Miro Board

Of the twenty-eight remaining activities, eighteen were briefly explored in plenary discussions based on the comments participants posted during the online Miro board exercise; ten activities did not receive any comments (see page 5). The section below presents a record of all the activities and their associated verbatim comments from the Miro board. The comments represent participants' views of the topic and activities in discussion.

Activity 1 - Changed fertilizer practices including new formulations and more organic systems of production

- ◦ Greater use of organic fertilisers
  ◦ Unrealistic to think synthetic fertilisers will be completely replaced by organic
  ◦ If we are to cut carbon use in fertilizer and keep supplying our food this is the way to go. No food is a problem
  ◦ Concerned there is a risk that different pathogens could take hold / be seen
  ◦ Less H-B nitrogen will lead to question of where CO2 for food and beverage will come from
  ◦ Yield levels much lower with organic fertilisers
  ◦ Lower artificial chemical inputs replaced by bio and GM (fertilizer, pesticides)
  ◦ CO2 is a by-product of synthetic fertilizer manufacture; where will CO2 come from

Activity 2 – New crop and plant varieties produced by conventional and new breeding methodologies

- Potential new allergens, and other food safety concerns should be covered by novel food risk assessment
- Gene edited crops, if successful, will potentially increase yields 2 or 3-fold for e.g., wheat and barley and will decrease fertiliser need
- Potential for more healthy products as well.

Activity 3 - Less chemical options for pest control and moves to more IPM

- Increase in aflatoxins / pest derived 'toxins' but countered by a reduction in pesticide residues
- Less artificial inputs (fertilizer and pesticides and replaced by biocontrol and plant breeding solutions)
- Will there need to be a different skill set, testing regimes and controls?

Activity 4 – Changes to cultivation methods – reduced tillage

- Min-till, no-till potential for lower carbon emissions plus lower fuel requirements.

Activity 5 – Changed rotations and crop mixtures

- Use of legumes is good but could see other crop diseases we're not planning to see

Activity 6 – Policy changes to increase on-farm biodiversity and carbon sequestration

- Land will be used for multiple functions to include food production, biodiversity and carbon sequestration
- Also water management (flood and storage)

Activity 7 - Development of circular economy principles to utilise waste streams

- Side stream valorisation, linked to agile biorefineries

- Definite risk if not monitored
- Good thing but will doing this accidentally cause BSE so to need to do with caution. Even avoiding bad things like BSE, by feeding livestock new things the nutritional profile of meat could change - good or bad is possible - meat will have a different nutritional profile
- This is important
- Intense commercial pressure linked to SBTI, net zero, unintended consequences
- Removal of contaminants from the waste streams
- Novel food ingredients, which will require a safety assessment
- Link to Activity 28 (Conversion of and reuse of food waste)

Activity 8 - Reduction of inputs (e.g. water, biocides) that affect food safety

- Potential impact on cleaning during food production if there is water scarcity and subsequent impact on management of a range of risks
- Water as a priority

Activity 9 - Improving nutrient management

- Healthy processed foods by design
- Consumer misunderstanding of safe/sensible ingestion levels - link to attitudes to supplements (more is better)
- Inherent need for segregated supply chains + assurance
- Need for standards on labelling for specific nutrients / sustainability attributes
- Crops with increased nutritional yield rather than 'yield' per se
- Crops and minimally processed primary products for increases in bio accessibility and then bioavailability

Activity 10 - Protection of peatlands and increased carbon sequestration

- Potential positive impact as will increase water attenuation, cleansing and flood reduction (impact on field crops)

Activity 11 - Encouragement to protect soil biodiversity

- N/A

Activity 12 – Increased use of agroforestry, cover and nitrogen fixing crops

- Increased use of legumes, which are known source of allergens. Need to review which allergens are of greatest public health concern on a regular basis?

Activity 13 – Mixed rotations which include livestock

- In going organic/ reducing fertilisers you do need livestock in the fields to get the fertiliser in but need to manage the risks of mixing livestock and arable

Activity 14 – More hedgerows, woodland and forests

- N/A

Activity 15 – Investments in Anaerobic Digestor plants

- N/A

Activity 16 – Land use change; Balance between for agriculture and for carbon storage

- Planting woody biomass (for energy production / Biochar)
- Restoration of peatlands
- Agroforestry
- Return of land use for biofuels?

- This is important

Activity 17 – Mixed rotations including livestock

- Opportunities to reduce chemical inputs including pesticides and fertilisers and antimicrobials by effective circular economy and livestock grassland rotation integrated to crops
- Indications are this benefits animal health and resilience to disease
- Potential for unexpected crop co-mingling / cross contamination

Activity 18 – Greater integration of arable and livestock farming

- N/A

Activity 19 – Multi-stream culture systems (e.g., fish plus water plants such as watercress)

- Important and to add the growth of recirculation systems that integrate species

Activity 20 – Ocean farming and harvesting of seaweed

- Sustainable 'farming' of seaweed
- Issues surrounding 'ownership' of marine 'space' used for farming and hence implications for control/responsibility regarding integrity and food safety. Heightened risks require greater controls
- Potential market expansion linked to solving water quality problems. Marine and terrestrial water management frameworks need to be integrated. Regulator remits need reviewing. Recognition of significant sector investment and better enforcement.
- Control of production of secondary metabolites as a function of fermentation conditions
- Potential for carbon sequestration
- Certain species have potential for reducing ruminant methane production

- Management of upstream and downstream cultivation and supply chain routes
- Micro and macro algae, making best use of the coastal waters of the UK
- Safety around transfer of radioactivity
- Link to Activity 8 (Reduction of inputs – e.g., water, biocides – that affect food safety)

Activity 21 – Novel animal feed; insect protein, soy replacement, new proteins

- Anti-nutritional factors should be considered from both insects and emerging crop sources
- Understand any conditions, causes of toxic or anti nutrient, unwanted interactions elements
- Great opportunity to enhance aquaculture using alternative protein sources and the impact they can have in nutritional levels of the fish produced.
- Feeding animals insect protein is changing what the animals are eating potential animal welfare challenge and could change nutritional profile for human consumed meat. Might be safe but it might be more fatty or leaner
- Agree that omega 3 sources provide opportunity in aquaculture but also in other livestock that are more widely consumed
- Price volatility linked to fraud and authenticity

Activity 22 – Insect feed in aquaculture

- Primary market at this point in time due to current legislation
- Also for other livestock, once approved. Links to food waste as sources of substrate materials will change
- Organoleptic considerations of fish products

Activity 23 – Supplements for livestock to reduce methane

- Need to consider wider probiotic feed supplements
- Link to Activity 20 (Ocean farming and harvesting of seaweed)
- How does this scale? (e.g., seaweed farms); How to maintain safety at scale?
- Most likely as synthetic chemical feed additives in the short term rather than organic, such as seaweed

- Animal feeding to deliver sustainable protein nutrition + lower methane emission

Activity 24 – Livestock and rumen microbes as part of the pangenome approach

- N/A

Activity 25 – Livestock breeding (traditional and/or GE and/or GM) for more sustainable traits

- Intensification of animal and crop agriculture (e.g., indoor animal systems; welfare-safety axis; multi-stream).
- Consumer concerns around GE & GM developments

Activity 26 – Bio based and other novel packaging and food contact materials

- Opportunities to use novel packaging determined by food pathogen load at primary production
- Microbial contamination of biobased materials
- Nascent standards for assessing novel packaging materials, much still to be understood
- Increase in different novel materials could potentially increase risks, given that there may be some unknowns in terms of food contact. Manufacturers switching to novel/bio-based may not be familiar with legislative requirements
- Biobased and recycled packaging materials
- Need for an understanding of the physical and functional properties of bio-based vs the optimised functionality of petrochemical based packaging materials

Activity 27 – Reduced plastic packaging

- In addition to potential risks (allergens, chemicals etc) from the new packaging’s, a reduction / change in use of packaging could increase cross contact risks between products. Putting this between two items as both are

closely related / interrelated
- Risks of new packaging derived from recycled 'ocean bound plastic'
- Packaging and plastics raise food contact material risks and behavioural risks over not using plastic packaging
- Move away from petrochemical plastics in processing infrastructure (cf.26), robustness of replacements and novel biological packaging, e.g., based on allergens
- This has links to food waste reduction
- Problems with reuse of consumer's own containers l- hygiene, cross contamination lack of labelling and safe shelf life etc.
- Consumer negative attitudes to plastics packaging and hence rejection - puts integrity, safety of food content at risk.
- Increasingly the recycled content of packaging is to come from truly circular use, ie meat trays to meat trays, so we need to have robust cleaning and protective layering

Activity 28 – Conversion of and reuse of food waste

- This is important
- Link to Activity 7 (Development of circular economy principles to utilise waste streams) and Activity 8 (Reduction of inputs – e.g., water, biocides – that affect food safety)
- Commercial pressure to address this linked to cost and achievement of science-based targets, net zero. Unintended consequences, varying quality of resulting output as an ingredient hence impact on final product.
- Rework is a recognised key risk area for allergen management - this takes it to another level...
- The principles industry is following is to upgrade to higher value and better use, not just to address waste. Need to ensure risks are addressed in by-product handling and processing
- Microbiocidal safety, etc use of chitin as soil additive, promotes activity that reduces PCM levels, wouldn’t count as a pesticide but as soil addition
- Bioaccumulation of chemical contaminants
- Also, new RM and feedstocks based on unused parts of food plants

Activity 29 – Abstraction of slurry (to allow use of low emission slurry spreading machines)

- N/A

Activity 30 – Manure management; anaerobic digestion

- Novel manure treatments and processing will create new fertilizers and by products
- Better use of anaerobic digestion (AD) slurries

Activity 31 – More plant-based diets

- Individual foods like to be safe, but potential for small suppliers to bypass regulation, and longer-term dietary questions around nutritional content. Same issues with novel proteins
- Up to date food intake data for the UK is an important part of food safety risk assessment, dietary survey data needs to keep pace with these changes. It is already challenging.
- Understanding and capability of small suppliers to meet safety requirements / what is required for a novel food approval is variable
- This one could be a big impact, but wider shifts and many pathways

Activity 32 – Novel proteins in consumer diet; insects, cultured meat, meat and dairy substitutes

- Unknown and unintended consequences around development of novel proteins - insects as vectors of disease - use of non-native species of insects. Link to animal health diseases
- BSE type event, concerns over feeding new protein sources that will then be eaten by humans
- Differentiate between novel and alternative non-novel proteins
- Need to consider consumer understanding of materials from different sources and the safety implications of potential confusion e.g., animal derived allergens made in non-animal systems being used in products with

vegan claims
- Understanding and capability of small suppliers to meet safety requirements / what is required for a novel food approval is variable
- Insects as vectors of disease i.e., Bluetongue, Dengue, Malaria

Activity 33 – Decarbonisation of crops grown in polytunnels

- N/A

Activity 34 – Vertical Farming systems

- Non-competitive environment (no background level of competition in soil environment) and ability to spread contamination around the environment
- Chemical contamination is in theory lower, due to a more controlled environment
- Linked to intensive farming with concerns over food contact risks
- recirculated water in vertical or closed agricultural environments can spread problems through a crop
- Potential for use of existing infrastructures e.g., mine shafts etc, with use of LED lighting for optimal nutrition and flavour yields

Activity 35 – Robots and drones used in farming systems

- Potential for increases in productivity (lights out production)

Activity 36 – Animal and plant health Sustainable intensification - Lower carbon agronomy

- Intensive indoor dairy and livestock systems
- Intensive plant growing systems intensification of animal and crop production. Concern for Animal welfare-food safety axis
- This overlaps with novel feed sources that improve animal performance and resilience or reduce emissions. Also requires land use management for feed.

Activity 37 – High-tech production systems (glasshouses, Controlled Environment Agriculture (CEA), hydroponics)

- N/A

Activity 38 – Reduced water uses

- Recycled water
- Reduced washing
- Not clear what would look like in supply chain but is risk around changing key input and hygiene control
- Challenge to maintain GAPs while reducing water, potential for cross-contamination

Activity 39 – Energy use reduction measures

- N/A

Activity 40 – Land-based renewables and energy storage, for on-farm and export

- N/A

Activity 41 – Bioenergy with carbon capture and storage - not in the food system, but uses land so will affect the food system

- Is this on farm, fertilizer production? At home? All of this would make a big difference and have food safety issues

New Activity: More farm produce supply direct to consumers following on-farm primary processing

- Need for increased focus on re-distributed manufacturing and innovation ecosystems