What will the Scottish potato sector look like in 2040 and will varietal diversity be important?

Report of a Workshop held at the Doubletree by Hilton, Dundee

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Photograph courtesy of John Marshall

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Executive Summary

Potatoes are one of the most important crops in Scotland, providing a buoyant export market and an important dietary staple. However, the industry is facing increasing challenges with changing consumer demands, climate change and the risk of increased disease outbreaks as pesticide regulation becomes more stringent.

Scenario planning is a proven technique used to make flexible, long-term plans. In our workshop participants were asked to imagine 3 plausible futures built around relevant drivers of change before crafting strategies that could address potential challenges.

Scenario 1, ***Salvation through Science***, envisaged a buoyant market with Britain out of the EU and adapting positively. Increased research & development in the sector has opened up new export markets with modern breeding techniques including gene editing ensuring expanding markets. Pesticide use has declined partly due to successful genetic technology and Scotland is largely disease free. There is growth in the market for bio composites and alternative foodstuffs (e.g. potato pasta) and the domestic industry is buoyant.

In scenario 2, ***Survival of the Fittest***, there are few new potato varieties, and conventional breeding techniques are still the norm. Scotland has an internationally recognised high health status, however due to stricter pesticide regulation, waste products have reached an all-time high and alternative uses for damaged potatoes are being developed in response. There is a buoyant export market, but the cost of production is elevated, lack of labour is an issue and Scottish producers are finding it difficult to compete on the world stage.

Participants working with Scenario 3, ***Potato production in a pesticide free world*** visualized an industry struggling with increased incidence of serious disease outbreaks, reduced yields, agricultural labour shortages and a low to no subsidy domestic environment. The industry is relying on breeding techniques rather than advanced genetic breeding and varietal mixes and bio-control agents are the preferred options in the war against pests and diseases. Scotland has become isolated but has a thriving domestic market, particularly with regard to processed products.

Among the many strategies conceived to address the challenges raised in these scenarios, participants thought that the potato industry should lobby hard to get gene editing accepted, work together to promote health benefits of potatoes via government and social media, and develop varieties to cope with the combined threat of an increased disease burden, reduced pesticide input and extreme weather events.

Following the scenario planning exercises participants discussed the future. The potato industry is constantly facing and coping with challenges which will continue as markets and consumption patterns change and the impact of increased pesticide regulation and climate change become clearer. There was agreement that strategies need to be identified and policies developed at a regulatory and farm level to increase or maintain resilience.

Introduction

Potatoes are one of the most important crops in Scotland, providing a buoyant export market and an important dietary staple. There is increasing pressure on the potato sector to compete with other popular staples, (e.g. rice, pasta) and provide varieties that suit the demands for processed products (e.g. chips, crisps), fuel and bio-plastics.

The research that we are undertaking within 2.3.2 explores some of the complexities of the potato sector to ensure that it is best placed to take advantage of opportunities, manage risks and create resilience both now and in future. In this workshop we used a Scenario Planning technique, inviting stakeholders to use their expertise to consider current trends alongside 'what if' hypotheses to create plausible, imagined futures including the events leading to those futures, and strategies that could be implemented to mitigate or perhaps facilitate the projected futures.

The 13 stakeholders that contributed to the workshop included ware and seed producers, merchants, policy representatives and researchers.

Scenario Planning Technique.

Time-line, Drivers of Change, Back-casting and Strategies.

Scenario planning (SP) is a proven technique used by organisations to draw out knowledge and expertise in a creative way to facilitate planning for the future. The future is inherently uncertain and scenario planning aims to draw on the expertise of stakeholders and existing knowledge to envisage plausible future states based on current trends, typically taking account of social, technological, environmental, economic and political (STEEP) drivers of change. There are many variants of scenario planning. This research adopted a qualitative, narrative approach through which workshop participants can co-create contrasting future states in order to develop plans robust enough to produce desirable outcomes in the face of hypothetical challenges. As there are an infinite number of possible futures it is not a futile attempt to predict the unknowable, rather a way of imagining a series of instructive, plausible futures.

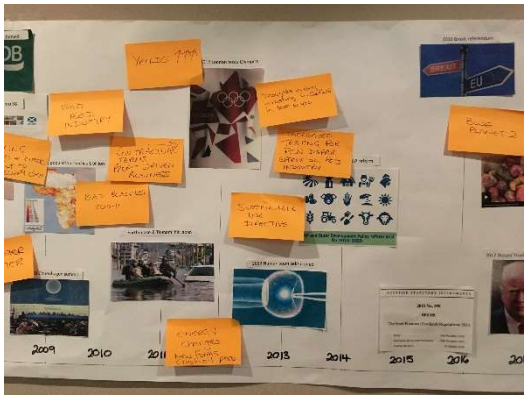
A future time horizon of 2040 was established. Experience of previous scenario planning exercises and a deep understanding of the literature recommends the selection of not too distant futures which participants and the wider audience often find too 'far fetched' to usefully inform the present. The further away a future date, the greater the associated uncertainty appears. Anything might happen given long enough. Equally, futures that are more immediate may be too close to allow the sort of strategic conversation desired and business as usual tends to be most people's assessment of near future states. Hence a reasonable horizon of 2040 that better reflects policy cycles and holds more potential interest for strategic planners was adopted.

Researchers began by taking participants through a *timeline* exercise. The rationale is, that by considering the nature and consequences of past events, stakeholders are encouraged to recognise unusual, game-changing events as plausible and even inevitable before looking forward in time with creative imagination. The timeline was followed by an exercise to choose *drivers of change* to model the scenario concepts. Once the scenarios had been built *back casting* provided a sense check of the scenarios before *strategie*s were designed to meet the perceived challenges.

Timeline

We began with a timeline (1996-2018) prepopulated with historic events by the facilitators that highlighted significant global and national events that may have shaped the potato industry we see today. We asked the stakeholders to reflect on those events and add any which tey thought had impacted on the potato sector.

Figure 1- A section of the Timeline



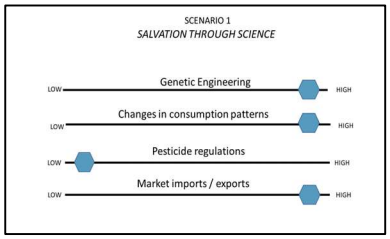
According to our timeline, from 1996 onwards production is changing from seed to ware. From around 2005 increasing rainfall and the rise of consumer preferences for processed ready meals is increasingly impacting on production resulting in the reduced sale of fresh potatoes. In 2008 the Rooster variety arrives in the shops and the global financial crisis impacts the sector. This is followed by a bad outbreak of Blackleg disease in 2010-11 putting additional stress on the industry. Fast food chains are on the increase increasing the requirement for processable varieties and a heightened testing requirement for potato cyst nematode (PCN) have a disproportionate effect on the industry in 2013. By 2018 previously rising yields have plateaued and extreme weather events are increasingly having an adverse effect on the industry as a whole

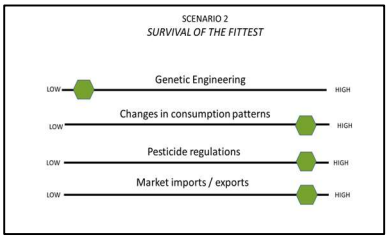
Drivers of Change

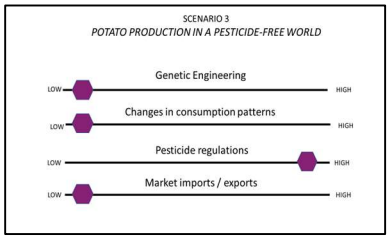
Drivers of change are key issues and trends that influence our society or markets. The facilitators gathered drivers from participants of the Hutton Potatoes in Practice 2018 event (PiPs) and invited stakeholders at the workshop to add their own. The STEEP heuristic, eliciting social, technological, environmental and economic drivers, was used to ensure a wide range of drivers were considered. Participants were asked to prioritise drivers with high uncertainty and high impact. Appendix 1 shows all the drivers that were collected. Participants were asked to vote for the high-uncertainty drivers they felt would have the most impact or influence on the sector looking forward. Voting aims to give participants buy-in to the scenarios they are asked to create. When participants are not in control of driver selection there can be incredulity surrounding the plausibility of the different combinations. The drivers attracting the most votes were *genetic engineering, consumption patterns, pesticide regulations and market imports / exports.* These parameters were used to build the scenario models. Extreme weather events and climate change were not included as a variable driver but were considered to be a constant parameter across all three scenarios.

Scenario Slider Models

The facilitators allocated the 4 drivers chosen by the participants (*genetic engineering, consumption patterns, pesticide regulations and market imports / exports)* low or high impact or influence in 3 slider models shown below. This visual device allows participants to readily appreciate binary oppositions such as the influence of genetic engineering being either high or low. Four variables has been found to be manageable for most participants allowing an interesting framework with 16 possible combinations but not too many for the participants to have to reconcile. These models were then used by the participants working in 3 groups to build 3 plausible scenarios of how the potato industry may look in 2040. The exercise comprised each subgroup building a narrative consistent with their set of sliders but adding creative content based on their understanding of the sector.

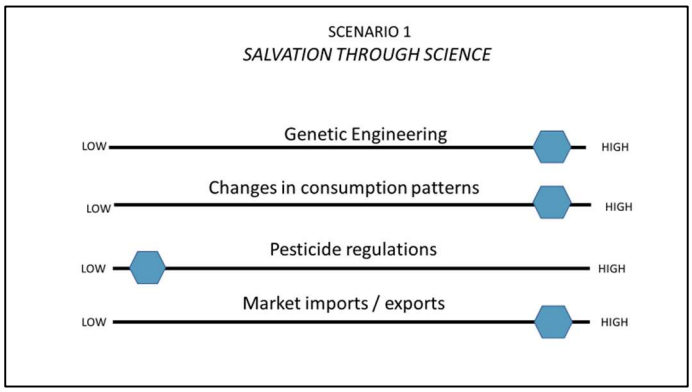






Scenario 1: Salvation through Science

Scenario 1 envisaged a buoyant market with Britain (including Scotland) having left the EU under Brexit but having adapted positively. A technology driver has been dominant with increased research & development in the sector helping to open-up new export markets.



Modern plant breeding techniques including gene editing have played a big part in the success of expanding markets and Maris Piper 2.0 (a gene-edited variety based on the current best seller) became the most popular variety in 2035.

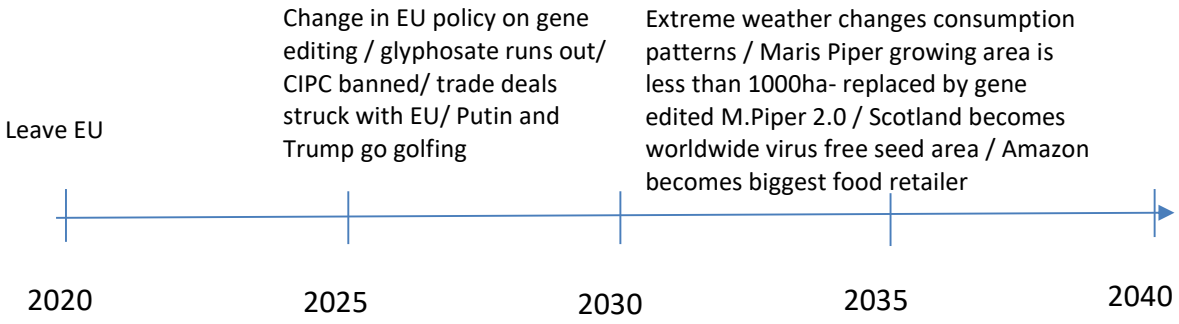
The role of pesticides has declined with gene editing technology taking over as the main line of defence against pests and diseases and Scotland's potato sector is largely disease free. Regulatory pressures around pesticides have similarly declined. Pesticides are no longer widely available, partly due to the exhaustion of chemical resources, exacerbated by public environmental concern, but mainly having been superseded by genetic lines of defence including better knowledge of MRL's (maximum residue levels).

With technology driving innovation there has been a growth in the market for potato-based alternatives to plastics (bio composites) and alternative foodstuffs (e.g. potato pasta). There are more varieties available, many being niche, suiting the export market but there has been little success on the true potato seed (TPS) front.

Scotland's potato sector has consolidated considerably, and businesses are no longer working in silos. Scotland's potato sector is having a perverse benefit from climate change and potato cultivation is creeping northwards. Climate change has created new markets for Scotland's potatoes and there is a big Asian and African export market.

In the market, the retailer is king, calling the shots about what is grown and influencing consumption patterns. There has been some innovation in terms of flexible purchase options (people routinely buy single potatoes) however there is a continuation of the trend towards processed potatoes with movements like Slow Food failing to make ground in this technologically shaped future.

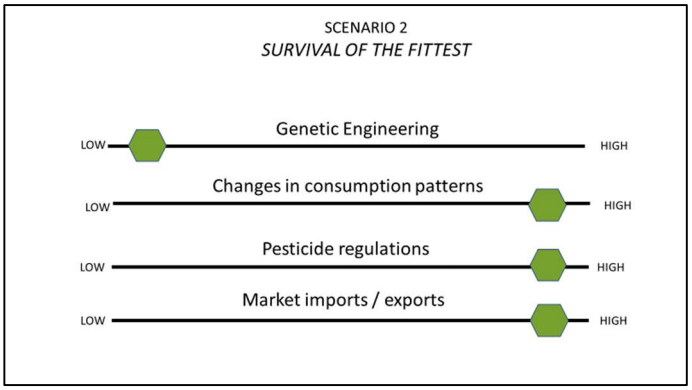
Scenario 1 Back-casting



Scenario 1 Strategies

1. Industry to lobby HARD to get gene editing the GREEN LIGHT
2. Promote health benefits of potatoes via government social media & breeding for health
3. Develop varieties to cope with weather extremes- especially for export
4. Adopt new pest management technology and crop health (to replace pesticides)

Scenario 2: Survival of the Fittest

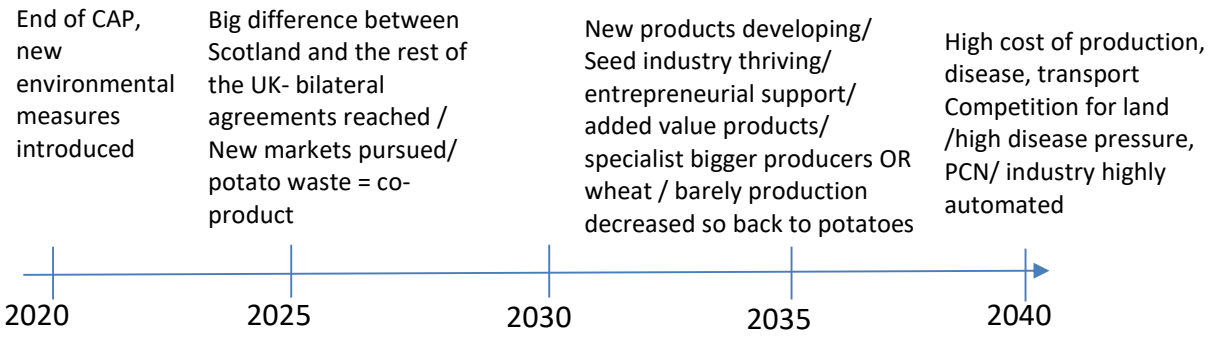


In this scenario, potato varieties haven't really changed, Maris Piper is still 'king' and conventional breeding techniques are still the norm as gene editing is not widely accepted. Scotland has an internationally recognised high health status with a low virus risk and soil testing is high with 100% PCN (potato cyst nematode) testing on all potato growing land, however due to high pesticide regulation, waste is high and alternative uses for damaged potatoes are being developed e.g. butanol and ethanol and bioplastics. Around 80% of potatoes are exported to China and India to be processed into food like potato noodles or potato pasta and the industry has consolidated with fewer, larger more specialised growers competing for land. The cost of production is high, lack of labour is an issue and Scottish producers find it difficult to compete on the world stage.

In this scenario the participants developed 'news headlines' to highlight the state of the industry.

- Piper power destroys industry
- JHI closes due to overseas brain drain
- Potato pasta in potato plastic
- Potato powers public transport
- Potatoes new super food
- Number of growers can be counted on two hands
- Scottish seed celebrates high health longevity @WPC (World Potato Congress)

Scenario 2: Back-casting

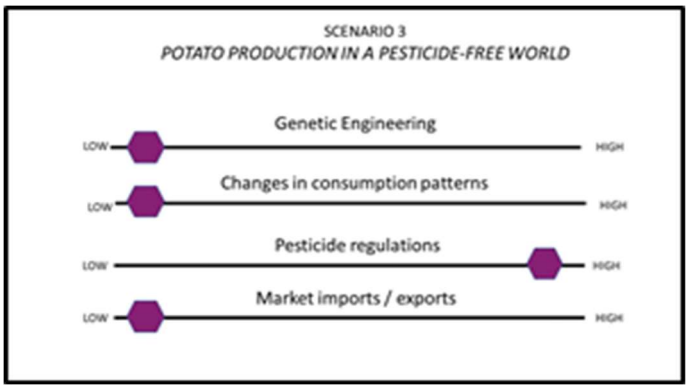


Scenario 2: Strategies

1. Regulatory change required to overcome Court of Justice of the European Union ruling.
2. Support from industry and government regarding the innovation of new products- fuel, plastics, food etc
3. Support for main research providers
4. Economic strategy alignment-agriculture, food, wider industry

Scenario 3: Potato production in a pesticide free world

High pesticide regulation has resulted in elevated incidences of serious disease outbreaks and reduced yields, labour is in short supply and subsidies are no longer available which means a reduction of small scale seed producers and an increase in large and / or organic businesses. As the industry relies on more successful breeding techniques there is an increase in the use of varietal mixes and intercropping and a dependence on bio-control agents to combat pests and diseases. China is investing in the innovation sector and is a major business partner. Strong international competition combined with a low export market has resulted in Scotland becoming isolated but there is a thriving domestic market for predominantly processed potato products. Consumers are not interested in food security and processed fried food is now "good for you".

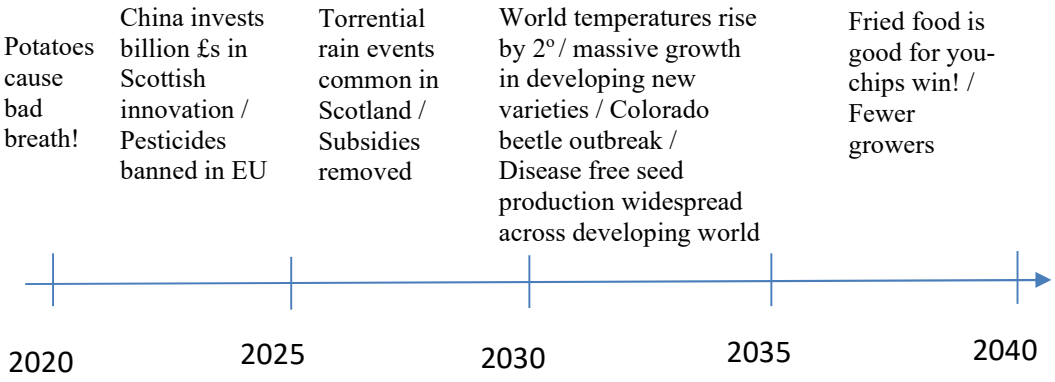


As in scenario 2 the participants in this scenario suggested 'news headlines' to highlight the state of the industry.

- Production patterns- business as usual
- Better land use- right skills right land
- Ban on pesticides
- Big political upheaval

- Potato production in pesticide free world

Scenario 3: Back-casting:

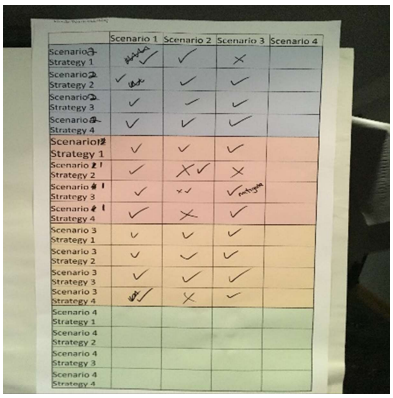


Scenario 3: Strategies:

1. Increase investment & implementation in Research & Development (R & D) with a focus on quality.
2. Move to a low carbon economy
3. Support land stewardship and value public goods
4. Develop a marketing strategy to "Make Scotland Great Again"

Wind-tunnelling exercise:

From the many strategies suggested to address potential challenges, participants voted on the 4 in each scenario they felt were the most relevant. These were used in a 'wind-tunnelling' exercise to evaluate their effectiveness across the 3 scenarios. It was apparent that strategies developed for one scenario may not necessarily be the most appropriate for others, highlighting the need for caution when attempting to design future "one size fits all" strategies for the industry. See Appendix 2 for the full strategy / scenario matrix.



Plenary discussion:

During the plenary discussion participants were encouraged to think about the exercises they had completed and feedback their thoughts and opinions about the future of the potato industry.

One participant asked whether we were doing this exercise too soon with regards to continuing Brexit uncertainty and felt it would be useful to run it again at a later date. He also thought that it would have been useful to have some 'dashboard' statistics about the size of the market, amount of land under potatoes, yields etc. to help contextualise the scenarios under discussion, which the facilitators will bear in mind for future events.

There was a suggestion that the potato industry, in terms of manoeuvrability, was 'a bit like a container ship that needs to become more like a speedboat'. It needs greater agility and a change of mindset. There is a need to identify strategies and policies that work, including those that can be applied independently of Brexit, both at a regulatory and farm level to increase or maintain resilience.

With regard to consolidation of businesses, it was argued that with only 25 growers in the UK, further consolidation would be of little benefit and may incur more risks. Similarly, the loss of productive land (through disease or climate change) incurs additional risks despite the number of varieties being tested or grown. Looking ahead to 2040 there may be a change in markets with varieties being produced for alternatives to consumption and the industry may become more production led rather than consumer led.

The relationship between the grower, retailer and consumer needs to change to move the discussion away from retailer driven decisions to focus instead between the grower and the consumer. For example, one producer claimed to have convinced a retailer to change their marketing to offer stock in an area where it had not been sold before. By offering a "reds" variety the stock went up 25% because the retailer was selling in a new area with a large North African population who were used to the "reds" variety of potato, but then it dropped again because the retailer decided to change, which suggests that the 'expertise' lies with producer/packer and not the retailer and therein lies a problem if it is the retailer making the decisions about what to sell and where and when.

Acknowledgements

We are very grateful to the participants for the time they spent with us to contribute to this research. We would also like to extend our thanks to those who helped to broaden the breadth of expertise by generously sharing their personal networks.

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The views and recommendations expressed in this report are drawn from the participants and are not necessarily representative of the wider potato growing community. Furthermore, this report does not represent Scottish Government policy.

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APPENDIX 1 Drivers of Change

The drivers in blue received the most votes (in brackets) from the participants and were used to build the scenario models.

Social	Economic	Environmental	Political	Technological
Changing eating habits (8)	*Labour*	*Temperature change*	***Losing export markets (4)***	*Automation*
"Unhealthy" carbs	*Exchange rates*	*Water availability (4)*	***Gaining new markets (5)***	*Labour*
Flexible	*Macro economy (3)*	***Pesticide regulation /reduction (4)***	*GM sentiment*	*Organic pesticides / minerals*
Les fresh, more processed	*Tariffs fluctuating*	*Inorganic fertilizers*	*ECJ (European Court of Justice)*	***CRISPR & GM (5)***
Smuggling	*Changing varieties*	Speed of change (public access)	*Internal sustainability*	Precision farming (4)
GM sentiment	Availability of source fertilizers	Plant health regs (1)	*GM EU rules*	Soil microbes (1)
Speed of change – social (eating habits) (2)	Varieties fit for purpose	Extreme weather events e.g. floods (6)	Border issues- Ireland	Starch & plastic diversification (2)
Public value -CAP support payments will go	Free market	Sheep off hills, trees increase- climate mitigation	Pesticide regulations (4)	Conventional breeding techniques (3)
Education		Soil health (5)	Losing CAP support	
Science scepticism		Carbon footprint, Internal sustainability	International protocols	
Fake news		Increased understanding of chemicals & effects on environment		
		Improvements in environments- healthier		

APPENDIX 2. Matrix of strategy relevance to scenarios

	Scenario 1	Scenario 2	Scenario 3
Scenario 1 Strategy 1 Industry to lobby HARD to get gene editing GREEN LIGHT	YES	YES	YES
Scenario 1 Strategy 2 Promote health benefits of potatoes via government social media & breeding for health	YES	MAYBE	NO
Scenario 1 Strategy 3 Develop varieties to cope with weather extremes- especially export	YES	MAYBE	YES
Scenario 1 Strategy 4 Adoption of new pest management technology and crop health (to replace pesticides)	YES	NO	NO
Scenario 2 Strategy 1 Regulatory change required to overcome CJEU	YES	YES	NO
Scenario 2 Strategy 2 Support innovation of new products- fuel, plastics, food etc	YES	YES	YES
Scenario 2 Strategy 3 Support for main research providers	YES	YES	YES
Scenario 2 Strategy 4 Economic strategy alignment-agriculture, food, wider industry	YES	YES	YES
Scenario 3 Strategy 1 Increase investment & implementation in R&D with a focus on quality. Scottish power house of R&D	YES	YES	YES
Scenario 3 Strategy 2 Move to a low carbon economy	YES	YES	YES
Scenario 3 Strategy 3 Support land stewardship- public goods	YES	YES	YES
Scenario 3 Strategy 4 Make Scotland great again= marketing strategy	YES	NO	YES