Terms of Reference

Roadmap for scaling of insect protein production for use in animal feed

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**Commissioned by:** WWF-UK, Living Planet Centre, Brewery Road, Woking, GU21 4LL

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**Overarching purpose:**

The overall aim of this project is to develop a roadmap indicating how the production of insect protein for animal feed can be scaled up so that it can begin to displace fishmeal and eventually soybean meal.

**Background:**

Increasing global demand for animal-based foods is having a huge environmental impact. Producing sufficient feed for these animals, in particular protein sources such as soybean meal and fish meal, is a critical issue[[1]](#footnote-2).

Soy is one of the four main drivers of global deforestation. Its expansion, largely for feeding animals such as chickens and pigs, currently threatens valuable ecosystems in South America, most notably the Amazon, the Cerrado and the Chaco[[2]](#footnote-3). Meanwhile there is mounting evidence that the production of fishmeal for use in global aquaculture supply chains is accelerating the collapse of fish stocks[[3]](#footnote-4).

As awareness of these environmental issues has grown, and with no prospect of a plateau in soy demand, there have been increasing efforts to develop rival ‘novel proteins’. These novel proteins, if able to compete on price and nutritional quality, could be used to partially or completely replace fish meal and soy in animal feed and thus steady, or even reduce, demand for these feed ingredients over time[[4]](#footnote-5).

Whilst there are a range of novel proteins emerging, including algal, bacterial, and yeast-derived, the novel protein with the greatest potential to replace fishmeal and soymeal is likely to be insect protein. This is on the basis that relative to soy and many sources of fish meal, insects have:

1. Reduced environmental impact, for example through their ability to valorise low-grade food waste streams, which are in plentiful supply across the world[[5]](#footnote-6).
2. Neutral or positive impacts on animal performance and welfare[[6]](#footnote-7).

Some estimates suggest that as much as 50% of the fishmeal/soymeal in the diets of farmed fish and poultry could be replaced with insect protein[[7]](#footnote-8), [[8]](#footnote-9) . If successful in this, insect protein could, one day, play a significant role in addressing deforestation in South America.

There are many small and medium sized insect production facilities across the world, including in France, Netherlands, UK, Canada and South Africa. These facilities breed a variety of insects, most commonly black soldier fly and mealworms. Whilst insect protein is currently already available in small volumes for use in pet food and aquaculture[[9]](#footnote-10), it is unclear what the current global insect production capacity is. Also, whilst we expect that each insect protein producer has their own scale up plan, it is not yet clear what the industry could one day produce, depending on various regulatory and economic developments. Even less clear is how large-scale insect feed production can be achieved in a timescale that is needed to alleviate the pressing deforestation risks presented by soy production.

**Project objectives and required outputs:**

The overall aim of this project is to develop a roadmap indicating how the production of insect protein for animal feed can be scaled up so that it can begin to displace fishmeal and eventually soya bean meal. The report should consolidate existing research and build a body of evidence which can be used to catalyse the expansion of insect protein production in Europe, with focus on the UK. The final output will be a WWF report.

We suggest three key parts to the report:

1. **Context / scene-setting**

Explain why the use of insect protein has clear environmental benefits relative to existing feed ingredients and create a positive narrative about its use. Address any concerns there might be among readers regarding animal welfare and performance, and human health, if insect protein is included in animal feed. Allude to the macro-economic and political issues which could impact the sourcing, and price stability, of soybean meal and fish meal. Indicate how much fish meal and soybean meal is currently used by the animal feed industry in Europe (e.g. X million tonnes annually), and how demand is expected to grow between now and 2030; this will give a sense of how much insect protein is needed if it is to partially displace conventional feed ingredients. Finally allude to the current production capacity of insect protein in the world, Europe and UK.

1. **Roadmap to rapidly scale insect protein**

Develop a roadmap which indicates how the production of insect protein (solely fed on waste streams) for animal feed, in particular for chickens, pigs and salmon, can be scaled up so that it can begin to offset fish meal and eventually soybean meal, by being cost competitive and/or functionally superior. Also indicate how quickly this could be achieved. The suggested scope of the project is pan-European, however it is recognised that commodities like fish meal and soybean meal are globally traded commodities. The roadmap should:

* Identify which waste streams could in theory (not necessarily what is currently permitted) be used to produce insect protein, for example:
	1. Vegetable and bakery surplus / waste
	2. Mixed food waste including meat and dairy
	3. AD plant digestate
	4. Animal manures
	5. Sewage sludge

Quantify how much, and from what source, each of these waste streams might be available, such as clusters of large food manufacturers / processors, AD plants, large farms with slurry / manure stores, water treatment facilities. Scope should be pan-European however UK should be used as a case study. Indicate the risks from using these waste streams and costs associated with accessing waste streams.

* Based on different scenarios of available waste streams, model how much insect protein could be produced (e.g. in 2025, 2030, 2040 etc). To do this it will be necessary to establish typical conversion factors of waste stream to insect protein. Also indicate indicative costs, which will be influenced by the price that insect producers have to pay to access respective waste streams, and what their CAPEX and OPEX might be (it’s assumed that co-location with sites that have waste heat will be essential to be cost-competitive). Cost may also be influenced by the quality of the protein that they produce, which is also linked to the quality / consistency of the input waste stream.
* Indicate how many insect farms might be needed and at what size to produce different amounts of insect protein (e.g. 500 small sites utilising chicken manure; 50 large sites next to AD plants; example capacity of an insect protein facility is 100 tonnes waste per day, producing 1500 tonnes protein per year). Include a UK case study.
1. **Recommendations to realise the roadmap**

A series of recommendations which explain how the key barriers to scaling up insect protein, so that it can compete with fish meal and crucially soybean meal, can be overcome. As part of this it might be necessary to model how different financial interventions could help to support this growing industry, for example government subsidy or feed-in-tariff at £X / tonne protein output; £Xm capital investment from public or private sources.

We anticipate a key set of recommendations to be around amending regulations, in line with latest science, so that waste streams can be utilised by insect feed producers. Such recommendations could then be used by WWF and its partners in bringing about legislative change. Another recommendation could be around retailer animal feed standards, and the insertion of clauses which do not block the use of insect protein provided animal and human health concerns are addressed.

**Key audiences for this report include:**

1. **Governments:** we need to show governments and relevant departments (UK and elsewhere) that insect protein has great potential and should be supported with suitable policies (N.B. objective is not to repeat the set of recommendations made by the UK Task and Finishing Group in April 2019). Ideally the (UK) government would develop this draft roadmap into an even more comprehensive version.
2. **Financiers**: we need to show investors and charitable foundations that investment in individual insect producers is part of a wider plan to make the entire industry competitive with soy and help solve one of the world’s greatest environmental problems.
3. **Campaigners:** we need to show campaigners that insect protein is part of the solution to expanding meat consumption so they can pressure retailers and others to include insect in their feed specifications. Retailers which do so should be recognised as sustainability leaders.
4. **Insect protein customers** (e.g. feed manufacturers and fish/chicken/pig meat suppliers): we need to show what stages need to be achieved to make insect feed a reality (N.B. this report is not about proving the technical viability of insect protein).

We would also like to reach the following extended audiences whose support is required to create the necessary enabling conditions for scaling of insect protein:

1. **Retailers and food service**: we need to show that insect protein has a genuine future and that there are clear stages which need to be achieved in order to scale up the industry. This will incentivise retailers make their own contributions and start mandating insect protein in feed specifications (even in low levels).
2. **Engaged consumers:** need to be assured that it is safe and nutritious for fish, chicken and pigs to be fed on insect protein. Insects would feature in many fish species and chicken’s diets in the wild, and is therefore arguably more appropriate for use as feed than soy.
3. **Insect producers/entrepreneurs**: we will demonstrate the kind of volumes that insect producers might collectively be required to provide and how this could most efficiently be done.

**Suggested methods:**

* Extensive literature review, where possible using the most up to date information;
* Consultations with industry experts (we will provide a preliminary list of names but we will need the consultants carrying out this work to expand this list);
* Modelling different scenarios to enable insect feed to be scaled up

The consultant is also expected to bring their own experience to this task and include methods to be used in proposal.

**Roles and responsibilities:**

WWF is leading this piece of work, with close participation of Tesco, with whom we are working to reduce the environmental impact of the UK shopping basket by half. We believe that WWF, a credible and neutral organisation led by environmental values, is best positioned to produce a persuasive and impactful piece.

The consultant will:

* be under the direction of the WWF staff managing this project, namely Mollie Gupta;
* commit to regular check-ins with WWF (at least monthly) and inform WWF if and when issues arise between these check-ins;
* carry out a literature review, conduct interviews with industry experts, write the report, run modelling / collect data to create a credible roadmap;
* have expert knowledge of the animal feed industry;
* provide a full description of the data and the date on which it was collected;
* highlight any uncertainties surrounding the accuracy of the data
* the final report and the data will be owned by WWF-UK but attributed to the contractor.

WWF will:

* Work closely with the selected consultant to ensure that research is being completed according to the brief and to the timeline;
* Provide feedback on draft versions of the report;
* Provide a list of resources which can be used as a starting point for research (including prospective interviewee names and documents);
* Be on hand to answer queries;
* Provide final sign-off of report.

Tesco will:

* Assist in assessment of proposals and selection of consultant;
* Be informed of progress and consulted if issues arise;
* Provide feedback on any draft version of the research;
* Facilitate introductions with industry experts;
* Provide expert interview.

**Assessment of proposals**

Proposals should include the relevant background of the consultant(s) involved, CVs of consultants
who will participate in the project, a cost estimate for the project to include the daily rate, the
number of days the consultant(s) plan to spend on the work (broken down by task if possible), and a detailed timeline for delivery of the reports by 31 August 2020. The application should be no longer than 6 sides plus CVs of participating consultants.

Proposals will be assessed using a selection of criteria, likely including: fit to brief, previous experience of consultancy, how quickly the work can be completed, value for money, credible proposed methodology.

**Closing date to submit proposals:** 06 April 2020

**Delivery of final report**: TBC but approx. 31 August 2020

**Guidance on budget available**: £30,000 - £60,000

1. Forum for the Future, The feed behind our food <https://www.forumforthefuture.org/Handlers/Download.ashx?IDMF=00c4b14a-196d-4794-9bf9-e46509cac68b> [↑](#footnote-ref-2)
2. WWF, The Growth of Soy <http://awsassets.wwfdk.panda.org/downloads/wwf_soy_report_final_jan_19.pdf> [↑](#footnote-ref-3)
3. Changing Markets Foundation, Fishing for Catastrophe <http://changingmarkets.org/wp-content/uploads/2019/10/CM-EX-SUMMARY-FINAL-WEB-FISHING-THE-CATASTROPHE-2019-.pdf> [↑](#footnote-ref-4)
4. Due to the higher market price of fish meal relative to soybean meal, it is probable that these novel ingredients will first replace fish meal before being able to replace soy [↑](#footnote-ref-5)
5. IPIFF, The European insect sector today, <https://ipiff.org/wp-content/uploads/2019/12/2019IPIFF_VisionPaper_updated.pdf> [↑](#footnote-ref-6)
6. FAO, Edible Insects, <http://www.fao.org/3/i3253e/i3253e.pdf> [↑](#footnote-ref-7)
7. <https://www.fishfarmingexpert.com/article/insect-meal-in-salmon-feeds/> [↑](#footnote-ref-8)
8. <https://www.researchgate.net/publication/324400090_Effects_of_50_Percent_Substitution_of_Soybean_Meal_by_Alternative_Proteins_from_Hermetia_illucens_or_Spirulina_platensis_in_Meat-Type_Chicken_Diets_with_Graded_Amino_Acid_Supply> [↑](#footnote-ref-9)
9. [https://www.feednavigator.com/Article/2019/06/25/Cargill-InnovaFeed-tie-up-deemed-boost-for-insect-protein-sector#](https://www.feednavigator.com/Article/2019/06/25/Cargill-InnovaFeed-tie-up-deemed-boost-for-insect-protein-sector) [↑](#footnote-ref-10)