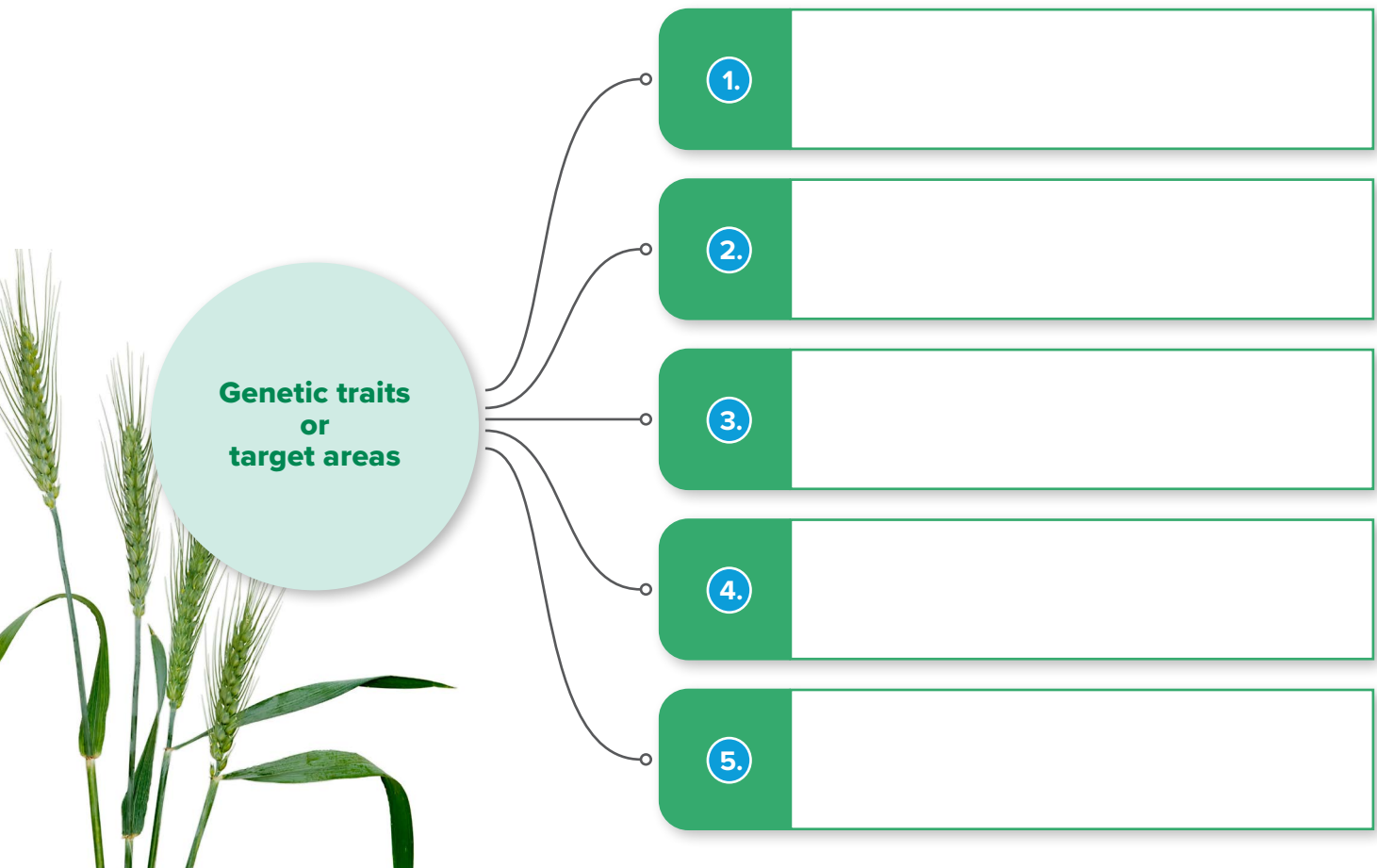


# Case Study One: Breeding Wheat for a Changing Climate

Scan the QR code or click on the [link](#) to scroll and view the video on breeding innovation and technology in the grain industry. Identify up to five genetic traits or target areas discussed in the video and record them in the mind map.



▶ Breeding wheat for a changing climate (10:06)  
<https://grdc.com.au/news-and-media/news-and-media-releases/national/2020/october/wheat-researchers-progress-quest-for-better-adapted-cultivars>



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# Case Study Two: Frost Mapping a Future Management Tool

Scan the QR code or click on the [link](https://www.youtube.com/watch?v=Pbmnwj23rf4) to view the video focused on innovation and technology in the grain industry.



▶ Frost Mapping a Future Management Tool (6:51)  
<https://www.youtube.com/watch?v=Pbmnwj23rf4>



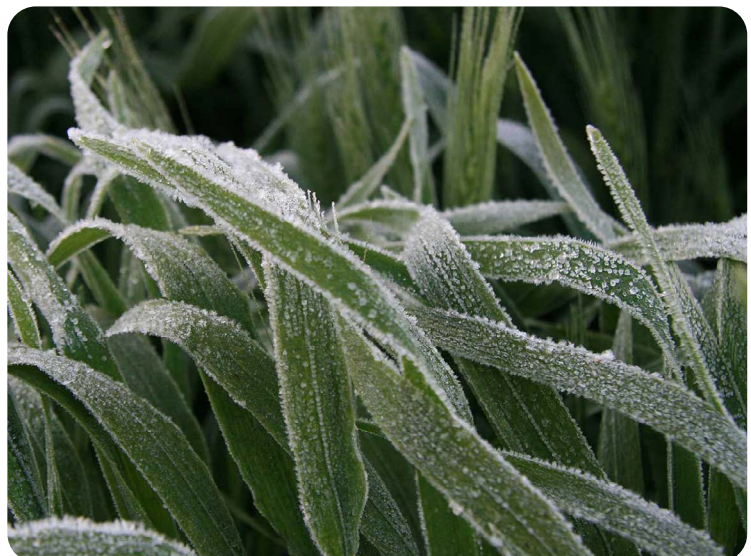
Read the information below before answering the questions on the following page.

## Frost effect on the plant

'White' frost occurs when the air around the plant is moist and the temperature around the plant is zero or below. Ice crystals form on the surface of the plant. The water in between plant cells freezes and draws water out of surrounding cells to form more ice. When the frost melts slowly (i.e. in winter), the damage is minor, and the plants repair themselves to fight another day. The visual effect is similar to drought stress as plants can temporarily appear wilted. In spring, the thawing can be rapid and damage can be severe.

'Black' frost occurs when the temperature drops below zero but the surrounding air is dry (i.e. drought conditions). Ice can't form on the plant surface and the water between cells freezes quickly and forms large crystals. These large crystals 'pop' holes in the cells causing permanent damage. Once thawed, plant parts affected immediately look floppy, spongy and discoloured. If that plant part happens to be a flower or a developing ovary, the result can be detrimental to yield.

*(Modified from GRDC, 2014)*



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# Case Study Two: Frost Mapping a Future Management Tool (cont.)

Answer the following questions about frost mapping as a management tool.

1. Typically, how many loggers are needed in a paddock for frost detection?

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2. Identify the problem with this.

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3. Identify the aim of the frost management tool.

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4. What do the red and blue colours on the map indicate to producers?

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5. Describe what is meant by spatial data.

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6. When the data was animated, what did it illustrate?

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7. Identify some of the data that the animation showed.

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## Case Study Two: Frost Mapping a Future Management Tool (cont.)

8. What was the difference in temperature between the regional weather station and the on-farm loggers?

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9. Explain how this technology might be used in practice.

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10. What does electromagnetic spectrum technology recognise and assess?

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11. Highlight the advantage to producers of combining these two technologies.

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# Case Study Three: Heat Tolerant Wheat

Scan the QR code or click on the [link](#) to view the video focused on the development of heat tolerant wheat varieties.



▶ Heat Tolerant Wheat:  
improving yield through  
heat tolerance (6:06)  
[https://www.youtube.com/  
watch?v=6nDjDdO-IWY](https://www.youtube.com/watch?v=6nDjDdO-IWY)



## Heat stress

Heat stress is a key abiotic stress affecting crop and cereal production in all regions of the Australian wheat belt. Heat stress can have significant effects on grain yield and productivity, with potential losses equal to and potentially greater than other abiotic stress, such as drought and frost.

(GRDC, 2013)



Flanker wheat heads just before harvest in December 2018, which was a very dry season. (Image courtesy: GRDC)

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# Case Study Three: Heat Tolerant Wheat (cont.)



Create bookmarks by summarising three important aspects about heat tolerant wheat on the bookmark templates below.

A vertical rectangular box with a thin black border, intended for a bookmark template. At the bottom center, there is a stylized green wheat leaf icon with five leaves.

A vertical rectangular box with a thin black border, intended for a bookmark template. At the bottom center, there is a stylized green wheat leaf icon with five leaves.

A vertical rectangular box with a thin black border, intended for a bookmark template. At the bottom center, there is a stylized green wheat leaf icon with five leaves.

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