

Stage 6 Agriculture
Preliminary course

Farm case study:

Australian chicken meat

Teacher guide



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Stage 6 Agriculture –
Preliminary course

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Farm case study:
Australian chicken meat
Student learning resource

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This teacher guide complements the student learning resource that offers eight sections of study investigating different elements of Australian chicken meat production.

The student learning resource is tailored predominantly to students studying the Stage 6 Preliminary Agriculture course.

In this guide, teachers can access suggested answers to activities to support their teaching and student learning.

Designed with flexibility in mind, the student learning resource enables both teachers and students to navigate the distinct sections focused on Australian chicken meat production and the broader industry in either a collaborative or independent way.

The resource presents a versatile learning pathway; its adaptive design ensures that educators across different states and territories in Australia can integrate content into their respective curriculums.

The resource is adaptable to diverse year groups, allowing students to immerse themselves in the details of Australian chicken meat production and the expansive industry, regardless of their educational stage.

Students learn about the components of farm case studies by viewing media links, accessing secondary sources, completing questions and collaborating with peers.

Teachers have the versatility to either distribute individual sections in print, provide the entire learning resource as a cohesive unit, or facilitate online engagement through the resource's interactive, writable sections.

Australian Chicken Meat Federation

The Australian Chicken Meat Federation (ACMF) is the peak council for participants in the chicken meat industry in Australia. The ACMF represents all elements of the industry, including chicken growers and processors, at the national level.

The ACMF represents members in matters including animal health, biosecurity, food standards and safety, animal welfare, sustainability, workforce, trade, and a range of other areas affecting the Australian chicken industry.

Additionally, the ACMF advocates for effective and strategic policy and standard setting, and supports the chicken meat industry on existing and emerging issues, providing members with tools to build and grow their businesses so they remain competitive and profitable.



AgriFutures Australia

AgriFutures Australia is one of 15 Research and Development Corporations (RDCs) that service the research, development and extension (RD&E) needs of Australian rural industries.

AgriFutures Australia represents the research needs for 13 rural industries by investing in RD&E that delivers real returns to farmers and producers, so they can thrive into the future. The 13 industries are chicken meat, rice, honey bee and pollination, ginger, tea tree oil, pasture seeds, export fodder, thoroughbred horses, kangaroo, buffalo, deer, goat fibre and ratite.

AgriFutures Australia also develops and delivers programs that respond to the specific workforce and leadership needs of those working in the Australian agricultural sector.



Contents

This student learning resource contains eight sections of study that investigate different elements of Australian chicken meat production.

1. Overview of the main features of the enterprise

2. Management on the farm (calendar of operations)

3. Measures of performance

4. The supply chain

5. Sustainable practices

6. Marketing the product

7. Technology and innovation

8. The agricultural workplace

Objectives and outcomes

Students will develop:

- knowledge and understanding of the physical, chemical, biological, social, historical and economic factors that interact in agricultural production systems.
- knowledge, understanding and skills required to manage agricultural production systems in a socially and environmentally responsible manner.
- knowledge of, and skills in, decision making and the evaluation of technology and management techniques used in sustainable agricultural production and marketing.
- knowledge and understanding of the impact of innovation, ethics and current issues on Australian agricultural systems.

A student:

- P 1.1** describes the complex, dynamic and interactive nature of agricultural production systems.
- P 1.2** describes the factors that influence agricultural systems.
- P 2.3** describes the farm as a basic unit of production.
- P 3.1** describes the role of decision making in the management and marketing of agricultural products in response to consumer and market requirements.
- P 5.1** identifies the role of associated technologies and technological innovation in producing and marketing agricultural products.

Proposed success criteria

P 1.1 describes the complex, dynamic and interactive nature of chicken meat production systems

- Students can identify and explain the components of chicken meat production systems in Australia.
- Students can demonstrate an understanding of the interrelationships between different elements within the chicken meat system.

P 1.2 describes the factors that influence chicken meat systems

- Students can list and explain various factors that impact chicken meat systems in Australia.
- Students understand hazards in chicken meat production systems and how these are reduced or prevented to protect stakeholders.

P 2.3 describes the chicken meat farm as a basic unit of production

- Students can define what constitutes a chicken meat farm in terms of production in Australia.
- Students can explain the various processes and activities on a chicken meat farm.

P 3.1 describes the role of decision making in the management and marketing of chicken meat products in response to consumer and market requirements

- Students can identify factors to consider when making farm management decisions.
- Students can identify management practices used to address sustainability in the Australian industry.
- Students can identify factors used to market chicken meat products in Australia.
- Students can observe market trends in the Australian context.

P 5.1 identifies the role of associated technologies and technological innovation in producing and marketing chicken meat products

- Students can list various technologies used in the production and marketing of chicken meat products in Australia.
- Students can explain how technological innovations have improved or changed chicken meat production practices in Australia.
- Students can evaluate the potential benefits and challenges of integrating new technologies into Australian chicken meat systems.



1. Overview of the main features of the enterprise

The farm as a production unit

Enterprises of a farm:

Physical and biological resources of a farm:

- Observe, collect and record information on the physical and biological resources of the farm, including soil, climate, vegetation, topography, water and infrastructure.

Farm management

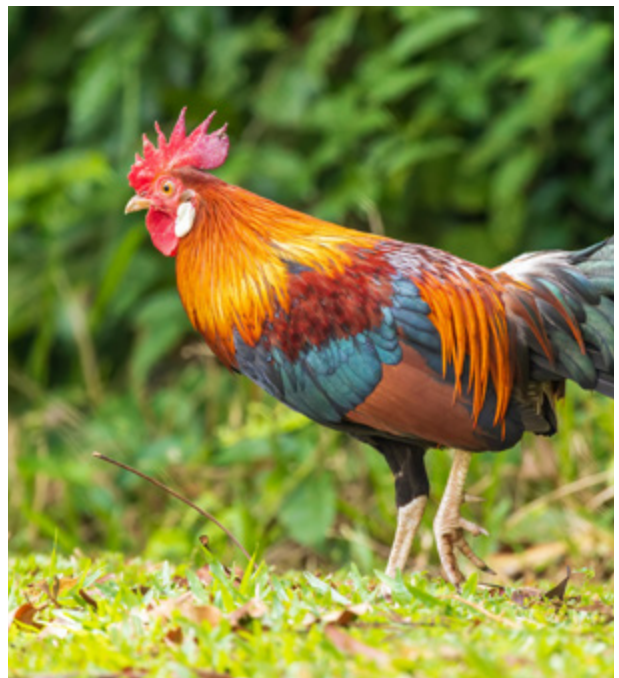
The impact of consumers on production:

- Describe the effect of demand and the role of consumer trends on farm production.

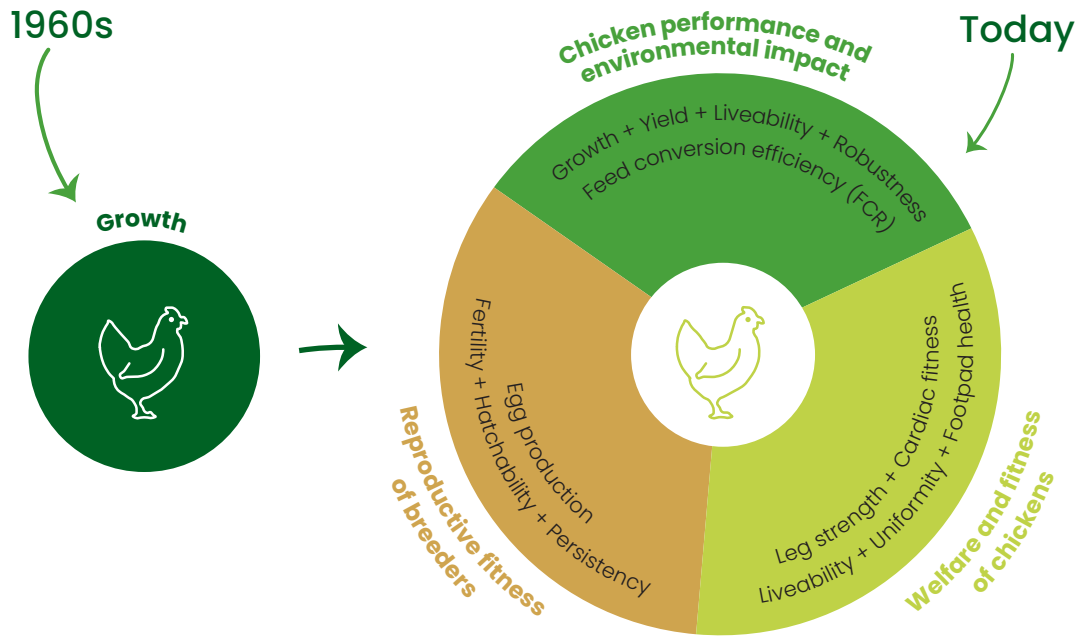
Genetic studies suggest chickens were initially domesticated about 8,000 years ago from a subspecies of red jungle fowl (*Gallus gallus*) found today in southwestern China, northern Thailand and Myanmar. By about 6000 BC, the Chinese were recorded as using chickens as a food source. Following their initial domestication, chickens were spread across South East and South Asia.

Domesticated chickens appeared in India by about 2000 BC and are thought to have spread from there to Africa soon after. This spread continued, mainly through the Iron Age, and chickens were taken through Russia across Europe. They also spread from China to Japan and Korea from about 300 BC to 300 AD.

Today's meat chicken, however, looks quite different from its wild ancestor – and quite different from modern laying chickens, which are bred specifically for egg production. The change in the focus of breeding programs has translated into real improvements in the health, fitness and robustness of today's modern meat chicken breeds.



A red jungle fowl in Thailand.

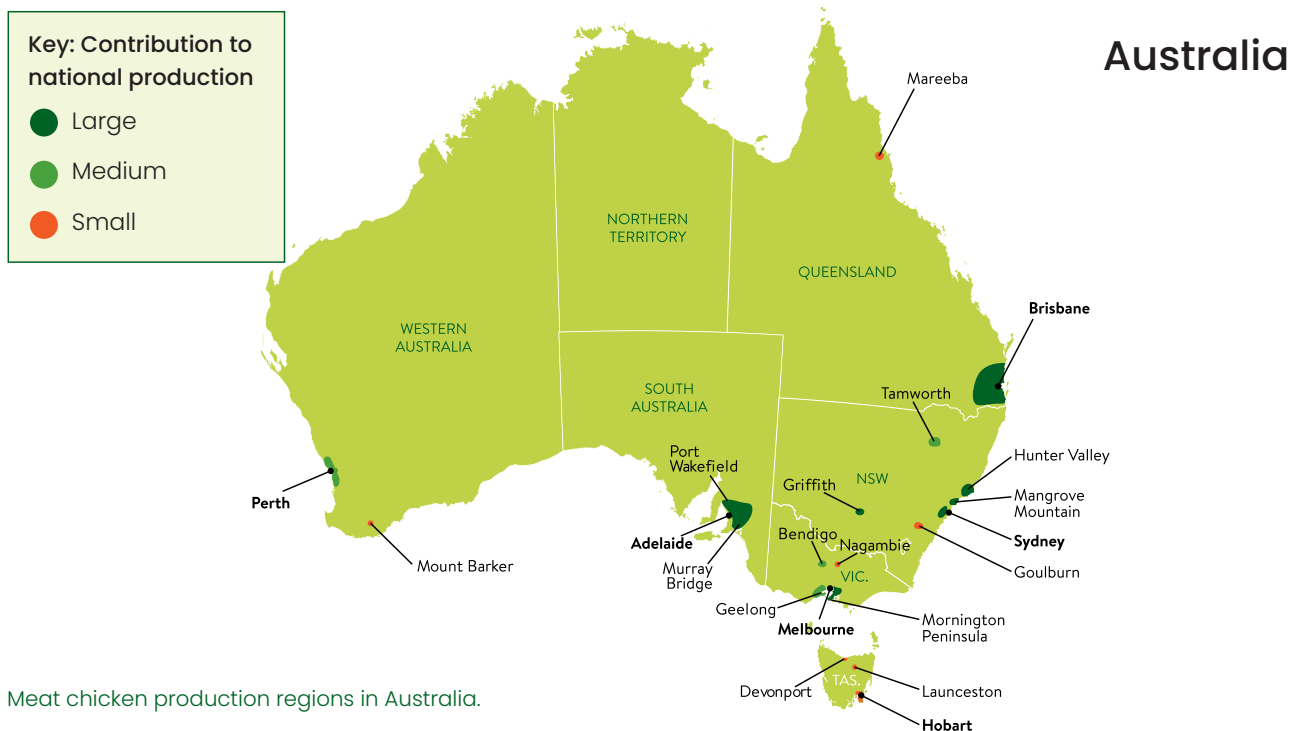


Evolution of breeding goals in the chicken meat industry.

In Australia, two hybrid meat chicken birds are mostly used: Ross and Cobb. To find out more about these strains, see:

- [Breeding success together](#) (Aviagen)
- [Genetic progress to help feed the world](#) (Cobb-Vantress)

There are currently more than 800 commercial meat chicken growers in Australia. Most grow chickens under contract to meat processing companies and are known as contract chicken growers; these producers grow 80% of Australia's meat chickens (Poultry Hub Australia, n.d.).



Meat chicken production regions in Australia.

The farm as a production unit

The Australian chicken meat industry is an important agricultural sector, contributing significantly to the economy and employment across various sectors, including farming, processing, transportation and retail. As the most consumed meat in the country, chicken meets the dietary preferences of many Australians, offering a healthy, versatile and affordable protein source.

Research conducted by AgriFutures Australia showed that the chicken meat industry contributes about \$7.9 billion to the Australian economy and generates 58,000 jobs (Henderson, 2020), with demand for chicken meat increasing by about 3% per year.

Environmentally, chicken farming boasts a smaller footprint than other livestock industries due to its efficient feed conversion and reduced land use. Chicken waste (manure) is a valuable by-product used as a fertiliser in crop farming, contributing to sustainable agriculture practices.

The industry is also at the forefront of innovation, with advanced breeding

programs and a focus on sustainable practices. Responding to consumer demands, there is growing emphasis on free range and organic farming, and the industry is making strides in transparency, addressing concerns about animal welfare and production methods.

A successful farm production system, such as that used by the Australian chicken meat industry, relies on effectively integrating various components. Two of these are the physical and biological resources.

Physical resources refer to the tangible assets and environmental factors utilised in agricultural operations. These resources are non-living and are essential for the infrastructure and functioning of the farm.

Biological resources are living entities or materials derived from living organisms utilised in agricultural operations. These resources play a role in the production, protection and enhancement of agricultural yield.



1.

Read the information below and complete the table by ticking whether each component is a physical or biological resource.

Soil

Soil quality can impact the growth of feed crops and the overall health of the farm environment. The soil on chicken meat farms should be well-draining to prevent waterlogging in outdoor areas. Proper waste management ensures that chicken manure, which is rich in nutrients, doesn't lead to soil or water contamination.

Climate

Temperature: Chickens have an optimal temperature range for growth. Too cold or too hot conditions can stress the birds, affecting growth rates and overall health.

Rainfall: Excessive rainfall can lead to muddy conditions, which can harm chicken health, especially if they have outdoor access. Proper drainage systems are essential.

Vegetation

Feed crops: Some chicken meat farms might grow their feed crops, like wheat or soybeans. The quality of these crops directly impacts the chickens' health, growth and production quality (specifications).

Natural vegetation: Farms practising free range or organic poultry farming might have paddocks with natural vegetation for chickens to forage, promoting natural behaviours.

Topography

Land slope: The slope of the land can affect drainage. Elevated areas are preferred for building chicken sheds and infrastructure to prevent waterlogging.

Land use: Flat areas might be used for building infrastructure, while slightly sloped areas can be used for free range activities or growing feed crops.

Water

Quality: Clean water is crucial for chicken health. Water sources should be free from contaminants.

Sources: Farms might rely on boreholes, dams or municipal water. Rainwater harvesting can also be an additional or primary source.

Usage: Apart from drinking, water is used for cleaning chicken houses and, in some cases, cooling systems in controlled environments.

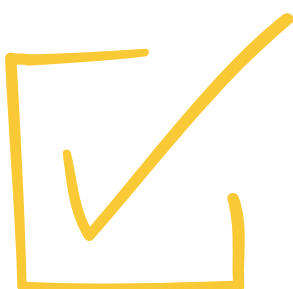
Infrastructure

Chicken sheds: These can range from open-sided sheds to fully controlled environments with temperature and humidity control. Shed technology significantly contributes to producing a consistent number of quality animals for consumption.

Feed and water systems: Automated systems ensure consistent feed and water supply to the chickens.

Waste management

Proper infrastructure for handling and processing chicken waste (manure) is essential. This can be used as a fertiliser or sold as a by-product.



Factor	<input checked="" type="checkbox"/> Physical resource?	<input checked="" type="checkbox"/> Biological resource?
Soil		
Temperature		
Rainfall		
Feed crops		
Natural vegetation		
Land slope		
Land use		
Water quality		
Water source		
Water usage		
Chicken sheds		
Feed and water systems		
Waste management		

2.

Read the following information about the components of an Australian chicken meat production system. Highlight the important components.

The Australian chicken meat industry, like many agricultural systems, is complex and involves numerous interactions and feedback loops. These definitions and examples provide a basic understanding of the components and dynamics of a system.

Agricultural system

Definition: An agricultural system is a set of interconnected components or units that together produce agricultural products through a series of processes.

Example: The entire chicken meat production process in Australia, from breeding to processing and distribution.

Inputs

Definition: Inputs are the resources or materials used in the production process.

Example: Feed, water, day-old chicks, electricity, labour and equipment.

Outputs

Definition: Outputs are the products or results of the production process.

Example: Processed chicken meat, chicken by-products (feathers and manure), and waste.

Boundaries

Definition: Boundaries define the system's limits or restrictions.

Example: The boundary of a chicken farm might be the physical limits of the property, its finances, or the knowledge and skills of the employees.

Subsystems

Definition: Subsystems are smaller systems within the larger agricultural system, each with its own inputs, processes and outputs.

Example: Components of a subsystem include:

Resources: Inputs like feed, water, electricity, equipment and infrastructure.

Plants: While a chicken meat farm primarily focuses on poultry, plants play a role in feed crops like soybeans and grains.

Animals: This primarily refers to the chickens but can also include other animals on the farm, such as pest-controlling birds or animals.

Microbes: These are the bacteria and other microorganisms that play roles in digestion, disease and waste decomposition.

Management: This encompasses the strategies, decisions and actions taken by the farm's operators to ensure efficient and profitable operations.

Processes

Definition: Processes are the series of actions or steps to achieve a particular end.

Example: Feeding, vaccination, temperature control and slaughtering are processes within the chicken meat production system.

Interactions

Definition: Interactions refer to the relationships and exchanges between components or subsystems.

Example: The quality of feed (input) can affect the growth rate of chickens (process) and the quality of the meat produced (output).

Feedback

Definition: Feedback is information about the output of a system that can be used to make adjustments to the system.

Example: If processed chicken meat is found to have a high fat content, this feedback might lead to changes in the feed composition or feeding processes.

Monitoring

Definition: Monitoring is the regular observation and recording of activities taking place in a system to ensure it operates efficiently.

Example: Regular health checks and weight measurements of chickens to ensure they grow at the desired rate and are disease-free.

These components are linked together in the production systems. A method of representing the connections can be shown by creating a systems diagram.



3.

Using the information below and the content from (1), create a systems diagram showing the relationship between some subsystems on a farm.

Write the following headings inside the boxes: Resources, Animals, Plants, Microbes and Invertebrates, and Management. On each of the arrowed lines write an interaction between the two components.

Examples of subsystems on an Australian chicken meat farm include:

Resources and Plants: Feed crops require water, sunlight and soil nutrients. Equipment, such as tractors or harvesters, might be used to plant, maintain and harvest these crops.

Resources and Animals: Chickens need feed and water daily. Infrastructure like chicken coops or sheds provide shelter and controlled environments for the chickens. Electricity might be used for heating, lighting and automated feeding systems.

Animals and Microbes: Chickens have gut microbes that help them digest food. Harmful microbes can cause diseases, so biosecurity measures are essential. Beneficial microbes can be introduced to poultry through probiotics to enhance gut health.

Plants and Microbes: Soil microbes help break down organic matter, making nutrients available to feed crops. Some microbes can act as pathogens to plants, necessitating pest management.

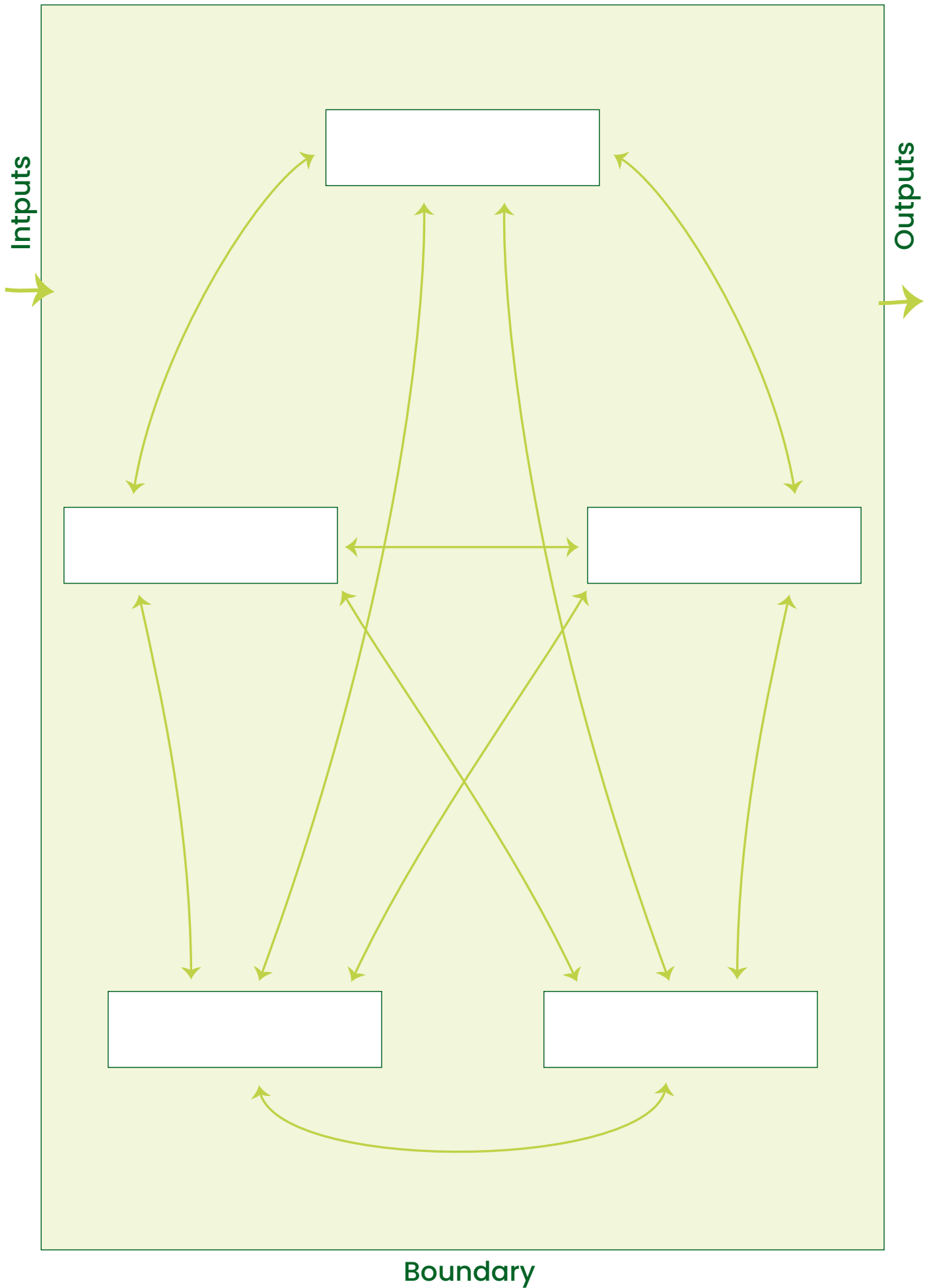
Management and Resources: Farm managers decide on the allocation and use of resources. Decisions about purchasing equipment, expanding infrastructure or investing in renewable energy sources fall under management.

Management and Animals: Decisions about breeding, culling, health interventions and selling are made by farm managers. Management strategies can influence the growth rate, health and overall yield of chickens.

Management and Microbes: Biosecurity measures, such as disinfection protocols, are implemented to control harmful microbes. Vaccination schedules might be decided based on microbial challenges.

Management and Plants: Decisions about which feed crops to grow, when to harvest and how to store them are made by farm managers. Pest and disease management in crops is also a managerial responsibility.







Click the link or use the QR code to view the video. Answer the questions below.



[This is Aussie Ag: Higher Animal Welfare in Meat Chickens – Humans of Agriculture \(21:18\)](#)

4.1 How much chicken does an average Australian consume annually?

4.2 Why did the RSPCA invite the creators to visit chicken farms?

4.3 What common myth about chicken farming has been debunked?

4.4 Approximately how many birds are housed in each shed at Inghams farm?

4.5 At what age do chickens have access to the entire shed?

4.6 Describe some indicators of a happy and healthy bird.

4.7 Why are daily inspections important in chicken farming?

4.8 Explain the balance producers aim to achieve regarding food production.

4.9 How does Inghams ensure compliance with the RSPCA's standards?

4.10 Describe RSPCA's mission in relation to animal welfare.

4.11 Why it is important to maintain good indoor conditions for chickens?

4.12 What are some challenges of entirely free range farming?

4.13 What was the main objective of the team's visit to Olympic Farms?

4.14 What is unique about the Hubbard birds introduced at Olympic Farm?

4.15 How does Daniel Blakemore, the manager of Olympic Farm, start his day?

4.16 Why is it important for chickens to access outdoors in a free range system?

4.17 How does Baiada prioritise animal welfare in its production?

4.18 Identify the factors that influenced the introduction of Hubbard birds in Australia.



4.19 How do consumer preferences impact the taste and texture of chicken meat?

4.20 Why is collaboration important in the chicken industry supply chain?

4.21 What are the benefits and challenges of indoor conditions vs free range for chickens?

4.22 How does Coles approach product offerings in relation to chicken?

4.23 Why is feedback important in supply chain dynamics?

4.24 What is the significance of offering diverse farming systems in poultry?

5.

The table below summarises the definitions and examples of physical and biological resources on a farm.

Using the information you have learned from questions 1-4, complete the following table by providing three examples of physical and biological resources that can be viewed in the video segment.

	Physical resources	Biological resources
Definition	Physical resources refer to the tangible assets and environmental factors utilised in agricultural operations. These resources are non-living and are essential for the infrastructure and functioning of the farm.	Biological resources are living entities or materials derived from living organisms utilised in agricultural operations. These play a role in the production, protection, and enhancement of agricultural yield.
Examples	<p>Land: The ground or terrain where crops are grown or animals are raised.</p> <p>Water: Rivers, dams, tanks or boreholes provide water for irrigation, livestock and other farm operations.</p> <p>Climate: The weather conditions, including rainfall, temperature and sunlight, that influence crop growth and animal wellbeing. This may be a controlled environment in a chicken production system.</p> <p>Buildings and infrastructure: This includes sheds, storage facilities and other structures.</p> <p>Machinery and equipment: Tractors, harvesters and other tools used for various farming activities.</p> <p>Energy: This can be electricity from the grid or renewable energy sources, such as solar panels, or fuel for machinery.</p>	<p>Crops: The plants that are cultivated for food, fibre, medicinal purposes or other uses.</p> <p>Livestock: Animals raised for meat, milk, wool or other products.</p> <p>Soil microorganisms: Beneficial bacteria, fungi and other microbes that enhance soil fertility and assist in breaking down organic matter.</p> <p>Beneficial insects: Insects like bees, which aid in pollination, or ladybugs, which act as a natural predator to harmful pests.</p> <p>Seeds: Used for planting and propagating crops.</p> <p>Biopesticides: Natural agents, such as certain bacteria or fungi, used to control pests.</p> <p>Genetic material: This can be improved seed varieties or breeds developed for better yield, disease resistance or other desirable traits.</p>
Example 1		
Example 2		
Example 3		

Answers

Question 1

Factor	<input checked="" type="checkbox"/> Physical resource?	<input checked="" type="checkbox"/> Biological resource?
Soil	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Temperature	<input checked="" type="checkbox"/>	
Rainfall	<input checked="" type="checkbox"/>	
Feed crops		<input checked="" type="checkbox"/>
Natural vegetation		<input checked="" type="checkbox"/>
Land slope	<input checked="" type="checkbox"/>	
Land use	<input checked="" type="checkbox"/>	
Water quality	<input checked="" type="checkbox"/>	
Water source	<input checked="" type="checkbox"/>	
Water usage	<input checked="" type="checkbox"/>	
Chicken sheds	<input checked="" type="checkbox"/>	
Feed and water systems	<input checked="" type="checkbox"/>	
Waste management	<input checked="" type="checkbox"/>	

Question 2

Not applicable to the activity.

Question 3

Examples of answers are provided.

Examples of subsystems on an Australian chicken meat farm include:

Resources and Plants: Feed crops require water, sunlight and soil nutrients. Equipment, such as tractors or harvesters, might be used to plant, maintain and harvest these crops.

Resources and Animals: Chickens need feed and water daily. Infrastructure like

chicken coops or sheds provide shelter and controlled environments for the chickens. Electricity might be used for heating, lighting and automated feeding systems.

Animals and Microbes: Chickens have gut microbes that help them digest food. Harmful microbes can cause diseases, so biosecurity measures are essential. Beneficial microbes can be introduced to poultry through probiotics to enhance gut health.

Plants and Microbes: Soil microbes help break down organic matter, making nutrients available to feed crops. Some microbes can act as pathogens to plants, necessitating pest management.

Management and Resources: Farm managers decide on the allocation and use of resources. Decisions about purchasing equipment, expanding infrastructure or investing in renewable energy sources fall under management.

Management and Animals: Decisions about breeding, culling, health interventions

and selling are made by farm managers. Management strategies can influence the growth rate, health and overall yield of chickens.

Management and Microbes: Biosecurity measures, such as disinfection protocols, are implemented to control harmful microbes. Vaccination schedules might be decided based on microbial challenges.

Management and Plants: Decisions about which feed crops to grow, when to harvest and how to store them are made by farm managers. Pest and disease management in crops is also a managerial responsibility.

Question 4

- 4.1 Nearly 50 kilograms of chicken every year.
- 4.2 To visit free range and barn-raised chicken farms to give viewers an understanding of the processes and standards involved in chicken farming.
- 4.3 That chickens are given added hormones in their production.
- 4.4 Each shed at Inghams' farm houses about 40,000 birds.
- 4.5 After 14 days.
- 4.6 Active movement, alertness and showing signs of contentment.
- 4.7 To promptly identify and address any health concerns in the birds.
- 4.8 Providing affordable and consistent food while ensuring the highest animal welfare standards.
- 4.9 Regular audits, both announced and unannounced.
- 4.10 To push for incremental change in animal welfare, working closely with producers to improve the lives of as many animals as possible.
- 4.11 Good indoor conditions are essential as chickens spend a significant portion of their lives inside, ensuring their comfort, health and overall wellbeing.
- 4.12 Biosecurity risks and the need to feed a growing population sustainably.
- 4.13 To explore a different chicken farm and understand the similarities and differences between various farming methods.
- 4.14 A new slow-growing breed in Australia that grows 30% slower than other breeds. They reach their final weight in 60 days.
- 4.15 By opening up the range doors to let the birds out.
- 4.16 Let them engage in natural behaviours like frolicking, eating bugs and enjoying the sun, contributing to their welfare.
- 4.17 By committing to high standards, introducing breeds like the Hubbard birds that grow slower, and ensuring the wellbeing of the birds throughout their lifecycle.
- 4.18 Market demand and consumer preferences.

- 4.19 Consumer preferences can influence the breeds and farming methods used.
- 4.20 Ensures all stakeholders, from farmers to supermarkets, work together to meet consumer demands while maintaining high animal welfare standards.
- 4.21 Indoor conditions provide a controlled environment, ensuring optimal temperature, protection from predators and biosecurity. Free range allows chickens to exhibit natural behaviours. However, it may pose biosecurity risks and challenges in maintaining consistent conditions.
- 4.22 Coles is consumer-led and constantly seeks customer feedback, offering a range of chicken products to cater to different preferences (price, quality, farming type).
- 4.23 Ensures that the supply chain is responsive to consumer needs and preferences, allowing for adjustments and improvements to product offerings.
- 4.24 Ensures the industry can sustainably support a growing consumer base while catering to various preferences regarding animal welfare and production methods.

Question 5

Physical resource	Biological resource
Chicken sheds	Free range chickens
Personal protection equipment	Barn-raised chickens
Water	40,000 birds
Technology (automation, climate controls etc.)	Feed (from plant material)
Building and infrastructure needed for free range and barn systems	Animal genetics/genetic potential
	Microbes in systems
	Invertebrates in free range system

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2. Management on the farm

(calendar of operations)



Farm management

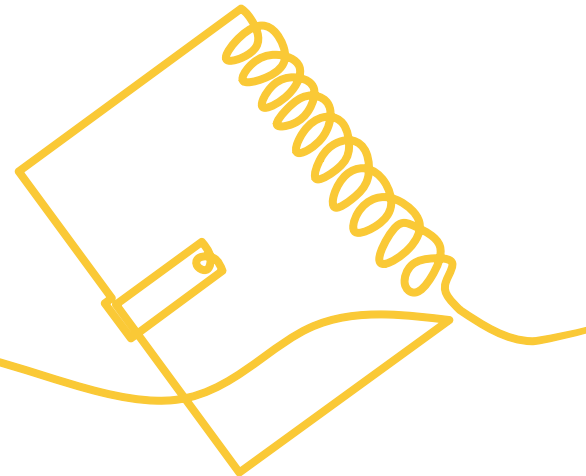
The role of the farm manager:

- Construct a calendar of operations for an enterprise production cycle.
- Identify problems associated with production on the farm.

Decisions made by the farm manager:

- Suggest factors a farmer considers when making farm management decisions.

A calendar of operations provides a structured framework for managing various aspects of chicken meat farming in a production cycle. It aids in planning, decision making, productivity optimisation and ensuring regulatory compliance, ultimately contributing to the overall success and efficiency of the farm.



Click the link or use the QR code to view the video to observe how chicken producers Sue and Andy manage their farm and daily tasks during a typical production cycle.



[A day in the life of a chicken meat farmer – Australian Chicken Meat Federation \(8:26\)](#)

2.

Read and highlight the text below, exploring the changes occurring to chickens on a commercial chicken farm each week as they grow, the key decisions made by farm managers and their workers, and the tasks they undertake each week during the production cycle.

Use different coloured highlighters to identify specific information. Choose one colour for the changes occurring to the animals and their changing needs, and another for the activities of the people on the farm.

The process of raising and processing meat chickens in Australia involves several stages and various activities to be carried out on farms to ensure the health, welfare and growth of the chickens for a successful production cycle. The farmer or farm manager plays a pivotal role in ensuring the conditions the chickens experience are optimal. They oversee and manage various aspects of the farm to ensure efficient and profitable chicken meat production.

Commercial chicken farming is dynamic; the chickens' needs and the workers' activities change each week as part of the production cycle.

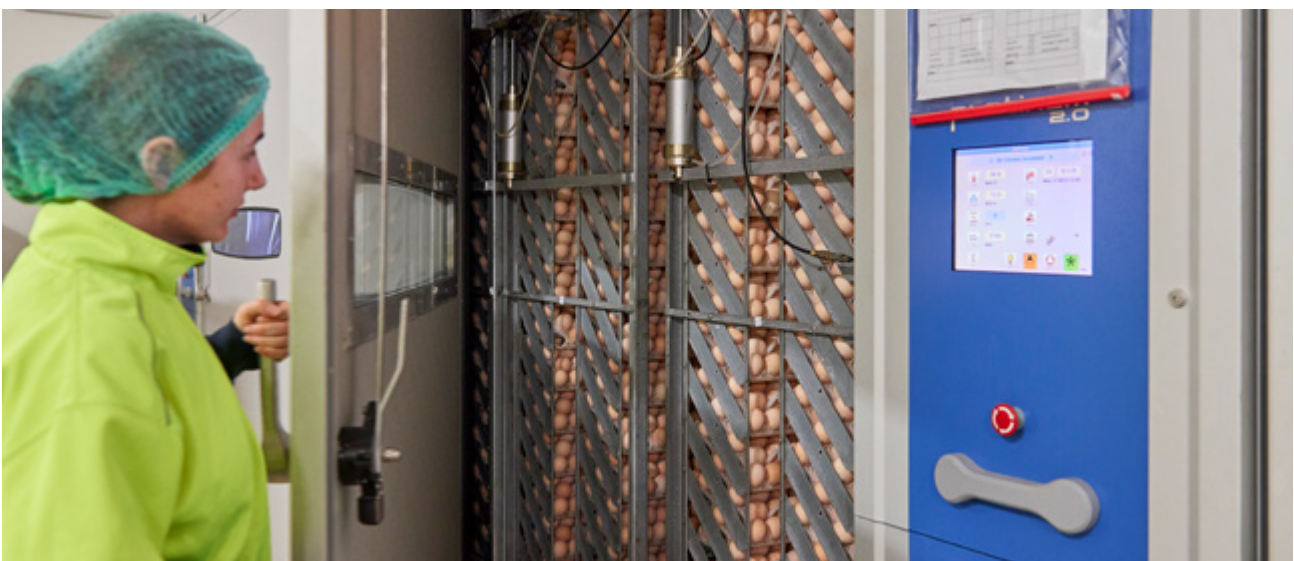
Note that the number of days of chicken development can vary slightly depending on the breed, management practices on the farm and market requirements.

Prior to the arrival of chicks on rearing farms

Fertile eggs from breeder farms are sent to a hatchery, where they are placed in racks on shelves, sprayed to kill any bacteria or viruses on the eggshell (if they haven't already been fumigated at the farm), and held in a cooled storage room until incubation.

Incubation doesn't need to commence immediately, and fertile eggs can be held in storage, usually for no more than a week, before entering the incubation process. This allows hatching to be planned to meet future day-old chick needs.

Incubation lasts 21 days and mimics the natural conditions a hen would provide for the proper development of the chicken embryo inside the egg.



Preparation of the barn (week prior to the arrival of chicks)

Before the scheduled arrival of a new batch of day-old chicks on their farm from the hatchery, farm workers have a number of tasks or operations to carry out in preparation. These include:

- Cleaning the barn and all equipment, including feeding pans and drinking systems.
- Spreading a layer of bedding material (litter), such as sawdust, wood shavings or rice hulls, across the entire barn floor.
- Dropping feeders and waterers to the correct height for baby chicks.
- Checking all feed and water systems to ensure they are functioning correctly and not leaking.
- Preheating the barn to the correct temperature for baby chicks – a minimum of 32 °C. It's important that not just the air in the barn has been heated to the correct temperature – there must have been sufficient pre-heating time to allow the bedding material/litter to warm up.
- Putting down 'chick paper' underneath feeders, where a small amount of feed is spread. This facilitates chicks to find food as quickly as possible after arrival.



Hatching (day 0)

After hatching, chicks are graded and checked to confirm they are fit enough to go to the farm. They may be vaccinated for diseases, such as infectious bronchitis, Newcastle disease and Marek's disease.

The chicks are counted and transported from the hatchery to meat chicken farms, usually in ventilated chick boxes in specially designed, air-conditioned trucks.

Although the remains of the yolk sac that is absorbed into the chick's abdomen at hatching contain sufficient nutrients and moisture to sustain the chick for at least 72 hours, it is important that chicks stay warm and receive feed and water as soon as possible after hatching.



Brooding or starting phase (days 0-14)

Day-old chicks are delivered to the farm, unloaded in their chick trays or boxes from the delivery truck, and placed in a barn with a controlled temperature, ventilation and lighting.

They may initially be confined to a smaller section of the barn (the 'brooding area'), which is one-quarter to one-third of the entire floor area. This assists in providing supplementary heating from gas heaters or heat lamps. Extra feed pans and water dispensers are provided in the brooding area, and bedding may be partly covered with paper to stop dropped feed from getting into bedding and spoiling.

Both male and female chicks are reared as meat chickens, and are typically grown together in the same barn.

Chicks are provided with clean water and starter feed. During the first 24 hours on the farm, husbandry checks are performed every few hours.

Chicks are monitored and inspected regularly by observing their behaviour to ensure they are comfortable and are eating, drinking and behaving normally. Any chicks that have died are removed, and ventilation and temperature are monitored to ensure optimum conditions.

Shed temperature, humidity, air quality and moisture levels in the litter are managed by altering ventilation.

The brooding period typically lasts for about two weeks, during which chicks are closely monitored, and their health and growth are managed.

As the chickens grow, they need less heat to keep warm, so the temperature of the barn is gradually lowered by about 0.5 °C each day after the first two days until it reaches 21-23 °C at 21 days. The farmer aims to maintain barn temperatures within this range.

On free range farms, farm managers make the decision to allow chickens access to the range during the day when they are fully feathered.

Growing and finishing phase (days 15 to 30-65)

Chickens continue to be provided with ample water and fed a balanced diet that supports their rapid growth.

Farmers check feeders and drinkers to ensure they are functioning correctly and not leaking.

Shed temperature, humidity, air quality, and moisture levels in the litter are managed by altering ventilation.

Throughout the rearing period, the farmer checks their flocks regularly to monitor health and progress, remove any dead birds, and cull any severely sick or injured birds so they do not suffer. The farmer records the chickens' health, growth and behaviour so that any emerging disease or other problem can be identified rapidly and acted upon.

Monitoring and management practices focus on feed consumption, weight gain and overall flock health.

As the chickens approach market weight, they enter the finishing stage. Feed rations may be adjusted to optimise growth and meat quality. Finisher rations are fed to chickens.

This stage can vary in duration depending on market requirements, with some chickens reaching processing weight at about day 49, while others may take longer.



Harvesting (days 30–65)

In Australia, it is usual practice for a percentage of chickens to be harvested for processing on several occasions. This practice is called 'thinning out' – sometimes 'partial depopulation' or 'multiple pick-ups' – and may be done up to five times depending on the chicken company's market requirements for different-sized chickens. Thinning out barns allows more space for the remaining birds and helps manage optimal barn temperature and air and litter quality. The first harvest might occur as early as 30–35 days and the last at 55–65 days.

Chickens are often harvested at night as it is cooler and the birds are more settled. They are generally picked up by specialised contract 'pick-up' crews under low lighting conditions so that they are calm and easy to handle.

Chickens are usually caught by hand and placed into plastic crates or aluminium modules designed for good ventilation and protection from bruising during transport.

The crates they are collected into are then handled by forklift equipment and loaded onto trucks for transport to the processing plant.

Processing (days 30–65)

Once the chickens have reached the desired market weight, they are ready for processing.

On the day of processing, the chickens are humanely slaughtered and prepared for distribution and sale.

Processing can occur at an on-farm facility or a dedicated processing plant.

Cleaning of the barn (the week following removal of chickens)

When all the chickens have been removed from the barn, it is cleaned and prepared for the next flock of chickens.

The next flock generally arrives in one to two weeks, allowing downtime in which the barn can be cleaned and prepared for the next flock. The break between consecutive flocks also reduces the risk of common ailments being passed between flocks as many pathogens die off.

Many farms undertake a full cleanout of the barn after every flock. This includes removing used bedding (referred to as litter), brushing floors, scrubbing feed pans, cleaning out water lines, scrubbing fan blades and other equipment, and checking rodent bait stations. The floor bases are usually rammed earth or cement, and because low water volumes are used, there is little water runoff.

On other farms, a partial cleanout of the barn is done after each flock, which might include treating the old bedding by partial composting before re-spreading and/or topping up fresh bedding material, and cleaning and sanitising equipment. In such cases, a full cleanout is done after every second or third flock of chickens.

The barn is often disinfected after cleaning, using low volumes of disinfectant, which is sprayed throughout.

An insecticidal treatment may be applied in areas where insects, such as beetles, are a problem and could threaten the next flock. Disinfectants and insecticidal treatments must be approved by the Australian Pesticides and Veterinary Medicines Authority as safe and fit for use in chicken barns.

3.

Use the information in the video and the highlighted text to complete a calendar of operations for a typical chicken meat farm production cycle.

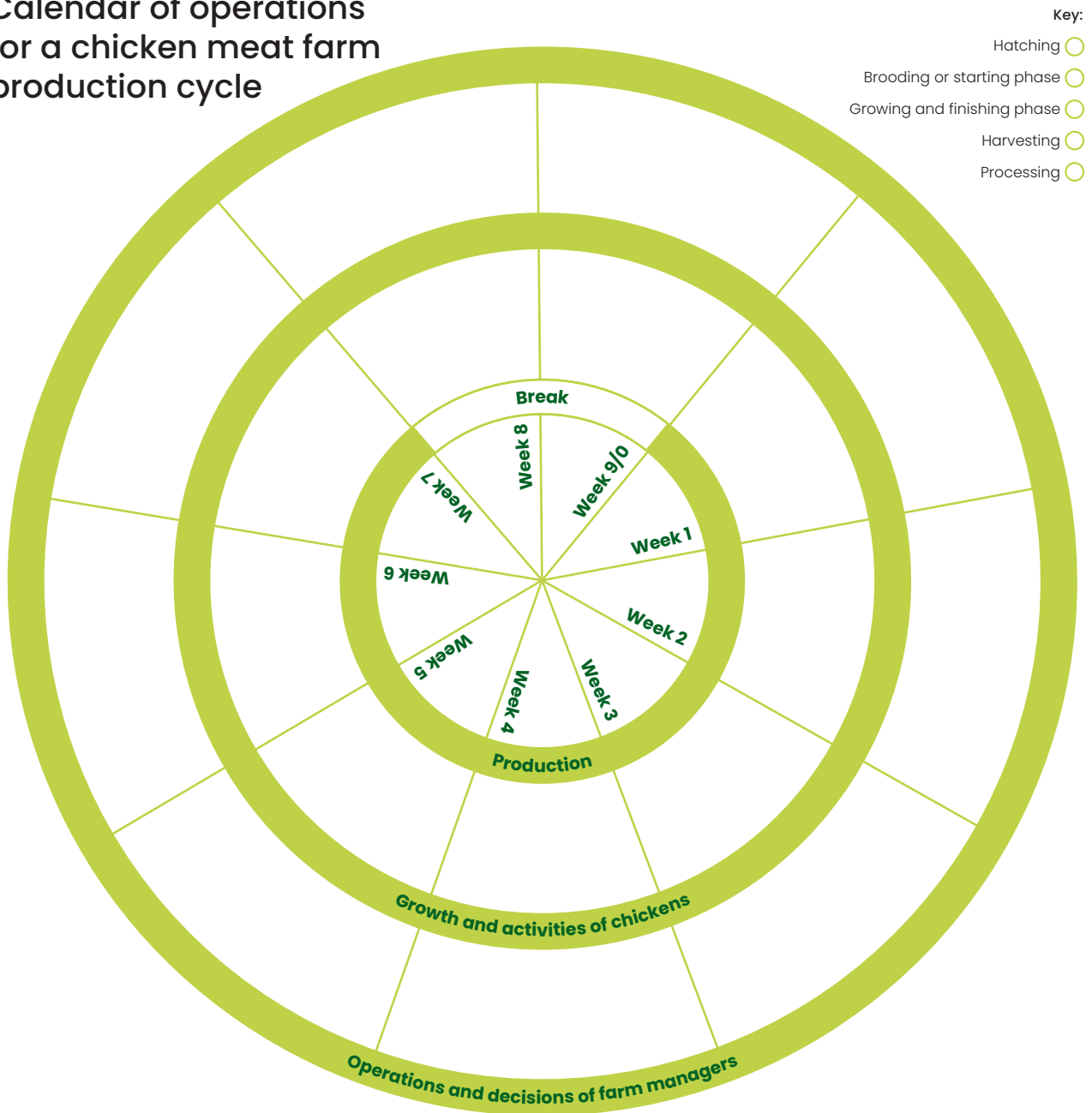
Use the template below to draw a calendar of operations on A3 or butcher's paper. Write the changes occurring to the animals as they grow and their changing needs in the inner segments. Write the operations carried out by the workers on the farm in the outer segments.

Note that the number of days of chicken development can vary slightly depending on the specific breed, management practices

on the farm and market requirements. For this activity, assume the chickens are kept on farm for seven weeks before processing, with a two-week break between production cycles.

Often, a calendar of operations for a farm outlines the processes and procedures that occur on the farm over a calendar year, i.e. 12 months.

Calendar of operations for a chicken meat farm production cycle



4.

Discuss whether it would be suitable to utilise a traditional calendar of operations for Australian chicken meat farms with the operations divided into months and seasons. Justify your answer.





Work in pairs to develop a series of questions (at least one per week of the production cycle) that the producer would ask themselves or other workers before deciding whether or not to undertake a certain course of action.

For example: Week 0 — Question: Is the temperature of the shed and litter or bedding 32 °C?

Course of action: If yes, the decision would be made that the shed is suitable for the arrival of day-old chicks, and they could be delivered and released into the shed. If no, the decision would be made that the shed is not suitable for the arrival of day-old chicks, and they must only be delivered and released into the shed once the temperature is correct.

Week 1

Question:

Course of action:

Week 2

Question:

Course of action:

Week 3

Question:

Course of action:

Week 4

Question:

Course of action:

Week 5

Question:

Course of action:

Week 6

Question:

Course of action:

Week 7

Question:

Course of action:

Week 8

Question:

Course of action:

Week 9

Question:

Course of action:

6.

Consider problems that may impact the productivity of chicken farms, such as disease, feed contamination or water contamination, and when they might occur. Using sticky notes as 'flags', label the calendar of operations with problems that might occur during the production cycle and how they can be managed.



7.

Use the link to view the interactive simulator. Read the instructions and study the three graphs at the bottom of the page. Adjust the temperature, lighting and crude protein levels for a chicken at each week of development to obtain optimum conditions for the growth and welfare of meat chickens.



[Chicken Growth Simulator – Poultry Hub Australia](#)

Answers

Question 1

Not applicable to the activity.

Question 3

Week 0/9

Key: Hatching

Production: Fertile eggs from breeder farms are incubated in hatcheries.

Growth and activities of chickens: Chicks are developing inside eggs.

Operations and decisions of farm managers:

Farm managers oversee barn preparation, ensuring that cleaning and maintenance are carried out and that proper temperature, feed and water systems are available to support the chicks' immediate needs upon arrival.

Week 1 and 2

Key: Brooding or starting phase

Production: After hatching, chicks are graded, checked for health, vaccinated and transported in ventilated, air-conditioned trucks from hatcheries to meat chicken farms.

Growth and activities of chickens:

Day-old chicks are placed in a controlled barn environment with proper temperature, ventilation and lighting. They receive clean water and starter feed, and are monitored closely. Chicks are growing rapidly and develop feathers.

Operations and decisions of farm managers:

Farm managers oversee the chicks' health and growth, adjust barn conditions for optimal temperature and air quality, and decide when to allow free-range access (on a free-range farm) as chickens become fully feathered.

Question 2

Not applicable to the activity.

Week 3 to 6

Key: Growing and finishing phase

Production: Chickens are provided with water and a balanced diet to support rapid growth, with feed rations adjusted as they approach market weight to optimise growth and meat quality.

Growth and activities of chickens:

Chickens grow rapidly, moving around, feeding and drinking water in a controlled environment to meet their needs. Chickens on a free-range farm access the range when fully feathered.

Operations and decisions of farm managers:

Farm managers regularly check flock health, record data on growth and behaviour, adjust feed rations as chickens near market weight, and manage environmental conditions to ensure optimal rearing conditions.

Week 7

Key: Harvesting and processing

Production: Chickens are harvested multiple times (thinning out) to meet market requirements for different-sized chickens. Chickens are humanely slaughtered and prepared for distribution and sale.

Growth and activities of chickens:

Thinning out allows more space for remaining birds, helping to maintain optimal temperature, air quality and litter quality in the barn.

Operations and decisions of farm managers:

Farm managers coordinate the thinning out process, typically performed by specialised crews at night, to ensure chickens are calmly and efficiently transported to processing plants.

Week 8

Production: After the chickens are removed, the barn is cleaned and prepared for the next flock, which typically arrives in one to two weeks, to reduce the risk of disease.

Growth and activities of chickens: N/A

Operations and decisions of farm managers:

Farm managers oversee the cleaning and disinfection process, ensure proper disinfectant and insecticidal treatment application, and manage downtime between flocks for optimal biosecurity.

Question 4

It would not be suitable to determine a traditional calendar of operations with the operations on a chicken meat farm divided into months and seasons. This is because there are a number of production cycles that a chicken farm is able to facilitate in a year, and these are not based on the seasons like some other animal production cycles. Producers can stagger production through numerous sheds and use technology to control the climate of each shed so that Australia’s seasonal conditions do not impact chickens.

Question 5

Answers will vary. For example:

Week 0

Question: Is the temperature of the shed and litter or bedding 32 °C?

Course of action: If yes, the decision would be made that the shed is suitable for the arrival of day-old chicks, and they could be delivered and released into the shed.

If not, the decision would be made that the shed is not suitable for the arrival of day-old chicks, and they must only be delivered and released into the shed once the temperature is correct.

Question 6

The calendar of operations may be labelled with some of the following:

Potential problems that may occur	When in the production cycle the potential problem might occur	Impact of the potential problem	How the potential problem could be prevented, managed or mitigated
Disease outbreak	Any stage of the production cycle.	Diseases can spread rapidly among chickens, leading to increased mortality, decreased growth rates and reduced meat quality.	Chicken meat farms in Australia implement strict and comprehensive biosecurity programs, including vaccination schedules, regular veterinary check-ups and strict hygiene practices. They also isolate and treat infected birds promptly to minimise the spread of diseases if an outbreak occurs.

Feed quality and nutrition	Throughout the production cycle.	Poor-quality feed or nutritional imbalances can result in reduced growth rates, lower feed conversion ratios and lower meat quality.	Supply of high-quality feed from a reputable supplier prevents this problem. Consultation with a poultry nutritionist to develop balanced and age-appropriate diets for optimal growth and health can also help prevent this problem.
Environmental stress	Throughout the production cycle, especially during extreme weather conditions.	High temperatures, humidity, poor ventilation or inadequate lighting can cause stress in chickens, leading to reduced feed intake, slower growth and increased susceptibility to diseases.	Producers need to regularly monitor shed conditions to provide and maintain optimal temperature control, adequate ventilation and appropriate lighting. They must also provide access to clean water at all times to prevent environmental stresses.
Sudden mortality	Mostly during the rearing stage.	Sudden deaths among chickens can lead to significant losses and compromised flock health.	Producers can provide adequate space and proper litter management to minimise stress and prevent overcrowding. Regular monitoring of the flock for unusual behaviour can lead to early detection of an issue that can be addressed.

Note: Regular monitoring, proactive management and seeking professional advice from veterinarians, nutritionists or industry experts can significantly reduce the likelihood of these problems occurring, and can help producers deal with these swiftly and effectively if they do occur.

Question 7

Answers will be provided as students complete the interactive activity.

References

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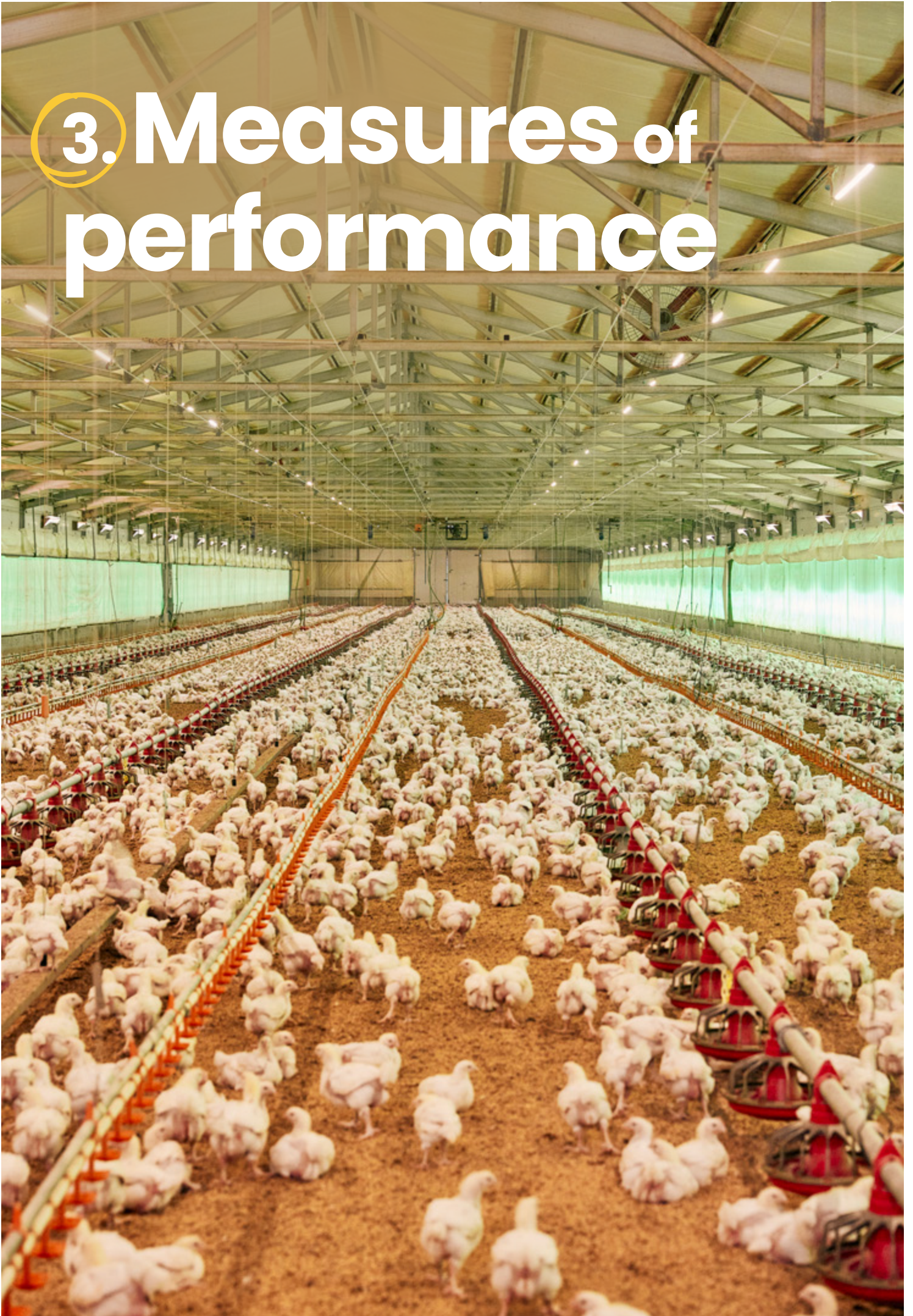
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③ Measures of performance



Farm management

The role of the farm manager:

- Describe methods of agricultural record keeping.
- Identify various measures of performance, including gross margins, yield, and profitability.

Record keeping is a crucial aspect of modern agriculture and essential for Australian meat chicken farms. It involves systematically documenting various aspects of farm operations and management to track performance, ensure compliance with regulations such as biosecurity measures, care for the environment, improve sustainability and make informed management decisions, which is vital for economic success.



1.

Read and highlight the following information on the data that Australian chicken meat farm managers commonly keep.

Stocking records

These records include the number of chicks or chickens brought onto the farm, their breed, the date of arrival of day-old chicks and any other animal movements. These records help to monitor growth and development, and enable tracking through the production cycle.

Feed records

Maintaining records of feed consumption, including the types of feed (starter, grower, finisher) and quantities, is critical for optimising feed efficiency, ensuring proper nutrition and managing feed costs.

Health records

These records detail vaccinations, any required medications, and disease outbreaks if they occur. Regularly monitoring the flock's health helps identify potential issues early and allows implementation of appropriate biosecurity measures if necessary.

Environmental records

These records track shed conditions – the temperature, humidity levels and air quality within the chicken shed. Maintaining optimal shed conditions is vital for bird welfare and production efficiency.

Mortality records

Records of bird mortality are essential for identifying potential health issues. Tracking mortality rates helps assess flock performance and identify areas for improvement. According to Poultry Hub Australia (n.d.), “over the life of the broiler flock, only about 4% of chickens are lost, and these are through natural causes or culling”.

Processing records

Details of birds sent for processing, including dates and quantities, are recorded to keep track of production volumes and enable producers to calculate yields and margins.

Biosecurity records

These records document the biosecurity measures taken to prevent disease introduction and transmission. They include visitor logs (contractors, service people, veterinarians), cleaning and disinfection schedules, rodent control measures, movement of spent litter, and quarantine records.

Labour or employee records

Farms keep records of employee training, work hours and tasks performed to ensure and maintain a skilled and organised workforce.

Financial records

Farms maintain financial records to track income and expenses related to chicken production. This helps them evaluate the operation's performance and profitability, and enables them to plan for future investments.



2.

Read and highlight the information below on digital agricultural record-keeping methods.

Digital records of agricultural record keeping

Farm managers on Australian chicken meat farms use various methods to record and keep data accurately and efficiently. While some traditional pen-and-paper methods, such as logbooks or record sheets, are still used to write down information during daily checks and activities, modern technology has introduced digital solutions that improve and streamline the record-keeping process.

Spreadsheets

Many producers use spreadsheet software like Microsoft Excel or Google Sheets to create and maintain records. They can customise templates for various records, such as feed consumption, health, mortality and production data. Spreadsheets offer flexibility, data analysis capabilities and ease of sharing among staff members.

Specialised farm management software

These platforms cater specifically to the needs of chicken meat processors and provide integrated solutions for various record-keeping aspects, including flock management, feed tracking, and health and welfare parameters. Chicken meat growers utilise shed controllers, which control shed ventilation and lighting, as well as record temperature and humidity. This software often has user-friendly interfaces and cloud-based storage for easy access and collaboration.

Data loggers and sensors

Modern chicken sheds are equipped with data loggers and sensors that automatically collect environmental data, such as temperature and humidity. These devices continuously record the conditions within the shed, allowing farm managers to monitor and analyse the data in real time.

Mobile apps

Mobile apps designed for farm management are gaining popularity. These apps run on smartphones and tablets, enabling farm managers to record data while working in the field. They offer convenience, especially when recording data on the go. A current project is to develop a farm visitor biosecurity risk assessment solution, which will be made available through users' mobile phones, tablets and desktop computers. With the software, producers will be able to assess the biosecurity risk of all visitors to their properties, including staff, delivery drivers, contractors, government staffers and members of the public, creating a system of record for declarations made and conditions of entry provided.

Barcode scanners

Some farms use barcode scanners to track bird movement and manage inventory. This technology helps streamline data entry and reduces the risk of errors.

Cloud storage and back-up

To ensure data security and accessibility, many farm managers use cloud-based storage solutions. This protects digital records from loss due to hardware failures and allows access from computers, laptops, phones and tablets.

Integration with processing plants

As most Australian chicken meat farms are part of vertically integrated supply chains, many have systems that integrate with processing plants. This allows for the seamless transfer of data on bird weights, feed conversion ratios and other production metrics from the farm to the processor.

3.

In pairs, choose one of the methods of digital record keeping on chicken farms and write one page of notes that could be used to pitch to a farm manager currently using pen and paper records to convince them to switch to digital record keeping.

Describe the inefficiencies and complexities associated with manual record-keeping processes.

Highlight the potential environmental and financial consequences of inaccurate or incomplete record keeping.

Consider how the chosen digital record-keeping method will improve upon the current manual method.

Explain how digital record keeping will cater to farm managers' specific needs and 'pain points', and make their record-keeping tasks more efficient and effective.

For example, write notes to give a well-researched and compelling case as to why Microsoft Excel spreadsheets are excellent tools to track feed consumption, or why using a mobile app to record stocking, mortality or feed data is recommended.

4.

Join another pair to make a group of four and use the notes to pitch to them, as the farm manager, on why they should consider switching to your chosen method of agricultural record keeping. Provide two to three reasons why their pitch was compelling and one way they could improve.



Read the information below on the financial measures of performance on chicken meat farms.

Financial record keeping – gross margin and profitability

Ensuring farm profitability is one of the most important tasks for every farm manager or owner. Being profitable means the farm is generating enough money to pay employees and bills, repay loans, allow for investment in technology, genetics and management practices that improve productivity, and provide the farmer with enough earnings to make a living. Commercial farming must be profitable.

To improve farm profitability in an increasingly competitive and changing market, producers must understand their profit and know how to change management practices to improve profitability.

Several calculations can be used to measure and analyse profitability. One of these is gross margin (also known as the enterprise budget), which is used to measure and compare the performance of individual enterprises, not whole-of-farm performance.

Gross margin = Enterprise income – Variable costs

Gross margin is a financial measure representing the difference between the gross (total) income generated from sales of goods or services and the variable costs incurred in achieving it. It does not include fixed or overhead costs that relate to the whole farm, such as depreciation, interest payments, rates or permanent labour. Gross margin budgets are intended to provide a guide to the relative profitability of similar enterprises and an indication of management operations involved in different enterprises (Department of Primary Industries, 2017).

Enterprise income refers to the total sales revenue an enterprise generates from selling its products or services. **Variable costs** are specific to an enterprise and include the direct costs associated with producing or providing the goods, products or services, such as raw materials, labour and processing expenses.

Fixed or overhead costs affect the whole farm and are not specific costs for an enterprise type, so cannot be included in an enterprise's gross margin. Costs such as marketing, maintenance and repairs, costs of finance, and research and development expenses are fixed costs and not included in gross margin calculations.

Gross margins are useful as they allow the performance and financial position of different enterprises to be compared.

The gross margin is a critical measure for chicken meat producers as it helps them assess the efficiency of their production processes and can provide insight into the strengths and weaknesses of the enterprise. A higher gross margin indicates the business is producing its goods at a lower cost than it sells them for, which generally means better profitability. On the other hand, a lower gross margin may indicate that the company's production costs are relatively high compared to its revenue, which could be a concern for its overall financial health, profitability and competitiveness.

The gross margin represents the **initial profit** before factoring in other operating costs or expenses.

6.

Complete the table by ticking whether each measurable aspect of production on a chicken meat farm would be considered revenue, fixed cost or variable cost. Use the last column to tick whether the aspect would be used to calculate the gross margin.

Measurable aspect of production	<input checked="" type="checkbox"/> Fixed cost?	<input checked="" type="checkbox"/> Variable cost?	<input checked="" type="checkbox"/> Revenue?	<input checked="" type="checkbox"/> Used for margin?
Sale of mature animals				
Replacement chicks				
Feed				
Litter				
Permanent labour				
Vaccines and medications				
Electricity				
Water rates				
Cleaning and disinfection of sheds				
Slaughter				
Depreciation of the building				
Machinery/technology depreciation				
Maintenance of the building				
Machinery/technology maintenance				
Interest rates				
Council rates				

7.

Predict what would happen to the gross margin and potential profitability if the cost of grain increased significantly over a short period of time while all other costs and total revenue remained relatively stable.



Agricultural yield – a measure of performance

In agriculture, yield is a measurement of the amount of crop grown or the amount of product (chicken meat, wool, milk) produced per unit area of land.

The agricultural yield for Australian chicken producers varies depending on the type of production system (conventional, free range, organic), management practices and other factors, such as the genetic predisposition of the chickens. The yield is measured in terms of the weight of meat produced per chicken, in kilograms.

The yield can be relatively high in conventional production systems that focus on efficient meat production. On average, a meat chicken in Australia can yield 1.9–3.5 kg of meat at the time of processing, usually at five to seven weeks of age.

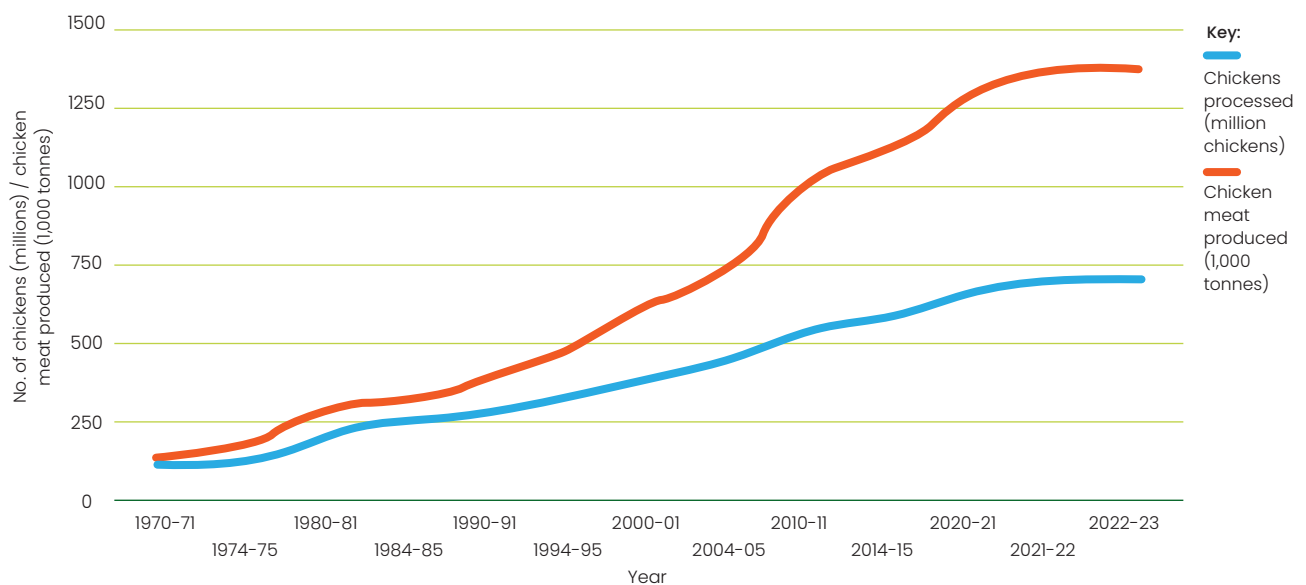
Yields for free range and organic chickens typically differ due to differences in growth rates, space requirements for the chickens, the feed composition and the genetic predispositions of the chickens.

A chicken meat producer measures their total yield by multiplying the average yield per chicken by the number of chickens produced on the farm over a year.



Chicken production in Australia is also measured annually. Observe the graph representing how chicken production in Australia has changed over time. Use the link to scroll over the points in the graphs and obtain specific data points for answers.

[Facts and Figures – Australian Chicken Meat Federation](#)



Chicken production in Australia

8.1 Describe the trend shown by the blue line indicating the number of chickens processed over time.

8.2 Describe the trend shown by the red line indicating the amount of chicken meat produced over time.

8.3 Describe the trend shown by comparing the two lines.

8.4 Recall what occurred in 2020–21 and 2022–23. Consider how this would have affected this data.

8.5 Propose why the chicken meat industry in Australia has the trend shown in question 8.3.



8.6 Click the link or use the QR code to read the information about common misconceptions about the industry.

[Animal health FAQs – Australian Chicken Meat Federation](#)

Does this change your answer to question 8.5? Explain your answer.



Consumers purchase whole chickens in various sizes in supermarkets, chicken shops and other retail outlets. Explain why this is the case.

Answers

Question 1

Not applicable to the activity.

Question 2

Not applicable to the activity.

Question 3

Answers will vary depending on student responses.

Question 4

Not applicable to the activity.

Question 5

Not applicable to the activity.

Question 6

Measurable aspect of production	<input checked="" type="checkbox"/> Fixed cost?	<input checked="" type="checkbox"/> Variable cost?	<input checked="" type="checkbox"/> Revenue?	<input checked="" type="checkbox"/> Used for margin?
Sale of mature animals			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Replacement chicks		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Feed		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Litter		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Permanent labour	<input checked="" type="checkbox"/>			
Vaccines and medications		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Electricity		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Water rates	<input checked="" type="checkbox"/>			
Cleaning and disinfection of sheds		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Slaughter		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Depreciation of the building	<input checked="" type="checkbox"/>			
Machinery/technology depreciation	<input checked="" type="checkbox"/>			
Maintenance of the building	<input checked="" type="checkbox"/>			
Machinery/technology maintenance	<input checked="" type="checkbox"/>			
Interest rates	<input checked="" type="checkbox"/>			
Council rates	<input checked="" type="checkbox"/>			

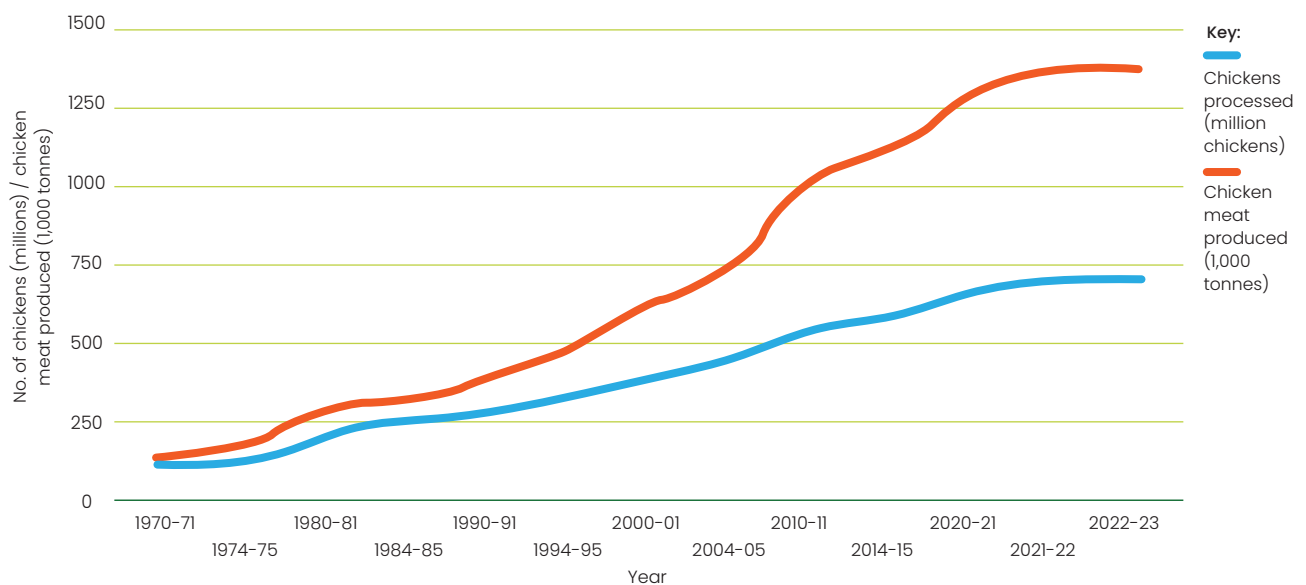
Question 7

If the cost of grain increased significantly over a short period of time, the cost of producing chicken feed would increase as feed is made up of 85–90% grains, such as wheat, sorghum, barley, oats, lupins, soybean meal, canola and other oilseed meals and grain legumes. This increased cost would likely be passed onto the producer as increased feed costs, so they would end up paying more for the feed. Since feed constitutes a significant portion

of the total expenses in chicken production, higher feed costs would increase the cost of goods sold (COGS). If the COGS increases without an increase in total revenue, the gross margin and potential profitability will reduce (unless other measures are taken).

This example highlights the interdependence of various factors within the agricultural supply chain and the need for producers to manage risks and make informed decisions to maintain financial stability.

Question 8



Chicken production in Australia

- 8.1** Between 1970–71 and 2022–23, the number of chickens processed has increased at a steady rate from X to Y, slowing as shown by the flattening of the curve between 2020–21 and 2022–23.
- 8.2** Between 1970–71 and 2022–23, the chicken meat produced has increased at a steady rate from X to Y, slowing as shown by the flattening of the curve in 2020–21 and 2022–23.
- 8.3** As the number of chickens between 1970–71 and 2022–23 has increased from X to Y, so too has the amount of chicken meat produced, but at a different rate. The chicken meat produced compared to the number of chickens processed has increased at an increasing rate each year. The rate stayed similar between 2020–21 and 2022–23.
- 8.4** The COVID-19 pandemic occurred in 2020–21 and 2022–23 and greatly impacted the production of many agricultural products around the world, including chicken meat.

8.5 Students may have various responses related to increasing production efficiency, which leads to higher meat yields per chicken.

Chickens have been selectively bred over the past 60 years for a variety of characteristics, including growth rate and efficiency to convert feed into meat. This is why they reach the desired market weight and quality more quickly than the progenitor breeds of chickens from which they were originally derived.

8.6 Various responses.

Students may clarify misconceptions they may have had, such as thinking that hormones (which are not given to chickens) may have increased yields over time.

According to the Australian Chicken Meat Federation (2023a), chickens sold these days are much bigger than they were 20, 30 or 40 years ago. It may be easy to conclude that this must be the result of some unnatural intervention. The reason for this increased size is ongoing selective breeding programs and improved animal husbandry over the past 60 years.

Question 9

Consumers have choices and different preferences for the size (weight) of the chickens they purchase. Diverse target markets desire meat chickens with different specifications. For example, supermarket barbeque or rotisserie chickens are generally smaller than a chicken purchased for a family to roast at home. Some people desire free range or organic chickens, which may grow at a slower rate and be processed when the chicken is smaller. Generally, smaller chickens are younger than larger chickens, and are processed earlier in the production cycle. Smaller chickens are simply younger and not yet fully grown.

References

Australian Chicken Meat Federation. (2023a). **Animal Health FAQs**. <https://chicken.org.au/faqs/animal-health-faqs/>

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Cobanoglu, F., Kucukyilmaz, K., Cinar, M., Bozkurt, M., Catli, A. U. and Bintas, E. (2014). **Comparing the profitability of organic and conventional broiler production**. Brazilian Journal of Poultry Science, 16(1), 89–95. <https://doi.org/10.1590/S1516-635X2014000100013>

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Poultry Hub Australia. (n.d.). **Meat chicken (broiler) industry**. <https://www.poultryhub.org/production/meat-chicken-broiler-industry>

4.

The supply chain



Farm management

The role of the farm manager:

- Construct a calendar of operations for an enterprise production cycle.
- Identify problems associated with production on the farm

Decisions made by the farm manager:

- Suggest factors a farmer considers when making farm management decisions

The supply chain refers to the entire process of producing, processing, distributing and delivering food products, from the initial production stage to the end consumer. It involves a series of interconnected steps to ensure a continuous flow of food products for Australian and overseas consumers.

An understanding of the Australian chicken meat supply chain and knowledge about the industry, including sustainable food production, means consumers are informed and empowered, and are aware of career opportunities in the industry.

1.

Brainstorm the processes involved (supply chain) to bring meat chickens (broilers) on a farm to the tables of Australian consumers. Working in groups of two or three, record your ideas below on butcher's paper or using a whiteboard.

2.

Click the link or use the QR code to view the source video. Add any additional steps or processes to the brainstorm notes from question 1.

[Tastes Like Chicken – Behind The News \(3:58\)](#)



3.

Consider the steps or processes that must have occurred prior to the meat chickens (broilers) arriving on a farm. Where did they come from? How did they arrive in Australia? Do these steps need to be included in the supply chain? Add these to the brainstorm notes if necessary.

4.

Conduct further research into the Australian chicken meat supply chain using the following links or QR codes.

[Meat chicken farm sequence – Poultry Hub Australia](#)



[How is chicken produced in Australia?](#)



5.

Use the information from the brainstorm and further research to draw a final flowchart that shows the entire supply chain, from egg to consumer. Present the flowchart to the class or to members of a small group.



Supply chain flowchart

6.

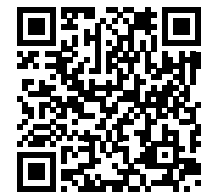
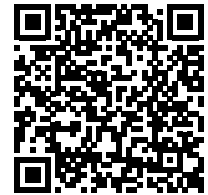
Extension activity: Create a series of cards (playing card size) for each step in the supply chain, as well as a range of arrow cards. Use these cards to create an Australian chicken meat supply chain sequence. When creating the cards, include information on each step or process, as well as a relevant image.

7.

Read the text and click the links or use the QR codes to view various career opportunities in the Australian chicken meat and poultry industries.

[Career Stepping Stones Posters – Career Harvest](#)
(choose *Stepping stones in and out of poultry*)

[Industry careers – Australian Chicken Meat Federation](#)



Careers in the Australian chicken meat supply chain

The Australian chicken meat industry offers a wide range of career opportunities across various sectors of the supply chain. More than 40,000 people in metropolitan and regional Australia are employed in the industry, in diverse roles.

Careers include farm managers, animal nutritionists, veterinarians, hatchery technicians, processors, quality control specialists, logistics managers, marketers and sales representatives. Careers in the industry can range from entry-level positions to specialised roles requiring technical expertise, as well as corporate jobs in agribusiness. These careers contribute to the efficient operation of the supply chain, ensuring the production, processing and distribution of chicken meat drives and achieves consumer demand.



8.

Identify 10 careers in the chicken meat supply chain. Annotate your supply chain flowchart using a different colour (e.g. red) to show where in the supply chain the identified careers are relevant.

9.

Explain why an understanding of the Australian chicken meat supply chain is important to those in the industry as well as consumers.

Answers

Question 1

Answers will vary depending on student responses.

Question 2

Answers will vary depending on student responses.

Question 5

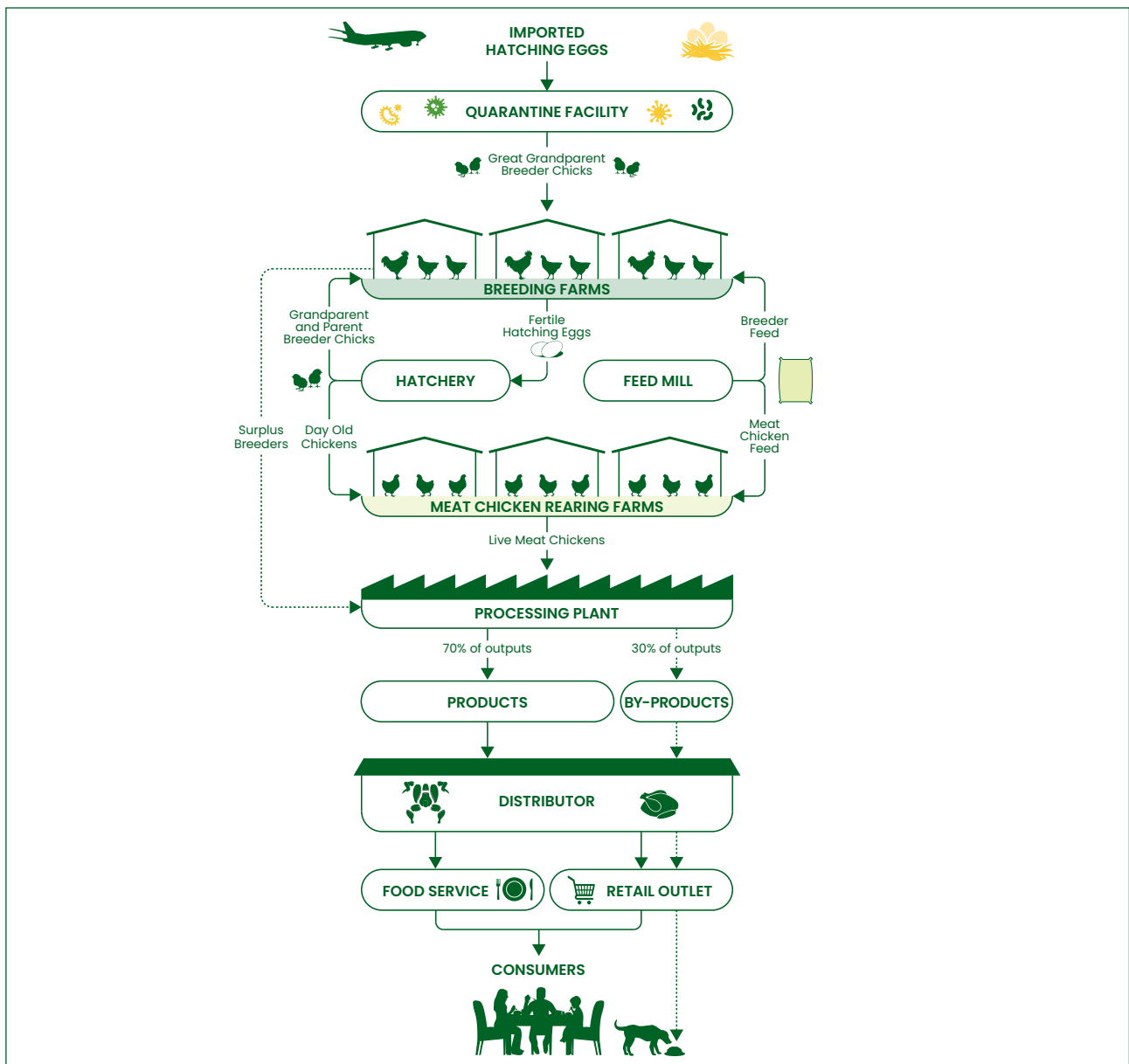
Student supply chain flowcharts will vary – see the example as a suggested answer.

Question 3

Answers will vary depending on student responses.

Question 4

Not applicable to the activity.



Question 6

Not applicable to the activity.

Question 7

Not applicable to the activity.

Question 8

Student responses will vary. Some example careers based on the supply chain flowchart in answer 5 are given below.

Importing hatching eggs: Pilot, quarantine officer

Breeding farms: Poultry veterinarian

Hatchery: Hatchery technician, hatchery shed manager

Feed mill: Feed supplier, poultry nutritionist

Meat chicken rearing farm: Broiler farm manager, farm hand, poultry field technician

Processing plant: Packing shed manager, poultry inspector, processing plant manager, packer, chicken boner

Distribution: Distribution manager, truck driver

Retail outlet: Retail worker, retail manager

Food service: Restaurant manager, chef

Agribusiness: Poultry strategic account manager, manager of product research and development, processing and product development, sales and marketing, public relations, accounting/human resources, government/industry advisor, business finance management, health and safety, lawyer

Science and engineering: R&D, engineer, virologist, geneticist, diagnostics, laboratory technician, environmental scientist, animal scientist, facility design

Question 9

An understanding of the Australian chicken meat supply chain provides knowledge about the industry, promotes sustainable food production awareness, empowers us as informed consumers and opens up career opportunities.

References

Australian Chicken Meat Federation. (2023a). **Careers.** <https://chicken.org.au/our-industry/careers/>

Australian Chicken Meat Federation. (2023b). **What makes chicken Australia's favourite meat?** <https://chicken.org.au/our-product/australian-chicken-meat/>

Career Harvest. (2023). **Career Stepping Stones Posters.** <https://www.careerharvest.com.au/career-stepping-stones-posters>

Poultry Hub Australia. (n.d.). **Meat chicken farm sequence.** <https://www.poultryhub.org/production/meat-chicken-broiler-industry/meat-chicken-farm-sequence>

Thiele, N. (2019). **Tastes Like Chicken.** ABC News. <https://www.abc.net.au/btn/classroom/tastes-like-chicken/10534830>



5. Sustainable practices

Farm management

Current management practices, with reference to sustainability:

- Identify management practices being used to address environmental sustainability.
- Report on planning for future farm improvement.

The Australian chicken meat industry is among the most environmentally sustainable systems for producing land-based animal protein. The care of natural resources and reduction of environmental impacts remain extremely high priorities for the industry (AgriFutures Australia, 2022).

Sustainability can be defined as the ongoing capacity of Earth to maintain all life. Sustainable patterns of living seek to meet the needs of the present generation without compromising the needs of future generations (Australian Curriculum, Assessment and Reporting Authority, 2022). It is the ability to maintain healthy environmental, social and economic systems in balance on a global and local scale.

Sustainability encompasses three key areas, often referred to as the three pillars of sustainability.



1.

Recall the three pillars or areas of sustainability. Record them below. Brainstorm definitions for each of the pillars and examples of management practices on Australian chicken meat farms – and in the broader industry – that would address each pillar/area, and record them below.

Note: This concept will be revised at a later point – record only current knowledge.

Sustainability pillar 1:

Definition:

Example chicken meat industry management practices that would address the pillar:

Sustainability pillar 2:

Definition:

Example chicken meat industry management practices that would address the pillar:

Sustainability pillar 3:

Definition:

Example chicken meat industry management practices that would address the pillar:

Designing solutions and actions for a sustainable future requires an understanding of the ways these three sustainability pillars interact, and the ability to make balanced judgements and management decisions based on present and future impacts.

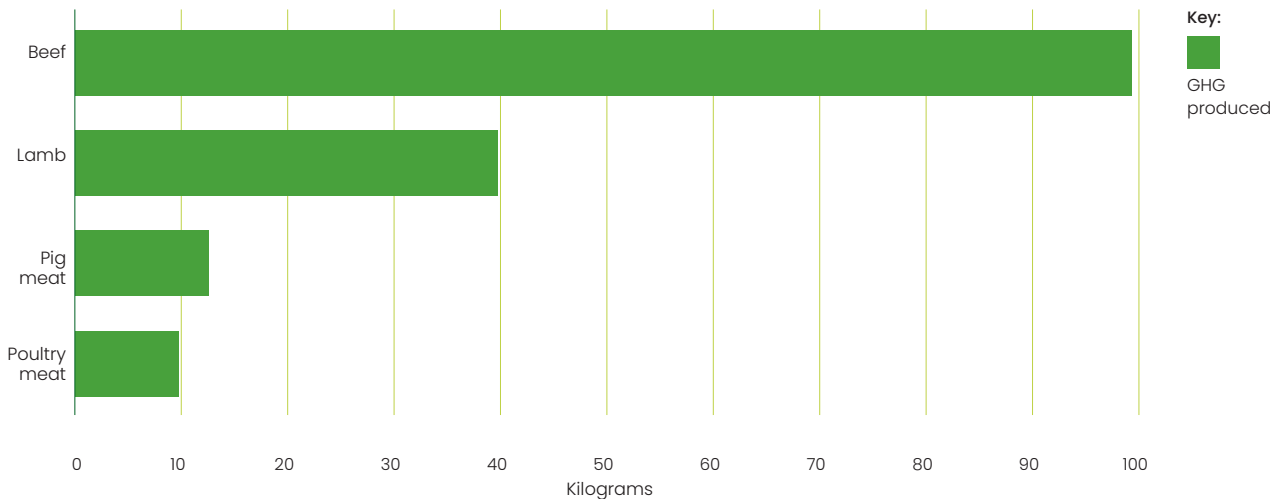
Commercial chicken meat production in Australia has a modest environmental impact (Australian Chicken Meat Federation,

2023). Independent research has shown chicken meat production has the lowest greenhouse gas footprint of all intensive meat production industries. Furthermore, chicken meat production uses the least water of all intensive meat production systems, a critical consideration for food security in the Australian environment (McGahan *et al.*, 2021).

2.

Click the link and list the meats shown in the graph from least to most greenhouse gases produced per kilogram of food product.

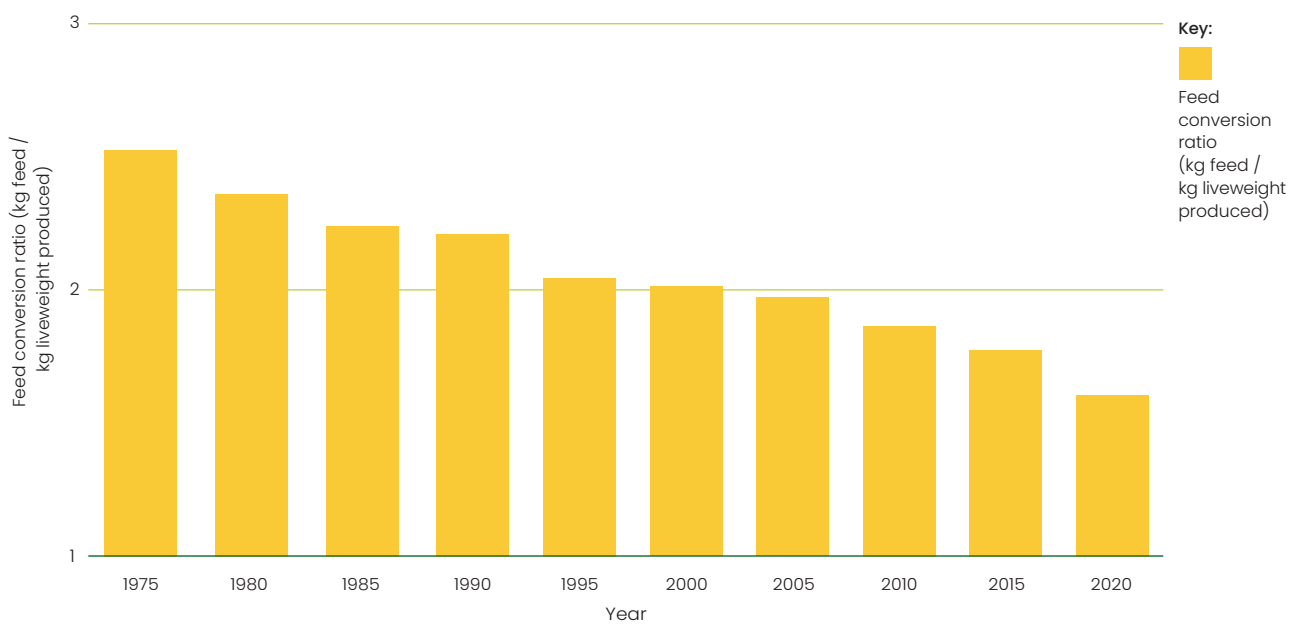
[Our sustainability – Australian Chicken Meat Federation](#)



Greenhouse gas emissions per kg of food product

Feed conversion ratio (FCR) is a crucial metric in animal production systems. It quantifies how efficiently an animal converts the feed it consumes into body mass (measured by live weight). A lower FCR is desirable in chicken meat production because less feed is required to produce a unit of body mass. This means greater efficiency in converting feed into meat, leading to reduced production costs and a more sustainable system. FCR will also be explored in Section 7 of this resource in the context of management innovation.

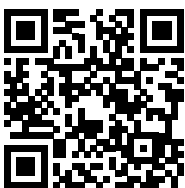
A lower FCR is a goal of the Australian chicken meat industry. This can be achieved through selective breeding, advancements in feed formulation leading to improved nutrition, technological advances and improved management practices.



Efficiency of chicken meat production in Australia. Source: Data in the above graph are Australian Chicken Meat Federation estimates of industry-wide converted FCR (CFCR), which is FCR (kg feed/kg liveweight) normalised for a standard chicken weight of 2.6 kg.

3.

Click the first link or use the QR code to view the video focusing on sustainability and technology at AAM, Australia's largest free range chicken meat farm (2020). As an alternative to watching the video, click the second link to read about the same farm. Answer the questions below focused on the video and/or news article.



[The country's biggest free-range meat chicken farm embracing solar – Landline \(26:00-37:05\)](#)

[Massive \\$5 million solar power system pays off for Australia's largest free-range chicken farm – Landline](#)

3.1 Within the Australian chicken meat supply chain, where would AAM be placed?

3.2 Identify the pillar or area of sustainability addressed in this video/article.

3.3 Describe what the team at AAM do to measure this aspect of sustainability.

3.4 Describe some of the management practices used at AAM to address sustainability.

3.5 Outline the measurable benefit to the environment and the company.



Click the link to read about Inghams' water-saving solutions and answer the following questions:

[Somerville's water-saving solutions – Inghams](#)



4.1 Within the Australian chicken meat supply chain, where is Somerville placed?

4.2 Identify the pillar or area of sustainability addressed in this article.

4.3 Describe what the team at Somerville do to measure this aspect of sustainability.

4.4 Describe some of the management practices used at Somerville to address sustainability.

4.5 Outline the measurable benefit to the environment and the company.

5.

Enhance the definitions and examples of management practices recorded in question 1 with additional information acquired through learning.

6.

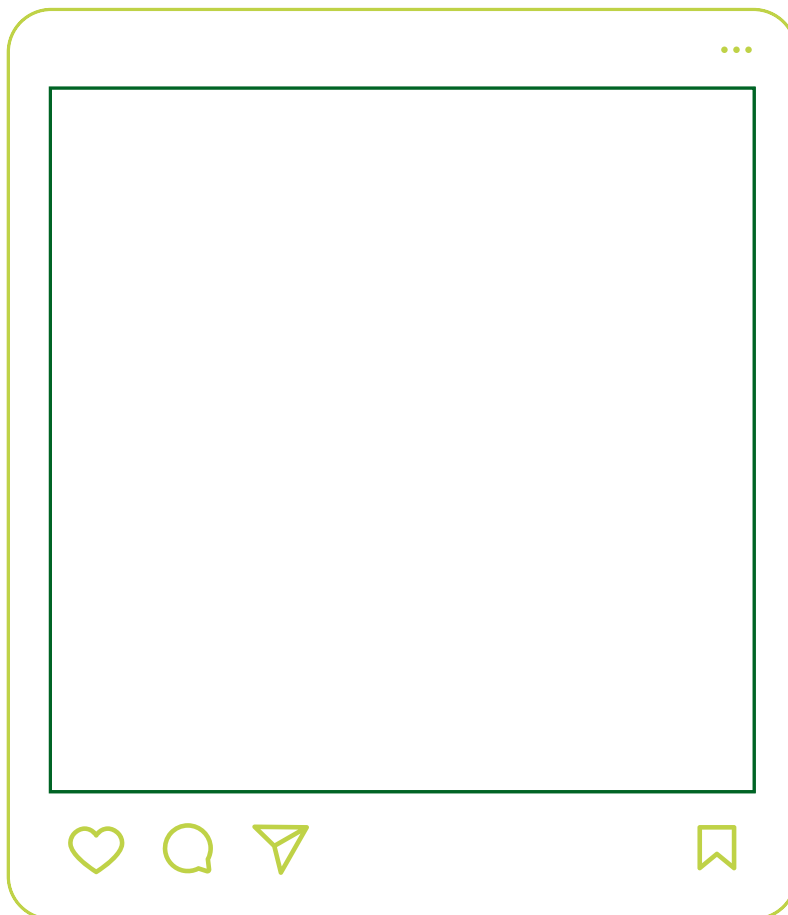
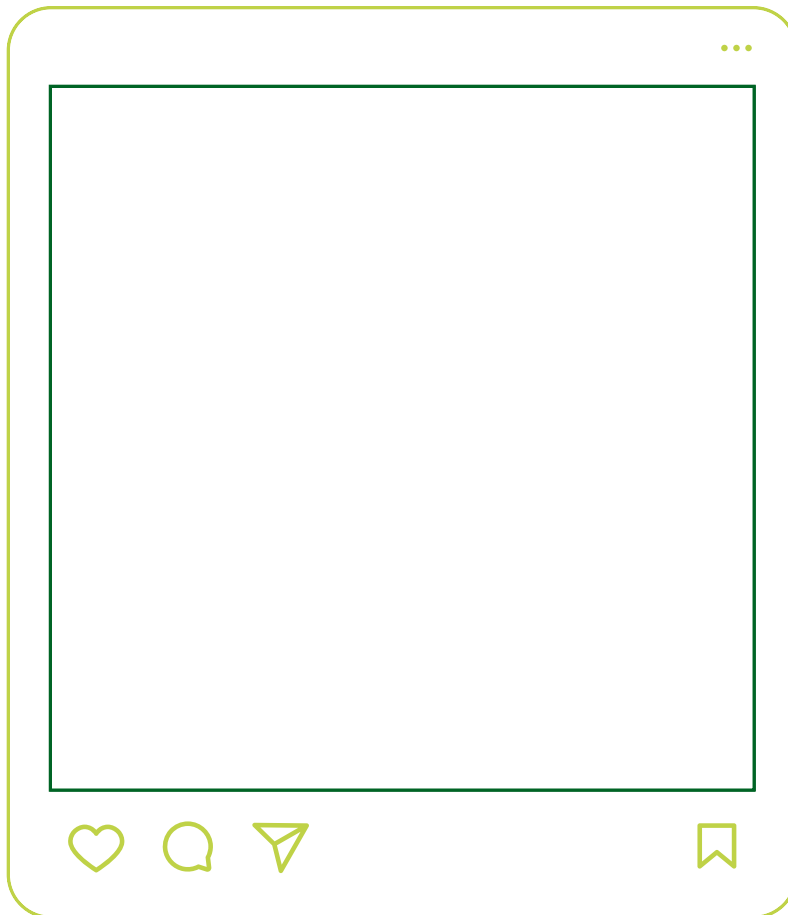
Read the following information about planning for future farm improvement. Highlight the important components. Individually or in pairs, generate two positive social media posts about the importance of planning for the future in the space provided.

Planning by Australian chicken meat producers and the wider industry for future farm improvement is vital for **sustainability** and **long-term success**. Planning enables farms to adopt sustainable practices, enhance efficiency and comply with regulations. It also promotes **animal welfare**, leading to healthier and more productive chickens. Adapting to changing market demands and mitigating risks are essential aspects of the planning process.

Planning for the future also supports long-term viability by enabling investment in infrastructure and technology that improve **productivity** and **resource management**. Farm improvement planning encourages innovation and ensures farms stay competitive. Efficient resource management is crucial due to concerns about resource

scarcity and environmental impact. Strategic planning is integral for Australian chicken meat farms to thrive, meet consumer expectations and navigate the evolving agricultural landscape.

Like many other industries, the Australian chicken meat industry is actively working on meaningful and achievable ways to reduce its environmental impact and **further improve the sustainability of the sector**, with several initiatives already underway. The Australian Chicken Meat Federation is working with industry experts and their R&D provider, AgriFutures Australia, on a project to develop a **chicken meat sustainability strategy** that will further showcase the industry's sustainability commitments and credentials (Australian Chicken Meat Federation, 2023).



Answers

Question 1

Student responses will vary. Sample answers are shown below.

Sustainability pillar 1: Environmental sustainability

Definition: Describes the adoption of practices and systems in agricultural production that prioritise the long-term health and resilience of resources and ecosystems. This aims to achieve the ongoing availability of food and fibre to meet the needs of present and future generations.

Example management practices on Australian chicken meat farms and in the broader industry that would address the pillar:

- Renewable energy sources to generate electricity, e.g. solar.
- Measures to reduce water waste.
- Minimising processing waste, e.g. chicken products not viable to sell to humans are used to produce dog food, reducing waste.
- Composting litter for use as fertiliser for other agricultural industries.

Sustainability pillar 2: Social sustainability

Definition: Emphasises the promotion of high quality of life for workers, communities and consumers associated with the agricultural sector. It seeks to cultivate inclusive and resilient agricultural systems that contribute to the overall welfare and satisfaction of people connected to the industry.

Example management practices on Australian chicken meat farms and in the broader industry that would address the pillar:

- Providing jobs with fair pay and healthy working conditions.
- Good health and safety measures in the workplace.
- Providing people with safe, nutritious food.

Sustainability pillar 3: Economic sustainability

Definition: Encompasses the management of food and fibre production that is financially viable and profitable for stakeholders at the local, regional, national and international levels. It focuses on ensuring economic growth and contributing to the overall stability and prosperity of the agricultural sector.

Example management practices on Australian chicken meat farms and in the broader industry that would address the pillar:

- Good prices for producers so that they can be profitable.
- Innovation, research and development to support the economic growth and stability of all aspects of the supply chain.

Question 2

Lowest to highest greenhouse gas emissions per kg of food product:

Poultry meat → Pig meat → Lamb → Beef

Question 3

- 3.1 Producer
- 3.2 Environmental sustainability
- 3.3 They have developed an energy management platform that enables them to measure all aspects of energy use and electricity generation so they know when to use the stored energy in batteries, when to use solar energy directly, and when to draw power from the grid.
- 3.4 The large-scale free range meat chicken farm has invested in extensive solar and battery systems. AAM added 1.4 megawatts of solar panels to the farm sheds and installed five Tesla batteries. It is also turning straw and manure from chicken sheds into profitable compost, making the company money and reducing waste to landfill.
- 3.5 Reducing electricity consumption by approximately 70% benefits the environment as less electricity from fossil fuels is used. This also increases the company's profitability by reducing costs. "As part of putting in the solar and the batteries, we are now abating 1,500 tonnes of CO₂ equivalence, which, to try and put into normal everyday speak, is something like [taking] 1,200 cars off the road or planting 25,000 trees."

Question 4

- 4.1 Processing or processor
- 4.2 Environmental sustainability
- 4.3 The team measures and assesses **water usage** every week and during the site's regular sustainability team meetings. Since July 2022, the team has also developed Toolbox Talks to increase awareness and deliver messages on the importance of reducing the water usage footprint to the team. The team also leverages Azzo's (digital) monitoring system to provide daily diagnostics on water usage in specific site areas and at the equipment level.
- 4.4 Sustainability management practices used at Somerville include:
- Installation of aeration in spin chillers, which increases the water flow without using additional water.
 - Recapturing and recycling water previously lost through the live bird and evisceration processes.
 - Shutting off water on key equipment during break times.
 - Automating the trailer wash system to optimise and control water usage.
 - Daily site inspections by the environmental team have also helped to monitor and mitigate any water leaks.

- The production and maintenance teams work closely with the quality team to ensure that, at all times, the reduced water usage does not compromise the quality of their products.

4.5 Since July 2022, the water-saving initiatives have reduced the site's water usage by 11% compared to the previous financial year.

Question 5

Student responses will vary. More information should be added to the management practices row, especially for 'Environmental sustainability', including further detail on water efficiency and solar power generation and management.

Question 6

Student responses will vary.

References

- ABC Landline. (2020). **Landline: Series 2020**. <https://iview.abc.net.au/video/RF1904Q040S00>
- ACARA. (2022). **Sustainability**. <https://v9.australiancurriculum.edu.au/teacher-resources/understand-this-cross-curriculum-priority/sustainability>
- AgriFutures Australia. (2022). **AgriFutures Chicken Meat Program RD&E Plan 2022–2027**. <https://agrifutures.com.au/wp-content/uploads/2023/02/22-117.pdf>
- Australian Chicken Meat Federation. (2023). **Our Sustainability**. <https://chicken.org.au/our-sustainability/>
- Crump, S. (2023). **Somerville's water-saving solutions**. Inghams. <https://ingham.com.au/somervilles-water-saving-solutions/>
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- McGahan, E., Wiedemann, S. and Galvin, G. (2021). **Planning and environment guideline for establishing meat chicken farms: Guide 1 – Assessment guide**. AgriFutures Australia. <https://agrifutures.com.au/wp-content/uploads/2021/12/21-080.pdf>
- Poultry Hub Australia. (n.d.). **Meat chicken (broiler) industry**. <https://www.poultryhub.org/production/meat-chicken-broiler-industry>
- Straight, K. (2020). **Massive free-range chicken farm slashes costs with sustainable solar power and composting**. ABC Landline. <https://www.abc.net.au/news/rural/2020-10-31/free-range-meat-chicken-farm-solar-battery-power-landline/12817786>



6. Marketing the product

Marketing

Ways products from the farm are marketed:

- Identify marketing strategies.
- Explain reasons for particular marketing strategies for the farm.

Marketing and promotion are vital for driving demand for a product or service, shaping consumer perceptions, building trust, educating consumers and ensuring sustained industry growth and a competitive edge.

Marketing and promotion methods include:

Method	Description
Branding	Products are often branded to differentiate them from competitors. Consumers associate specific logos and slogans with particular products and services. In agriculture, this can be based on quality, origin (e.g. "locally grown") or specific farming practices (e.g. "organic" or "free range").
Advertising campaigns	Campaigns can be viewed on television, radio, print media and, increasingly, digital platforms. This form of marketing highlights the benefits of the product or service, its uses and, sometimes, its superiority over alternatives. Campaigns use company branding and slogans along with different strategies to encourage consumers to purchase their product or service.
Social media and digital marketing	With the rise of digital platforms, many industries engage with consumers directly through platforms like Facebook, Instagram and X (Twitter). They share content ranging from farming practices to recipes, and promote their values (e.g. sustainability and animal welfare). Modern advertising fosters engagement, allowing for two-way communication and immediate feedback.
Educational initiatives	This marketing method includes farm tours, workshops and school programs to educate potential consumers about the industry, its practices and the benefits of its products.
Trade shows and exhibitions	Trade shows and exhibitions allow industries to showcase their products to potential buyers, retailers and other stakeholders. Stakeholders can engage with companies, ask questions, view products and, in some cases, sample products and services.
Packaging	Innovative and informative packaging can serve as a marketing tool, providing information about the product, its origin and its benefits. This could include nutritional benefits, value for money and the method of farming. Website links and QR codes on packaging can also increase consumer engagement.

1.

Think about a product or service you are familiar with, e.g. a footwear, electronics, clothing or food brand. Consider how this product or service is marketed and promoted.

Does the product use clever branding (logos and slogans)? What method of marketing and promotion is used? Where is the product or service advertised?

In the space below, describe how the product or service is promoted and how it appeals to consumers.

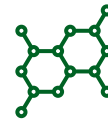


2.

Click the link below. The available information promotes the value of Australian chicken meat to consumers. View the website tiles and record the information being promoted to potential consumers of Australian chicken meat.

[What makes chicken Australia's favourite meat? \(Australian Chicken Meat Federation\)](#)

"Research tells us that Australian consumers select chicken meat for its value, taste, nutrition and versatility, but there are even more reasons to enjoy Australia's favourite meat."



The chicken meat industry is predominantly vertically integrated. This means individual companies own almost all aspects of chicken production – parent breeding farms, hatcheries, feed mills, processing plants and sometimes meat chicken rearing farms. This structure means the chicken meat industry differs from most rural industries, which typically operate through a more complex supply chain.



Click the link and identify the main companies that produce Australia's chicken meat.

[Our Industry Overview – Australian Chicken Meat Federation](#)

Advertising and promotion create product and brand awareness in a competitive market. They help companies to stand out but also shape consumer perceptions, building trust and a positive brand image.

Through targeted advertising, companies can reach specific audiences, ensuring their message resonates with those most likely interested. Marketing strategies are designed to appeal to customers in ways that encourage them to purchase a product or service. Some of these strategies are listed in the table below.

4.

For each marketing strategy identified, think of an advertising campaign or product or service that is promoted using this strategy. If you can't think of an example, leave the section of the table blank.

Strategy	Description	Example
Emotion	Brands often tap into emotions like happiness, nostalgia, love or sadness to create memorable advertisements and campaigns.	
Social responsibility	Highlighting a brand's commitment to social causes, sustainability or charitable efforts can resonate with socially conscious consumers.	
Aspirational messaging	Brands often portray a lifestyle or image that consumers might aspire to, especially in the healthy living, luxury or fashion sectors.	
Inclusivity and diversity	Representing a diverse range of people can resonate with a broader audience and showcase a brand's commitment to inclusivity.	
Scarcity and urgency	Limited-time offers or limited-stock items can create a sense of urgency, prompting quicker purchasing decisions.	
Educational content	Providing valuable information or teaching consumers something new can position a brand as an authority.	
Storytelling	Narratives or stories can make advertisements more relatable and memorable.	

5.

View the secondary sources focused on advertising material from Inghams and Lilydale chicken production companies.

Campaign 1: Inghams

[Ingham's launches first campaign since 2005 via Bohemia – Mumbrella](#)

[Ingham's Always Good – Inghams \(1:00\)](#)

Campaign 2: Lilydale

[Dedication You Can Taste – Lilydale Free Range Chicken \(0:45\)](#)

6.

Consider the strategies used in both campaigns that encourage consumers to purchase Australian chicken meat. With the class, discuss the following aspects of the advertising campaigns.

Who thought the campaigns were successful?

How did the companies encourage consumers to think about purchasing and eating more chicken meat?

What strategies were used to appeal to consumers in the campaigns?

Who is the target audience of the campaigns (age, gender, etc.)?

What is the main message in each of the campaigns?



7.

Refer back to question 3 and observe the brands of the main chicken meat production companies in Australia. Individually or in pairs, generate a logo and slogan for a new Australian chicken meat production company.

Logo – a symbol or design to identify or represent a product.



Slogan – a memorable phrase used in advertising.



Consider the main message/s that need to be conveyed to consumers about the new company (sustainable, profitable, considers animal welfare, nutrient content, versatility, affordability). Create a short pitch (writing notes below) using the logo and slogan, and a two-minute presentation detailing a single method of promotion and why this would be an effective and persuasive strategy.

Data collection

Data collection throughout the supply chain (including the marketing and promotion stages) is important for companies and allows decision making and analysis based on quantifiable data. A significant amount of data is collected by the Australian Chicken Meat Federation.

9.

Read the overview of the Australian chicken meat industry and highlight any data that has been included.

Overview

The Australian chicken meat industry contributes significantly to the domestic economy, with an estimated gross value of production (2021-22) of \$2.97 billion and an estimated retail value of \$6.6 billion.

The domestic chicken meat industry provides jobs for more than 58,000 people (full-time equivalents), many in rural and regional communities. There is a strong industry connection with retail activity and food service outlets that sell chicken meat.

The industry provides the most popular source of animal protein to Australian

consumers, with annual per capita consumption of chicken meat exceeding 50 kilograms (and increasing year on year). Additionally, 68% of Australians eat chicken meat as part of a meal at least twice a week because of its affordability, popularity with the entire household, versatility and taste.

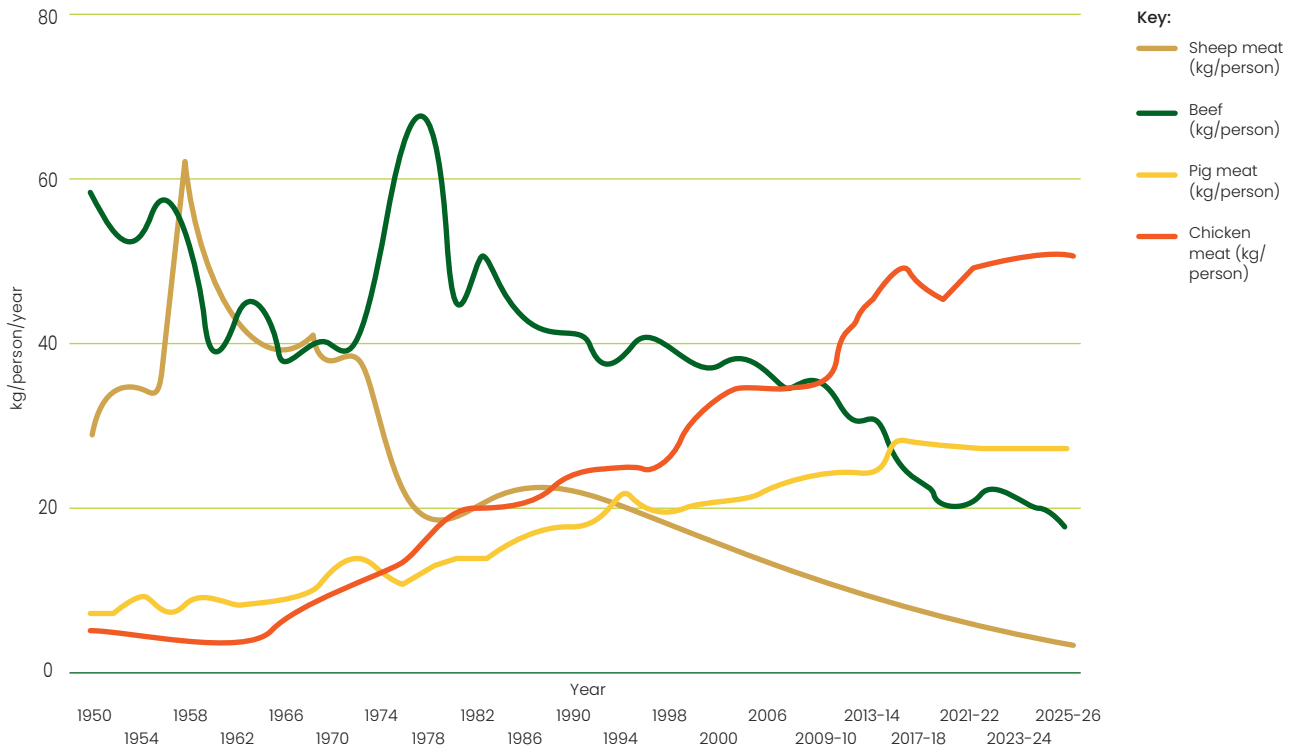
The Australian Bureau of Agriculture and Resource Economics' (ABARES) forward estimate for poultry meat production in 2022-23 is 1.367 million tonnes, or 1.367 billion kilograms (ABARES Meat Consumption Outlook).



10.

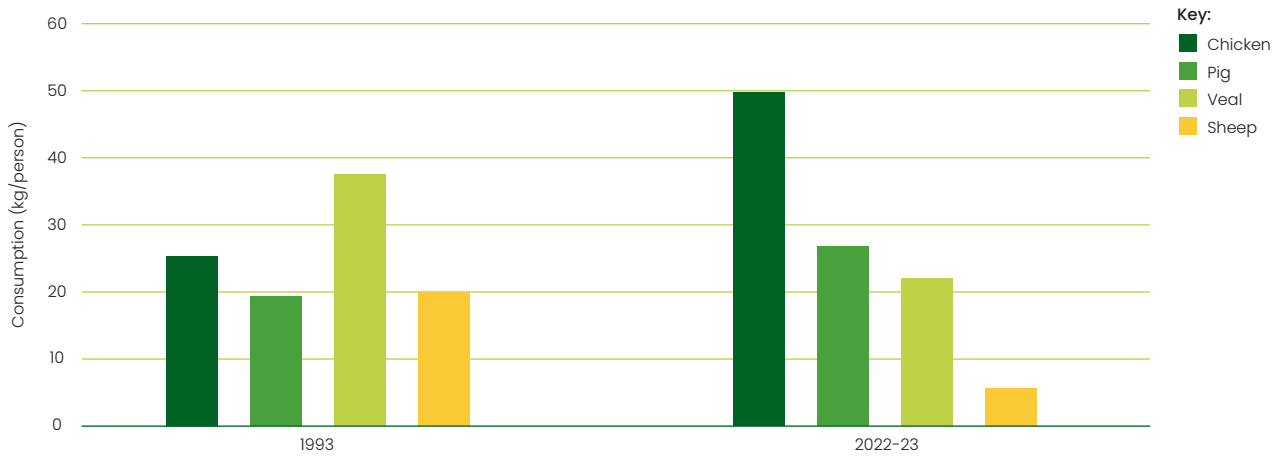
Observe the three graphs that represent different data collected by Australian Chicken Meat Federation. For each graph, describe the trend that can be seen from observing this data. Use the link below to scroll over the points in the the graphs and obtain specific data points for answers.

[Facts and Figures – Australian Chicken Meat Federation](#)



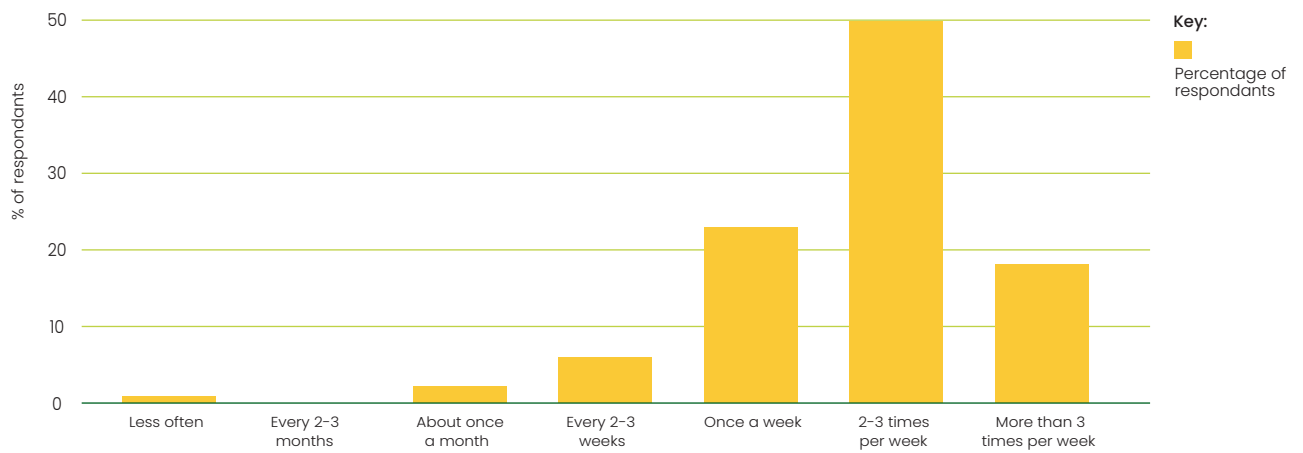
Per capita consumption of chicken meat, beef, pig meat and sheep meat

The trend shown by the above graph is:



How much meat Australians eat a year

The trend shown by the above graph is:



How often Australians eat chicken as part of a main meal

The trend shown by the above graph is:

11.

As a class, discuss why collecting this information is important for stakeholders in the Australian chicken meat industry. Record points in the space below.



12.

View the graphic 'The importance of data collection'. Either individually or as a group, rank the elements from most to least important in the space provided.

The importance of data collection

Analysing consumer purchasing patterns to work out why they choose specific products, taking into account trends, pricing, and timing.

To work out the best pricing strategy for a product, e.g. based on consumption is the price of the product appropriate.

To investigate if a product is outperforming a competitor or alternative product (different meat product).

Tracking data can allow more effective reporting, compliance to legal requirements and efficiencies.

Ensuring that product availability aligns with consumer demand, e.g. can producers supply enough meat for consumer demand.

Identifying top-selling products to optimise production strategies, e.g. weights of birds, method of farming etc.

To determine if a marketing campaign for a product has been successful in increasing demand, e.g. has consumption increased after a campaign?

Analysing purchasing data can highlight opportunities for improvement in different areas: feeding, packaging, branding versatility, consumer preferences.

Extension activity: Read the three case studies focused on different aspects of marketing and promotion within the Australian chicken meat industry.

Case study 1 – Marketing difference between chicken meat

Source: Australian Chicken Meat Federation website

Free range, RSPCA-accredited, organic – what are the differences?

The chicken meat industry often calls the system where chickens are raised on the floor in a large, enclosed barn, and do not have access to an outside area or range, as the 'conventional' production system.

While such barns are the fundamental housing unit provided in all Australian commercial meat chicken production systems, there are a range of variations to this approach, and a range of accreditation programs that farmers might belong to that affect the way the farm operates and how the chicken meat produced by them might be labelled. These systems and accreditation schemes include free range, RSPCA-accredited and certified organic.

Free range

In free range production systems, in addition to their barn, the chickens are able to access an outdoor area (or 'range') during daylight hours once they are old enough to deal with the temperatures and big enough that they aren't at high risk of predation. This happens from about 21 days of age. Access to the outdoor area is provided through flaps or 'pop holes' in the side of the barn.

Free range meat chickens are produced using similar management and feeding practices as for 'conventional' meat chickens. Apart from having access to an outdoor range for part of each day, they often have lower stocking densities inside the barn, to facilitate chickens' access to the barn openings and because it is harder to control

the internal environment of the barn if there are openings on the side. Depending on the accreditation program the farmer belongs to, the use of antibiotics to treat sick birds may preclude the meat from these birds being sold as free range.

The main certifier of free range chicken meat in Australia is Free Range Egg and Poultry Australia Ltd (FREPA). The standards free range chicken meat producers must comply with to be certified by FREPA can be viewed on the FREPA website. Chicken meat accredited under this program bears the FREPA logo.

The RSPCA Approved Farming Scheme also has standards for outdoor systems, which some farms are accredited under. Details of the standards that apply are available on the RSPCA Approved Farming Scheme website.

Certified organic

The focus of organic agricultural systems is on avoiding the use of synthetic chemicals, such as synthetic pesticides, herbicides, fertilisers and antibiotics.

In addition to chickens having access to an outdoor area, like free range systems, certified organic production systems must also meet the following additional requirements:

- Feed must be predominantly from certified organic ingredients.
- Birds cannot be given antibiotics or routine vaccinations. There are exceptions, such as where treatment is required by law or disease cannot be controlled with organic management practices alone.

Certified organic chicken meat bears a certification logo from an approved organisation. Please seek more

detailed information from the relevant accreditation body.

Note that, at present, chicken meat can be described as 'organic' without being certified by an organic association. Therefore, it is important to look for a relevant certification and to seek detailed information on the actual requirements mandated by the relevant standard from the administering organisation.

RSPCA Approved Farming Scheme

The RSPCA Approved Farming Scheme accredits chicken farmers who meet the RSPCA's animal welfare standards. These standards are species-specific and provide detailed requirements for the rearing, housing, handling, transport and slaughter of meat chickens. The RSPCA Approved Farming Scheme standards reach beyond the current legal requirements while still being commercially viable.

There are numerous additional requirements that must be met under this scheme, but the main differences include a lower maximum stocking density than is required in non-accredited chicken meat production, a requirement for perches and other enrichments (pecking objects) to be available, different lighting requirements, specific requirements for managing bedding in chicken sheds, and regular on-farm assessment by the RSPCA of accredited farms and other facilities to ensure compliance with the scheme's standards.

The RSPCA Approved Farming Scheme standards for meat chickens accommodate farming systems that house animals in enriched indoor environments or in systems where they are housed in a large shed with outdoor access (free range). Producers who market their product as RSPCA-approved with outdoor access (free range) are required to meet the RSPCA's indoor housing standards plus the outdoor standards.

Case study 2 – Supply and demand in the chicken meat industry

Source: ABC News article

[Australia's chicken meat industry facing summer dip in supply – ABC News](#)

Case study 3 – Marketing insight

Source: AgriFutures Australia website

[Market insights for Australia's chicken meat industry – AgriFutures Australia](#)

Growth in per capita consumption of chicken meat continues to outpace demand for other meats in Australia's dynamic meat market. In the process of supplying the chicken meat needs of the nation, the Australian chicken meat industry contributes significantly to the Australian economy. This study helps the

industry by providing an understanding of the current demand drivers for chicken meat, and the future opportunities for the industry in the domestic meat and protein market.

As part of a three-year project (2017-2020), online surveys of nationally representative samples of Australian consumers were

conducted in 2019. Survey results provide current insights into consumer use of, and attitudes towards, Australian chicken meat. The 2019 responses are compared to data from a 2008 Australian chicken meat use and attitudes study. In-depth interviews with South Australian consumers provide deeper insights into chicken meat purchase drivers, and consumer understanding and use of labelling on chicken meat products.

Chicken consumption behaviour with respect to household and personal consumption frequency and purchasing behaviour (including cut preferences) has not changed significantly since 2008. Chicken continues to be the most frequently consumed meat product in the average Australian household. The appeal of chicken to Australian consumers continues to centre on its convenience, price/value for money, and popularity among household members of all ages.

However, consumers' reasons for increasing their chicken meat consumption have changed somewhat over time. Compared to 2008, a higher share of consumers in 2019 reported increasing their chicken consumption because they perceive chicken to be cheaper than other meats, easier to prepare, healthier/lower fat than other meats, and because of the greater availability of chicken-based ready meals and animal welfare-friendly chicken products. More consumers in 2019 were reducing their chicken meat consumption. This was primarily as part of an overall reduction in meat consumption. Other reasons given for eating less chicken were concerns about animal welfare and environmental impact.

Australian consumers are generally satisfied with the safety and eating quality of chicken meat, and they do not have strong concerns about the impact of chicken meat production on animal welfare and the environment.

General consumer understanding of chicken meat production practices remains poor, especially about the use of hormones/steroids and cages (neither of which are used in Australian chicken production), use of antibiotics, and country of origin. Consumers continue to trust government sources above all others for information on the production and safety of chicken meat.

When shopping for chicken meat, most consumers say they are driven by price, cut, free range and country of origin. Labelling related to production methods is not a strong purchase driver for most consumers – they generally have a low level of (perceived) understanding and trust in such labels. Nonetheless, consumers indicate they are paying more attention to product packaging/labelling information, and that they are using this information to guide their meat choices.

Overall, the consumer trends likely to affect future demand for chicken meat include: growth in the number of consumers limiting or reducing their meat consumption; developing interest in production-related credence attributes (e.g. free range, animal welfare, antibiotic use); increasing concerns about animal welfare; and emerging concerns about the environmental impact of meat production.

Demand for chicken meat in Australia is likely to continue growing as more consumers replace other meat products, e.g. beef and lamb, with relatively more affordable chicken meat. For chicken to remain the most popular meat for the average Australian household, the industry needs to continue offering animal welfare-friendly chicken meat products that provide versatility and value for money, and deliver consistently good eating quality.

The challenge for the industry will continue to be gaining the attention of consumers and effectively communicating facts.

13.

Individually or in pairs, generate one positive social media post focused on each case study and write this in the spaces provided.

Case study 1



A template for a social media post. It features a large rectangular area for writing the post content. At the bottom, there are four icons: a heart, a speech bubble, a paper plane, and a bookmark.

Case study 2



A template for a social media post. It features a large rectangular area for writing the post content. At the bottom, there are four icons: a heart, a speech bubble, a paper plane, and a bookmark.

Case study 3



A template for a social media post. It features a large rectangular area for writing the post content. At the bottom, there are four icons: a heart, a speech bubble, a paper plane, and a bookmark.

Answers

Question 1

Answers will vary depending on individual student choice. An example is provided:

Apple's advertising success can be attributed to consistent **branding, emotional** storytelling, and a focus on product **design** and **functionality**. By creating simple and **visually appealing** advertisements, Apple communicates the **simplicity** and **elegance** of its products. Its campaigns focus on

emotions, use **human experiences**, and emphasise how their products **integrate** into daily life. Apple's advertisements showcase the **innovative** features of its products **without** overwhelming **technical language**, making them accessible and enticing. The advertisements can be viewed on television and online, in print, on billboards, in stores, and at events.

Question 2



Chicken has the lowest carbon footprint of any meat.



Australian chickens are not given hormones or steroids.



Meat chickens in Australia are never raised in cages.



More than 99% of chicken meat consumed in Australia is grown in Australia.



Cooked chicken is an excellent source of protein as well as key vitamins and minerals.



No antibiotics that are critically important in human medicine are used routinely in chicken production.

Question 3

Inghams, Baiada, Steggles, Lilydale, Turosi, La Ionica, Golden Farms, Bannockburn, Cordina Farms, Summertime – premium poultry, Golden Cockerel Chicken, Elgin Valley – free range, Hazeldenes, Gourmet Poultry.

Question 4

Strategy	Description	Example
Emotion	Brands often tap into emotions like happiness, nostalgia, love or sadness to create memorable advertisements and campaigns.	Telstra ad – The Great Wall Of China (0:46)
Social responsibility	Highlighting a brand's commitment to social causes, sustainability or charitable efforts can resonate with socially conscious consumers.	WeAre8 – Social media for a better world (3:26)
Aspirational messaging	Brands often portray a lifestyle or image that consumers might aspire to, especially in the healthy living, luxury or fashion sectors.	Picking Australian fruit and veg first. That's today's fresh food people (0:15)
Inclusivity and diversity	Representing a diverse range of people can resonate with a broader audience and showcase a brand's commitment to inclusivity.	The Story of Australia (1:00)
Scarcity and urgency	Limited-time offers or limited-stock items can create a sense of urgency, prompting quicker purchasing decisions.	Provide examples of products only available during certain periods of time, often with promotions or collectables.
Educational content	Providing valuable information or teaching consumers something new can position a brand as an authority.	Ozzie vs Mozzie (0:33)
Storytelling	Narratives or stories can make advertisements more relatable and memorable.	Mitre 10: With You All The Way (0:45)

Question 5

Not applicable to the activity.

Question 6

Discussion points	Inghams	Lilydale
Who thought the campaigns were successful?	Answers will depend on individual student choices.	Answers will depend on individual student choices.
How did the companies encourage consumers to think about purchasing and eating more chicken meat?	Showcases meat chicken farming practices and commitment to animal welfare and sustainability, addressing myths in the industry.	Uses humour, music and visuals to appeal to consumers. Promotes the care and freedom of the animal.
What strategies were used to appeal to consumers in the campaigns?	Online video content. Appeals to social conscience.	Humour, imagery and music are all used to engage viewers.
Who is the target audience of the campaigns (age, gender, etc.)?	Answers will depend on individual student choices.	Answers will depend on individual student choices.
What is the main message in each of the campaigns?	Promoting a 'good' image of the whole production chain of chicken meat (environment, animals and consumer).	The freedom and care of the animals by producers. The value of the end product.

Question 7

Answers will depend on individual student choice.

Question 8

Answers will depend on individual student choice.

Question 9

Overview

The Australian chicken meat industry contributes significantly to the domestic economy, with an estimated gross value of production (2021-22) of **\$2.97 billion** and an estimated retail value of **\$6.6 billion**.

The domestic chicken meat industry provides jobs for more than **58,000 people** (full-time equivalents), many in rural and regional

communities. There is a strong industry connection with retail activity and food service outlets that sell chicken meat.

The industry provides the most popular source of animal protein to Australian consumers, with annual per capita consumption of chicken meat exceeding **50 kilograms** (and increasing year on year). Additionally, **68% of Australians** eat chicken meat as part of a meal at least twice a week

because of its affordability, popularity with the entire household, versatility and taste.

The Australian Bureau of Agriculture and Resource Economics' (ABARES) forward

estimate for poultry meat production in 2022-23 is 1.367 million tonnes, or 1.367 billion kilograms (ABARES Meat Consumption Outlook).

Question 10

10.1 The trend shown by this graph is:
From the time period of 1950 to 2023, Australian chicken meat consumption has increased from 4.2 kg per person to 50.2 kg per person. Chicken meat consumption has increased over this period of time to be greater than sheep meat, pig meat and beef consumption in Australia.

10.2 The trend shown by this graph is:
Chicken meat consumption has increased from a rate of 25.4 kg per person in 1993 to 50.1 kg per person in 2002-23. The next largest consumption is pork, which is 27.1 kg per person.

10.3 The trend shown by this graph is: 50% of people who responded to this survey consume chicken 2-3 times per week.

Question 11

Observe graphic for answers.



Question 12

Answers will depend on individual student responses.

Question 13

Answers will depend on individual student responses.

References

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- Woolworths. (2022). **Picking Australian fruit and veg first. That's today's fresh food people.** <https://www.youtube.com/watch?v=uZPPFjVSWZ0>

7. Technology and innovation



Farm technology

Technology used in management and production on the farm:

- Identify technologies used on the farm.
- Gather data using appropriate instruments to measure resources, including weather and soils.
- Explain ways in which technology is used in farm management and production.

Technology is crucial in enhancing efficiency, productivity and sustainability within the chicken meat supply chain. Technology enables better coordination and integration between stakeholders, from farmers and processors to distributors and retailers.

As a research team led by University of New England's Derek Baker identified (Baker *et al.*, 2020): "The Australian chicken meat sector has embraced technology, genetics, marketing and industrial organisation so as to rival chicken industries in most advanced economies. It faces challenges from increasing costs of feed, energy and labour, static product prices, expanding compliance requirements, and retail market power.

"Maintaining chicken's place as the most affordable and popular meat in the domestic market will require leveraging existing strengths and capitalising on its untapped opportunities. Data, new ways of collecting and using it, and organisational change to mobilise its benefits along the supply chain provide a basis for innovation targeting these ends."

Advanced breeding techniques and **genetic selection** contribute to improved chicken health, growth rates and feed efficiency.

On farms, technologies such as **automated** feeding systems, climate control systems and **data analytics** are used to optimise production and animal welfare.

Processing facilities employ **automation and robotics** to increase efficiency, precision and food safety in tasks such as deboning, portioning and packaging.

Automated monitoring systems, including temperature sensors, humidity control and real-time data analysis, help maintain optimal storage conditions of processed meat and reduce the risk of spoilage or contamination.

Traceability systems and **barcode scanning technologies** help track and monitor product movements throughout the supply chain, ensuring quality control and food safety.

Integrated systems enable real-time tracking of inventory levels, demand forecasting and efficient order management, minimising waste and optimising inventory turnover.

Modern technologies and the industry's capacity to innovate will help drive increased productivity and profitability of the Australian chicken meat industry (AgriFutures Australia, 2022). AgriFutures Australia provides the research, development and extension for Australia's chicken meat industry. An Advisory Panel of industry professionals provides guidance as to what research projects should be undertaken.

The report referred to above (Baker *et al.*, 2020) identified the top three ranked technologies used in the industry as being environmental (temperature and humidity) sensors, cameras (broadly defined) and automatic weighing.

Before the digitalisation of data collection and automated climate-controlled sheds, environmental conditions would have been monitored with devices to provide this on-farm information to producers.




1. Research the instruments and units used to measure the factors in the table below that can impact productivity and food security. Use either the named instrument, an app, Google or the [Bureau of Meteorology](#) website (typing in the appropriate location in the search bar) to record as many of these conditions at the current location or area within the school.

Factor	Instrument used to measure factor	Unit used to measure factor	Measurement at current location
Temperature			
Humidity			
Airspeed/ movement			
Soil moisture			
Soil pH			
Rainfall			

2.

Read the below information on technology in the chicken meat industry and design an icon to represent the type of technology described in the right-hand column.

Examples of technology in the Australian chicken meat industry:

Technology	Icon	Description
Automated feeding systems		Delivers feed to chickens at specific times and in specific amounts. Ensures uniform feeding, reduces labour costs and can be adjusted based on the growth stage of the chicken.
Climate-controlled housing		Modern chicken houses have temperature control systems to maintain an optimal environment. These systems promote faster growth, reduce mortality rates, and ensure the wellbeing of the chickens.
Health monitoring systems		Sensors and cameras to monitor the health and behaviour of chickens. These systems enable early detection of diseases, reduce mortality and improve overall flock health.
Genetic selection		Breeding programs select for specific traits, such as faster growth rate, disease resistance and meat quality. The outcome is healthier and more productive birds.
Renewable energy		Integration of solar energy in poultry farming to reduce the carbon footprint of the industry. Energy is used in sheds to generate power to control temperature and lighting, heat water, and power fans.
Processing technologies		Automation in sorting, cutting and packaging. Automation increases processing speed, reduces manual labour, ensures consistent product quality and reduces wastage.

Genetic innovation and technology

According to the Australian Chicken Meat Federation (Australian Chicken Meat Federation, 2023a), traditional breeding, also called **selective breeding**, involves selecting the chickens with the most desirable traits (genetic characteristics) as parents for the next generation and repeating this generation after generation. There are about 50 chicken generations to every human generation, so the past 50 years of commercial breeding are equivalent to more than 2,000 years of human evolution!



This simple but effective mechanism has allowed all agricultural industries (grains, horticulture, dairy, meat) to improve their products and productivity.

Poultry is no different from the other sectors in this respect, although the process is more effective because the industry has greater control over it, the approach is used internationally, a large number of breeding animals can be maintained, and the generation times are shorter.

Meat chickens have been selectively bred over the past 60 years for a variety of characteristics, including growth rate and efficiency to convert feed into meat. This is why they reach the desired market weight and quality more quickly than the progenitor¹ breeds of chickens from which they were originally derived.

Australian chickens are not given hormones in any way. Their size occurs naturally due to selective breeding and optimal nutrition.

Climate-controlled housing innovation and technology

In Australian chicken production systems, technology monitors the environmental conditions inside broiler sheds. These technologies utilise remote sensing capabilities to measure various parameters indicative of production efficiency.

The data collected can be streamed to computerised control systems, which then assess the information and automatically adjust or provide instructions for precise environmental conditions to be changed for optimal production. Key metrics measured include temperature, air quality and other factors influencing production and welfare outcomes.



¹ A progenitor is a person or thing from which an organism is descended.

3.

Click the link and answer the following questions about the information.

[Climate in Poultry Houses – Poultry Hub Australia](#)

3.1 What does the climate in poultry houses influence?

- A. The respiratory system of birds.
 - B. The digestive system of humans.
 - C. Both the wellbeing of humans and the health of birds.
 - D. The behavioural patterns of birds during the night.
-

3.2 Which of the following is NOT a climatic factor to be measured at the animal level in poultry houses?

- A. Light.
 - B. Airspeed.
 - C. Sound level.
 - D. Air composition.
-

3.3 What is the term for the climate directly surrounding the birds?

- A. House climate.
 - B. Ambient climate.
 - C. Microclimate.
 - D. Macroclimate.
-

3.4 Which gas is mentioned as being heavier and can have higher levels at bird level compared to at 2 m height?

- A. Oxygen.
 - B. Nitrogen.
 - C. Carbon dioxide.
 - D. Methane.
-

3.5 What is the term for the temperature zone in which birds can keep their body temperature constant with minimum effort?

- A. Thermoneutral zone.
 - B. Comfort zone.
 - C. Critical temperature zone.
 - D. Ambient zone.
-

3.6 What is the average body temperature of birds?

- A. Between 35 °C and 38 °C.
 - B. Between 39 °C and 40.5 °C.
 - C. Between 41 °C and 42.2 °C.
 - D. Between 43 °C and 45 °C.
-

3.7 Which of the following statements about the gas detector used for measuring the gas content of the air is NOT true?

- A. The gas detector primarily relies on a pump for its operation.
 - B. The tubes in the device are filled with a substance that remains unchanged regardless of the gas passing through it.
 - C. Measurements using the gas detector should always be taken at the animal level.
 - D. There are specific tubes designed for determining the contents of gases like CO₂, NH₃ and H₂S.
-

Feeding innovation and technology



Access or observe the graph 'Efficiency of chicken meat production in Australia' from the link below.

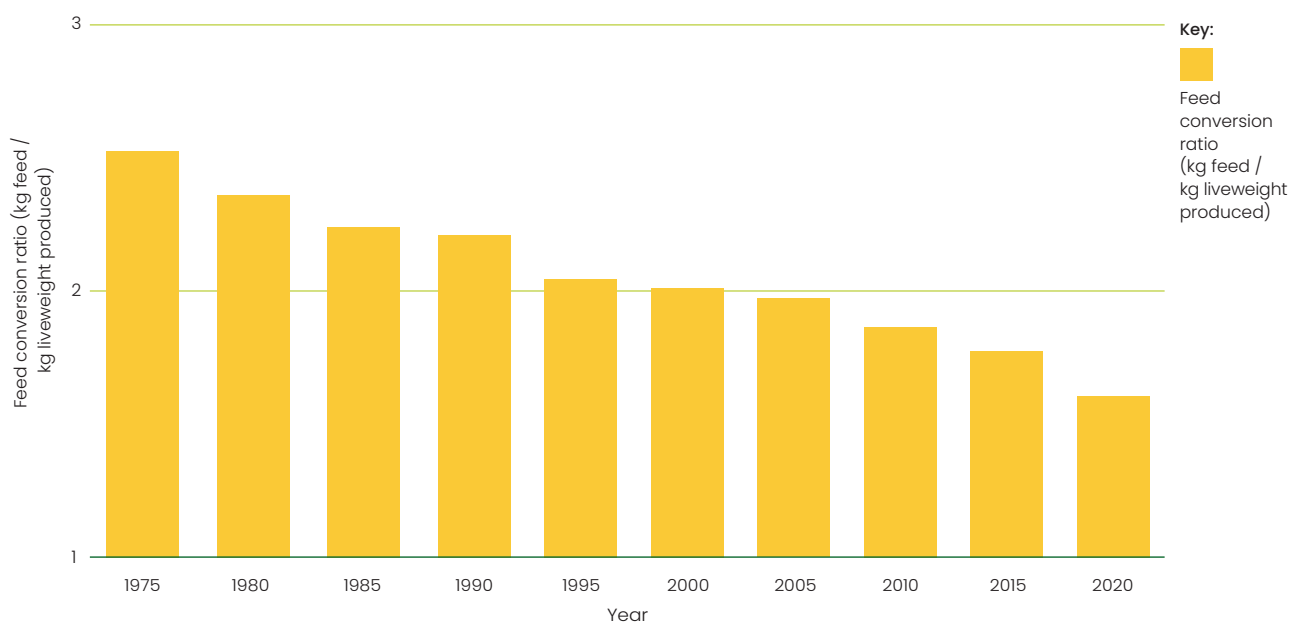
[Our Sustainability – Australian Chicken Meat Federation](#)

According to the Australian Chicken Meat Federation (Australian Chicken Meat Federation, 2023b), FCE in animal nutrition represents feed conversion efficiency, and is also known as feed conversion ratio (FCR). It is a measure used to determine how efficiently an animal converts the feed it consumes into the desired output, such as meat, milk or eggs. A lower FCE or FCR indicates the animal is more efficient at converting feed into the desired product.

One of the biggest determinants of how much energy is used (and thus how much greenhouse gas is created) to produce livestock products, such as chicken, other meat products and dairy products, is how efficiently the animals convert feed into edible products. This is because feed represents the

biggest source of these impacts. The good news is that chickens are the most efficient converters of feed into meat of all land-based livestock species. This has improved significantly over the past 45 years.

Feed comprises 85–90% grains, such as wheat, sorghum, barley, oats, lupins, soybean meal, canola and other oilseed meals and grain legumes. Hormones are not added to chicken feed or administered to commercial meat chickens or breeders in Australia. Hormone supplementation is a practice that has been banned internationally for more than 50 years. Meat chicken diets are formulated to strict nutritional standards.



Efficiency of chicken meat production in Australia



5.

Describe the trend in data from 1975 to 2020 and propose ideas about why this trend has occurred.

6.

Add the missing words in the below sentences using words from the word bank.

continuously

low

water

growth

kilogram

climatic

efficient

food

energy

Chickens are raised in large barns that have been designed so that they provide birds with ideal _____ conditions. They have _____ and _____ provided _____, and they are fed a diet that has been specially formulated for each stage of _____. This means their growth is optimised, and the amount of feed the birds receive is just what they need.

Using this farming system, the amount of _____ that chickens put into maintaining their body temperature and finding food and water is _____. This results in more _____ use of feed, energy and water to produce each _____ of chicken meat, and therefore fewer greenhouse gas emissions created.

Feeding innovation is a key area for research and development in food production industries. Improving feeding efficiency can promote better animal welfare, decrease costs associated with feed waste, improve meat quality and promote better FCE.

The *Sustainable Precision Feeding in Broiler Chickens in Australia* project (AgriFutures Australia, 2023) is working to tackle key questions, including:

- How can we influence nutrition in parent birds to improve health and production outcomes in future generations?
- How can we improve the digestibility of locally grown high-protein feed grains to reduce the industry's reliance on imported soybean?
- Could we implement a lower-protein diet yet maintain health and production?
- What impact do these nutritional changes have on gut health and, consequently, the environment in which broiler chickens are raised?
- How do we turn these research outcomes into actionable insights for producers?

Automation innovation and technology



View the video and answer the questions on feeding technology in the poultry industry.

[Precision Poultry Facility – Poultry Hub Australia \(2:23\)](#)

7.1 Identify the primary function of “Dorothy”, the feed logic robot mentioned in the video.

7.2 Explain why “Dorothy” is significant to the poultry industry.

Processing automation innovation and technology



Click the links to learn more about processing technologies. Answer the questions provided about the value of these technologies in the poultry industry.

[The Harvesting Robot “Gribbot” – Norwegian Sci-Tech News \(3:15\)](#)

[Automation in meat processing – Kuka](#)

Source 1

8.1 Identify the main function of the robot “Gribbot” as depicted in the video.

8.2 Describe how the introduction of “Gribbot” will benefit the chicken meat industry.

Source 2

8.3 What can robot technology achieve in meat processing?

8.4 Scroll and access the ‘Picking & Packaging’ and ‘Further Processing’ areas of the website. View the footage and read the descriptions in these areas.

9.

Read the sample case study provided below.

This case study features an introduction, a description of innovation/technology, the advantages and disadvantages of the innovation/technology, an assessment of the sustainability features (environmental, economic and social), and a conclusion. The case study also details the sources used to generate the information.

Sample processing innovation and technology case study

Introduction

The Australian chicken meat industry is one of the most rapidly growing agricultural sectors. With demand for chicken meat increasing,* the industry has turned to advanced processing technologies to enhance efficiency, safety and quality. This case study delves into the significance of these technologies, their advantages and disadvantages, and their impact on economic, environmental and social sustainability.

Description of innovation/technology

Advanced processing technologies encompass a range of automated systems used in the chicken meat production line. These include automated sorting, cutting, packaging and monitoring systems. Such technologies are important in ensuring consistent product quality, reducing wastage and increasing processing speed.

Advantages of innovation/technology

Efficiency: Increases processing speed, allowing for higher production rates.

Safety: Reduces human interaction with machinery, leading to fewer workplace accidents.

Consistent quality: Ensures uniformity in product quality, leading to higher consumer trust.

Reduced wastage: Precise cutting and sorting mechanisms lead to minimal wastage of meat.

Disadvantages of innovation/technology

High initial cost: The initial investment required for these technologies can be substantial.

Dependency: Over-reliance on machinery can lead to significant downtimes in the event of technical failures.

Job displacement: Technology can lead to less manual labour being required,* potentially leading to job losses.

Assessment of innovation/technology

Economic sustainability: The industry has experienced growth,* with chicken meat production forecast to increase.* Automation plays a crucial role in meeting this demand efficiently; however, the high initial investment can be a barrier for smaller producers, potentially leading to industry consolidation.

Environmental sustainability: Automation ensures optimal use of resources, leading to less wastage. For instance, precise cutting reduces meat wastage. The energy consumption of these automated systems can be high, leading to a larger carbon footprint if not powered by renewable sources. Fewer inputs are also required as the FCR of animals is decreasing* due to innovation in feeding.

Social sustainability: Enhanced safety protocols in automated systems reduce workplace accidents, ensuring the wellbeing of employees. Consideration must be given to the potential job displacement due to automation. However, it's worth noting new job roles, especially in technology maintenance and monitoring, emerge as a result.

Conclusion

Advanced processing technologies in the Australian chicken meat industry have undeniably revolutionised production processes. While they bring about efficiency and safety, it's essential to address the associated challenges to ensure holistic sustainability. As the industry grows,* striking a balance between automation and sustainability will be pivotal.

Sources

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AgriFutures Australia. (n.d.). **Chicken Meat.** <https://agrifutures.com.au/rural-industries/chicken-meat/>

Poultry Hub Australia. (n.d.). **Meat chicken (broiler) industry.** <https://www.poultryhub.org/production/meat-chicken-broiler-industry>

Using this case study and its sources, and the 'Facts and Figures' link below, annotate appropriate data into the case study to improve its assessment (the * symbol has been included in the text to pinpoint areas where data inclusion is recommended).

[Facts and Figures – Australian Chicken Meat Federation](#)

For example, research and include data relating to the:

- 1. Number of employees in the chicken meat industry**
- 2. Value of the industry to Australia's economy**
- 3. Rate of consumption**
- 4. Increase in consumption over time**

Extension activity: Consider the information about innovation/ technology in the chicken meat production chain and use this to annotate the supply chain flow chart from Section 4. Use a different colour again (e.g. blue) to show where in the supply chain each type of technology is relevant.

Answers

Question 1

Factor	Instrument used to measure factor	Unit used to measure factor	Measurement at current location
Temperature	Thermometer	degrees Celsius (°C)	Dependent on student location
Humidity	Hygrometer	Moisture per cubic metre of air (g/m ³ or g/kg), often reported as a percentage	Dependent on student location
Airspeed/movement	Anemometer	Knots (kn)	Dependent on student location
Soil moisture	Tensiometers	Kilopascals (kPa)	Dependent on student location
Soil pH	Soil pH meter, millivoltmeter or colourimetric methods	0-14	Dependent on student location
Rainfall	Rain gauge	millimetres (mm)	Dependent on student location

Question 2

Icons will depend on individual student design.

Question 3

- 3.1 C. Both the wellbeing of humans and the health of birds.
- 3.2 C. Sound level
- 3.3 C. Microclimate
- 3.4 C. Carbon dioxide (CO₂)
- 3.5 B. Comfort zone
- 3.6 C. Between 41 °C and 42.2 °C.
- 3.7 B. The tubes in the device are filled with a substance that remains unchanged regardless of the gas passing through it.

Question 4

Not applicable to the activity.

Question 5

In 1975, the FCR of chicken meat production in Australia was 2.52. Over 45 years, the FCE of chicken meat decreased. In 2020, it was recorded as 1.6. This means the FCR of chickens has become more efficient, with a difference of 0.92.

Factors that have contributed to this decrease include:

- Selective breeding for rapid growth and efficient feed conversion. This means modern broilers have genetics predisposing them to convert feed into muscle (meat) more efficiently than their ancestors.
- Advances in poultry nutrition have led to the formulation of diets that are precisely tailored to the nutritional needs of broilers at different stages of growth. This ensures the birds receive the right nutrients in the right amounts, minimising waste and maximising growth.
- Using controlled environment systems that regulate temperature, humidity and lighting. Such optimal conditions reduce the energy broilers need to expend on thermoregulation, allowing more energy to be directed towards growth.
- More effective health management practices, including vaccination programs and biosecurity measures, reduce the incidence of diseases. Healthy birds are better at converting feed into body mass.
- Increased recognition of the role of gut health in FCE. A healthy gut can better absorb nutrients, and there's ongoing research and application of probiotics, prebiotics and other additives to enhance gut health in broilers.

Question 6

climatic; food; water; continuously; growth; energy; low; efficient; kilogram.

Question 7

7.1 "Dorothy" is a feed logic robot that operates like a "chicken feed sushi train". She runs on a rail system, can blend multiple diets together to achieve the desired composition, and then dispenses the feed into each feeder around the shed. This technology allows for the distribution of different diets each day, enabling unique experimental designs.

7.2 The feed logic robot can revolutionise poultry feeding. Operating on a rail system, Dorothy can blend and dispense multiple diets, offering unparalleled flexibility in daily feeding routines. This innovation exemplifies the synergy between academia and industry, enabling researchers to devise novel methodologies to address pressing challenges in the poultry sector.

Question 8

- 8.1 To harvest chicken fillets automatically.
- 8.2 By potentially increasing efficiency in the chicken meat industry through automating the process of harvesting chicken fillets, reducing the need for manual labour and ensuring consistent quality.
- 8.3 Use the home page of the source to answer the question – [Automation in meat processing](#).
- 8.4 Not applicable to the question.

Question 9

Number of employees in the chicken meat industry: 58,000

Value of the industry to Australia's economy: \$6.6 billion

Rate of consumption: 68% of Australians eat chicken at least twice a week, or 50 kg on average per year, and consumption is increasing.

Increase in consumption over time: 1950 – 4.2 kg; 2023-24 – 50.2 kg

“The Australian chicken meat industry is a significant economic contributor. The estimated gross value of poultry farm production in 2021-22 was \$3.149 billion (ABARES, 2022; chicken production represents approximately 95% of poultry production), while chicken meat has an estimated retail value of \$6.6 billion. The industry provides direct employment to more than 58,000 people (full-time equivalents) (RMGC and BDO EconSearch, 2020), many in rural and regional communities. The Australian Bureau of Agriculture and Resource Economics (ABARES) forward estimate for poultry meat production in 2023-24 is 1,356 kilotonnes (ABARES Meat Consumption Outlook, 2019), compared with 1,267 kilotonnes in 2019-2010.”

– AgriFutures Australia

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8. The agricultural workplace



The agricultural workplace

Potential safety hazard in agricultural workplaces:

- Recognise and use safe work practices.

Safe work practices employed in agricultural workplaces:

- Identify potential safety hazards in agricultural workplaces, assess the risk and suggest strategies to reduce or eliminate the risk, e.g. safe machinery.

Legislative requirements:

- Outline WHS legislative requirements that impact the farm.

Australia's diverse agricultural industries play a crucial role in our economy and food and fibre supply. These workplaces can be deceptively hazardous.

The combination of heavy machinery, unpredictable livestock, disease transmission and the natural elements means there are numerous risks. Tractors can overturn, objects can cause injuries and without proper protection, workers can be exposed to harmful chemicals. Additionally, the locations of many farms can make it challenging to get immediate medical help in the event

of an accident. It's essential to understand that while farms (and their supply chains) are places of productivity and growth, risks to people, animals and the environment must be managed correctly. Proper training, awareness and safety measures are vital to ensure hazards throughout the supply chain are reduced or eliminated.





Identify potential safety hazards in agricultural workplaces.



For four of the hazards identified in question 1, in the table on the following page record:

- The hazard.
- What harm the hazard could cause to a person or animal.
- How the hazard could be controlled or managed.
- How the hazard could have been prevented.

An example is provided.

Hazard	What harm the hazard could cause to a person or animal	How the hazard could be controlled or managed	How the hazard could be prevented
Workers can be injured by sharp equipment while processing chicken meat.	Injury/cuts to human body parts.	Have a first aid kit readily available and ensure workers are trained in basic first aid.	<p>Checking equipment is suitable for use.</p> <p>Ensuring workers have the appropriate training and skills suited to the operation.</p> <p>Wearing covered, appropriate clothing and PPE.</p>

Optional activity: Observe an area (e.g. a school farm) around the school. Identify any hazards or potential risks. Discuss how these hazards could be reduced or eliminated.



Animal health

Safety throughout a production system is not limited to simply considering the wellbeing of people. Creating a safe environment for livestock and those who handle them is crucial to a productive and sustainable enterprise and industry. Management decisions focused on animal welfare, biosecurity, bird health and nutrition are vital aspects of a farm. Animal health and safety are directly related to reduced spread of disease on farms and via consumption.

According to the Australian Chicken Meat Federation (Australian Chicken Meat Federation, 2023), farmers and chicken

companies are committed to ensuring the chickens in their care are free from disease and are as healthy as possible. Disease prevention and control are managed through effective biosecurity practices, alongside careful animal husbandry practices applied by experienced and knowledgeable farmers, with the support and guidance of specialist poultry veterinarians.

Biosecurity and quarantine are integral parts of any successful poultry production system. Biosecurity refers to measures taken to prevent or control the introduction and spread of infectious agents to a flock.



View the video and answer the questions about disease management and biosecurity.

[Poultry Meat Biosecurity – Australian Chicken Meat Federation \(13:58\)](#)

3.1 Identify the primary objective of on-farm biosecurity in poultry operations.

3.2 List some of the main ways pathogens can spread among poultry.

3.3 Explain why it is essential to manage the cleanliness and movement of people on poultry farms.

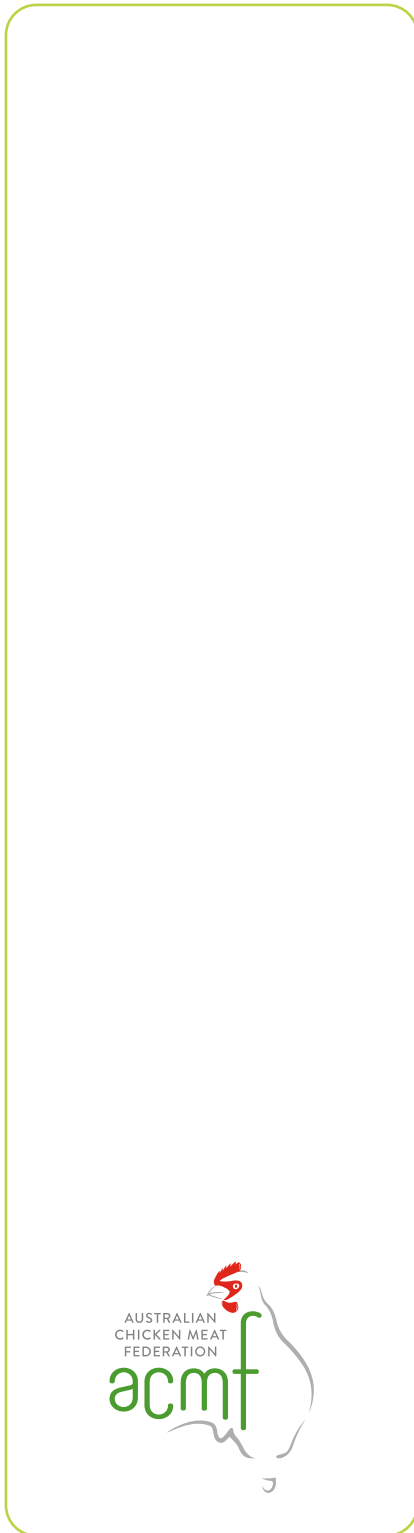
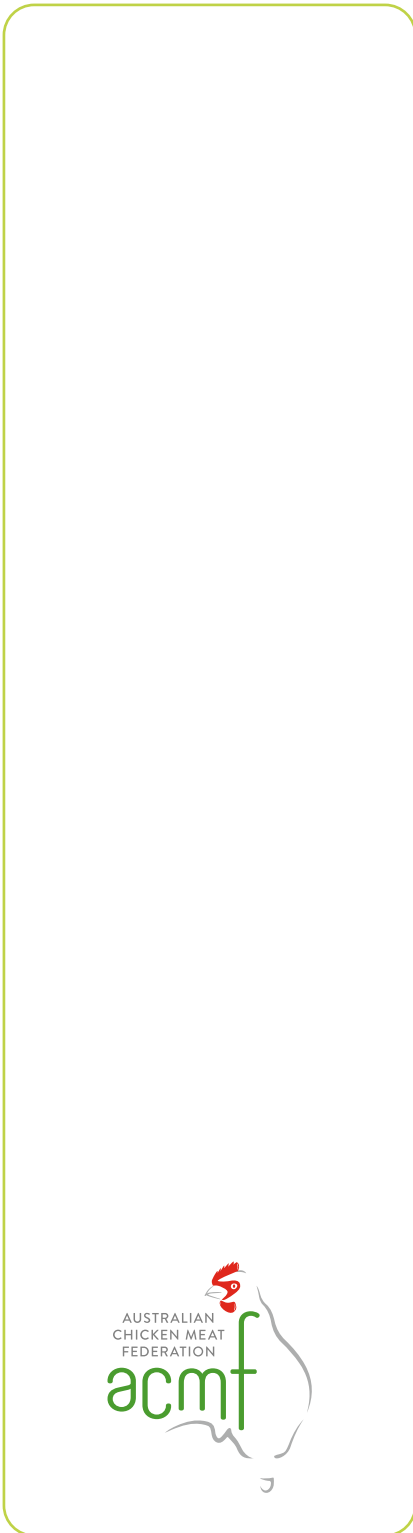
3.4 Describe how water sources on poultry farms pose a risk and what measures should be taken to ensure water safety.

3.5 Describe why it is crucial to manage dead birds on poultry farms and what procedures should be followed.

4.

Click the link and read about the Australian Chicken Meat Federation's commitment to maintaining the highest standards of animal health and protecting consumers. Summarise three main points in the bookmarks below.

[Animal Health – Australian Chicken Meat Federation](#)



5.

Propose a safety slogan that could be used to promote risk management or animal health on Australian chicken meat farms, e.g. “Chickens thrive when safety’s alive!” or “Aussie farms lead with care!”

Work health and safety

There are codes of practice for businesses to guide both the people who own workplaces and those who are employed there. These legal standards and guidelines enable stakeholders to understand their roles and responsibilities, and the standards that should be maintained to ensure a safe work environment.

6.

Click the link and read how businesses are legally obligated to protect everyone in the workplace. Make a list of the WHS obligations of a business.

[Work health and safety – Australian Government](#)

For more specific guidelines focused on regulations, legislation and work health and safety, refer to the Safe Work Australia webpages covering [agriculture](#) and [laws and regulations](#), and the [Farmsafe Australia website](#).

Answers

Question 1

Answers will vary depending on individual student responses. Suggestions include:

- Machinery or equipment accidents and injury.
- Chemicals – pesticides, herbicides and fertilisers can be toxic to humans and animals, and can also cause environmental damage.
- Livestock can be unpredictable and pose risks of kicking, biting or transmitting disease when handled.
- Lifting heavy objects and performing repetitive tasks can lead to injuries.
- Prolonged exposure to loud machinery or noises can lead to hearing loss.
- Activities like ploughing and handling grain or compost can lead to respiratory issues.
- Slips, trips and falls on rough terrain, wet surfaces or cluttered work areas can be hazardous.
- Danger of electrocution around powerlines.

Question 2

Answers will vary depending on individual student choices. Answers to avoid hazards/risks could include:

- Ensuring all workers are adequately trained to use machinery and handle chemicals.
- Wearing appropriate PPE like gloves, masks, ear protection and safety boots.
- Regularly inspecting and maintaining equipment to ensure it's in good working condition.
- Storing chemicals and tools in designated areas.
- Ensuring workers take regular breaks to decrease injuries and accidents from fatigue.
- Using signs to indicate hazardous areas or activities.
- Being aware of the emergency procedures in place and ensuring all stakeholders are familiar with them.
- Ensuring strict biosecurity measures, such as disinfecting equipment and tracking and monitoring visitors.
- Using appropriate handling techniques with animals.
- Disposing of waste correctly.
- Vaccinating livestock to prevent outbreaks of diseases.

Question 3

3.1 To prevent or control the introduction and spread of infectious diseases and food safety pathogens to a flock. Implementing daily biosecurity procedures helps produce healthy and productive poultry, and ensures that the food is safe for consumers.

3.2 The main ways pathogens can spread among poultry are:

- Contaminated people
- Contaminated vehicles and equipment
- Contaminated litter
- Wild birds, rodents, feral animals and insects
- Livestock and domestic pets
- Contaminated feed and water
- Poultry movements, including mortality
- Through the air

3.3 People's movement and cleanliness is one of the biggest risks for disease spread. Food safety and disease pathogens can be carried on people, including their hands, hair, clothing, footwear and personal equipment, such as mobile phones. To reduce this risk, farm staff and visitors must follow specific biosecurity measures, such as wearing clean clothing, sanitising hands and avoiding contact with other birds.

3.4 Surface water sources, such as dams, rivers and tanks, may be contaminated by wild birds and waterfowl, which can carry diseases and food safety pathogens. These pathogens can survive in water for extended periods and potentially infect poultry flocks.

To ensure water safety, any water used for drinking, shed cooling and range irrigation must meet specific microbiological standards. Surface water and any other water that doesn't meet these standards must be treated appropriately, for example by chlorination, and stored in a closed system to prevent recontamination.

3.5 Dead birds may be infected with diseases and food safety pathogens. It's essential to collect all mortalities and culled birds from sheds and ranges daily to prevent the spread of these pathogens. All containers for collecting dead birds must be cleaned and disinfected before being returned to the production area.

Dead birds can be stored in a freezer or composted in purpose-built structures. If collected by a contractor, the collection area should be away from the production area to prevent contamination.

Question 4

Answers will vary depending on individual student choice.

Question 5

Answers will vary depending on individual student choice.

Question 6

As per the Australian Government (2024), you must put health and safety practices in place as soon as you start your business. Under Australian WHS laws, your business must:

- ensure the health and safety of your workers
- not put the health and safety of other people at risk.

To do this you must:

- provide a safe work environment

- provide and maintain safe machinery and structures
- provide safe ways of working
- ensure safe use, handling and storage of machinery, structures and substances
- provide and maintain adequate facilities
- provide any information, training, instruction or supervision needed for safety
- monitor the health of workers and conditions at the workplace.

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