

VeGIN Stakeholder Event  
1<sup>st</sup> December 2021

# Separating future profitable breeding opportunities from genetic cul-de-sacs in the fresh produce sector

Dr E R Moorhouse  
Agri-Food Solutions

# Plan

- ▶ Background
- ▶ Drivers of change
- ▶ Current & future opportunities for breeding
- ▶ Risks & challenges
- ▶ Conclusions

# Disclaimers!

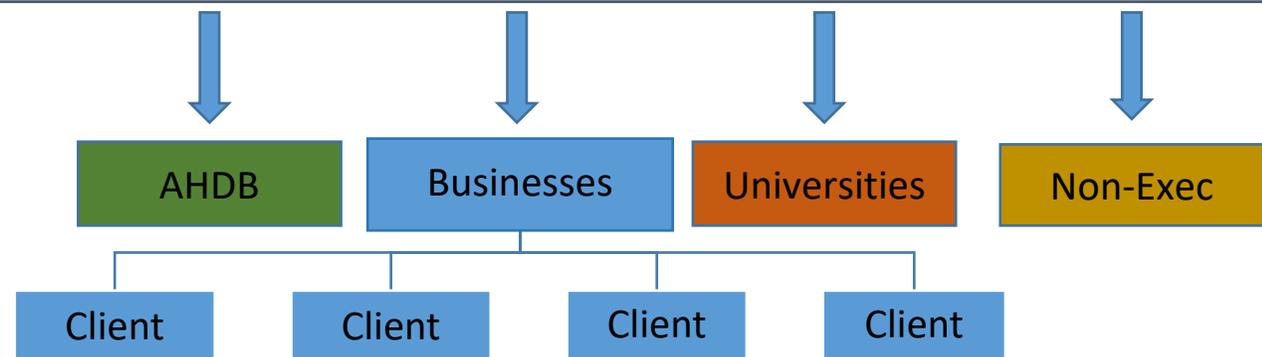
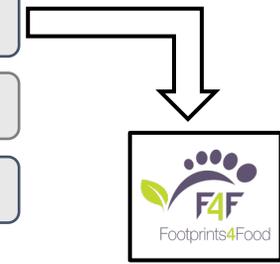
## Note:

The presentation is based on my personal views rather than the corporate position of my current clients or previous employers

## Health Warning:

**Some material may not be appropriate for more delicate members of the audience**

# My background



Who drives  
genetic  
innovation?

Most companies claim their genetic exploitation strategy is based on what the consumer wants, but is this really true?

# Customer Expectations



- 
- Connection with consumers
  - Quality standards
  - Production demands

- 
- Gross environmental impact

# Key Challenges – Urban Consumer



Waitrose store



**audrey farnsworth**

@audipenny

So I'm just supposed to know that you can't eat the outside of the pineapple, like I'm some sort of scientist

Consumer Challenges!

# What do customers really want?

- Consumer expectations are very diverse ~ market stalls to discounters to Fortnum & Mason
- General view that food is too expensive, yet it has never been cheaper
- Requirements change with time and circumstances ~ eg. organics
- Most consumers don't really understand the concerns about sustainability and similar issues
- Consumer behaviour is becoming increasingly unpredictable driven by social media and more traditional sources of "reliable" information such as Daily Mail
- Inconsistency between opinions and purchasing behaviour

Cut through the hype to get to reality

# Fresh produce supply chain



Who drives  
genetic  
innovation?

Most companies claim their genetic exploitation strategy is based on what the consumer wants, but is this really true?

Who is the consumer – is this the end user or just the next stage in the chain?

Do all the stages in the supply chain have the same objectives?

Where do the benefits lie?

# Who gains from genetic innovation?

Stakeholder	Financial	Non-financial	Examples
Breeder	✓✓✓	✓	Increased revenue from new varieties Raised market share
Seed producer/Plant raiser	✗	-	Complexity adds to cost
Grower	✓✓	✓	Reduced costs/increased efficiency
Processor	✓	-	Similar to grower, but direct opportunities more limited
Marketing company	✓✓	✓✓	Deliver USP to customers and increase market share
Supply Chain	✗	-	Complexity adds to cost
Retailer	✓	✓✓✓	De-link with EDLP strategy Promote innovations to customers
Consumer	-	✓✓✓	Improved quality
Researcher	✓✓✓	✓	Funding from breeding companies/public funding
Society	-	✓✓✓	Reduced food miles

# Key investment questions

1.

- Is there a realistic route to market?

2.

- Do you have/can you secure the funds to get there?

3.

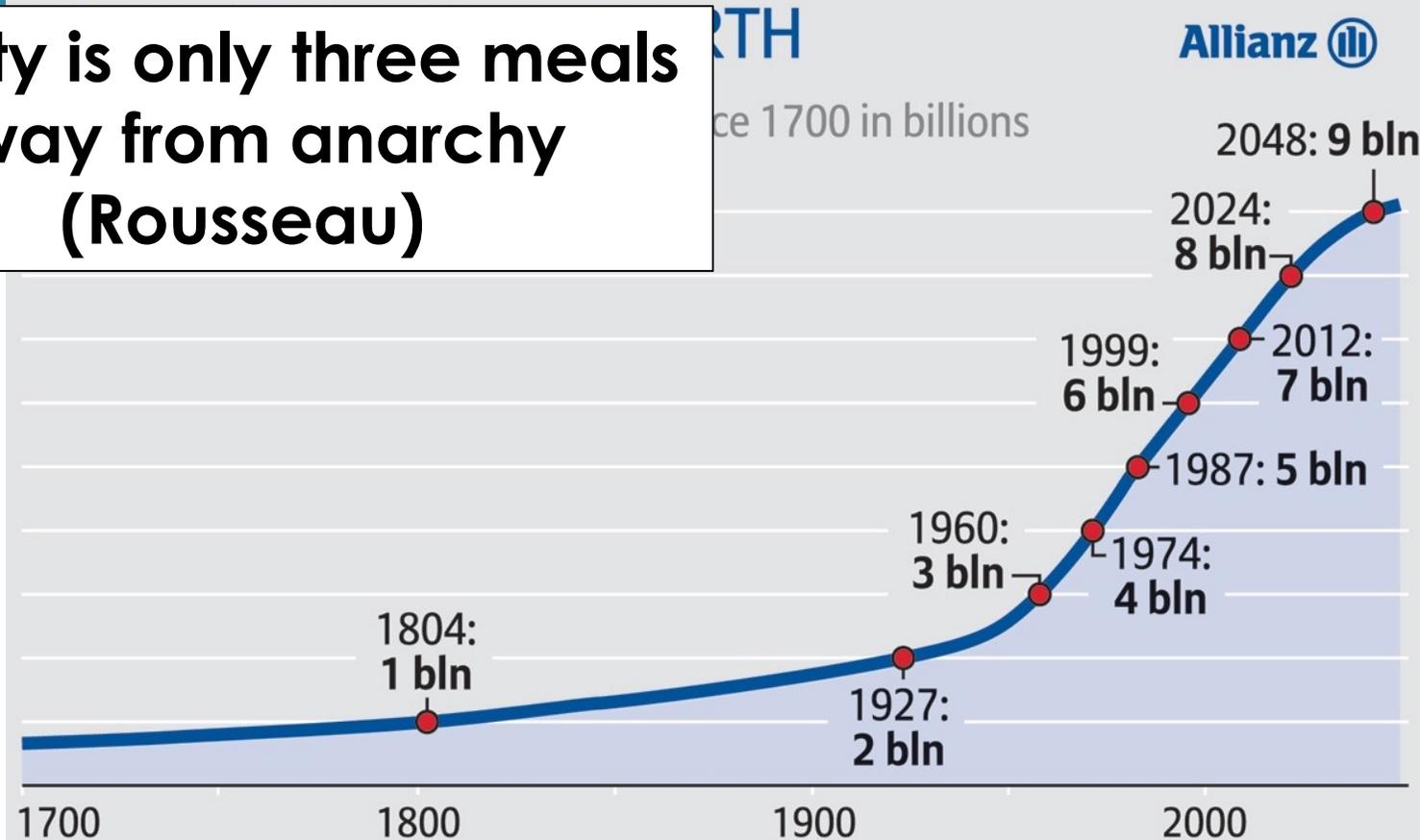
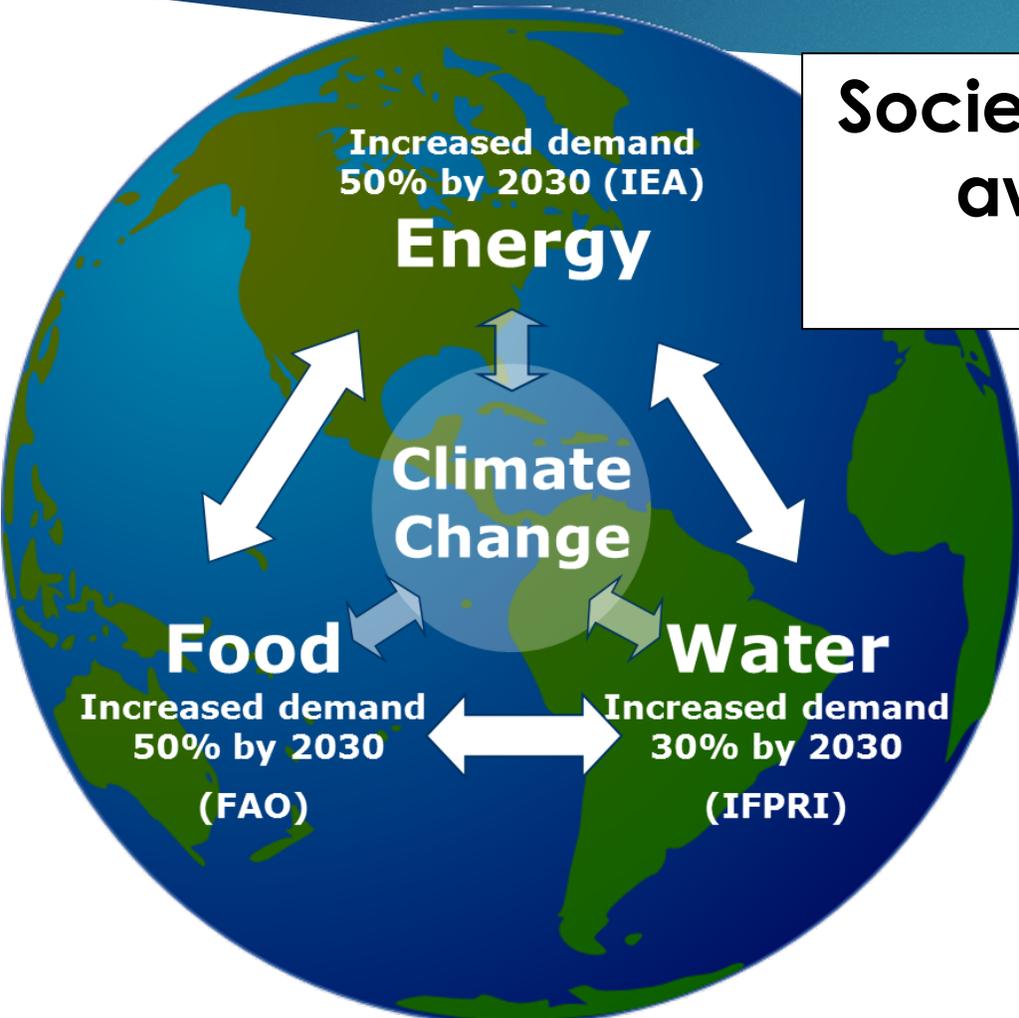
- Will the market generate an acceptable ROI?

4.

- Would you invest your own money in the innovation?

# Background to all decisions - Global food challenge

**Society is only three meals  
away from anarchy  
(Rousseau)**



Source: United Nations World Population Prospects, Deutsche Stiftung Weltbevölkerung

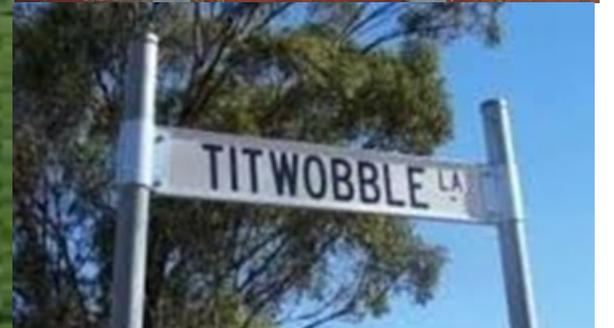
For further information please visit: [www.knowledge.allianz.com](http://www.knowledge.allianz.com)

# Breeder's journey to commercial success – appealing new route



Beware - Poor navigation can end in a cul-de-sac!

**Look for  
the signs**



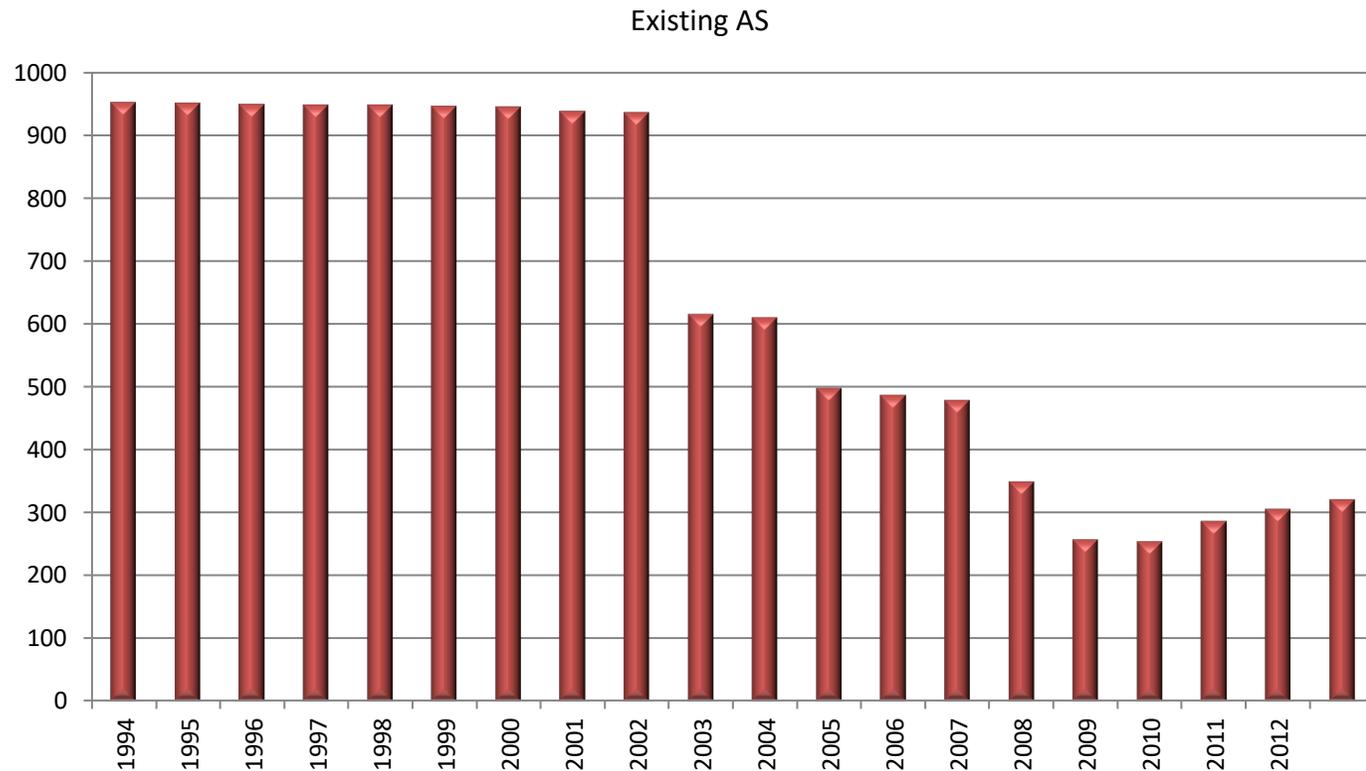
# Risks of misinterpreting information

**When looking for the  
“signs” breeders need to  
be wary about misleading  
information**

# Current farming challenges

- ▶ **Rising input costs**
- ▶ **Loss of plant protection products**
- ▶ **Pest, disease and weed resistance**
- ▶ **Water restrictions**
- ▶ **Climate change**
- ▶ **Loss of soil resilience**
- ▶ **Reduced labour availability**
- ▶ **Retail pressure**
- ▶ **Environmental demands**
- ▶ **Politics**
- ▶ **.....etc**

# Breeding opportunities – P&D resistance



- **66% of all active substances have been lost in the EU in last 20 years!**
- **Development of new products is increasingly difficult**
- **IPM becoming more important and plant resistance will have a bigger/critical role**

# Crop protection challenges – biology



New *Fusarium* sp. on lettuce

- Critical need to identify threats and develop resistant lines
- The “arms-race” is now more dependent that ever on effective genetics

# Crop protection challenges – politics

## Neonic ban threatens UK mustard crop

BY NICHOLAS ROBINSON

UK mustard production could be at severe risk, causing problems for manufacturers of brands such as Unilever's Colman's mustard, if a ban on neonicotinoid pesticides is enforced in the UK, a leading seed geneticist has warned.

"Not using neonicotinoids on mustard is an undoubted risk to the UK's mustard crop," said Anthony Keeling, deputy chairman of seed specialist Elsoms. "If we can't use them, then the 2015 mustard harvest will be dramatically reduced," he warned.

A two-year ban on neonicotinoids is being imposed by the European Commission, after research claimed they posed a risk to honeybees. However, the UK government has not restricted the ban last



Colman's mustard may have to resort to overseas supplies if UK crops fail

and therefore allowed EMG to gauge the effect of a ban on neonicotinoids here, he added.

mustard's biggest threat, the flea beetle," he added.

president of the National Farmers Union (NFU).

"We [the NFU] are not convinced that science against the use of neonicotinoids and their affect on bees is robust enough," Smith added. A heightened risk of crop failure would deter farmers from growing mustard, he said.

More research was needed to reduce the risk posed by the flea beetle without resorting to neonicotinoids, urged David Pendlington, procurement operations director at Unilever.

"Mustard is a minor crop in the UK and we need to protect what we have," said Pendlington. "We don't know exactly what the risk [of banning neonicotinoids] will be, but we need to find an alternative

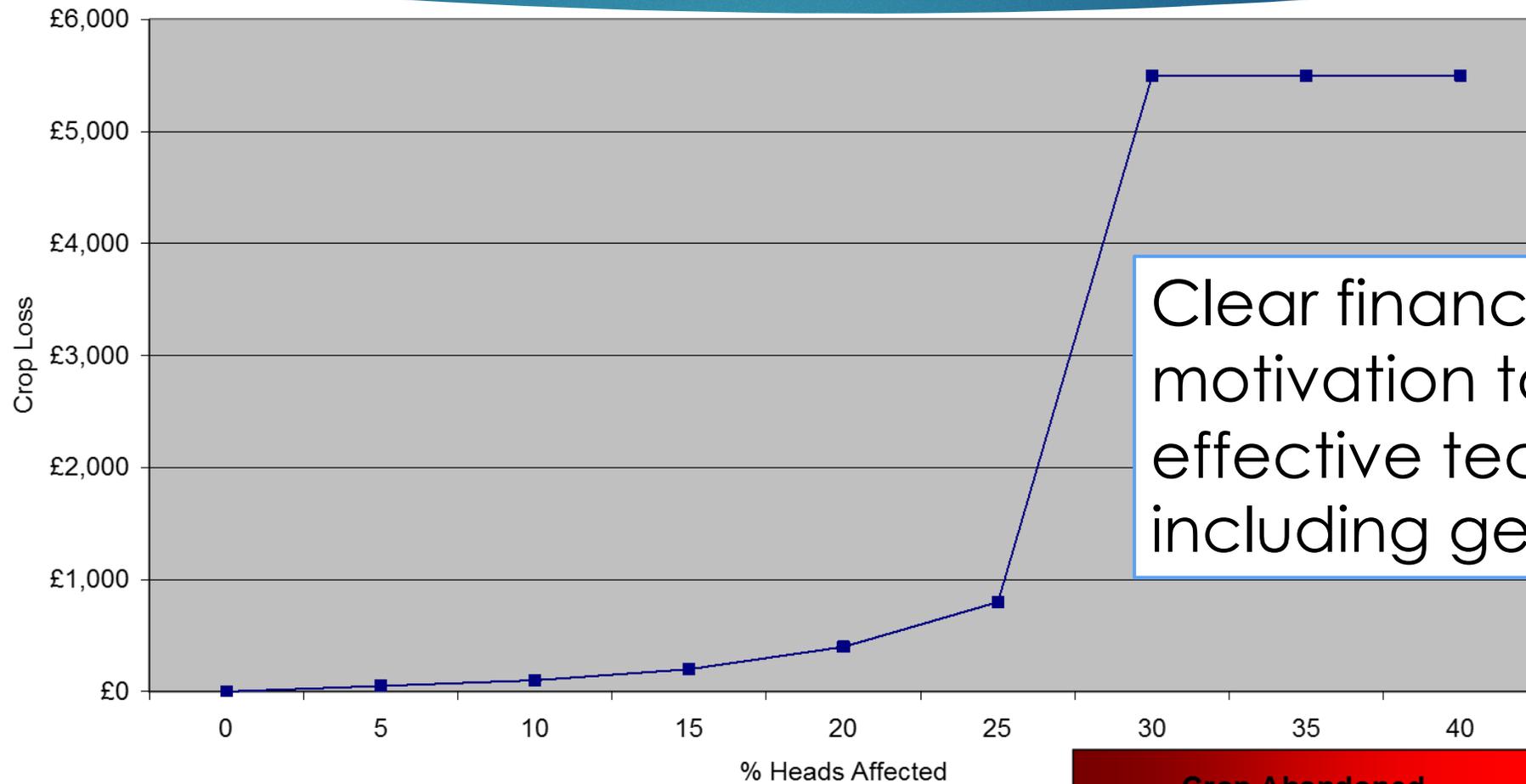


"Oilseed rape in Sweden had suffered a 70% yield fall as a result of the neonicotinoid ban"

# Management of post-harvest pests



# Impact of P&D levels on UK romaine



Clear financial motivation to adopt effective technologies, including genetics

Crop Abandoned

Breeding opportunities - Increasing operational efficiency!

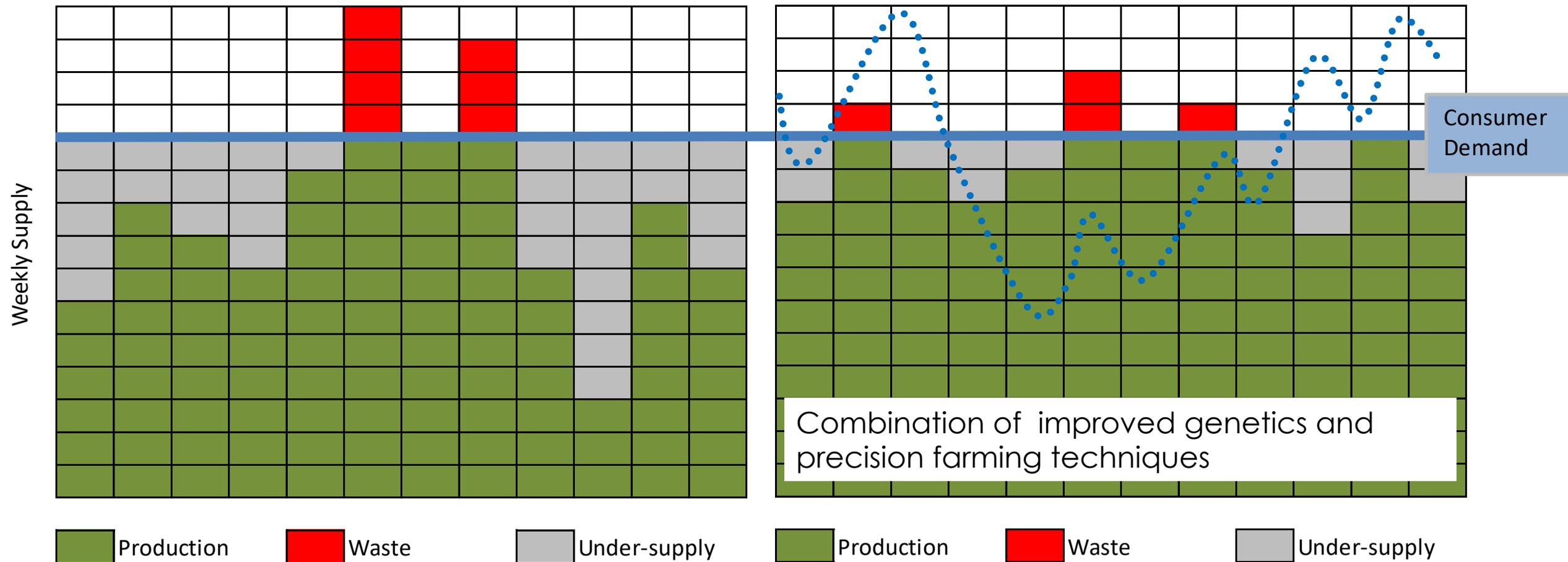
# Uniformity is critical



➤ **Variability = inefficiency & waste**

Waste

# Supply chain efficiency



# Breeding opportunities - Reduced labour costs





# Introduction of robotics

- Great enthusiasm from the funding community - the Tesla effect
- Commercialisation of technologies will be much more challenging than most supporters care to acknowledge
- Crop structures need to be changed to facilitate most current robotic operations, but will robotics evolve faster than breeding?
- Handling many products present significant biological challenges – can these be addressed without fundamental changes to the product?

# Breeding to improve post-harvest resilience



< 1 week



> 52 weeks

# Breeding opportunities – season extension & improved storage

Storage Conditions	Storage Period (months)												Cost
	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	
Ambient	Green	Green	Yellow	White	White	White	White	White	White	White	White	White	Red
Cooled	Green	Green	Green	Green	Yellow	White	White	White	White	White	White	White	
Refrigerated	Green	Green	Green	Green	Green	Green	Green	Yellow	White	White	White	White	
Controlled Atmosphere	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	Yellow	

Breeding can play an important role in expanding domestic production, but don't assume that displacement of imports will naturally follow – “food miles”, “freshness” etc are PR statements and are not necessarily supported by economics!

# Breeding opportunities - Quality

Breeding for quality improvement is a key objective for many programmes

- ▶ All stakeholders “have to” support quality objectives
- ▶ Improved quality lines present opportunities for premiumisation
- ▶ However, it is difficult to exploit quality improvements in the UK due to dominance of own-brand model
  - Greater opportunities with branded products
  - Growers need long term commitment
  - Too much buyer churn



# Own-brand vs Branded products



## 'Malling Centenary' A short-day cultivar from NIAB-EMR

A.B. Whitehouse<sup>1</sup>, D.W. Simpson<sup>1</sup>, A.W. Johnson<sup>1</sup>, K.J. McLeary<sup>1</sup>, A.J. Passey<sup>1</sup> and S.W. Troop<sup>2</sup>  
<sup>1</sup>NIAB-EMR, New Road, East Malling, Kent, ME19 6BJ, UK; <sup>2</sup>Meiosis Ltd, Bradbourne House, East Malling, Kent, ME19 6DZ, UK.  
 E-mail: [adam.whitehouse@emr.ac.uk](mailto:adam.whitehouse@emr.ac.uk), [sarah.troop@meiosis.co.uk](mailto:sarah.troop@meiosis.co.uk)

### Summary

'Malling Centenary' (formerly 'EM1764') was selected at East Malling Research, UK in 2006 and has a complex pedigree. It has a mid-early season, fruiting typically four days ahead of 'Elsanta' in the UK (Figure 1).

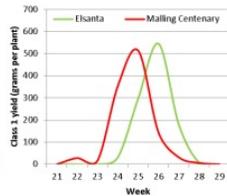


Figure 1. Crop profile of 'Malling Centenary' & 'Elsanta'. NIAB-EMR trial 2012 (misted tips, soil production)

It produces high quality fruit with low waste resulting in reduced picking costs.

### Fruit quality

Fruit quality is judged to be excellent, with a regular conical shape, sweet flavour, good skin and flesh firmness and good shelf life.

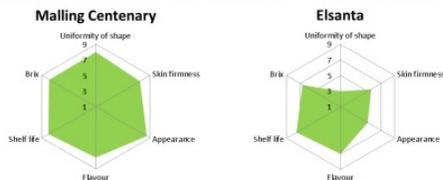
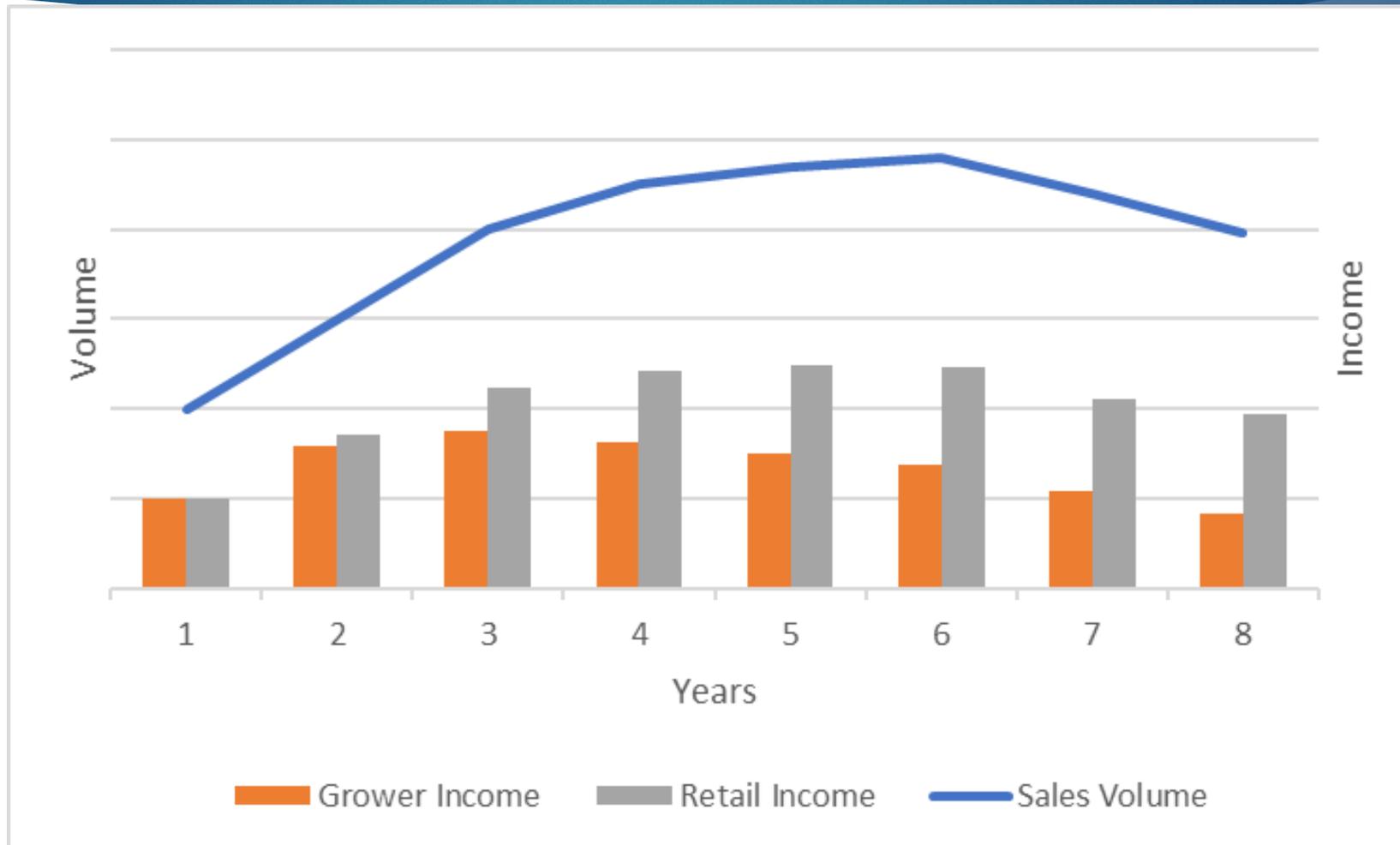


Figure 2. Mean fruit quality values from a main crop trial using tray plants grown in coir substrate under protection in the UK, where 1=poor and 9=excellent and actual Brix (°) source: Troop, S.W. (2012) HDC Project SF128, Final Report



# Financial benefits from new variety



## Breeding opportunities - Health

- ▶ Many breeding programmes have focused on specific health benefits – eg. raised vitamin levels, lycopene etc
- ▶ Great for PR, but have they generated the anticipated returns?
- ▶ Presents major marketing challenges since the base product has natural health benefits
- ▶ Additional challenge is limits to claims
- ▶ Need robust medical evidence, but this is expensive
- ▶ Products need effective brand management, but most end up being funded on a shoe-string and ultimately fail



# Breeding challenges – climate change

Need flexible strategies that can deal with too much and not enough water – often in the same season!



# Breeding Opportunities – adaptation for climate change

- Growers facing increased challenges from climate change
  - Move existing genetics to new production areas
  - Develop more resilient varieties
- Is the challenge too big/complex for breeding due to climatic instability?
- Will in-crop innovations provide better solutions? – eg. anti transpirant sprays in advance of drought periods
- Will structural changes provide the answer? eg. protected cropping



# Breeding to support disruptive strategies



Tread  
Carefully!

# Breeding to support disruptive strategies – where next?

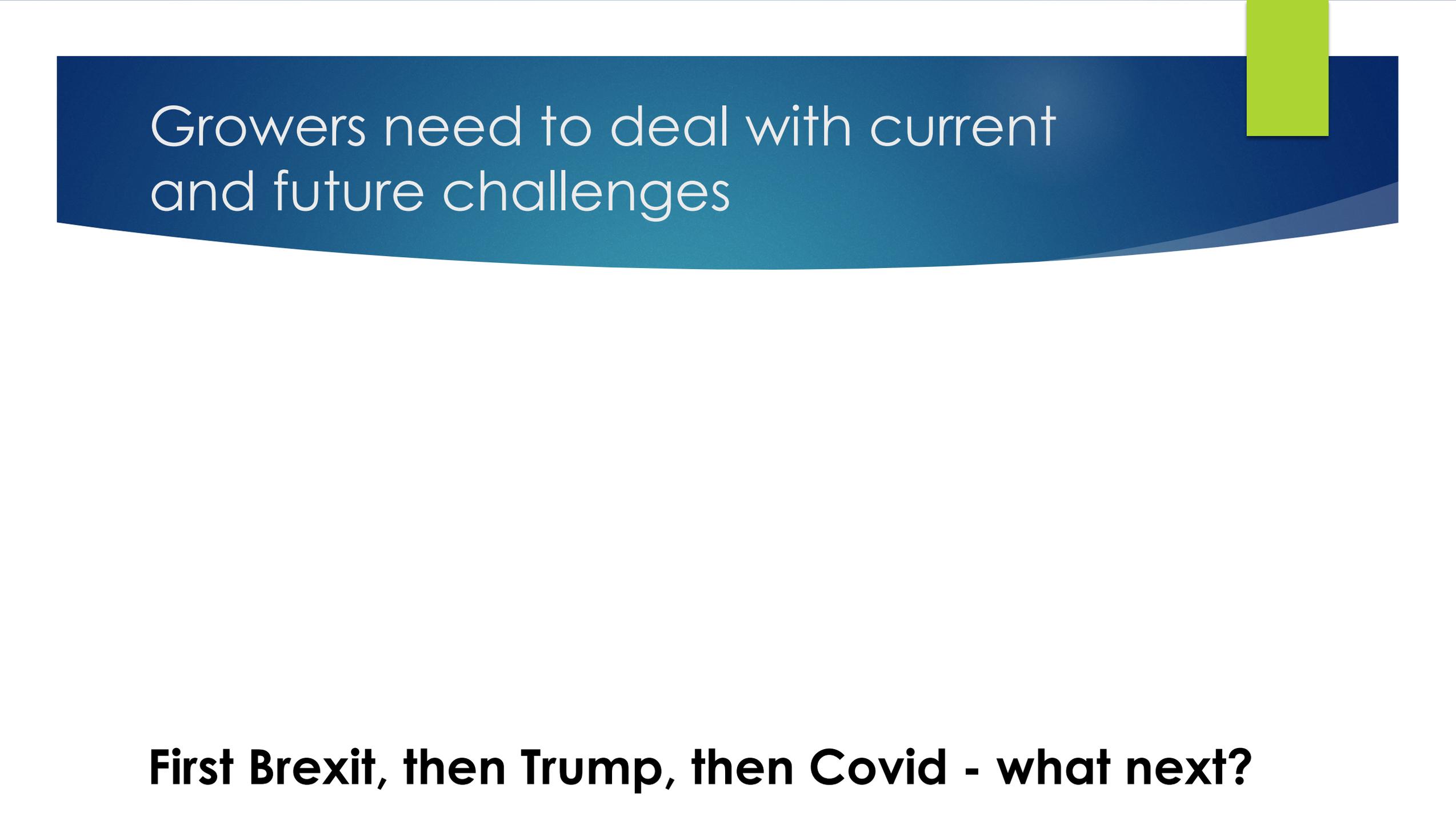


Vertical farming – a good case for breeding activity or great opportunity to waste money in a classic cul-de-sac?

- ▶ Significant investment in new projects
- ▶ Prolific generation of PR
- ▶ Uncertain that these will ever generate meaningful returns for the grower in commodity products
- ▶ Lack of grower profitability = high risk investment for the breeders



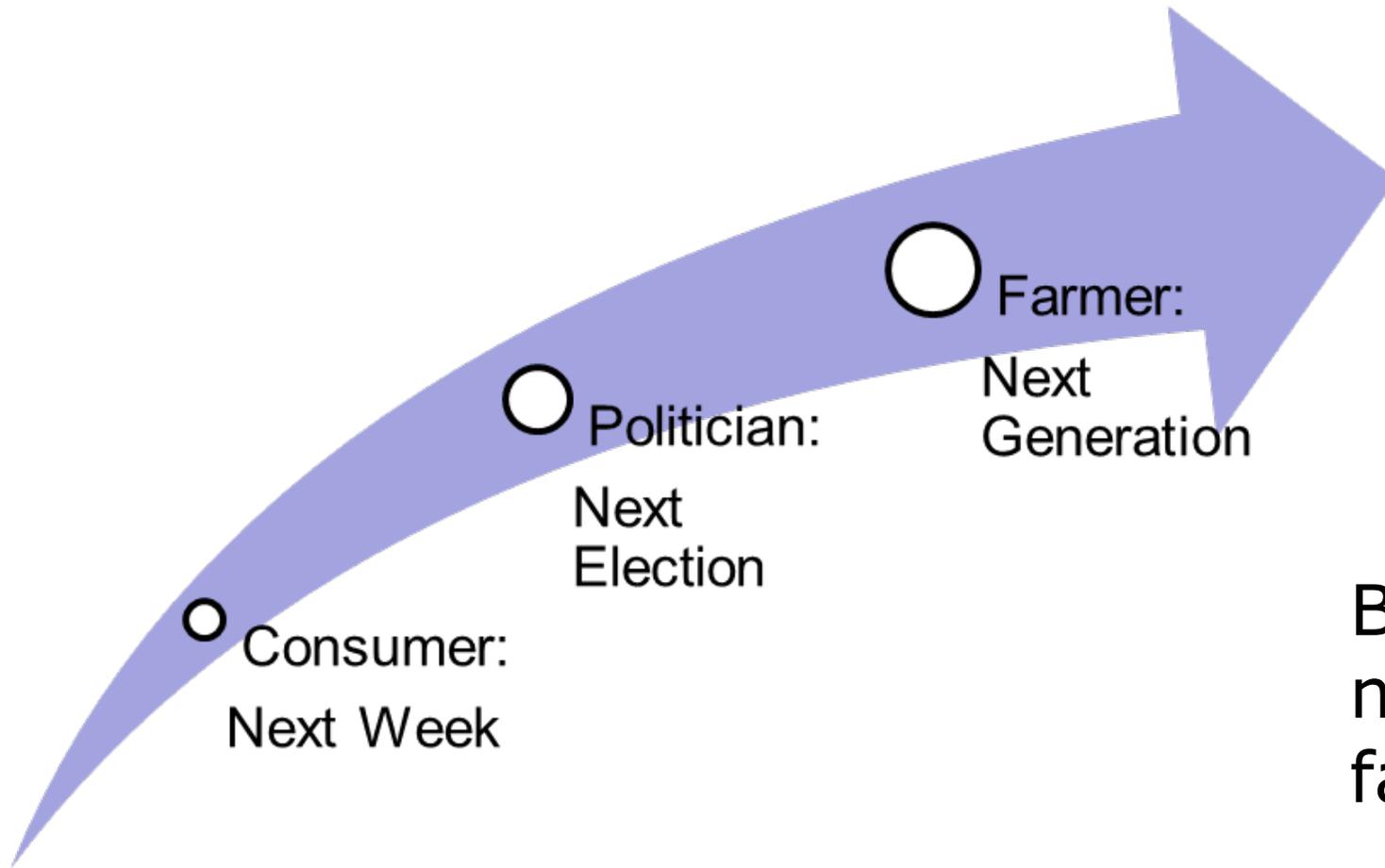
Challenges –  
New genetic  
techniques offer  
great potential,  
but this needs  
careful  
management



Growers need to deal with current  
and future challenges

**First Brexit, then Trump, then Covid - what next?**

# Timescale challenge



Breeding timescales  
more aligned with  
farming horizon

# The market is not always effective at prioritising innovation need!

- ▶ Role for Government/NGO's/ Charities to support work on public good objectives
- ▶ This support will help question 2 of the investment tree, but the other 3 questions still need to be addressed
- ▶ All projects should have effective collaboration with breeders to avoid adding more publicly funded failures to the breeding cul-de-sac

# Horizon scanning

Breeding for enhanced performance may be overtaken by other technologies!

Need to assess alternative technologies on a regular basis to determine future exploitation risks



Fresh produce  
suppliers are very  
innovative!

However, you  
need to remember  
that breeding is just  
one of the solutions

# Summary

- Salad, vegetable and fruit production in an increasingly unstable environment requires agility and adaptability to remain competitive
- Breeding has a key role to play in providing growers with the best varieties for their situations
- Selecting the right targets is key to success
- Need to “cut-through” the hype and PR messages to separate profitable traits from traits that end in cul-de-sacs
- Spend more time listening to people with real “skin in the game” rather than retailers, politicians, media commentators, influencers etc...

Thank you for listening