

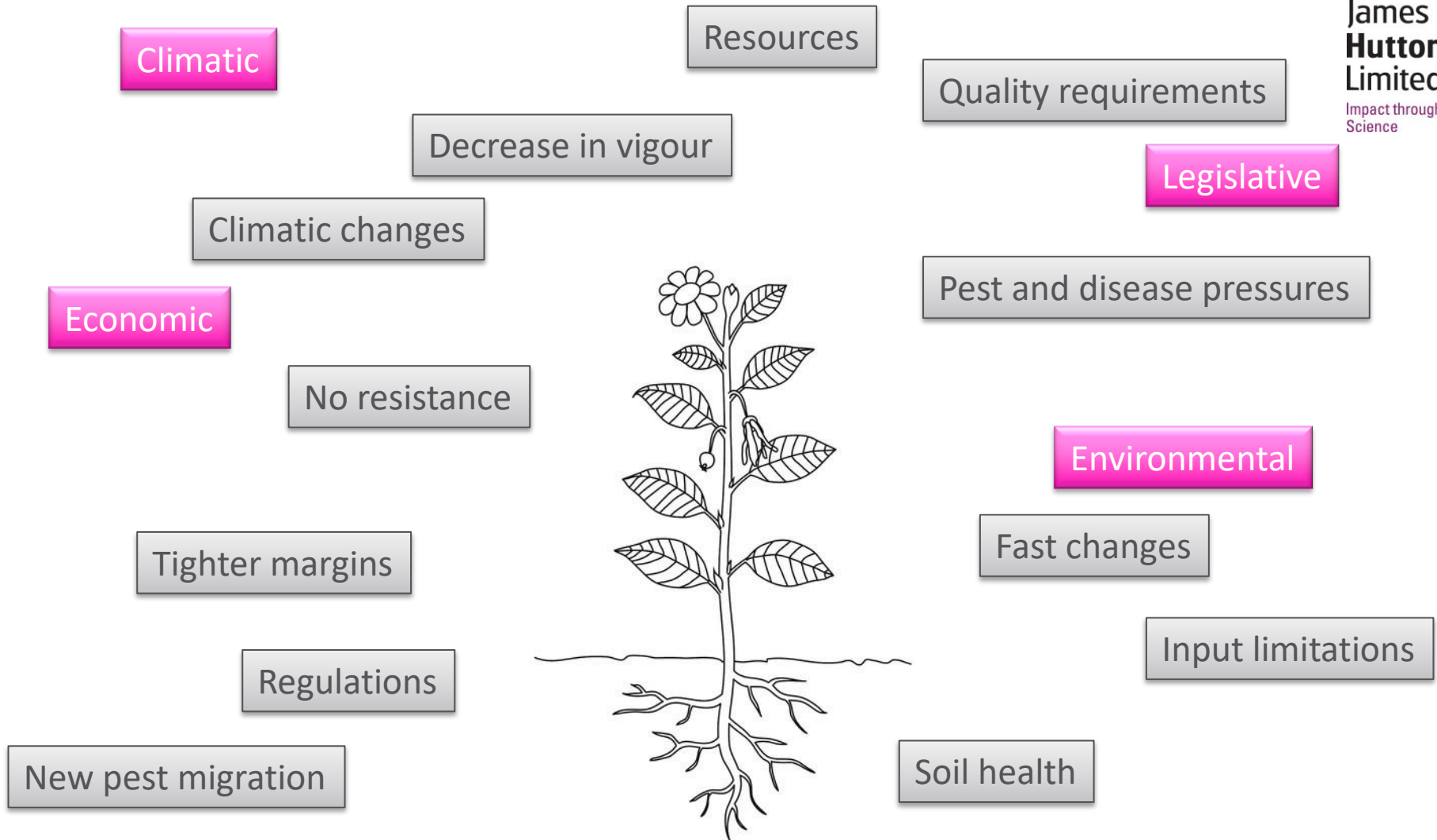


# Blackcurrant breeding - why and how

**Dr Dorota Jarret**

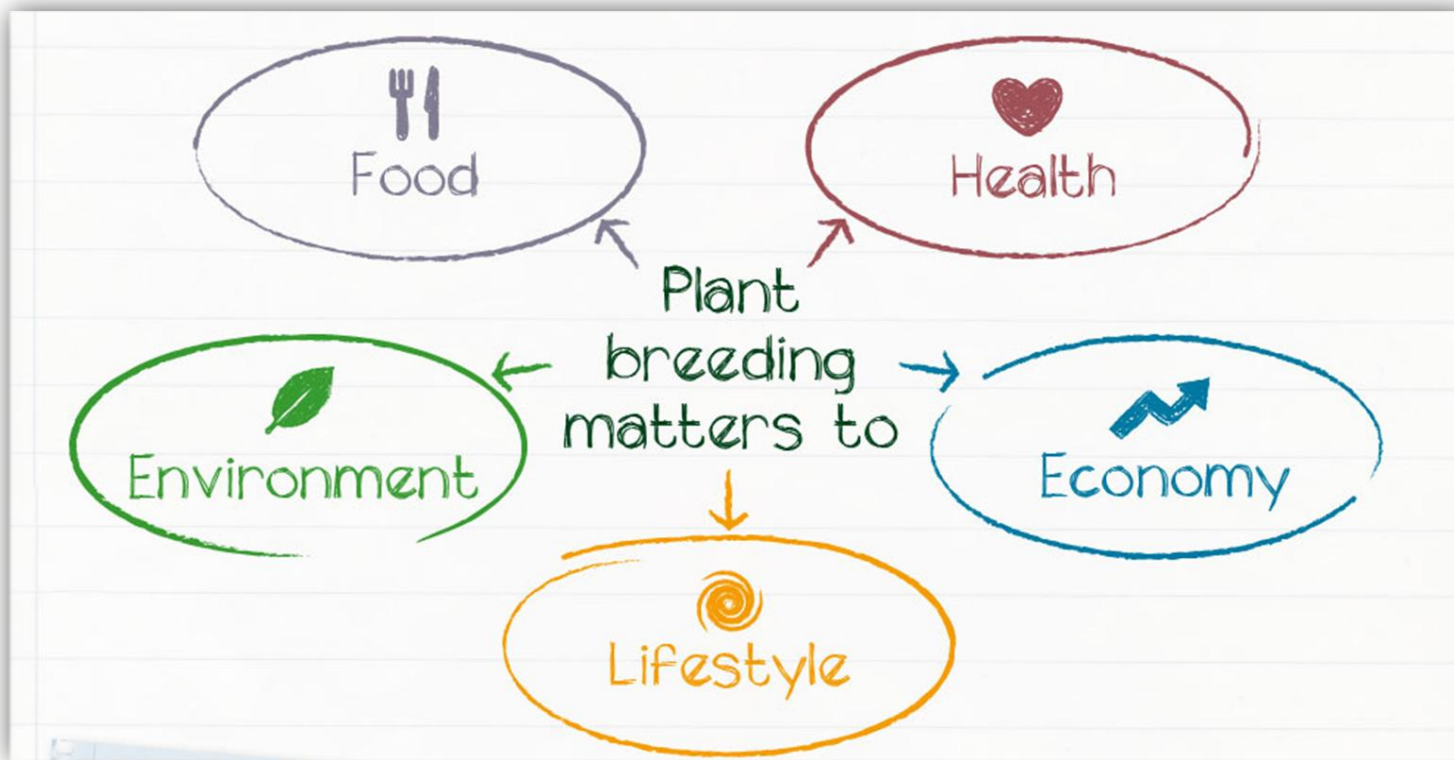


# Blackcurrant – Few of the challenges



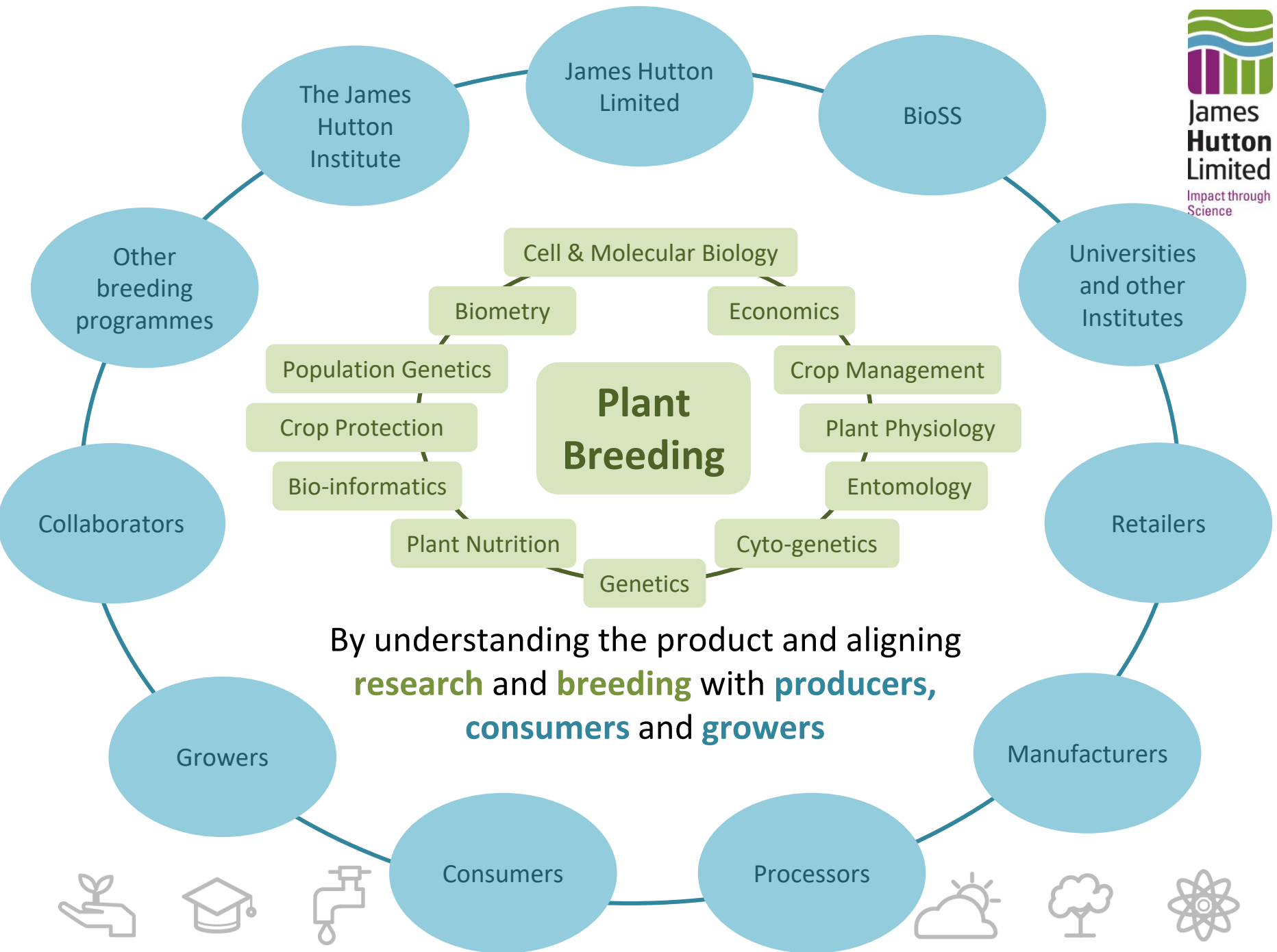


#Plantbreeding helps make #crops more resource-efficient and resistant, thus sustainably increasing agricultural production & #foodsecurity #EmbracingNature



‘Plant Breeding is responsible for **about 50%** of crop productivity increase over the last century, while the remainder of the yield increase comes from better crop management (e.g., fertilization, irrigation, weeding)’ [www.FAO.org](http://www.FAO.org)





James Hutton Limited

BioSS

The James Hutton Institute

Universities and other Institutes

Cell & Molecular Biology

Biometry

Economics

Population Genetics

Crop Management

**Plant Breeding**

Crop Protection

Plant Physiology

Bio-informatics

Entomology

Plant Nutrition

Cyto-genetics

Genetics

Retailers

By understanding the product and aligning **research** and **breeding** with **producers**, **consumers** and **growers**

Growers

Manufacturers

Consumers

Processors





By delivering **higher-yielding**, more **climate resilient** crop varieties, resistant to the emergence of new and **more virulent pests and diseases**

✓ Sources of resistance (species collection)

✓ Crossing programmes

✓ Selection

✓ Commercial trials

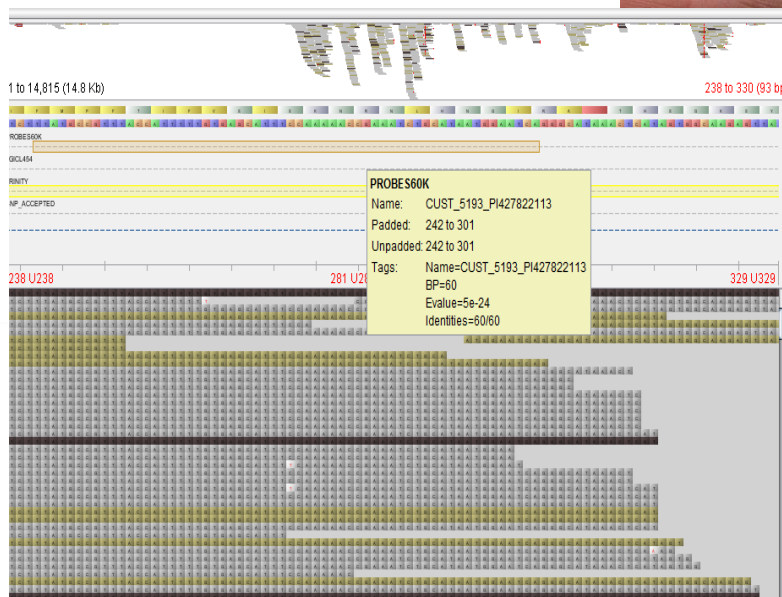
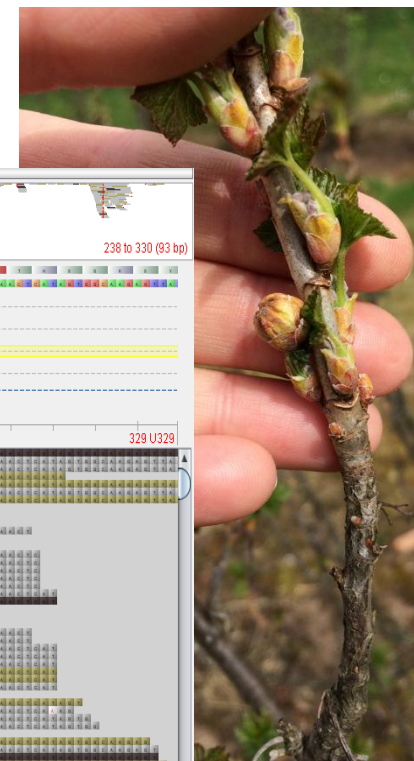
✓ Research

✓ Development of molecular markers

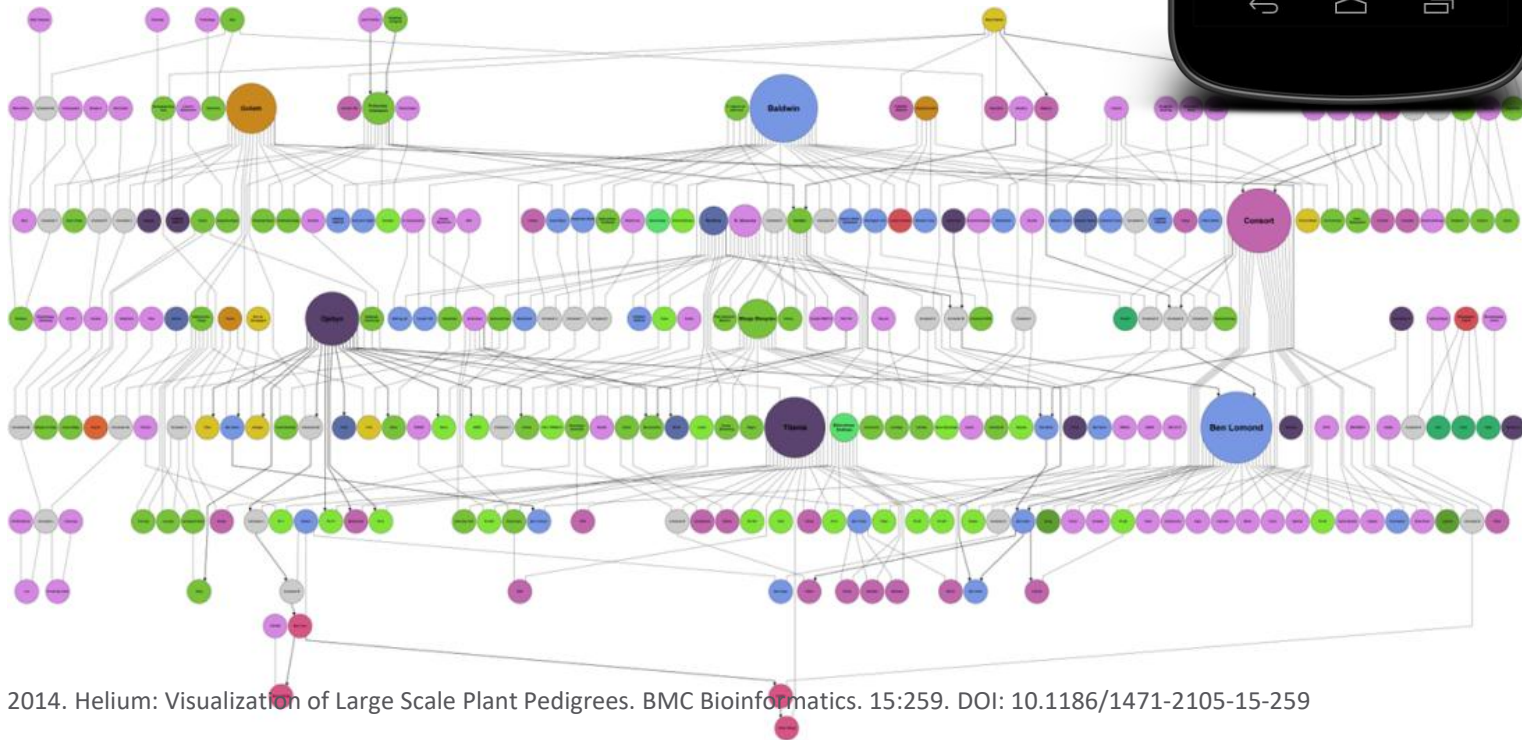
✓ Gall mite resistance

✓ Reversion virus indicators

✓ Development of other genetic resources (**genome**)





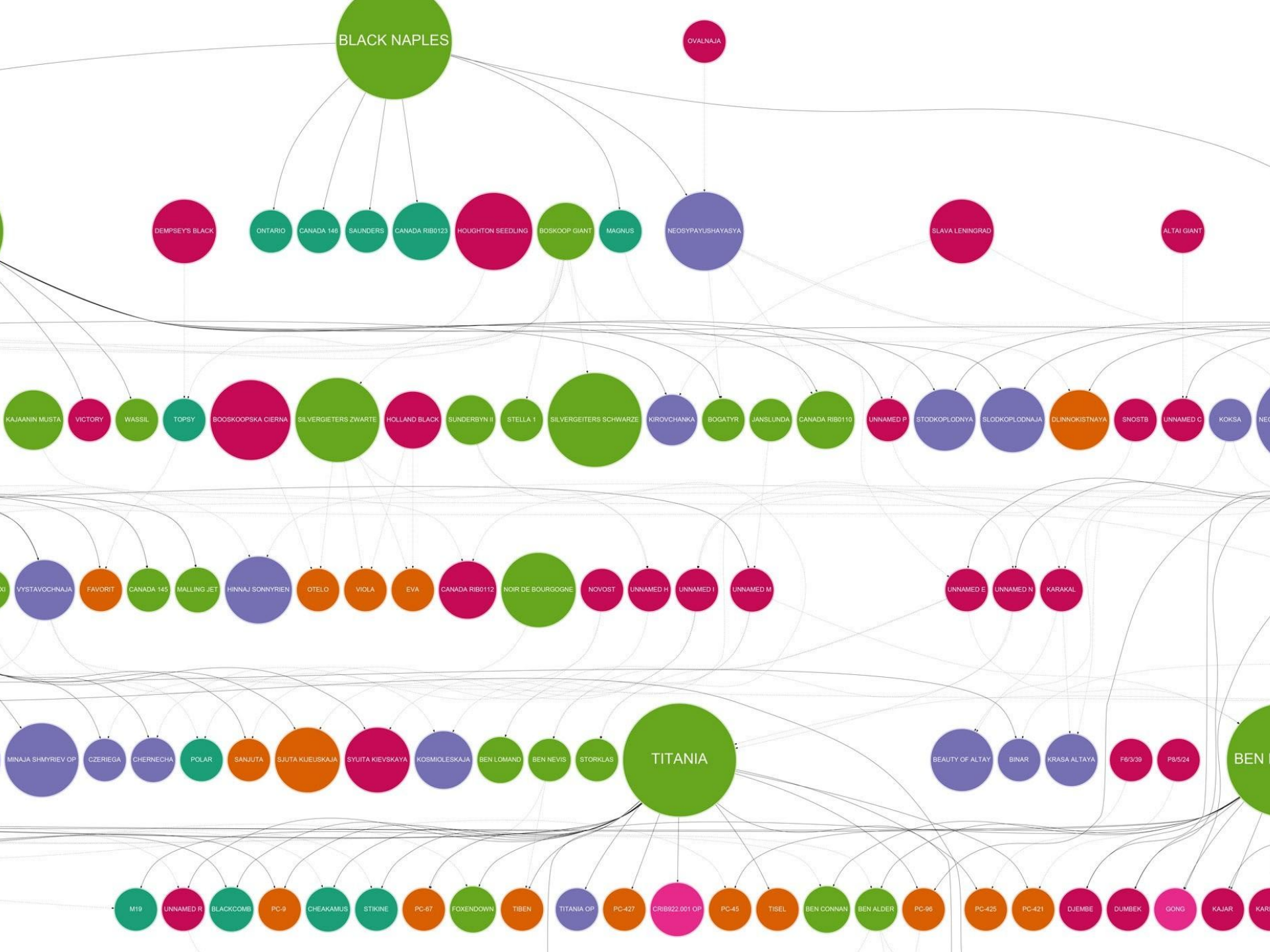


## Helium

Shaw, P.D *et al.* 2014. Helium: Visualization of Large Scale Plant Pedigrees. BMC Bioinformatics. 15:259. DOI: 10.1186/1471-2105-15-259

## Germinate

Shaw, P. D *et al.* 2017. Germinate 3: Development of a Common Platform to Support the Distribution of Experimental Data on Crop Wild Relatives. Crop Sci. 0. doi:10.2135/cropsci2016.09.0814







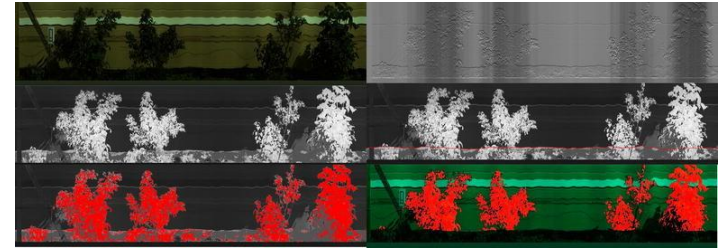
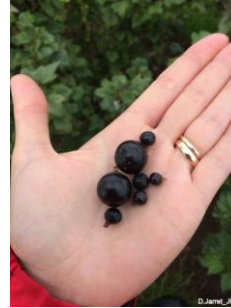
Increasing productivity while consuming fewer resources and with reduced impact on the environment

- ✓ Diversity
- ✓ Adaptation
- ✓ Commercial trials
- ✓ International and national collaborations



Innovate UK

- ✓ Resilience (dormancy/climate)
  - ✓ Chilling model development <sup>1</sup>
  - ✓ Drought tolerance <sup>2</sup>
  - ✓ Imaging



<sup>1</sup> Jones, H., Gordon, S. and Brennan, R. (2015) 'Chilling Requirement of Ribes Cultivars', *Frontiers in Plant Science*, 5.

<sup>2</sup> Čereković, N., Jarret, D., Pagter, M., Cullen, D. W., Morris, J. M., Hedley, P. E., Brennan, R. and Petersen, K. K. (2015) 'The Effects of Drought Stress on Leaf Gene Expression During Flowering in Blackcurrant (*Ribes Nigrum* L.)', *European Journal of Horticultural Science*, 80(1), pp. 39-46.





Independent economic research has demonstrated that every **£1** invested in plant breeding generates at least **£40** within the wider food economy (DTZ 2010).

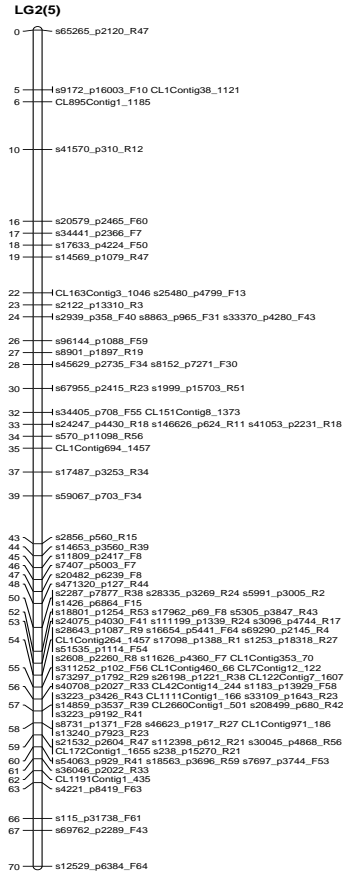


- ✓ Yield
  - ✓ Higher yield
  - ✓ More resistant plants
  - ✓ Resilient crop
  - ✓ Yield components
  - ✓ Harvestability
- ✓ Quality
- ✓ Sustainable plantation
- ✓ Healthy plant availability
- ✓ Plant production
- ✓ **Product alignment**





Food safety and nutrition are key priorities for today's health-conscious consumers.



Delphinidin 3-O-glucoside

- Glucose
- Fructose
- Sucrose
- Malic acid
- Citric acid
- Oxalic acid
- Ascorbic acid
- Delphinidins
- Cyanidins

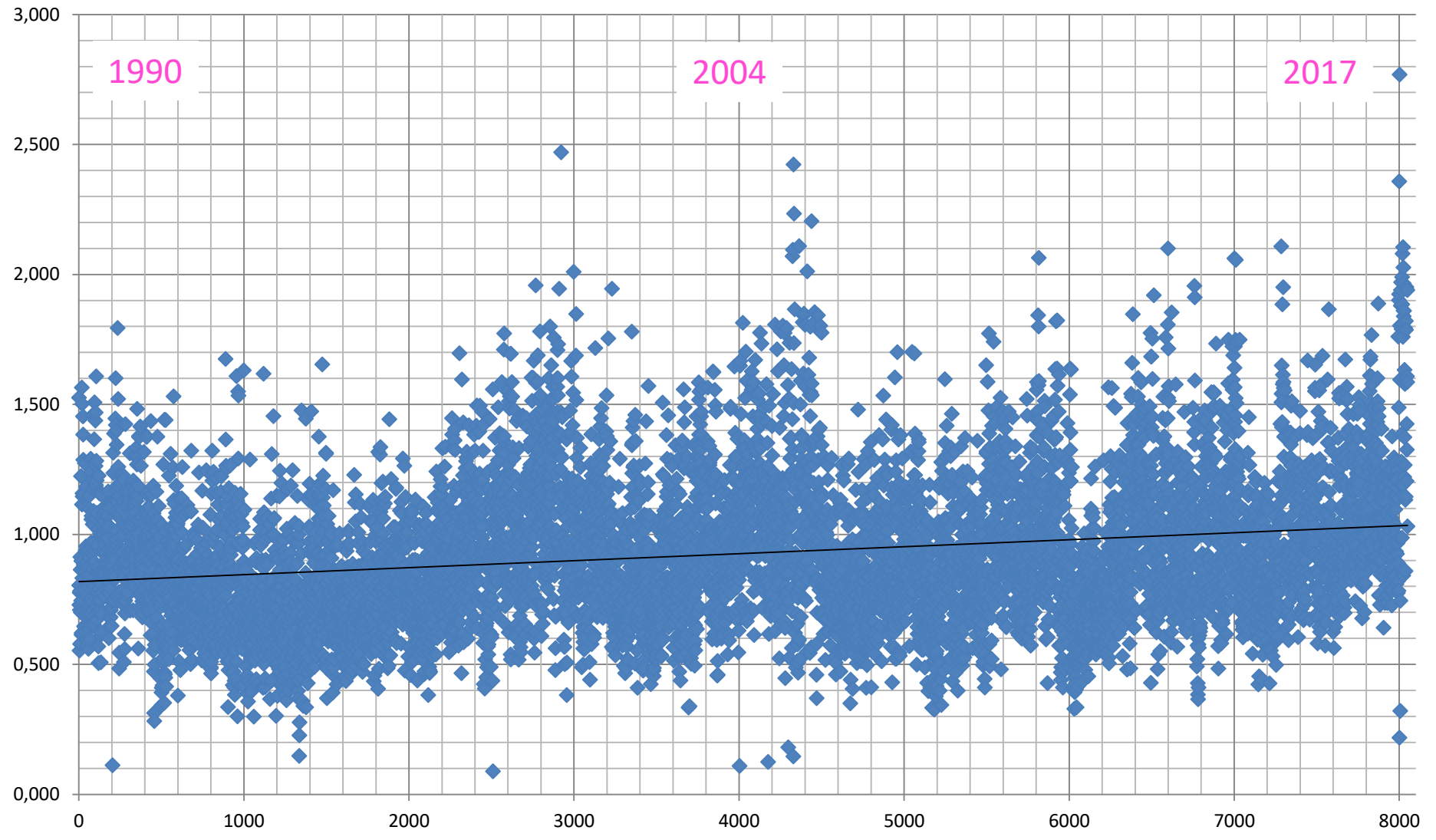
- Flavour
- Individual sugars
- Organic acids
- Vitamins
- Anthocyanins
- Polyphenols
- 'Brix
- Juice yield
- Berry size
- pH



Under review: Dorothea Jarret, Jenny Morris, Danny W Cullen, Sandra L Gordon, Susan R Verrall, Micha Matthias Bayer, Linda Milne, Pete E Hedley, J William Allwood, Rex M Brennan, Robert D Hancock

**A Transcript and Metabolite Atlas of Blackcurrant Fruit Development Highlights Hormonal Regulation and Reveals the Role of Key Transcription Factors.** *Frontiers in Plant Science*, section Plant Metabolism and Chemodiversity

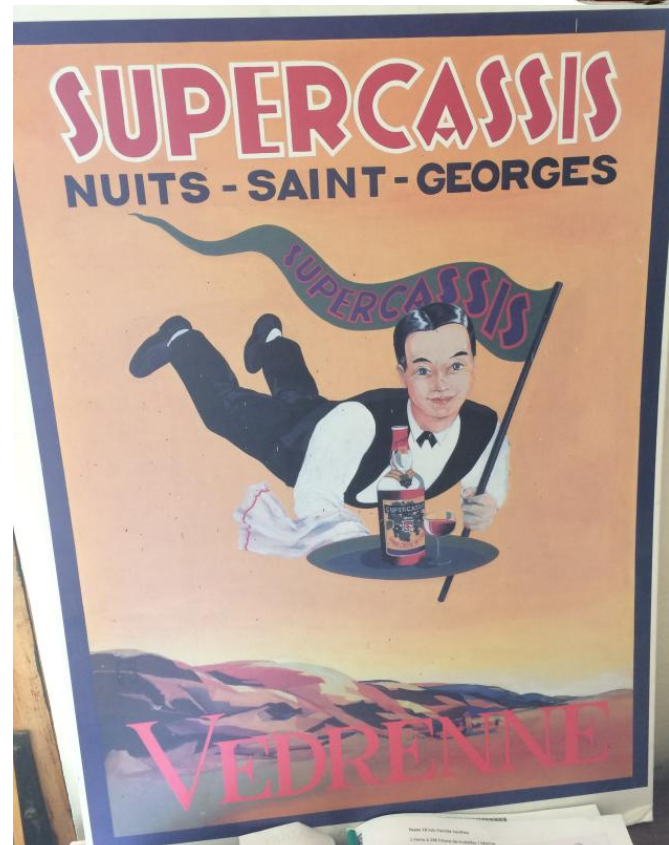
# Colour +25%







By improving the on-farm performance and end-use quality



- ✓ Sensory science
- ✓ 'Brix
- ✓ Colour
- ✓ Nutritional profiling
- ✓ Original features (provenance)
- ✓ Understanding supply chain
- ✓ Breeding aligned with product



New, resilient, high quality, well cropping, consistent varieties, suitable for processes around harvesting processing and consumption

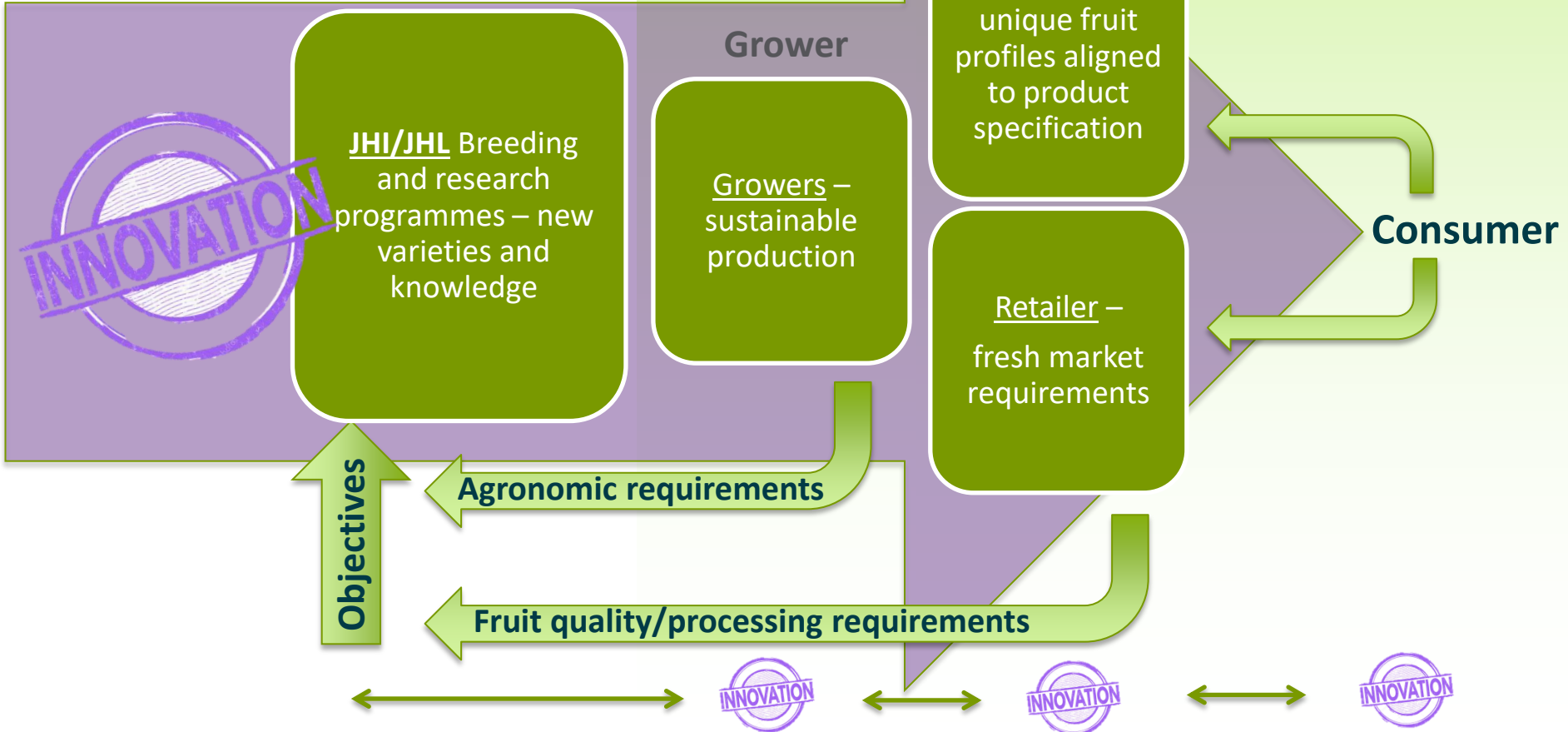


- ✓ Yield
- ✓ Resilience
- ✓ Economy
- ✓ Agronomic requirements
- ✓ Quality ('Brix)

- ✓ Specific availability
- ✓ Consistency
- ✓ Quality
  - ✓ Flavour
  - ✓ Processing quality

- ✓ Constant availability
- ✓ Consistency
- ✓ Quality marks
  - ✓ Flavour
  - ✓ Nutrition
  - ✓ Experience
- ✓ Cost
- ✓ Staple identity

**Customer**





# Cultivars for processing market



**James Hutton Limited**

Impact through Science



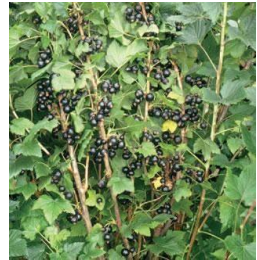
**LUCOZADE RIBENA SUNTORY**

10 special varieties

give Ribena the taste we love



**Ben Gairn**



1999

**Ben Lawers\***



2015

**Ben Hope**



1999

**Ben Klibreck\***



2006

**Ben Alder**



1989

Early

Late

2005



**Ben Vane\***

2006



**Ben Starav\***

2002



**Ben Dorain\***

2012



**Ben Finlay**

2003



**Ben Avon**

1989



**Ben Tirran**





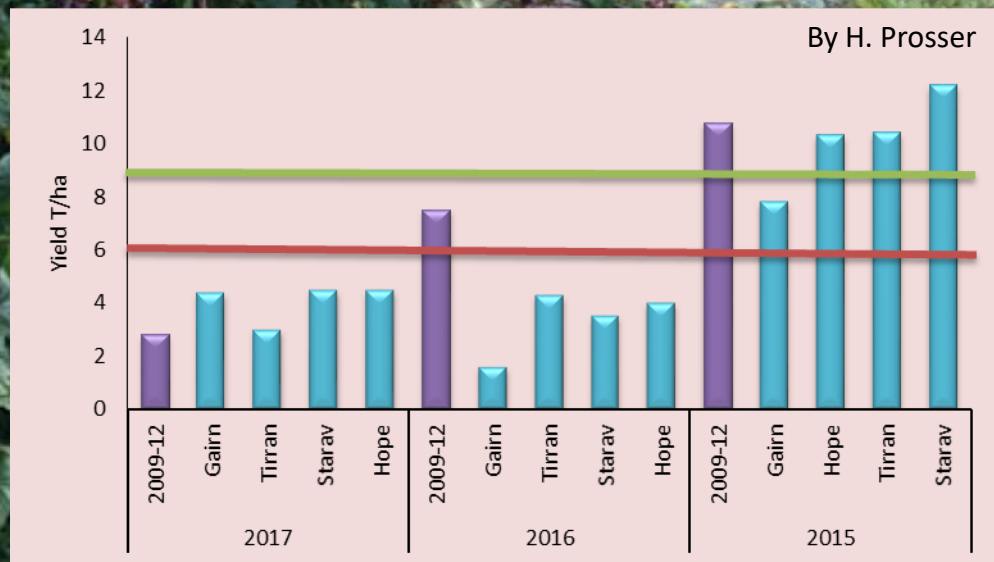
# 9996-2

GSK 2009-12

9137-4 x 9143-1



Early-mid  
Upright growth  
Consistent  
Large berry  
Good yield even in poor years (2014 & 16)  
Good habit  
Good quality





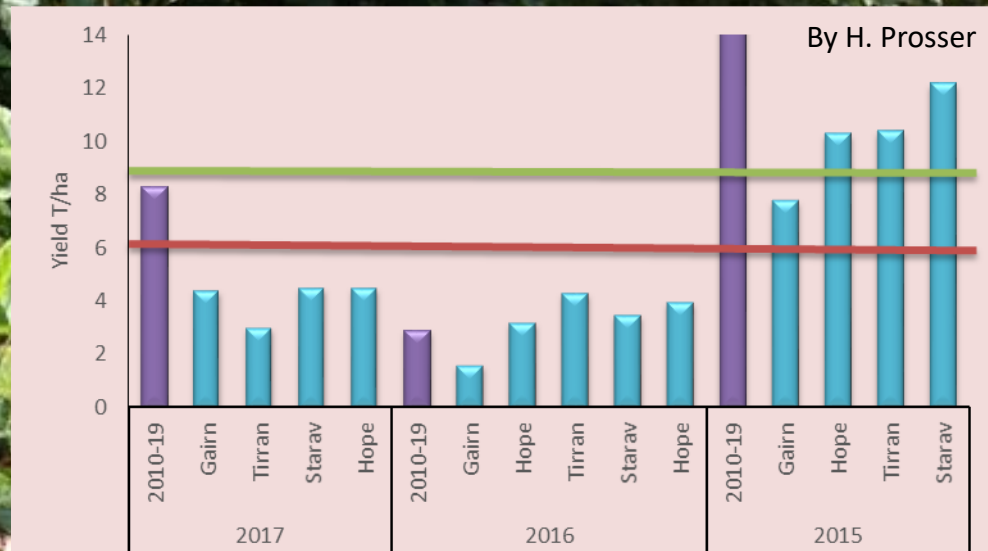
# 00-55-03

2010-19

Ben Hope x Ben Gairn



Early-mid season  
Ideal growth habit  
Nice flavour  
Capable of very high yields.





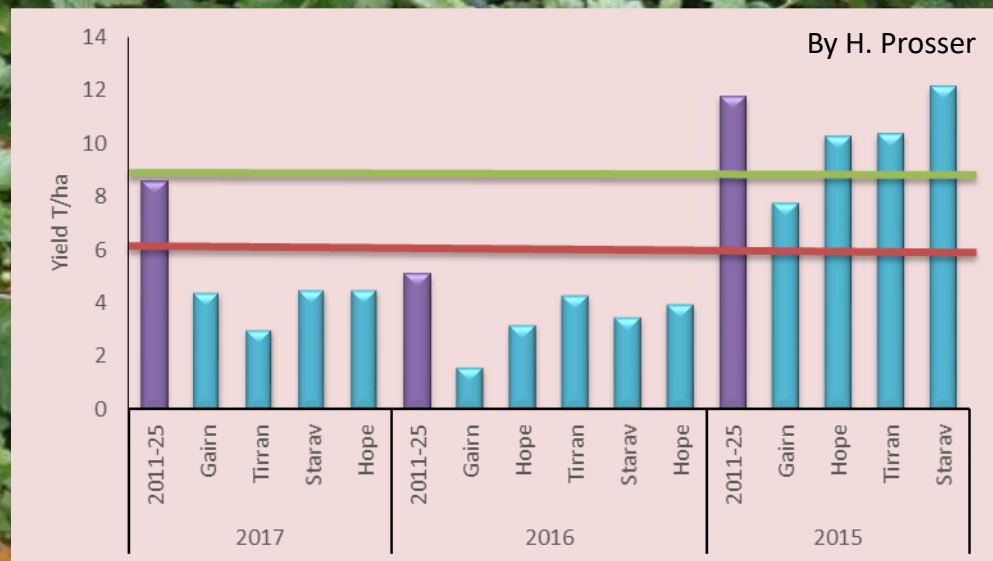
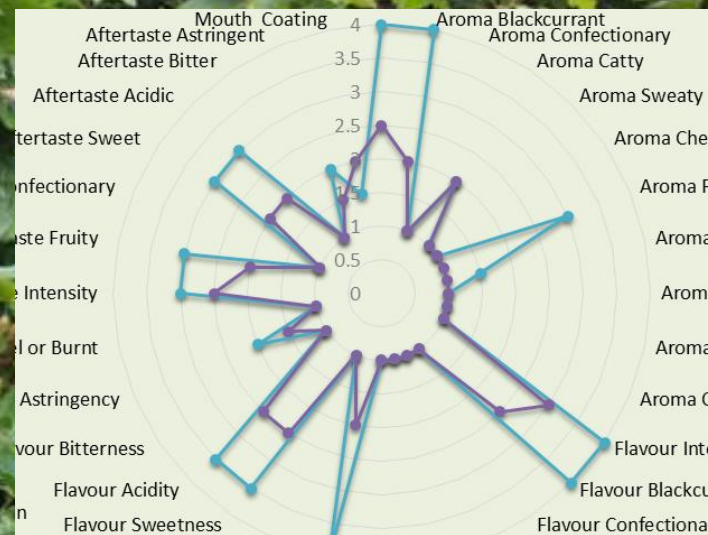
# 00-54-32

2011-25

Hope x 8837-11



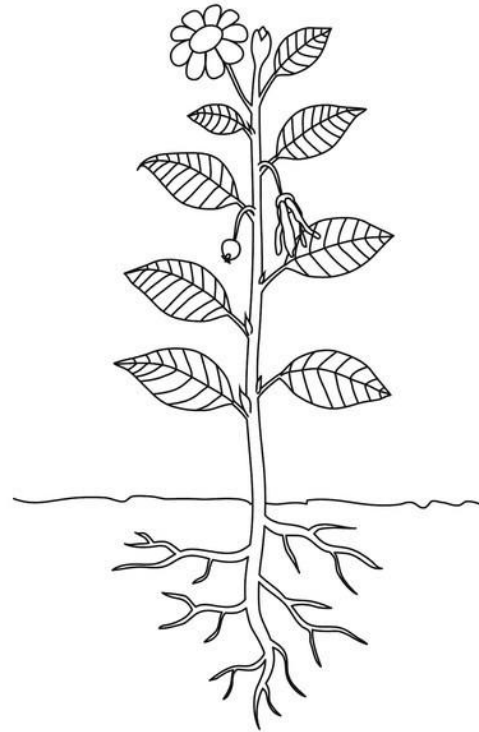
Mid season  
Good habit and acceptable yield  
Excellent flavour





Always do your best. **What you plant now, you will harvest later** - *Og Mandino*

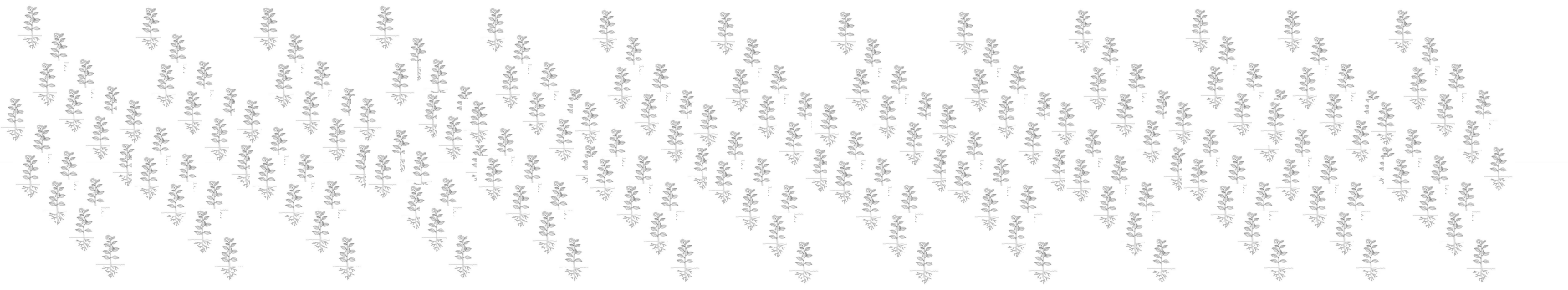
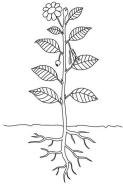
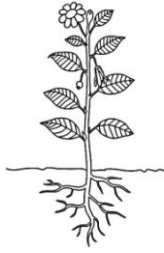
- ✓ Licenced propagator
- ✓ Certification scheme
- ✓ Disease free stock
- ✓ Close to mother stock
- ✓ Propagation separated from production



**Good plantation starts with healthy plant**



# Royalties vs Plant health vs Industry



...future



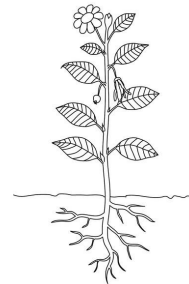
- New improved varieties



- New tools

(resistance, flavour screening, imaging, genetics)

- New [insert as required]





# Acknowledgements

## Funding

### *Breeding*

#### LR Suntory

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**Blackcurrant  
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SUNTORY**



**The Scottish  
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**Innovate UK**  
Technology Strategy Board



**GoodBerry**



**InHort**  
SKIERNIEWICE



**IBA**

International  
Blackcurrant  
Association

