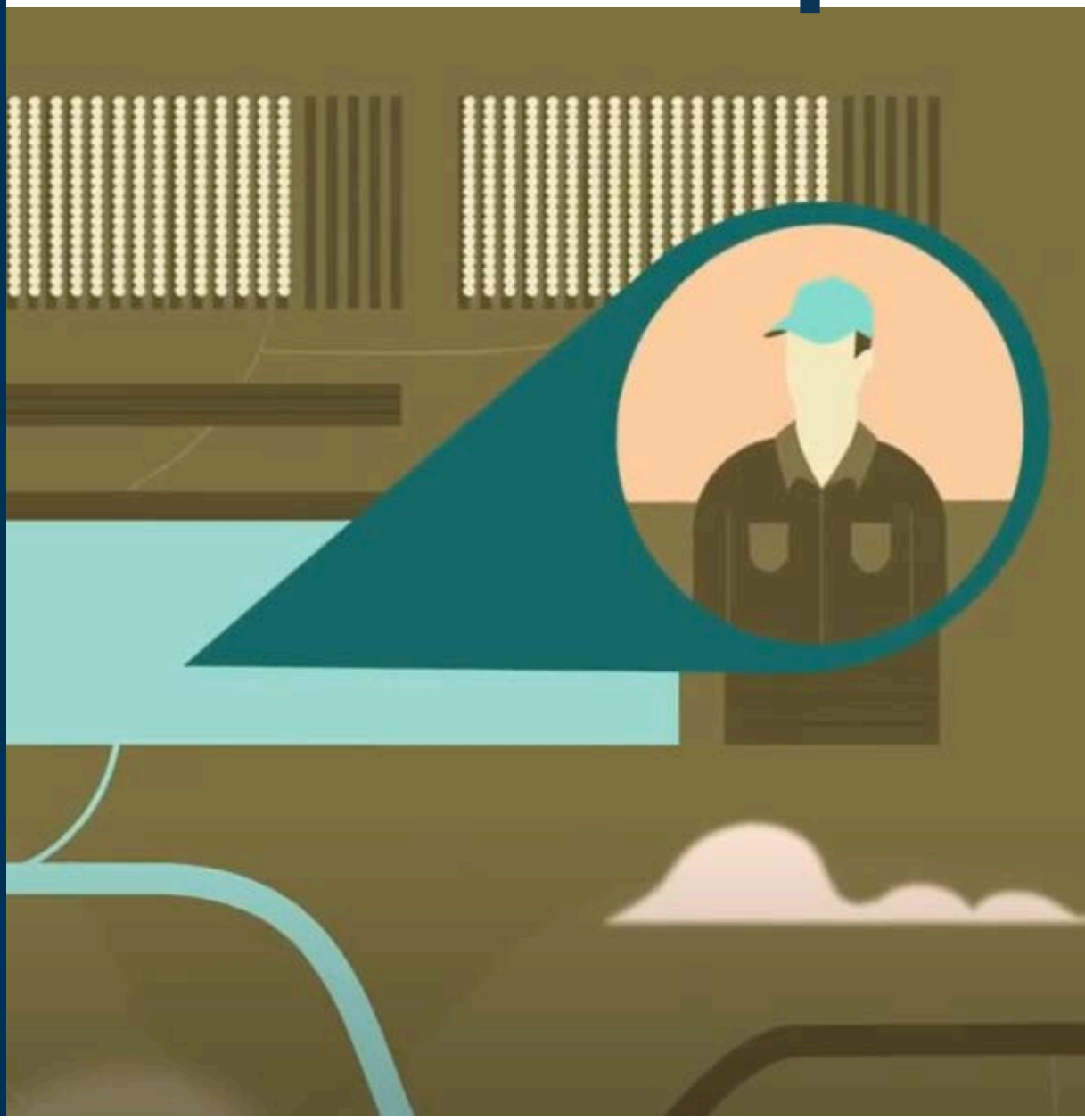
What Do You Need to Grow a Cotton Crop?



Lesson & Activity Guide
Years 7 to 10
Design and Technologies

COTTON AUSTRALIA

Primary Industries Education Foundation Australia

What Do You Need to Grow a Cotton Crop?
Overview

Lesson Objective

Students learn about cotton's vital role as a renewable, biodegradable natural fibre. They will differentiate between natural and made fibres, identifying their distinct characteristics and applications in the textile industry. Students will analyse the optimal abiotic and biotic resources required for successful cotton production and cultivation, recognising their influence on both the quality and quantity of cotton yield.

Lesson Overview

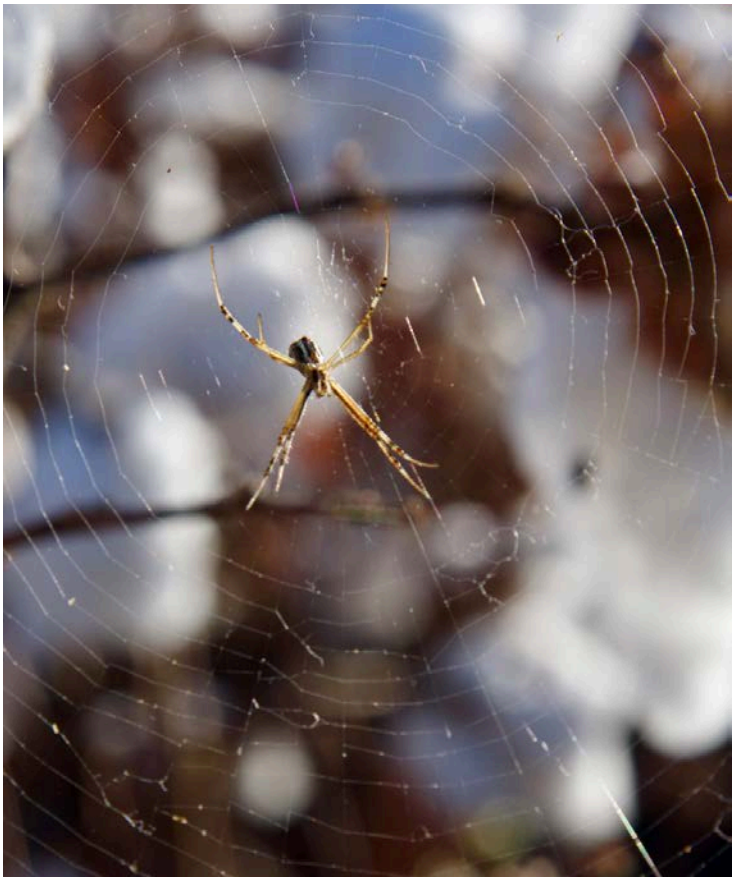
Activity 1.1 - Cotton Fibre Quality (60 - 80 mins)
Activity 1.2 - Life Stages Of Cotton Production (60 - 80 mins)
Activity 1.3 - Factors Influencing Production (60 - 80 mins)

CONTENTS

Australian Curriculum Content Years 7 - 10

Design and Technologies

- Analyse how people in design and technologies occupations consider ethical and sustainability factors to design and produce products, services and environments (AC9TDE8K01)
- Analyse how food and fibre are produced in managed environments and how these can become sustainable (AC9TDE8K04)
- Analyse how people in design and technologies occupations consider ethical, security and sustainability factors to innovate and improve products, services and environments (AC9TDE10K01)
- Analyse and make judgements on the ethical, secure and sustainable production and marketing of food and fibre enterprises (AC9TDE10K04)



ACTIVITY 1.1 - Cotton Fibre Quality

1. Cotton products such as cotton seeds, cotton wool (sometimes called cotton ripple), cotton balls, tips, buds, thread, napkins, cottonseed oil (if possible), hardcover "fabric" bookbinding, coffee filters, and bandages. Note that some cotton balls, tips, and buds are now often manufactured using made/synthetic fibre, so check the labels first. Typically if it is not labelled cotton, it is a made fibre (polyester or nylon).
2. Various cotton and non-cotton clothing with visible labels attached - 100% cotton, various cotton blends, and 100% synthetic material.
3. Cotton Products and Uses (3:07)
4. Cotton Products & Uses Quiz
5. Cotton Products Infographic
6. Digital devices
7. **Worksheet 1.1a - Cotton Fibre Quality Infographic** (Design activity)
8. Design software or pencils and markers
9. The Features and Benefits of Cotton
10. Products and Uses
11. Reasons for Australia's Superior Quality

ACTIVITY 1.2 - Stages of Cotton Production

1. **The Cotton Plant**
2. How is Cotton Grown?
3. The Australian Cotton Industry (3:34)
4. Cotton Australia From Field to Fashion Poster
5. **Worksheet 1.2a - From Seed to Sock** (Literacy activity)
6. Australian Cotton, From Seed to Sock (6:12)
7. **Worksheet 1.2b - Cotton Stages Flip Book** (Design activity)
8. Blank sheets of paper (cut into small rectangles)
9. Markers, coloured pencils or crayons, scissors
10. Stapler or binder clips
11. Optional: Cotton Plant Time Lapse (6:09) to show the growth of a cotton plant in a greenhouse and Cotton Boll Popping Open (0:37)

ACTIVITY 1.3 - Factors Influencing Production

1. **Worksheet 1.3a - Abiotic and Biotic Factors that Influence Cotton Production** (Literacy activity)
2. The Australian Cotton Story (9:43)
3. Biodiversity and Cotton
4. Australian Cotton Industry
5. **Worksheet 1.3b - Cotton Farm Scenario** (Literacy activity)

OTHER RESOURCES

A Season At Saunders
Cotton Australia Environment and Climate
Australian Cotton Following the Thread
Circular Cotton Initiative
Australian Cotton Industry Snapshot

Students will explore a variety of products made from cotton and the importance of fibre quality in the textile and apparel market. Students will learn the significance of cotton as a natural fibre compared to made alternatives.

a) Introduce the topic of where clothes come from by encouraging a class discussion and posing the question, 'Where do the materials for your clothes come from?'

b) Discuss the difference between natural fibres like cotton and made/synthetic fibres. Highlight the importance of understanding where our textiles come from and the impact of consumer choices on the textile industry. (Answers page 9)

c) Record student responses on the board or in a central area and explain that natural fibres come from the environment and may be cellulose-based, e.g. cotton, linen, bamboo; protein-based, e.g. silk, leather and wool; or mineral-based, e.g. rockwool, fibreglass. As cotton is grown on a plant, it is a natural, cellulose-based fibre. Synthetic polymer-based (plastic) fibres are manufactured and created by humans. They are made from chemical polymers not found in nature and, unlike natural fibres, are mainly insoluble (do not break down in water). Some of these fibres include nylon, acrylic, spandex, microfibre, elastane, and polyester.

d) Allow students to handle some of the many products made from cotton in addition to clothes, including seeds (used for livestock feed), cotton wool (sometimes called cotton ripple), cotton balls, tips, buds, thread, napkin, cottonseed oil (if possible), hardcover book-binding, coffee filters, bandages etc. Compare these with synthetic polymer-based fibres such as nylon and polyester fabrics. Facilitate a discussion on the 'properties' or 'characteristics' of cotton.

e) Show students a number of cotton and non-cotton clothing with labels attached. Ask students to examine the labels and look for information about the materials used in the clothing. Ask them to feel the fabric, discussing any differences they observe between 100% cotton and synthetic fabric.

f) View the video Cotton Products & Uses (3:07). Ask students to recall the many products made from cotton mentioned. Optional: Students may take the interactive online quiz based on this video Cotton Products & Uses Quiz.

g) Provide a copy of the Cotton Products Infographic for students to discuss. This infographic shows cotton, a natural fibre grown on a plant, and outlines the uses of the various parts of a cotton plant: the seed, lint, and trash as well as some industrial uses.

h) Distribute **Worksheet 1.1a - Cotton Fibre Quality Infographic** (Design activity). Students use digital devices and the information and links/QR codes provided to create an infographic displaying the features and benefits of cotton products. Include images, charts, facts, and figures highlighting a number of factors influencing cotton production and the benefits and features of cotton products. Design software may be used, or pencils and markers may be used to work on a printed copy of page 3 of the worksheet to design the infographic. (Answers page 10)

Students will access the following links

- The Features and Benefits of Cotton
- Products and Uses
- Reasons for Australia's Superior Quality

An infographic is a visual representation of information, data, or knowledge designed to present complex information quickly and clearly. It combines text, images, charts, and graphics in a visually appealing format to convey information easily. Refer to the Cotton Products Infographic *for an example.*

i) Students share infographics with the class.

Stages of Cotton Production

Lesson Guide for Activity 1.2

Students will explore the stages of cotton production from seed to end product. They will view a video and access written sources to research the stages and summarise their learning by designing a flip book.

a) Ask students what they know about cotton production.

- What does a cotton plant look like?
- What does a cotton seed look like?
- How is cotton grown?

b) Discuss and review that almost all parts of the cotton plant are used in some form, including the lint, cottonseed, stalks, and seed hulls. The cotton fibre is processed into yarn and fabric, and the seeds can be crushed for oil or animal feed. The remaining plant material is either mulched or composted and reapplied to the soil. Cotton seed plays a very important role during times of drought as a livestock feed.

- For more information, refer to The Cotton Plant and How is Cotton Grown?

c) View the video The Australian Cotton Industry (3:34) to gain an understanding of the processes involved in cotton production.

d) Discuss the basic stages of cotton production with students: *Planting, Growing, Harvesting, Ginning, Spinning, Weaving, and Manufacturing.* (Answers page 10)

e) Display and discuss Cotton Australia From Field to Fashion Poster with students. Allow students to identify any additional steps in the process.

f) Distribute **Worksheet 1.2a - From Seed to Sock** (Literacy activity) and view the video Australian Cotton, From Seed to Sock (6:12). Ask students to recall as much information as possible and record answers on their worksheets. (Answers page 11)

g) Distribute **Worksheet 1.2b - Stages of Cotton Production Flip Book** (Design activity). Students read and use the information to create a visual representation of the stages of cotton production by designing a flip book. The objective is to allow students to understand the sequential processes involved in planting, growing, harvesting, and processing cotton.

h) Distribute small rectangular sheets of paper to each student and instruct them to write one or two sentences, and draw a simple illustration representing each stage on separate pages. Encourage the use of colours and labels to accompany their text. Additional stages may be added.

i) Instruct students to arrange their pages in the correct sequence to represent the chronological order of cotton production. Staple or clip the pages together at one end to create a flip book.

j) Students share their flip books with the class. As each student flips through their book, they briefly explain the processes depicted in each stage of cotton production. (Answers page 12)

Students will learn about the optimum abiotic and biotic factors required for production and the impact on the quality and quantity of the product if these factors are limited. Students will understand the role of consultants and experts in assisting growers with decision-making.

a) Ask students if they know where cotton is grown in Australia. Discuss why they think cotton is only grown in some areas and not others.

- Where is cotton grown?
- Does cotton need a warm or cold climate to grow?
- Does cotton grow in dry conditions?
- Does cotton grow on flat or hilly land?
- What role does an Agronomist play in assisting growers with on-farm decision-making?

Cotton is grown in more than 249 regional Australian communities. The number of Australian farms growing cotton fluctuates depending on water availability. Australia is a small global cotton producer but the world's third-largest cotton exporter in a good season (Cotton Australia, 2024).

The suitability of an area for cotton production depends on a combination of factors. These include climate, water availability, soil conditions, and whether technology (e.g. machinery used for picking) and infrastructure, such as a cotton gin (which separates the lint from the seed and bales the lint for export) are easily accessible.

b) Display Cotton-Growing-in-Australia.pdf. Explain to students that this map shows the main cotton regions in Australia. The main production areas are central and southern Queensland, northern, central, and southern NSW, and northern Victoria (Cotton Australia, 2023). Once students have an idea of the locations relative to the whole of Australia and the state they live in, zoom in to see greater detail of the areas. The map also shows small areas of northern Queensland and the Northern Territory where cotton production is emerging (Government, 2020).

c) Discuss the importance of both biotic and abiotic factors that influence the growth of cotton.

Biotic factors include living organisms that directly or indirectly affect cotton cultivation. This encompasses pests, diseases, and beneficial organisms like pollinators. For example, the presence of certain insects, such as cotton bollworms, can pose a threat to cotton crops, while beneficial organisms like bees contribute to pollination.

Abiotic factors comprise non-living elements that impact cotton growth. These can include climate, soil composition, water availability, sunlight, and temperature. Adequate sunlight, optimal temperature, and appropriate soil moisture levels are essential abiotic factors for successful cotton cultivation. Soil pH, nutrient levels, and the presence of minerals also fall under abiotic considerations.

d) Distribute **Worksheet 1.3a - Abiotic and Biotic Factors** (Literacy activity) and view the video The Australian Cotton Story (9:43). Students list the abiotic and biotic factors that influence the growth of cotton discussed in the video.

e) Add any additional abiotic and biotic factors not mentioned. For example, pests and diseases (both harmful, e.g., cotton bollworm, aphids, and beneficial, e.g., bees and lady beetles). Answer the remaining questions on the worksheet. (Answers page 13)

f) Continue to discuss the Australian cotton industry's commitment to the careful and responsible management of the natural environment. Growers use natural resources to help manage pests and to store carbon in the soil and vegetation. The industry works alongside research organisations, state governments, local natural resource management organisations, and groups such as Landcare to ensure that best management practices are met. myBMP (Best Management Practices), the cotton industry's environmental management program, helps growers to manage the natural environment by ensuring they are operating at the highest level. The industry's on-ground extension team – CottonInfo – supports growers in adopting the latest best practices based on research and development. Refer to further information about Biodiversity and Cotton or see more about what the Australian Cotton Industry is doing to improve the natural environment on farms.

g) Distribute **Worksheet 1.3b - Scenario** (Literacy activity) that will assist students in understanding how Australian cotton farms exist in a diverse natural ecosystem, interacting with the soil, water, and biodiversity of the landscape.

h) In groups of three to four students, read the scenario and develop three recommendations to further assist the grower in implementing sustainable and innovative practices that align with the farm's values and enhance its overall efficiency. Students are encouraged to include visuals, charts, and data to support their recommendations. (Answers pages 14 - 16)

ACTIVITY 1.1 - Cotton Fibre Quality Infographic

b) Natural fibres are derived from plants, animals, or minerals. These fibres exist in nature and have been used for thousands of years in many cultures for making textiles. Natural fibres are biodegradable.

Examples include:

- **Cotton**: Obtained from the cotton plant's seed coat (called a boll), a protective case around the seeds of cotton plants. Cotton is soft, breathable, and widely used in the textile industry.
- **Wool**: Derived from the fleece of sheep, goats, or other animals. Wool is known for its warmth and insulating properties.
- **Silk**: Produced by silkworms. Silk is a luxurious and smooth fibre often used in high-quality fabrics.
- **Flax**: From the flax plant, flax fibres are used to make linen, a strong and breathable fabric.

Synthetic fibres are made and created through chemical processes. These fibres are designed to have specific characteristics for particular applications. Synthetic fibres are often more resistant to wrinkles, moisture, and insect damage than natural fibres. They are not biodegradable.

Examples include:

- **Polyester**: A versatile and durable synthetic fibre used in a wide range of applications, including clothing and industrial uses.
- **Nylon**: Known for its strength and elasticity, nylon is often used in the production of textiles, ropes, and other materials.
- **Acrylic**: Mimics the properties of wool and is lightweight. It is often used as a wool substitute in clothing and blankets.
- **Spandex**: Renowned for its elasticity, spandex is commonly blended with other fibres to provide stretch in fabrics.

Worksheet 1.1a - Cotton Fibre Quality Infographic (Design activity)
Infographic designs will vary. The following key messages could be included.
The properties of cotton refer to the distinctive characteristics or qualities that describe cotton fibres. These properties influence how and why cotton is used.

The properties of cotton include:

- Cotton is a **soft, absorbent and breathable** natural fibre, making it an ideal material for clothing and undergarments worn close to the skin.
- Due to its natural whiteness and high absorbency rate, cotton is **one of the best fabrics to dye**.
- **Softness**: Cotton fibres are naturally soft to the touch, making cotton a comfortable and pleasant material for clothing, bedding, and other textile products.
- **Breathability**: Cotton is very breathable, allowing air to circulate through the fabric. This property makes cotton garments comfortable to wear in warm weather.
- **Absorbency**: Cotton fibres are highly absorbent, meaning they can absorb and hold a significant amount of moisture. This property makes cotton towels, bathrobes, and other absorbent products highly effective.
- **Durability**: Cotton is known for its strength and durability, providing resilience to wear and tear. High-quality cotton fabrics withstand repeated washing and usage (e.g. denim jeans).
- **Versatility**: Cotton is a versatile material that can be woven or knitted into various fabric types, from lightweight and breathable to heavy and durable. This versatility allows for a wide range of applications in the textile industry.
- **Biodegradability**: Cotton fibres are biodegradable, meaning they can naturally break down over time, contributing to environmental sustainability when disposed of.
- **Thermoregulation**: Cotton can regulate temperature, keeping the body cool in warm conditions and warm in cool conditions because of its breathability and insulating properties. This thermoregulatory property enhances the comfort of cotton clothing.
- **Hypoallergenic:** Cotton is generally hypoallergenic, less likely to cause allergic reactions, and is suitable for sensitive skin.

ACTIVITY 1.2 - Stages Of Cotton Production

Worksheet 1.2a - From Seed to Sock (Literacy activity)

1. The business has employed the world's best technology and biotechnology to produce a quality cotton crop. This approach ensures advanced care and growth of the crop, resulting in some of the world's highest-quality cotton.
2. Roundball pickers provide a cleaner pick and less contamination during cotton harvesting. This practice ensures higher quality cotton, meeting quality standards that benefit the business and its customers.
3. The dyeing process enhances the quality of Australian cotton by ensuring even colouration and bright colours. The contamination-free nature of Australian cotton is vital as it results in a superior dyeing process, making the final product more appealing to customers. Contamination-free cotton refers to fibres free of impurities such as foreign materials, seeds, or synthetic substances, ensuring a high-quality, pure textile product.
4. The CSIRO spinning mill plays a vital role in processing Australian cotton, subjecting it to the entire industrial process. It contributes to the textile mills and marketplace by developing new spinning and fabric finishing technologies, ensuring Australian cotton meets the highest standards.
5. The company showcases its commitment to sustainability by working closely with Australian growers and spinners, establishing a fully traceable supply chain. Their focus on producing Australian-made socks demonstrates a commitment to the local market, contributing to the national economy, and promoting the quality of Australian-made products.
6. The gin is mentioned as it is where cotton lint is separated from the seeds, allowing it to be turned into bales and sold into the world market. It plays a crucial role in the cotton production process by facilitating the separation of these components.
7. The business addresses potential contamination by using round module pickers during cotton harvesting, ensuring a cleaner pick. This is essential in maintaining fibre quality, meeting high standards, and providing customers with superior-quality cotton.
8. Employing Australians in rural communities is significant as every farm employs nearly seven people, contributing to local economies. The industry's high labour standards ensure the well-being of employees, making the cotton industry a major contributor to the overall community welfare.
9. The Blue Jeans Go Green™ program contributes to sustainability by recycling old denim jeans into insulation. Since its creation in 2006, the program has collected over three million pieces of denim, diverting over 1,700 tonnes of textile waste from landfill.
10. Australian cotton is favoured by textile mills due to its contamination-free nature, resulting in more even coloration and brighter colours during processing. This makes it highly desirable for textile mills.

Worksheet 1.2b - Cotton Stages Flip Book (Literacy activity)
Flip Book designs may vary. Students must have the stages identified in sequential order. Students may add additional stages of production. For example, Ground Preparation, Planting, Growing, Watering, Caring for the Crop, Harvesting, Transporting, Ginning, Spinning, Dyeing, Weaving, Knitting, Manufacturing, Recycling. Students should accompany their text with images and diagrams.

- **Planting**: Cotton production begins with planting cotton seeds. Growers typically plant seeds in rows and the time of planting depends on the growing region. The seeds require adequate soil temperature and moisture to germinate (i.e. soil temperature reaches 14°C at a depth of 10cm and rises in temperature for at least three successive days). Growers check the soil temperature regularly before planting. Cotton seed is planted in Spring when the soil is warm enough to ensure satisfactory seed germination and crop establishment.
- **Growing**: Depending on soil temperature and moisture, cotton seeds emerge from the ground five to 14 days after planting. As the plants grow, they form green, leafy bushes. The cotton plant has several growth stages, including flowering and boll development. Flower buds develop a few weeks after the plant starts to grow, and flowers appear a few weeks later. After pollination, the flowers change colour and then fall off, leaving a ripening seed pod that becomes the cotton boll. The bolls contain the cotton fibres and seeds. Adequate water, sunlight, and nutrients are essential during this stage. Checks for pests, soil moisture level tests, and weed removal are ongoing. On irrigated cotton farms, the initial irrigation (watering) is usually followed by four to five irrigations at two to three-week intervals from mid-December to late February. This can differ greatly depending on the region, temperature, soil type and natural rainfall levels. Approximately four months of growing is needed for the cotton bolls to ripen and split open. Cotton growers use a range of natural and chemical options to control the pests that attack cotton (a process called Integrated Pest Management, or IPM) (Cotton Australia. (n.d.-c).
- **Harvesting**: The crop is checked to ensure it is ready to pick. Growers usually pick the cotton crop once most bolls have opened and matured. To speed up the plant maturity process, cotton growers apply products to open the cotton bolls and cause the plant to drop its leaves. This defoliation enables a cleaner picking process to occur. Large mechanical cotton pickers are used to pick the crop. It is extremely important that cotton is picked dry, or discolouration may occur and reduce quality. The cotton is loaded onto trucks and sent to the gin.

Worksheet 1.2b - Cotton Stages Flip Book (cont.)

- **Ginning**: This is a process of separating lint (raw cotton fibre), cottonseed, and trash. The boll protects the cotton fibres, and ginning removes the seeds and any remaining impurities. This process is essential for obtaining clean and high-quality cotton fibres. The cotton lint is tightly pressed into bales, most of which is sent to ports for shipping to overseas markets. The cotton seed is utilised locally as stock feed. Cottonseed oil can also be extracted and used as cooking oil or for a number of other purposes. The trash is composted locally and reapplied to the soil as a source of organic matter.
- **Spinning**: After ginning, the cleaned cotton fibres are spun into yarn. This involves twisting and drawing out the fibres to create a continuous strand of yarn.
- **Weaving** is the process of interlacing the spun cotton yarn to create fabric. The yarn is woven into a textile using looms, forming the structure of the fabric. Different weaving patterns and techniques result in various types of cotton fabrics, each with unique characteristics.
- **Manufacturing**: The final stage involves manufacturing finished products from the cotton fabric. This can include various items such as clothing, home textiles, and industrial products. Manufacturers cut and sew the fabric into the desired shapes and sizes, adding details and finishing touches.

ACTIVITY 1.3 - Factors Influencing Production

Worksheet 1.3a - Abiotic and Biotic Factors

1.

Biotic Factors (Living)	Abiotic Factors (Non-Living)
Cotton plant varieties Soil Weeds Animals Native vegetation Insects Fungi Bacteria Disease agents	Sunlight Air Wind pH Salinity Humidity Temperature, e.g. temperature probe Water environments, e.g. river Environmental conditions Water infrastructure, e.g. ditches, dams, and bores. Irrigation techniques Inorganic nutrients

ACTIVITY 1.3 - Factors Influencing Production

Worksheet 1.3a - Abiotic and Biotic Factors (cont.)

2. The primary purpose of the crop rotation system is to store soil moisture. It functions as a soil moisture storage system, ensuring that the soil retains an adequate amount of moisture for the cultivation of cotton crops.
3. The introduction of insect-resistant cotton varieties, such as In-Guard and Bollgard cotton, has led to a significant reduction in the use of insecticides. Unlike previous seasons, when growers applied numerous insecticide sprays, the farm mentioned experienced a season without insecticide usage in its rain-fed ground.
4. The temperature probe provides a live temperature reading, which is crucial for cotton growers during planting. It ensures the soil temperature at planting depth is at least 14 degrees Celsius for three consecutive days. This data, accessible to cotton growers through a website, aids in making informed decisions for optimal seed germination and emergence.
5. The farm ensures responsible cotton production through adherence to regulations and laws, such as those preventing the overuse of pesticides. Australia has strict measures to ensure a transparent and ethical cotton production process. This commitment is part of an effort to be recognised globally as responsible and ethical producers of high-quality natural fibre.
6. Research and development (R&D) play a pivotal role in the Australian cotton industry, with over $20 million spent annually on R&D. Since 1996, the sector has documented a 52% improvement in water use efficiency, highlighting the commitment to continuous improvement and sustainability. The focus on R&D aims to produce high-quality cotton with increased yields while addressing sustainability.

Worksheet 1.3b - Cotton Farm Scenario

Students are asked to develop three recommendations that would further assist the grower to implement sustainable and innovative practices that align with the farm's values and enhance its overall efficiency.

Students should be encouraged to use visuals, charts, and data to support their recommendations. For instance, a graph illustrating historical rainfall patterns or a timeline showcasing the implementation of technological solutions.

Varoius responses can be accepted. An example answer is provided below.

Recommendation 1: Consult with Industry Experts
To further assist the generational cotton farm in southern Queensland in implementing sustainable and innovative practices, it is highly recommended to consult with agronomists and industry experts. These professionals bring invaluable expertise and practical knowledge that can significantly enhance the farm's decision-making processes and implementation of best management practices.

Worksheet 1.3b - Cotton Farm Scenario (cont.)

For example:

Monitoring Soil Health Management:

- Conducting soil tests to assess nutrient levels, pH, and organic matter content.
- Implementing soil conservation practices such as minimum tillage, cover cropping, and crop rotation to improve soil structure and fertility.
- Recommending appropriate fertilising strategies based on crop nutrient requirements and soil analysis results to minimise possible nutrient runoff and leaching.

Water Management:

- Advising on efficient irrigation methods to optimise water use efficiency and minimise water wastage.
- Implementing soil moisture monitoring systems to better understand crop water requirements and avoid over-irrigation.
- Recommending water conservation practices to coincide with crop growth stages.

Pest and Disease Management:

- Providing integrated pest management (IPM) strategies to control pests and diseases while minimising reliance on chemical pesticides.
- Recommending crop monitoring programs to detect pest and disease outbreaks early and take timely preventive measures.
- Advising on the use of biological control agents, crop rotation, and resistant crop varieties to manage pest and disease pressure sustainably.

Crop Selection and Rotation:

- Recommending suitable cotton varieties based on local climate conditions, pest pressure, and market demand.
- Suggesting crop rotation plans to improve soil health and diversify farm income.
- Providing insights into alternative crops or crop diversification strategies that may offer additional economic and environmental benefits.

Recommendation 2: Introduce Precision Agriculture on Farm

- Recommending the adoption of precision agriculture technologies such as Global Positioning System (GPS)-guided machinery, drones, and sensor-based monitoring (e.g. soil sensors and systems) to optimise input use and improve farm efficiency.
- Providing guidance on data management and analysis to interpret information collected through precision agriculture tools and make informed decisions from this data and on farm improvements.

Worksheet 1.3b - Cotton Farm Scenario (cont.)

Recommendation 3: Habitat Conservation

- Seeking expertise in environmental management can assist in developing comprehensive riparian management plans tailored to the farm's specific landscape and needs. Knowing about soil conservation, erosion control, and vegetation management is important when promoting the health of riparian areas.
- Industry experts in sustainable agriculture and ecosystem services can provide guidance on enhancing riparian habitat quality and biodiversity, ensuring that management practices align with broader conservation goals. The development of such improvements on farms could be the establishment of wildlife corridors, planting of native vegetation, and creating habitat areas.

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Cotton Fibre Quality Infographic

Student Worksheet 1.1a

The cotton industry is committed to continuous improvement, whilst consistently delivering high-quality products. These commitments are evident in the following areas:

- environmental responsibility
- innovation in genetic engineering and selective breeding
- implementation of advanced harvesting technologies and quality control measures
- adoption of sustainable farming practices
- ethical sourcing initiatives, and
- flexibility to respond to market trends and consumer preferences.

Consumers can enjoy eco-friendly clothing and textiles with features such as softness, strength, and durability, reflecting the industry's commitment to sustainability, innovation, and customer satisfaction.

Read the information below, and use the links or QR codes to access the source materials. Make notes on the features and benefits of cotton products and the factors that affect high-quality cotton production.

Features of Cotton Products:

- Softness: cotton fibres create a soft and comfortable texture, ideal for clothing and
- bedding.
- Breathability: cotton allows air to flow freely through the fabric, making it breathable
- and suitable for all seasons.
- Durability: refers to the strength and resilience of cotton fibres, which contribute to
- the longevity of cotton products.
- Versatility: cotton can be woven into various products such as shirts, jeans, towels,
- and bedsheets.

Benefits of Cotton Products:

- Comfort: cotton products are comfortable to wear due to their softness and
- breathability.
- Hypoallergenic: cotton is less likely to cause allergic reactions than synthetic
- materials, making it suitable for sensitive skin.
- Moisture-wicking: cotton can absorb moisture from the body, keeping the wearer
- cool and dry.
- Eco-friendliness: cotton fibres are biodegradable and have a lower environmental
- impact than synthetic fibres.

Cotton Fibre Quality Infographic

Student Worksheet 1.1a

Features and Benefits of Cotton
https://australiancotton.com.au/assets/downloads/Australian_Cotton_Fact_Sheet_-_Features__Benefits_of_Cotton.pdf

Products and Uses
https://cottonaustralia.com.au/uses-of-cotton

Reasons for Australia's Superior Quality
https://australiancotton.com.au/supply_chain/reasons-for-australian-cottons-superior-quality

Cotton Fibre Quality Infographic

Student Worksheet 1.1a

Use the information provided to create an infographic displaying the features and benefits of cotton products.
Include images, charts, facts, and figures highlighting the journey to achieve product excellence. Refer to an example of a Cotton Australia infographic using the link or QR code.

https://cottonaustralia.com.au/assets/general/Education-resources/Cotton-Products-Infographic.png

From Seed to Sock

Student Worksheet 1.2a

COTTON AUSTRALIA

Primary Industries Education Foundation Australia

View the video [Australian Cotton, From Seed to Sock](https://youtu.be/t6plTYrBth4) and answer the following questions.
https://youtu.be/t6plTYrBth4

1. Explain how technology has been utilised in the last six months to produce a high-quality cotton crop.

2. Describe the use of round module pickers in cotton harvesting. Identify the advantages they bring to the process.

3. Explain how the dyeing process contributes to the quality of Australian cotton and why contamination-free cotton is crucial in this context.

4. Identify the role that the CSIRO spinning mill plays in the journey of Australian cotton and how it contributes to the textile mills and marketplace.

5. Explain how the company demonstrates its commitment to sustainability and the local market.

6. Describe the gin mentioned in the cotton production process, and its role in separating cotton lint from seeds.

7. Describe how the business addresses the issue of potential contamination in cotton, and provide reasons why this is important in maintaining fibre quality.

8. Explain the significance of employing people in rural communities within the cotton industry, and how it contributes to the overall well-being of the community.

9. Identify how the Blue Jeans Go GreenTM program contributes to sustainability, and describe the impact it has had on diverting textile waste from landfills.

10. Explain how the use of Australian cotton in textile mills benefit the industry, and why it is favoured by these mills.

Cotton Stages Flip Book

Student Worksheet 1.2b

COTTON AUSTRALIA

Primary Industries Education Foundation Australia

Use the information below to create a flip book displaying the stages of cotton production. Additional stages may be added to the books. Note: the below are not in the correct order.

Planting: Cotton production begins with planting cotton seeds. Growers typically plant seeds in rows and the time of planting depends on the growing region. The seeds require warm soil and adequate moisture to germinate. As the plants grow, they form green, leafy bushes.

Growing: Once planted, cotton plants require a warm, sunny climate for optimal growth. They go through several growth stages, including flowering and boll development. The bolls contain the cotton fibres and seeds. Water, sunlight, and nutrients are essential during this stage.

Spinning: After ginning, the cleaned cotton fibres are spun into yarn. This involves twisting and drawing out the fibres to create a continuous strand of yarn.

Weaving: Weaving is the process of interlacing the spun cotton yarn to create fabric. The yarn is woven into a textile using looms, forming the structure of the fabric. Different weaving patterns and techniques result in various types of cotton fabrics, each with its unique characteristics.

Manufacturing:The final stage involves manufacturing finished products from fabric. This can include a range of items such as clothing, home textiles, and industrial products. Manufacturers cut and sew the fabric into the desired shapes and sizes, adding details and finishing touches.

Ginning: Ginning is the process of separating the cotton fibres from the seeds. The cotton fibres are protected by the boll, and ginning removes the seeds and any remaining impurities. This process is essential for obtaining clean and high-quality cotton fibres.

Harvesting: Harvesting involves picking the mature cotton bolls from the plants. This is typically done when the bolls have opened, revealing the cotton fibres. Harvesting is done mechanically with specialised equipment.

Abiotic and Biotic Factors Influencing Cotton Production

Student Worksheet 1.3a

View the video '[The Australian Cotton Story]' and answer the following questions in the spaces provided.
https://www.youtube.com/watch?feature=shared&v=ZgqUbTY7nxo

1. List the biotic and abiotic factors that were addressed in the video.

Biotic Factors 	**Abiotic Factors** 

2. Describe the primary purpose of the crop rotation system.

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_____

3. Describe how the introduction of insect-resistant cotton varieties impacted the use of insecticides on the described farm.

_____

_____

4. Identify the significance of the temperature probe for cotton growers.

_____

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5. Explain how the farm ensures responsible cotton production, and what are some of the regulatory measures in place.

_____

_____

6. Explain the role research and development play in the Australian cotton industry, and what improvements have been documented in recent years.

_____

_____

Cotton Farm Scenario

Student Worksheet 1.3b

In groups of 3 -4, read the scenario below and develop three recommendations that would further assist the grower in implementing sustainable and innovative practices on the farm. These recommendations need to align with the farm's values and enhance its overall efficiency.

Some useful links:
https://www.agriculture.gov.au/agriculture-land/farm-food-drought/crops/cotton

https://cottonaustralia.com.au/sustainability

https://cottonaustralia.com.au/environment

https://cottonaustralia.com.au/research-technology-and-innovation

Challenge:
Part of the industry's work is to better understand vegetation on cotton farms and the broader landscape, including ecosystem services such as carbon storage, erosion control, natural pest control, providing habitat, and biodiversity value. The industry sees the importance of improving its management practices of riparian lands to contribute towards their improved health. myBMP (Best Management Practices), the cotton industry's environmental management program, helps growers manage the natural environment by ensuring they operate at the highest level.

Scenario:
You are a group of agricultural science students given the opportunity to work closely with a generational cotton farm. The farm, located in southern Queensland near Toowoomba and now managed by the fourth generation, has a strong commitment to leaving the land in better condition for future generations. However, no improvements have been made to the farm for some time.

Task:
Your task is to develop THREE recommendations to further assist the grower in implementing sustainable and innovative practices that align with the farm's values and enhance its overall efficiency. Including visuals, charts, and data to support your recommendations is important.

Cotton Farm Scenario

Student Worksheet 1.3b

COTTON AUSTRALIA

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Recommendation 1:

Recommendation 2:

Cotton Farm Scenario

Student Worksheet 1.3b

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Recommendation 3: