <p><b>White Hat</b></p> <p><b>Information</b></p> <p><i>List the facts that you know about ways electricity can be generated and how it affects the environment.</i></p>                  |
| <p><b>Blue Hat</b></p> <p><b>What thinking is needed</b></p> <p><i>What has happened so far?<br/>What should happen next?<br/>What questions should we consider?</i></p> | <p><b>Green Hat</b></p> <p><b>New ideas</b></p> <p><i>How could the problems related to greenhouse gases produced in electricity generation be solved?<br/>What needs to be done?</i></p> |
| <p><b>Black Hat</b></p> <p><b>Weaknesses</b></p> <p><i>What are some of the negative aspects and outcomes of seeking new technologies and new behaviours?</i></p>        | <p><b>Yellow Hat</b></p> <p><b>Strengths</b></p> <p><i>What are some of the positive aspects and outcomes of seeking new technologies and new behaviours?</i></p>                         |

## Blue hat thinking



Once students have explored issues using De Bono's 'Six Hat Thinking' method from above, ask the whole class to extend their discussion on the 'blue hat' line of inquiry.

This hat encourages the students to consider the context, or 'big picture' of climate change and pig industry actions. For example, start with the question:

How might the pig industry reduce greenhouse gas emissions?

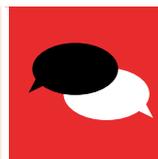
Ask students to think of the contexts this question demands before it can be answered. This might involve economics, social decisions, cultural values and technological progress. Write several of these contexts as headings above columns. In each column, provide other factors that need to be considered.

For example:

How might the pig industry reduce greenhouse gases emissions?

| <b>Economically</b>                           | <b>Scientifically</b>                    | <b>Culturally</b>                                  |
|---|--|--|
| <i>Which choices are more cost efficient?</i> | <i>What is their current technology?</i> | <i>Who thinks the benefits outweigh the risks?</i> |

## Share investigations



Encourage students to share their investigation or technology design with other classes or to submit either project to their local Science Teachers Association, Technology Teachers Association or Agriculture Teachers Association awards program.

## Step 5: Evaluating

### Think back and evaluate



#### Purpose

To provide students with opportunities to:

- Reflect on their own learning
- Provide a source of data for assessment.

To provide teachers with:

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

### Reflection



Begin by modelling reflective writing through a whole class learning log. Alternatively, you could model your own entry 'thinking aloud' as you write.

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

- Write about something new you learnt in this unit about ways pig farmers are caring for and housing their pigs, managing resources sustainably and reducing their impact on the environment
- What is one thing I have learned about my own values when it comes to sustainable farming?
- How might I help others know more about how the pig industry is reducing their impacts for the benefit of their pigs and the environment?
- What have I learned about innovation and sustainable technologies?
- What have I learned about the increases in scientific knowledge and developments in technology in ways pigs are housed?
- What would you still like to find out about pig farming?
- How well did I/we participate in any group/team 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, ACT.
- Cecil, N. (1995) The Art of Inquiry: questioning strategies for K-6 classrooms, Peguis, Canada.
- 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.
- De Bono, E. (1992) Six Thinking Hats for Schools, Books 1 & 2, Hawker Brownlow Educational.
- Hicks, D. (1996) Educating for the Future – a practical classroom guide, WWF.
- Hill, S. And Hill, T. (1990) The Collaborative Classroom, Eleanor Curtin, Melbourne.
- Stokes, C. & Howden, M. (2010) Adapting Agriculture to Climate Change. CSIRO Publishing, Victoria.
- Wilks, S. (1992) Critical and Creative Thinking: strategies for classroom enquiry, Eleanor Curtin, Melbourne.

## Websites (viewed January 2014)

### **Audacity**

<http://audacity.sourceforge.net>

### **Aussie Pig Farmers**

[www.aussiepigfarmers.com.au](http://www.aussiepigfarmers.com.au)  
[www.aussiepigfarmers.com.au/bigquestions](http://www.aussiepigfarmers.com.au/bigquestions)  
[www.aussiepigfarmers.com.au/types-of-farming/indoor-intensive-housing](http://www.aussiepigfarmers.com.au/types-of-farming/indoor-intensive-housing)  
[www.aussiepigfarmers.com.au/types-of-farming/barn-reared-eco-housing](http://www.aussiepigfarmers.com.au/types-of-farming/barn-reared-eco-housing)  
[www.aussiepigfarmers.com.au/types-of-farming/free-range](http://www.aussiepigfarmers.com.au/types-of-farming/free-range)  
[www.aussiepigfarmers.com.au/our-pigs](http://www.aussiepigfarmers.com.au/our-pigs)  
[www.aussiepigfarmers.com.au/looking-after-the-environment](http://www.aussiepigfarmers.com.au/looking-after-the-environment)

### **Australian Pork**

[www.australianpork.com.au](http://www.australianpork.com.au)

### **Australian Government Bureau of Meteorology**

[www.bom.gov.au/jsp/ncc/climate\\_averages/climate-classifications/index.jsp](http://www.bom.gov.au/jsp/ncc/climate_averages/climate-classifications/index.jsp)

### **Commonwealth of Australia Global Education Website**

[www.globaleducation.edu.au/verve/\\_resources/bibliography\\_frame.pdf](http://www.globaleducation.edu.au/verve/_resources/bibliography_frame.pdf)

### **CSIRO**

[www.csiro.au/multimedia/climate-adaptation-video](http://www.csiro.au/multimedia/climate-adaptation-video)  
[www.csiro.au/multimedia/adaptation-plan-for-agriculture](http://www.csiro.au/multimedia/adaptation-plan-for-agriculture)  
[www.csiro.au/multimedia/Adapting-agriculture-to-climate-change-how-to](http://www.csiro.au/multimedia/Adapting-agriculture-to-climate-change-how-to)

### **Glogster**

[www.glogster.com](http://www.glogster.com)

### **Google SketchUp**

<http://google-sketchup.en.softonic.com>

### **Microsoft Office**

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

### **Simple Mapper**

<http://simplemapper.org/?gclid=CLeDr8uA1bICFctDpgod6BsABg> or [http://www.globaleducation.edu.au/verve/\\_resources/webmap.pdf](http://www.globaleducation.edu.au/verve/_resources/webmap.pdf)

### **Slide Share**

[www.slideshare.net/slayas/storyboard-genre-ideas](http://www.slideshare.net/slayas/storyboard-genre-ideas)

### **The Garnaut Climate Change Review**

[www.garnautreview.org.au/index.htm](http://www.garnautreview.org.au/index.htm)

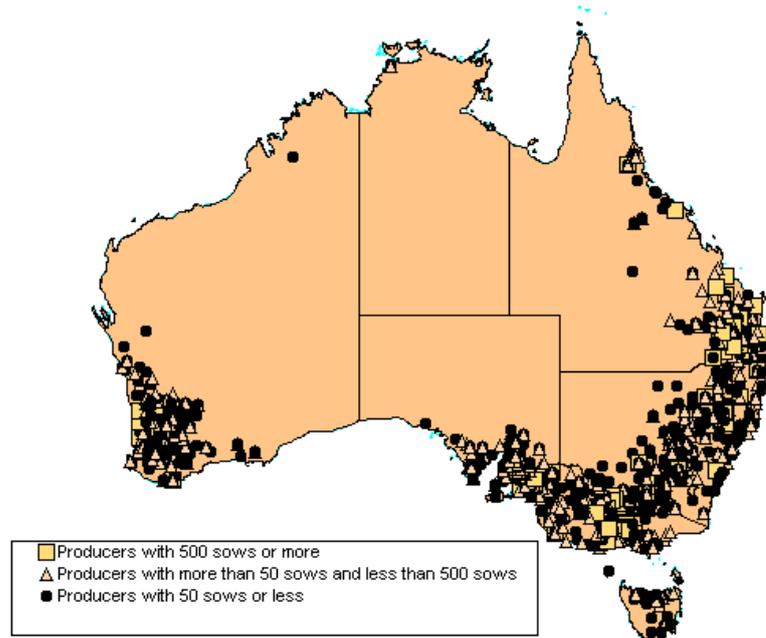
### **VoiceThread**

<http://voicethread.com>

# Resource pages

## Resource 1.1

### Pig production



Source: Australian Pork Limited

## Notes

## Resource 1.2

### Task sheet

Your task is to work in pairs to research five pig farms and report on the pig farms; how pigs are raised and housed; the use of technologies and science knowledge by farm families to house pigs and produce pork and, manage the farm; and the farm management practices utilised.

### Objectives

On conclusion of this research task, you should have demonstrated:

- An understanding of where pigs are raised/grown
- An understanding of how Australian pig farmers raise and house their animals in different ways
- An understanding of how different housing designs, systems and technologies are used to raise pigs
- An understanding of how the physical conditions of the farm environment and farm management practices used might impact on the production of pork
- Research skills that require finding, recording, selecting, presenting, analysing, evaluating and reporting secondary data on pig farming issues
- An understanding of the intrinsic value of healthy pigs, farmed in ethically appropriate ways and the value of the farm environment and the appropriate actions and strategies to sustain it in changing times.

### Overview

Using a range of websites including:

[www.aussiepigfarmers.com.au/types-of-farming/indoor-intensive-housing](http://www.aussiepigfarmers.com.au/types-of-farming/indoor-intensive-housing)

[www.aussiepigfarmers.com.au/types-of-farming/barn-reared-eco-housing](http://www.aussiepigfarmers.com.au/types-of-farming/barn-reared-eco-housing)

[www.aussiepigfarmers.com.au/types-of-farming/free-range](http://www.aussiepigfarmers.com.au/types-of-farming/free-range)

[www.aussiepigfarmers.com.au/our-pigs](http://www.aussiepigfarmers.com.au/our-pigs)

[www.aussiepigfarmers.com.au/looking-after-the-environment](http://www.aussiepigfarmers.com.au/looking-after-the-environment)

as a basis of your study, record and collect information about the pig farms, report on the animal welfare actions and types of sustainable farm management practices farmers use; the use of technologies and science knowledge and their farm management practices that manage resources on the farm sustainably.

You are also required to suggest ways to improve the farms practices or operations so that there might be a lesser impact on the environment and on the pigs in a changing climate.

You are encouraged to consider the positive, negative and interesting repercussions of these improvements.

## Part I: The five pig farms

Australia has a number of climatic zones. Using the Bureau of Meteorology Map of climate zones at [www.bom.gov.au/iwk/climate\\_zones/map\\_1.shtml](http://www.bom.gov.au/iwk/climate_zones/map_1.shtml) and the information below about the location of the farms featured in the videos consider whether there is a relationship between the climate of the area and pig farming in these areas.

Locations include:

Farm featured in 'Looking after the Environment' and 'Our pigs' videos is located north-east of Wagga Wagga in NSW.

Farm featured in the 'Indoor Housing' video is located north of Bendigo in VIC.

Farm featured in the 'Eco Housing' video is located north-west of Albury in NSW.

Farm featured in the 'Free range' video is located north of Inverell in NSW.

Consider additional questions like:

### Climate

- Where are these pig farms located?
- How might you describe the areas typical climate?
- What is the mean annual rainfall typically in these areas?
- Has rainfall increased or decreased over time in these areas?
- What are the average temperatures in these locations?
- Have temperatures increased or decreased on average over time?

### Geology and topology

Use Google Maps and research:

- How far these locations might be from a watercourse?
- What lakes, creeks and waterways are there nearby?
- Are these farms in hilly areas or a plain?

### Ecology

- What is the dominant ecosystem in the area? Grassland? Desert? Forest?
- What are the main plants and animals in the area?
- What purpose do they serve?

### Human activity

- Are the farms located near urban settings?
- What evidence is there of roads, railways, airports?
- Are there waste facilities nearby? Landfills? Resource Recovery Centres?

Record all information and remember to record all sources using a template like [www.globaleducation.edu.au/verve/resources/bibliography\\_frame.pdf](http://www.globaleducation.edu.au/verve/resources/bibliography_frame.pdf)

## Part 2: How pigs are raised and housed

Using the sites as the basis of your study, report on how the pigs are raised and housed.

Ask questions like:

- What is this pig farm and its pig housing type like?
- What is happening in this place?
- Could this place be anywhere else?
- How are pigs housed here?
- How are the pigs being affected by the methods of housing?
- How is this place affected by seasons or climate?
- How are people adapting the housing system to the seasons and changes being experienced?
- What changes to the housing system could science influence?
- What changes to the housing system could climate change influence?

### Site 1

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### Site 2

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**Site 3**

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**Site 4**

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**Site 5**

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### Part 3: Farm management practices

Collect information about the farm management practices being implemented at each site to raise and house pigs. Describe the farm management practices that have contributed to healthy pigs and healthy farms.

**Site 1**

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**Site 2**

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**Site 3**

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**Site 4**

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**Site 5**

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## Part 4: Changing times

Climate determines the growing conditions for all agriculture. Using the information gained so far, consider how a changing climate might impact on pig farming systems. It might involve changes to animal housing to protect stock from sun and heat, climate-controlled production sheds, utilizing water-based cooling mechanisms such as misting, redesigning buildings with passive heating and cooling or generating power onsite.

Suggest different practices, designs, systems that you think might be needed to adapt to changing times.

You might:

- Sketch and label a design
- Draft an idea for improved sustainability and reduced greenhouse gas emissions
- Test that idea and record your results.



## Resource 1.3

### 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 by the growing or production of a food or fibre source. 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 changes affecting how pigs are produced.



## Resource 1.4

### Plus, minus, interesting

What do you/your group think needs to change on Australian pig farms with regard to sustainable practices and why?

Use the Pluses, Minuses and Interesting/Implications (PMI) chart to evaluate any sustainability practices on pig farms, compare advantages and disadvantages, and make decisions. In the Pluses column enter all the positive elements, in the Minuses column enter all the negative elements and in the third column enter the issues and questions that arise from the ideas (Interesting) A scoring system can be added to this chart to inform decision-making.

| PLUS | MINUS | INTERESTING |
|------|-------|-------------|
|      |       |             |
|      |       |             |
|      |       |             |
|      |       |             |
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**Pork**<sup>™</sup>



**AUSTRALIAN PORK LIMITED**

ABN 83 092 783 728

Level 2, 2 Brisbane Avenue Barton ACT 2600  
PO Box 4746 Kingston ACT 2604 Australia

**P:** 02 6285 2200    **F:** 02 6285 2288

**E:** [apl@australianpork.com.au](mailto:apl@australianpork.com.au)

[www.australianpork.com.au](http://www.australianpork.com.au)