The New Zealand Institute for Plant & Food Research Limited

Plant & Food RESEARCH
RANGAHAU AHUMĀRA KAI

PLANT BREEDING FOR THE FUTURE:

Fruit breeding for the twenty-first century

Mrs Wendy Cashmore

Fruit breeding in the 21st C

1. Audacious goals
2. Breeding objectives & approach
3. Faster breeding
4. New technologies
5. IP rights & commercialisation

CIOPORA

CIOPORA – Fruit Section

- New members
- Very honoured to represent

Key initiatives:

- Promoting UPOV membership
- Fostering adoption of up to date legislation
- Championing accessibility of PVR systems & processes
- Arguing for stronger PVR protection

Plant & Food Research

A New Zealand based research and development company

- Providing research & development that adds value to fruit, vegetable, crop, & food products

Key focus

- Plant breeding, especially perennial fruit crops

Audacious goals

To produce more & better food with reduced environmental impacts & fewer inputs



Goals - Novel cultivars

Novel ideotypes that will:

- Change the traditional perceptions of fruit
- Create new market space & demand

The rationale = kiwifruit were green & hairy for 30 years….the range & novelty being developed in that crop could be replicated in others

Goals – sustainable & efficient production

The demand is for cultivars:

- Well-suited to different production regions
- Delivering grower benefits

Goals – consumer benefits

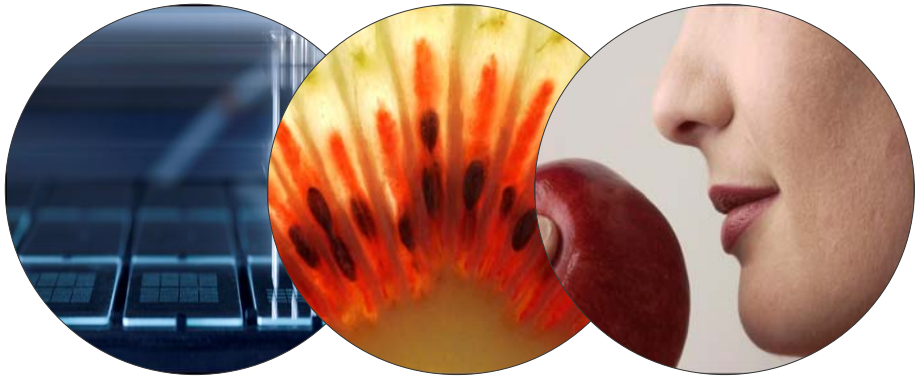
- Increasing recognition of health messages
- Food safety perceptions
- Differing target demographics

Sophistication for breeding success

Genomics & breeding tools

Breed new varieties faster

Consumers



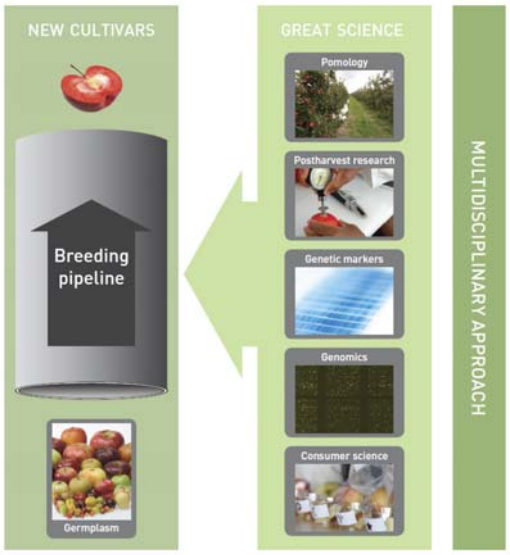
Breeding Objectives

Consumer needs largely dictating breeding objectives

Consumer needs characterised by global food trends:

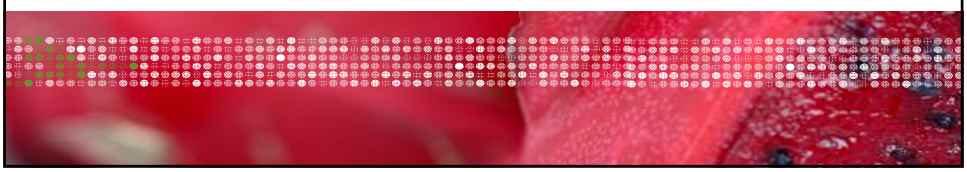
- Health
- Sustainability
- Convenience
- Novelty
- Sensory appeal

Whole of science approach

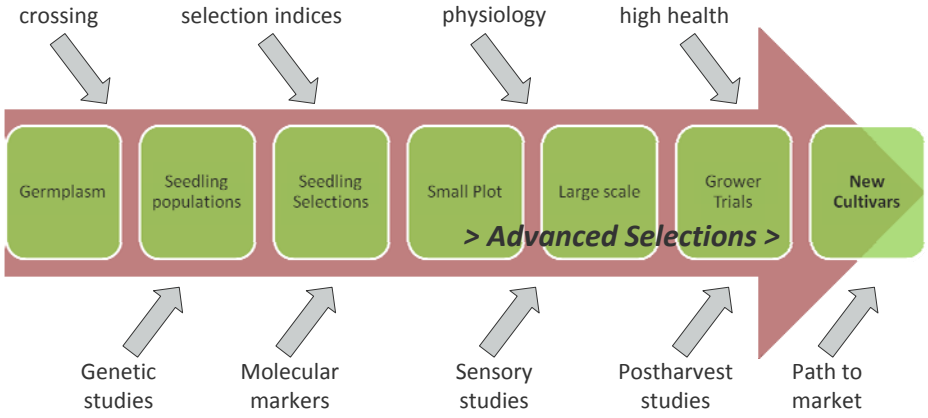


Change of emphasis

- Identifying genetic diversity
- Intensive pre-breeding & parental development
- "Cultivar assembly"
  - » The creation of readily commercially-adoptable cultivars



Breeding pipeline



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Faster Breeding

Minimising time between parental selection & full commercial release

- Identifying potential cultivars early
- Reducing generation time, speeding up delivery
- Increasing commercial releases per unit time
- Increasing efficiencies in the selection cycle
- Reducing the carry over of inferior genotypes



Faster breeding - tools

- High throughput phenotyping
- Extensive & easily accessible databases
- Use of efficient statistical information
  - to choose parents & seedlings
- Selection index approach - multiple characters
- Rapid clonal propagation techniques
- Molecular markers - nursery screening of large populations
- High density plantings
- Clonal rootstocks

New technologies

Knowledge of genetics of key traits to inform breeding process

Identify & isolate new genes

»Narrows the search for parents with ideal genetic traits

Sensory & consumer preference science

» Determines cultivars that offer characteristics *valued* by consumers

Multidisciplinary research approach

Marker Assisted Selection

Sex marker – in use in kiwifruit & hops breeding:

- Test in the nursery, late winter-early spring
- Discard males
- Plant females in the field in late spring

Tools on the way

For the future, fruit breeders can *realistically* look to:

- more genetic markers,
- whole-genome selection
- and, more cultivars faster (a greater rate of genetic gain).

The debate will also continue about whether GM offers advantages over other tools and techniques

  - » Currently no single key trait in fruits that seems to demand a GM answer

The 21st Century unfolding

- Future genetic improvement may take traditional fruit species into new market spaces
- Other fruit genera & species not currently commercially cultivated may yet become economically viable crops

Commercial outcomes

- Identify market opportunities
  - » Create objectives to meet those targets
- It's a long way from invention to market
  - » Other capability is required to ensure innovation becomes commercial

Intellectual Property outcomes

- New markers, & breeding tools to get cultivars to market quicker
- Cultivars developed in response to international consumer drivers e.g. with validated health functionality
- Cultivars & propagation systems with better adaptation to climatic change
- New cultivars resistant to key pests & diseases

Intellectual property

- Use of IP tools is well-established in mainstream fruit business
  - » Global perspective to commercial development & protection
- IP rights will develop in further territories
  - » UPOV will lead introduction & harmonisation among member states
- Scope & use of IP rights will evolve in response to the research & commercial environment

Conclusions

- Consumer & market research will **drive** breeding objectives
- New technologies **will** speed up varietal development.
- IP rights will continue to play a strong role in commercial success

We can look forward to many more fruitful years of breeding success in the 21st Century

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Wendy.cashmore@plantandfood.co.nz