



H E X I M A

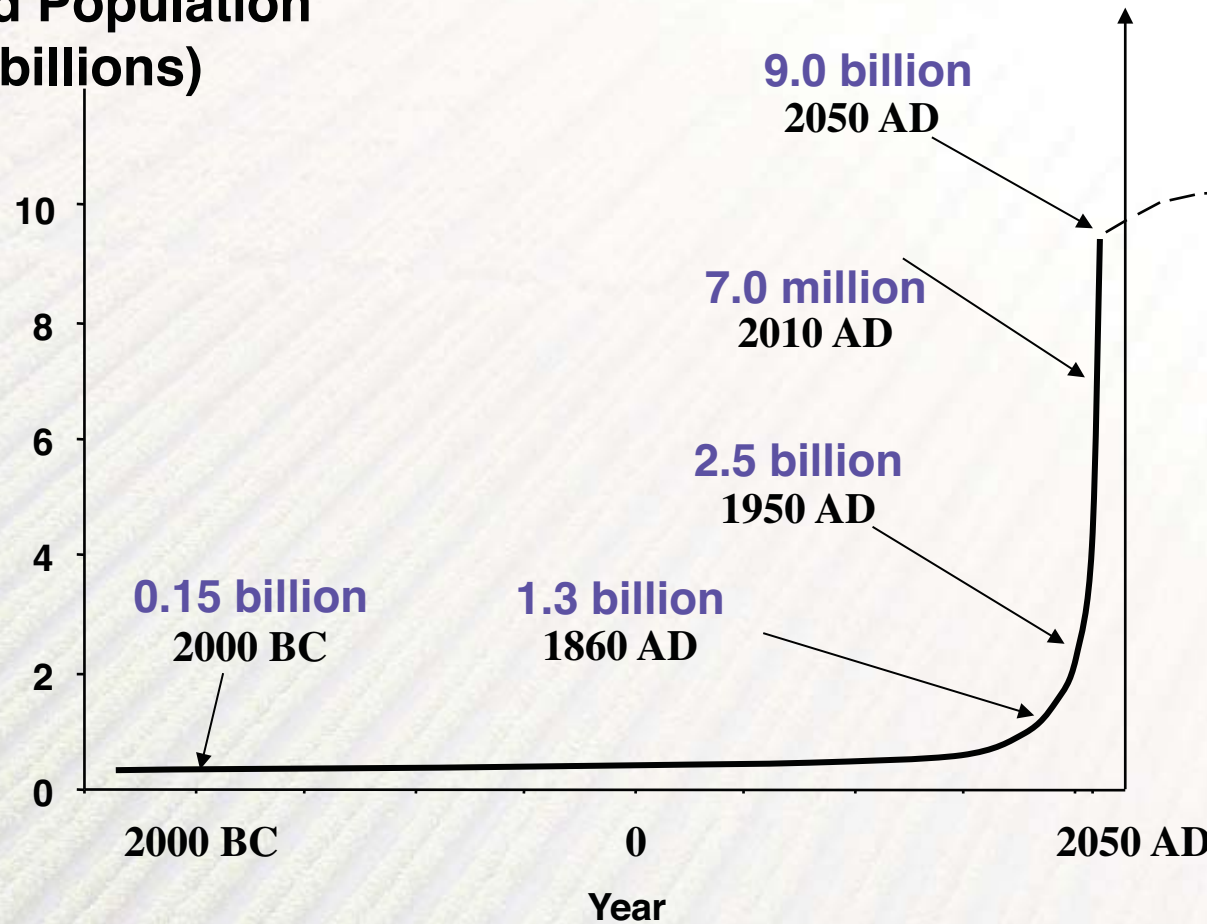
Annual General Meeting

23 November 2010

***Professor Marilyn Anderson**
Chief Science Officer*

Growth in world population

World Population (billions)



World population has increased more than 5 times in 150 years

Can we feed this growing population?

“Lifting a billion people out of poverty and feeding an extra 2.3 billion by 2050 will require an increase in cereal production by 70%.”

*Lele, Science (2010), 326,
1554,*



How do we feed everyone?



“We have about 40 years to radically transform agriculture, to work out how to grow more food without exacerbating environmental problems and to simultaneously cope with climate change”

*-Godfray, Science **327, 812 (2010)***

Major projects

- ◆ Disease resistance
 - corn and soybean (Pioneer)
 - cotton
 - canola
- ◆ Insect resistance
 - Climate Ready grant
- ◆ MGEV-multigene expression vehicle
 - Research licences with Pioneer and Monsanto

Hexima research



- ◆ Hexima research is contracted to three groups based at The University of Melbourne and La Trobe University
- ◆ Gene discovery – Professor Marilyn Anderson
- ◆ Product development – Dr Robyn Heath
- ◆ Pharmaceutical – Dr Mark Hulett



Mark, Robyn & Marilyn

Disease resistance - corn

- DuPont/Pioneer collaboration
- Produce transgenic corn with sustainable resistance/tolerance to fungal diseases using genes encoding antifungal proteins (AFPs)

Corn diseases



Gibberella stalk rot



Diplodia ear rot

Yield losses from fungal diseases are in the range of 10-12% annually and cost about US \$8 billion in North America.

High disease regions can lose 25% of yield.

Corn diseases



Some ear rot fungi produce mycotoxins that contaminate the grain and are hazardous to human and animal health.

Gibberella stalk rot

Current management practices for fungal diseases

- Fungicides
 - harsh chemical sprays
- Breeding for resistance
 - only possible if resistance genes present in some cultivars
- Management practices
 - crop rotation can be costly to farmers





New approaches

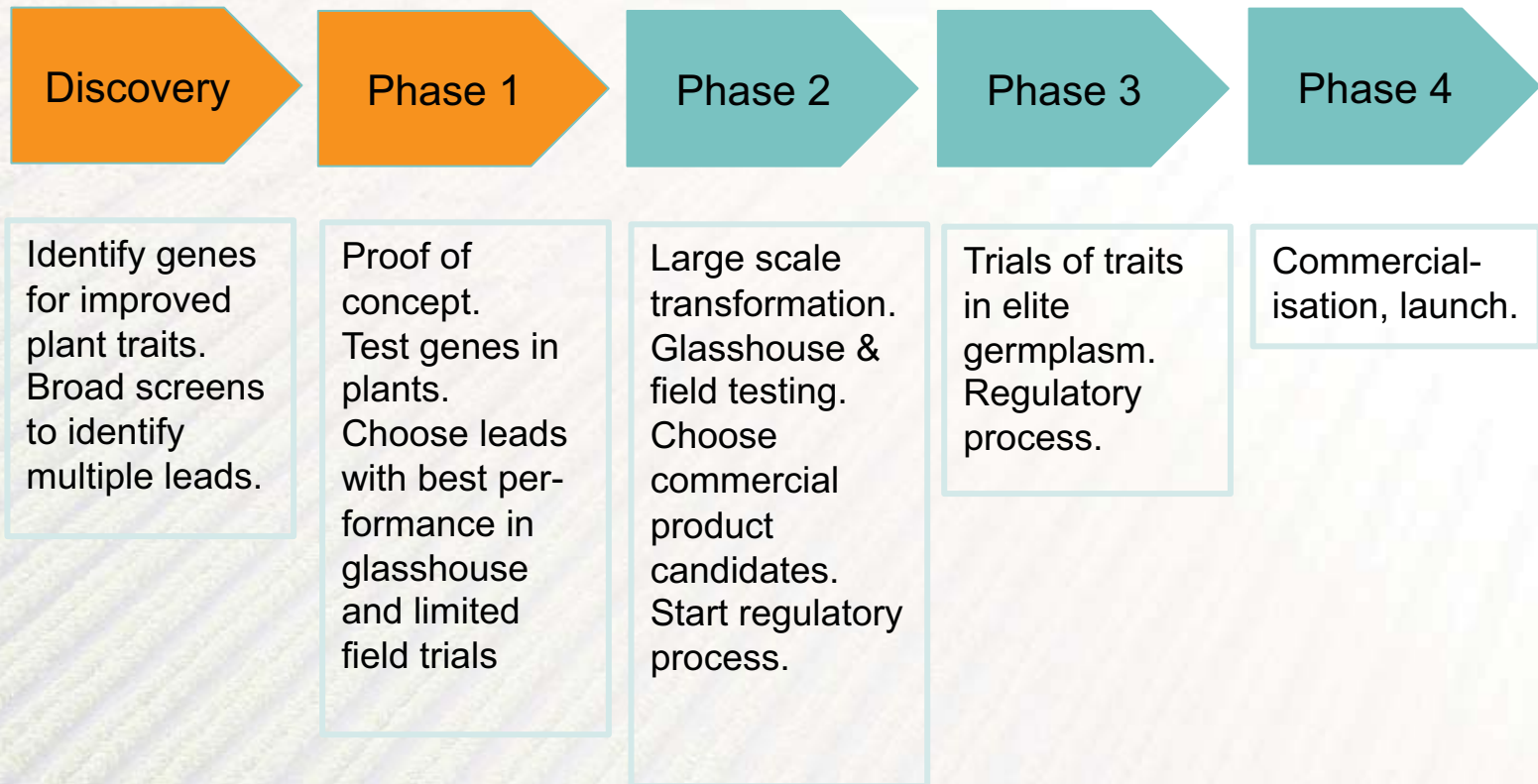
How do plants normally protect themselves against disease?

- ◆ Plants are very efficient chemical factories. They produce natural defence molecules.
- ◆ Plant reproductive structures are an excellent source of natural defence molecules.
- ◆ We have isolated potent fungicides and insecticides from plants.

Pipeline for new gene traits in crops plants



HEXIMA

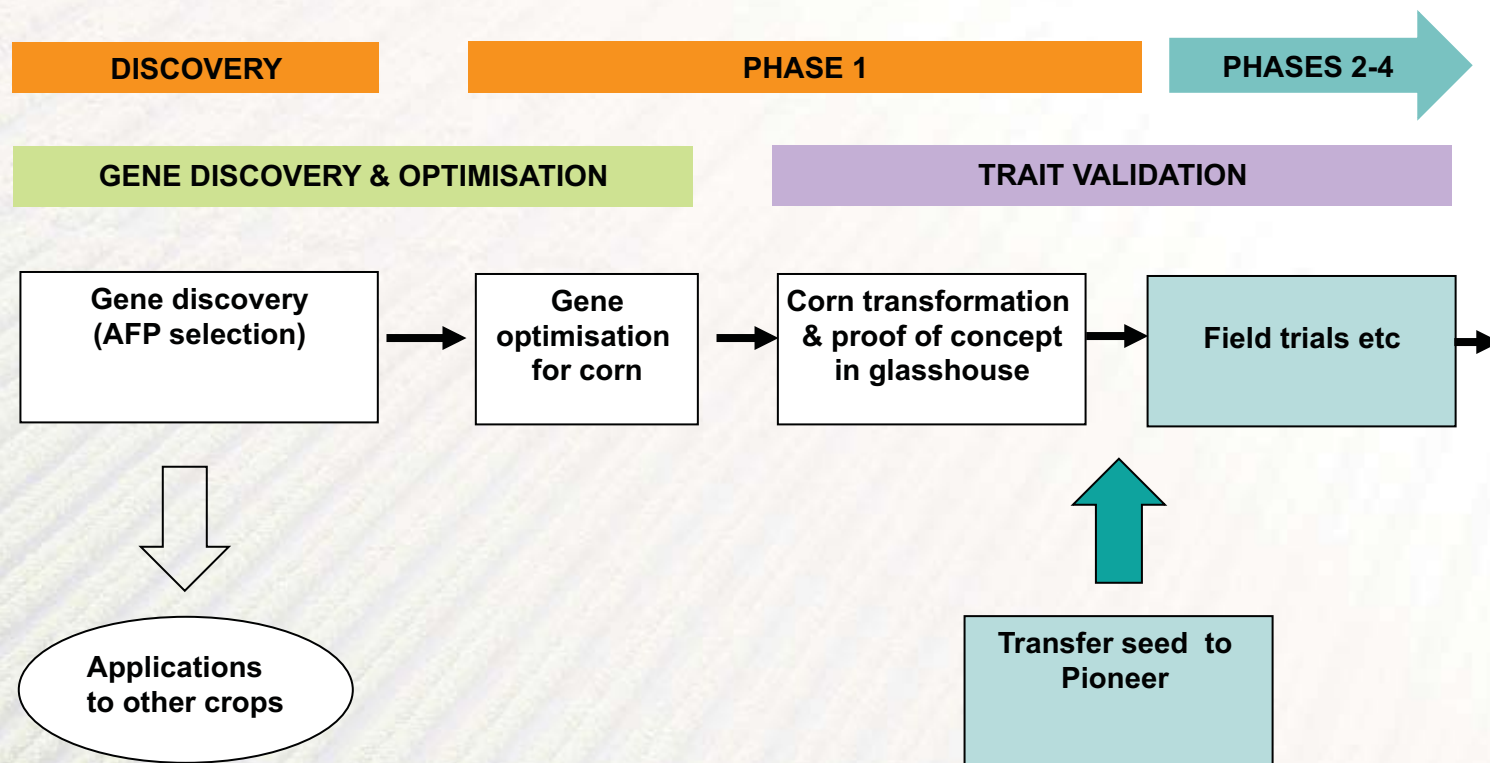


General industry timelines. Timelines will vary with crops and traits.

Milestones - DuPont/Pioneer collaboration



Resistance to fungal disease in corn



Phases may overlap

Hexima corn disease program



Five teams located at La Trobe University and The University of Melbourne.

- Gene discovery – Dr. Nicole van der Weerden



- Gene constructs and plant analysis – Dr. Simon Poon





HEXIMA

Hexima corn disease program

Five teams located at La Trobe University and The University of Melbourne.

- Glasshouse
 - Mr. Bruce McGinness
 - Dr. Gianna Kalc
- Corn transformation
 - Dr. Vijay Kaul
- Disease bioassays
 - Mr. James McKenna



Disease project- achievements to date

◆ Disease resistance – corn

- Established skilled, specialist teams.
- Discovered several new AFPs with activity against corn diseases (new patent application).
- Discovered new molecules that enhance the activity of the AFPs (2 patent applications).
- New corn tissue culture facility and glasshouse commissioned in Q1 2010 and fully operational.
- Established corn transformation. Produced transgenic plants using several different genes.
- Started disease testing of transgenic plants (bioassays).
- Met all the milestones in the DuPont/Pioneer program
- Corn and soybean (Pioneer)
 - looking for partners in other crops- wheat, canola, rice, cotton.

Insect resistance

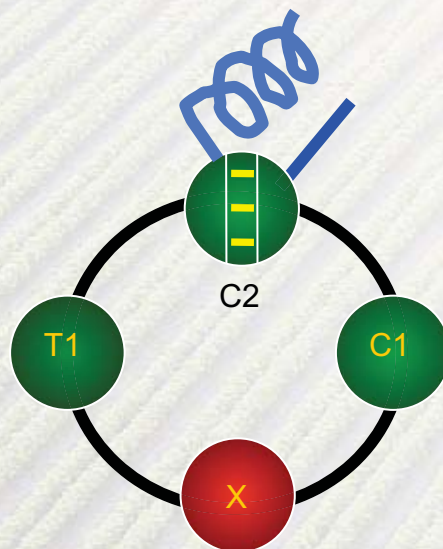
- ◆ Proteinase inhibitor technology to target caterpillar pests (major pests globally)
- ◆ Resistance to the Bt-toxins is beginning to emerge
- ◆ More urgent need for new insect control strategies
- ◆ Discovering genes that enhance the insecticidal properties of proteinase inhibitors
- ◆ Supported by Climate Ready Grant (\$1.38 million from mid 2009-mid 2012)

Multi-Gene Expression Vehicles (MGEVs)

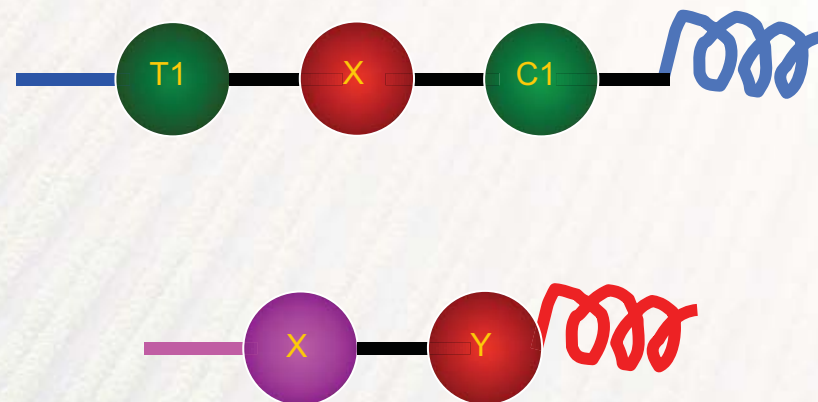


- ◆ A tool for expressing and stacking small proteins
- ◆ Platform technology for the corn disease program. Allows production of multiple antifungal proteins from one gene
- ◆ Non-exclusive licence with Pioneer and Monsanto

MGEV (circular)

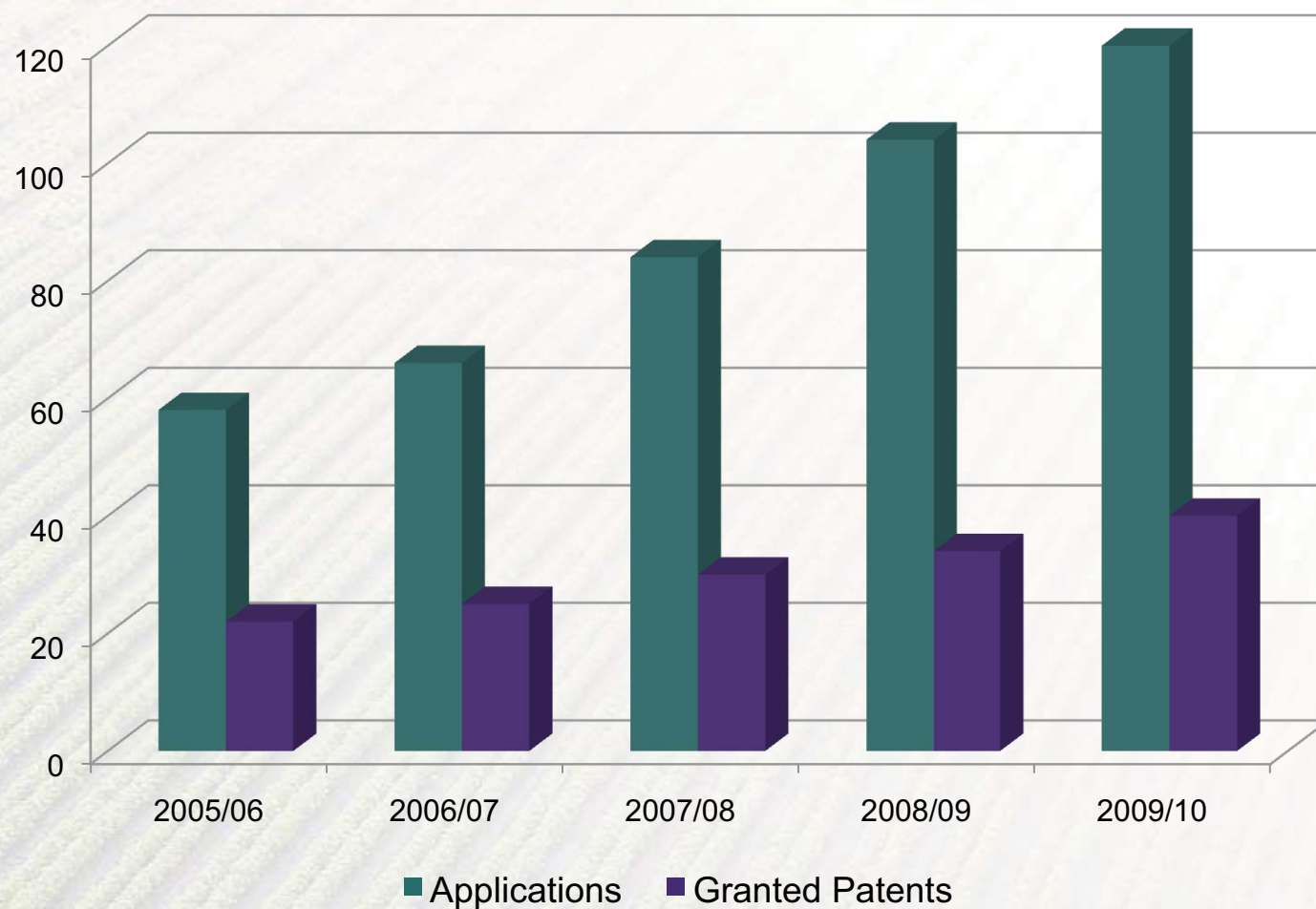


MGEV (linear)





Number of Applications Lodged & Granted Patents (Cumulative)



Thank you to our scientific teams

- ◆ Gene discovery – Prof.Marilyn Anderson
- ◆ Product development – Dr.Robyn Heath
- ◆ Pharmaceutical – Dr.Mark Hulett
- ◆ Intellectual property – Dr.Susanna Herd





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Dr Robyn Heath
Senior Vice President, Product Development

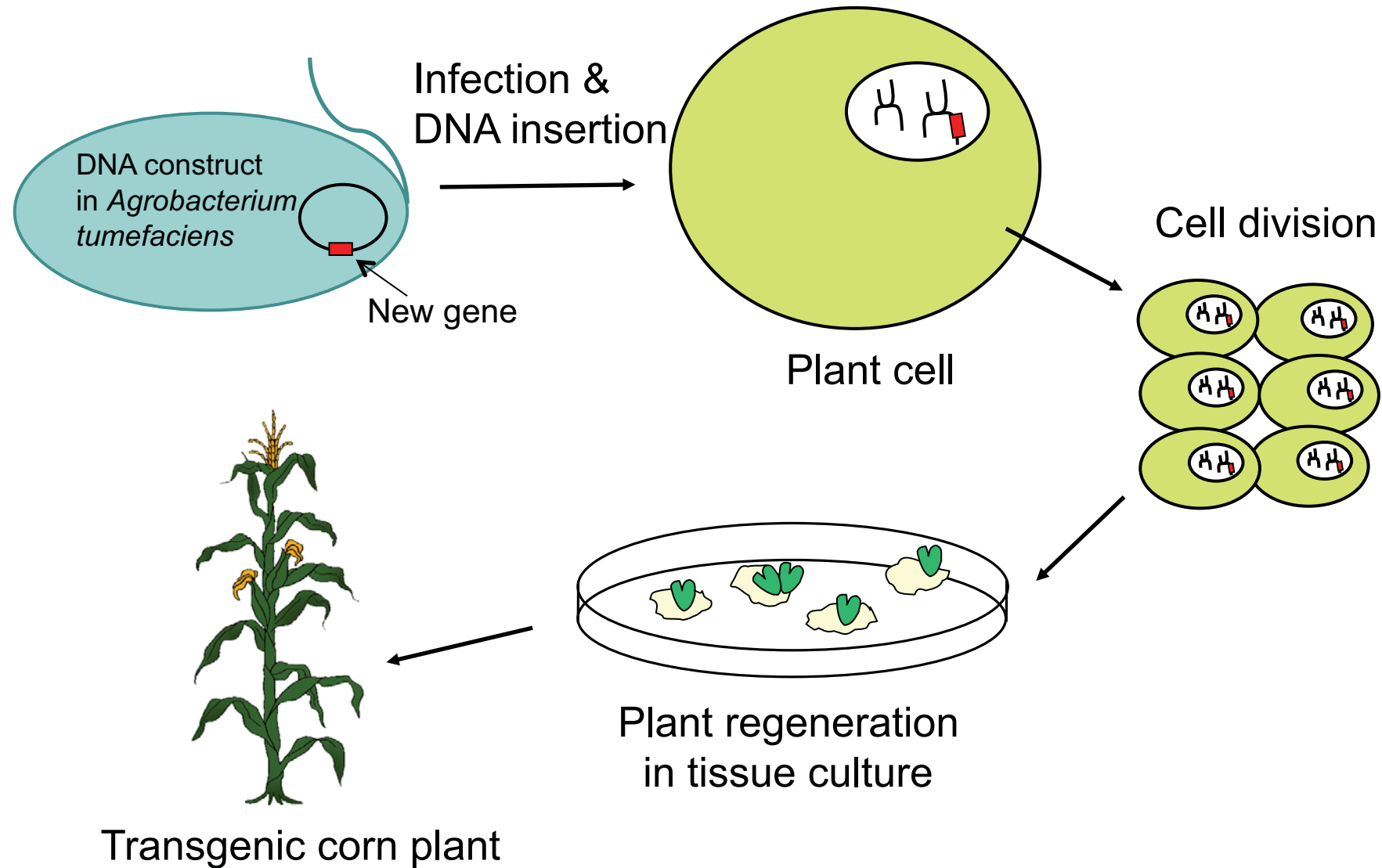
Hexima glasshouse facility at La Trobe University



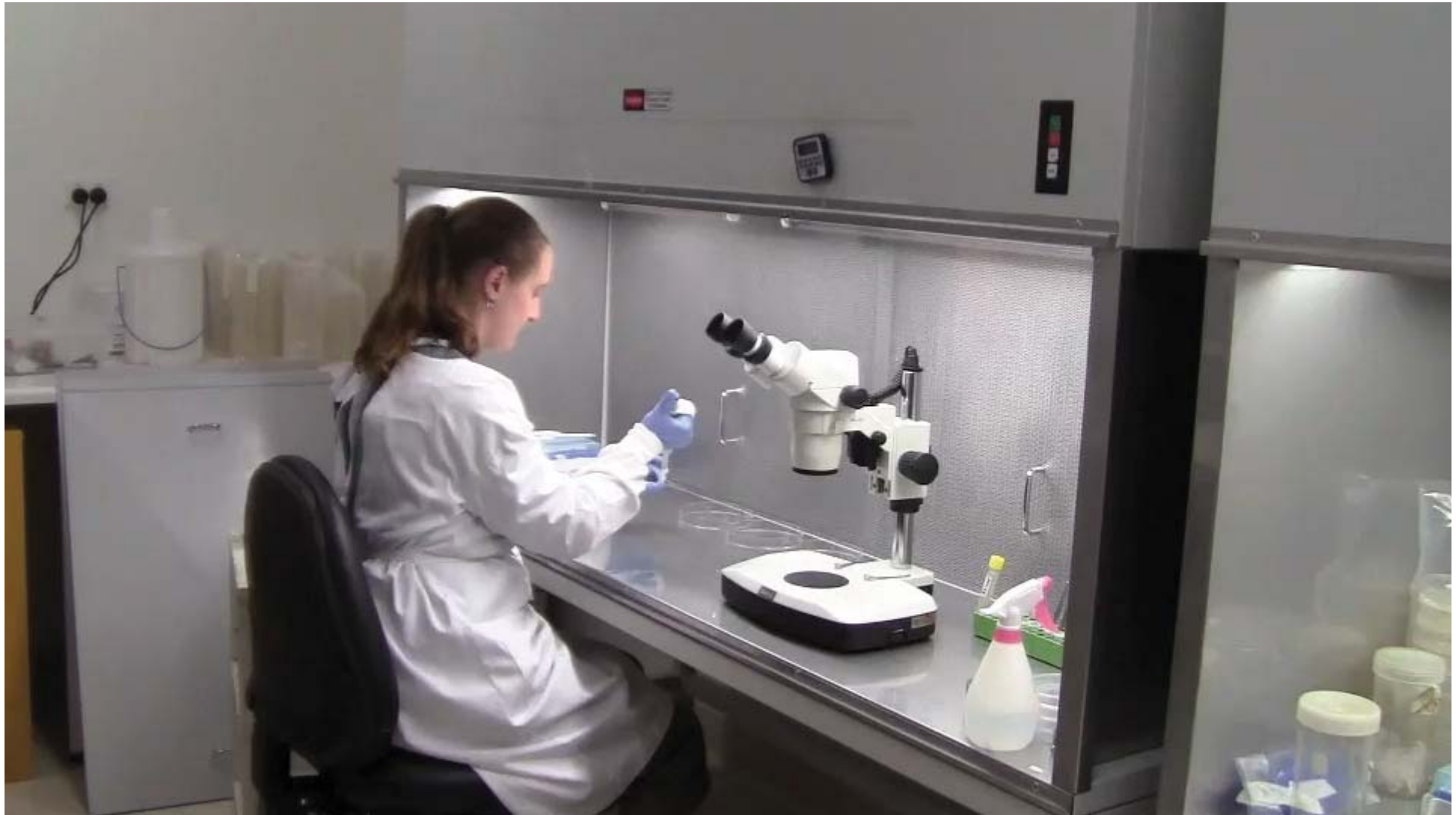
Harvesting cobs & isolation of immature corn embryos



Transferring the antifungal gene & regenerating plants



Transferring the antifungal gene & regenerating plants



GM corn plants

