

Annex A - Breakdown of key priorities

This paper describes the detail developed by the 5 multi-disciplinary groups around the 5 research priorities voted most important by the workshop attendees during the second session.

These priorities were:

- Availability and suitability of substrates
- Safety
- Legislation
- Economics of production
- Consumer acceptance

Availability and suitability of substrates

1. The affinity, efficiency and yield of insects reared on different substrates should be measured to find optimal insect-substrate pairs. These ideal couplings should then be mapped against substrate availability.
2. Optimal methods to store and deliver substrates to insects need to be developed. This would include an analysis of the trade-offs in terms of scale and geography (e.g. fewer large industrial centres near substrate sources which deliver insects to farmers vs. many, smaller on-farm units where substrate is delivered to farmers, or they produce their own).

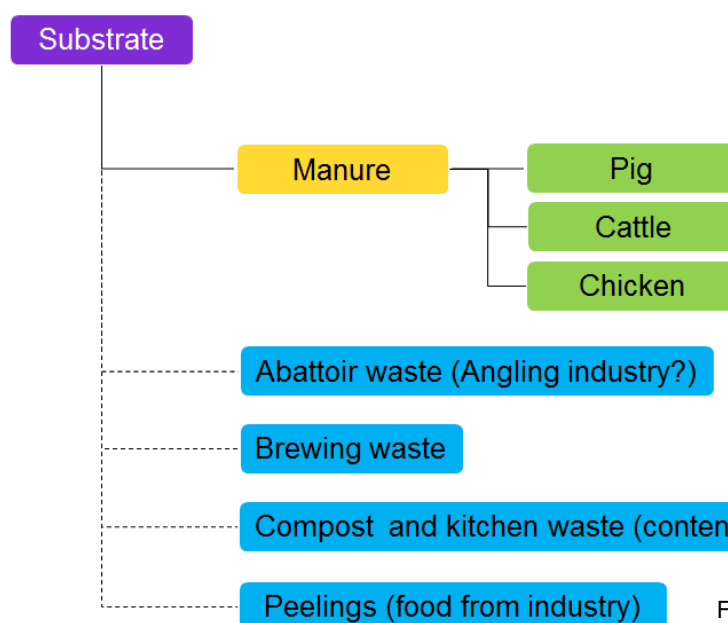


Figure 3: Potential substrate types

3. For research into identifying substrates for rearing insects, the value and current use of a potential substrate (e.g. fertiliser) should be compared to the value of it being used as animal feed.
4. Research would need to be conducted into the influence of substrate type on the resulting nutritional profile of the insect to achieve optimum efficiency and yields, as well as mitigate safety risks.
5. A risk assessment would need to be conducted for each substrate choice to mitigate the risks of insect diseases (as there would be potential to wipe out the whole colony), zoonotic diseases, biotic and abiotic contaminants as well as other pathogens that insects could potentially pick up and / or pass on to livestock and / or humans.

Safety

1. Public health – the safety of consumers and workers would need to be assured with respect to the following: zoonotic diseases, contaminants, bioaccumulation, frass impacts and substrate quality.
2. Animal health and welfare – any potential allergy, toxicology and microbiological issues for livestock, in general to a change of diet and, in particular to the introduction of insect meal, would need to be understood and mitigated. Technologies for their selective removal during processing would also need to be developed.
3. Full nutritional profiles of harvested insects would need to be developed to enable both the identification of any anti-nutrients present and the nutritional compatibility of the insect meal with livestock.
4. It is almost certain that insect protein will form only a proportion of the feed diet for livestock, therefore the compound interactions and the stability of 'mixed products' would need to be understood, as well as their optimum shelf life and storage conditions and any impact on the overall safety of the end livestock product.
5. It was agreed that UK research and industry is well positioned for the development of effective safety controls due to existing expertise in pesticide uptake mechanisms and existing knowledge built up from screening imported food products for pests and pathogens (e.g. rapid screening methods, source material assurance (pesticides, anti-oxidants, aerobic digestion), diagnostics to identify insect proteins, specific contaminants in relation to legislation).

Legislation

1. Currently, existing EU livestock regulations are being extended and interpreted by separate bodies to include invertebrates, but this is insufficient and there is a need for a central set of guidelines for the EU, local councils, farmers, food safety etc. Their potential impact on the existing pet and human food industries would also need to be assessed.
2. There is a need for further basic entomological research and lifecycle assessments (e.g. insect nutrient profiles, anti-nutrient limits, substrate safety etc) to develop a set of safety standards, standard operating procedures and best practice guidelines for insect rearing and processing to mitigate the risks of contaminants and disease coming up through the food chain.
3. In terms of primary agriculture, any biohazards relating to the farming of insects would need to be established and full risk assessments of the units / farms would need to be undertaken, including the welfare of the insects, farmers and livestock.
4. A decision would need to be taken on how far back along the supply chain information (including substrate, slaughtering and processing) would need to be supplied to ensure complete authenticity and traceability if the substrate was a waste stream e.g. manure or consumer food-waste.
5. It is not currently mandatory to label the animal feed type on animal products so, if insect meal is deemed safe, should it be treated as a special case?

Economics of production

1. The current lack of automation is a major barrier to the economic viability of this industry – although the potential for the scalability of production with modular units allows some flexibility – so the development of new technologies and identification of the risks of engineering for production (e.g. any potential threats including insect diseases, genetics etc) are essential first steps.
2. The economics of a model production system would need to be compared with current animal feed commodity costs. Added costs such as safety screening during processing would have to be included; these would, however, depend on the revised regulations.
3. Current knowledge levels of farmers and their willingness to invest/ take up insects as feed will need to be established. The identification of pull factors to accelerate market introduction will be essential in this case (e.g. positive messaging, market niches and gaps); it is therefore important to gauge the consumer response to the market and assess any potential vulnerabilities and opportunities.



4. To aid the economic sustainability of insect farming, the added values of insect protein (not just protein but e.g. making use of waste streams, desirable oils, chitosan etc.) would need to be demonstrated in order to generate wider demand.
5. In this case, a concerted approach is essential for a successful entry into market. Central funding projects involving industry, academia and policy are important for the open and free information exchange and joint working.

Consumer perceptions

1. It was agreed that consumers, retailers and farmers need to be engaged on a continual basis right from the start to make them feel involved in the choice of alternative protein source. The planning and application of appropriate change management as well as incentivising the user and retailers should be incorporated at the very beginning of any research projects.
2. In the small survey carried out by GFS, there was an overwhelming aversion to feather meal and ethical concerns about feeding fish fishmeal which shows that public engagement needs to start with educating the consumer about current animal feeds as well as demonstrating the need for change by informing the public about the vulnerabilities of the current system and the wider protein deficit.
3. Safety concerns need to be addressed methodically so as to avoid conjecture around potentially sensitive issues such as allergens, contaminants and other zoonotic diseases. It is also essential to educate consumers and retailers about processing methods which eliminate safety concerns.
4. The method of disseminating information needs to focus on positive messaging (e.g. natural, sustainable, nutritious etc) and avoid an information overload. We also need to consider whether more information would lead to more negativity and fear around the issue.
5. It was agreed that the fundamental, early stages of this research should be funded by government and the research councils before handing over to producers and retailers who can use other countries' advances in selling insects to UK advantage by evaluating which strategies have been successful and why.