



The interaction of genotype, environment and management in the forestry industry.

Year 12 Agriculture



Outcomes

- H1.1 explains the influence of the physical, biological, social, historical and economic factors on sustainable agricultural production;
- H2.1 describes the inputs, processes and interactions of plant production systems.

Students learn about:

- The interaction of genotype, environment and management.

Students learn to:

- Outline plant breeding systems and their genetic basis including selective breeding, hybridisation and genetic engineering;
- Explain how plant breeding is used to develop new plant varieties to improve product quality, yield and environmental adaptation.

Introduction to plant breeding and forestry:

The basic aims of plant breeding in agriculture are to; improve the quality and quantity of materials produced by the plant whilst ensuring that the plant is suitably resistant to attack from pests and disease and is capable of continuing to produce materials in variable climatic conditions.



Genetic variation between individual **Radiata Pine** trees exists for a wide range of characteristics. These traits can include:

Cone size and morphology	Branching traits
Stem form (straightness, volume, density)	Wood quality and fibre properties
Soil tolerances	Frost resistance
Disease resistance	

Breeding programs between trees aim to produce trees that give cumulative gains over successive generations and create trees that are able to be productive in different growth areas.

Radiata Pines can be propagated by seeds or cuttings (a desirable stock is grown to yield a number of desirable shoots that are then removed, treated and then planted to encourage root growth).

Currently, the Forestry Corporation NSW states the follow information as the method of breeding Radiata Pines.

"FROM CONES TO PLANTATION:

Radiata pine is a conifer or cone bearer. Conifers are trees which have cones and do not have flowers or fruit. Ripe (mature) pine cones from the best trees are selected by State Forests personnel for seed collection. The collected cones are heated and tumbled to release the seeds. The seeds are de-winged and sorted into size and weight before being planted into seedbeds or pots in a nursery. Fertilisers, fungicides and weeding are used to produce good seedlings. At about nine months old, the seedlings are ready for planting. A plantation is where many seedlings are planted by people and grown into trees for a range of purposes from timber production through to environmental protection."

Forestry corporation, accessed 5th June 2017

<http://www.forestrycorporation.com.au/our-forests/education/resources-and-publications/wild-forest/woodwork/info/forest-supermodels/radiata-pine/information>



Activity One: Group presentation of stimulus material

Your teacher will provide you with instructions on how to complete this activity using the table below.

Stimulus Material One

The Land: 23rd June 2016

On Farm: TREEPLAN's goal to make bigger and better trees.

URL: <http://stba.com.au/cms/doc?id=81afbde1>

Stimulus Material Two

New pine breeding technique may help trees adapt to climate change

October 12, 2011, Source: Wiley-Blackwell

URL: <https://www.sciencedaily.com/releases/2011/10/111012124016.htm>

Table One:

<u>Summary of Stimulus One</u>	<u>Summary of Stimulus Two</u>



Activity Two: Multimedia questions and answers

Multimedia One:

Going Bush: Episode 4- Seed Processing (0.00- 5.04)

URL: <https://www.youtube.com/watch?v=EpgpzuUl8us>

After viewing the above video, answer the following questions:

1. Identify what happens to the seeds after they are collected from a logged coupe.
2. Describe what regeneration forestry is?
3. When are the seeds replanted?
4. Identify how the seeds are planted.

Your answers:



Multimedia Two:

Going Bush 2016 EP03 Tumut Pine

URL: <https://www.youtube.com/watch?v=NEX2fE2IFXA> (0.00-7.15)

After viewing the above video, answer the following questions in the box below:

5. Identify the number of pines that are grown at the Tumut nursery.
6. How long are the young pines in the nursery for?
7. Describe some of the management processes that occur during the growth of the forest.
8. Identify some of the end uses of the trees.

Answers:

**Multimedia Three:**

Blowering Nursery, Tumut

URL: <https://www.youtube.com/watch?v=7XG853o53Vk> (0.00-3.55)

After viewing the above video, please answer the following questions in the box below:

9. Define the term "bare rooted".
10. Identify the regions that the seedlings are sent to for forest plantation.
11. Describe how the process of shortening the tap root is performed.
12. Identify how much water is conserved when seedling are growth in containers.

Answers:



Activity Three: Case study on Southern Tree Breeding Association.

The Southern Tree Breeding Association (STBA) is a national organisation which controls Australia's tree improvement programs for Radiata Pine and Blue Gum. It provides genetic evaluation data for forestry trees. The ability to understand and analyse genetics and create breeding programs is a crucial strategy to improve the outcomes of most enterprises.

Access the source material below and complete an extended response question. Your teacher will provide you with information on how to prepare for completing the question.

Source 1: Southern Tree Breeding Association: About STBA

URL: <http://stba.com.au/page/about%20stba>

Source 2: PlantPlan Genetics

URL: <http://stba.com.au/cms/doc?id=429969c8>

Source 3: seedEnergy: Production and sale of seed orchard seed for plantation and farm forestry

URL: <http://www.seedenergy.com/pinus-radiata.html>

Questions

- A) Explain the various plant breeding strategies that the STBA and related organisations use to improve the productivity of the Radiata Pine Industry.
- B) Evaluate the importance of this work



Answer A



Answer B



References

1. Forestry Corporation. Accessed 5th June 2017
<http://www.forestrycorporation.com.au/our-forests/education/resources-and-publications/wild-forest/woodwork/info/forest-supermodels/radiata-pine/information>
2. On Farm: TREEPLAN's goal to make bigger and better trees. The Land: 23rd June 2016. Accessed 29th May 2017. <http://stba.com.au/cms/doc?id=81afbde1>
3. New pine breeding technique may help trees adapt to climate change. October 12, 2011. Wiley-Blackwell. Accessed 28th May 2017.
<https://www.sciencedaily.com/releases/2011/10/111012124016.htm>
4. Going Bush: Episode 4- Seed Processing. Accessed 28th May 2017
<https://www.youtube.com/watch?v=EpgpzuUI8us>
5. Going Bush 2016 EP03 Tumut Pine. Accessed 28th May 2017
<https://www.youtube.com/watch?v=NEX2fE2IFXA>
6. Blowering Nursery, Tumut. Accessed 28th May 2017
<https://www.youtube.com/watch?v=7XG853o53Vk>
7. Southern Tree Breeding Association: About STBA. Accessed 30th May 2017
<http://stba.com.au/page/about%20stba>
8. PlantPlan Genetics. Accessed 28th May 2017
<http://stba.com.au/cms/doc?id=429969c8>
9. seedEnergy: Production and sale of seed orchard seed for plantation and farm forestry. Accessed 5th June 2017
<http://www.seedenergy.com/pinus-radiata.html>

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