I would like to thank you for this opportunity to contribute to the discussion on the **Bioeconomy Action Plan Consultation and Discussion Document 2022** for Ireland.

To begin with, I would like to note that the opening statement introducing this consultation fails to mention our declared biodiversity crisis, and fails to explicitly afford our native biodiversity any protection.

"The bioeconomy considers our use of biological resources in a holistic way, supporting food and nutrition security, mitigating, and adapting to climate change, reducing dependence on non-renewable unsustainable resources, managing natural resources sustainably and strengthening competitiveness, creating jobs, and supporting a just transition."

Given that the bioeconomy is based on biological resources and therefore directly relates to our native biodiversity, omission of a statement **which affords protection to our native biodiversity** is surely a huge oversight? A statement on managing natural resources sustainably does not equate to one which affords protection for our native biodiversity.

As many are aware, Dáil Éireann declared a Biodiversity Crisis in 2019. In the draft national biodiversity action plan (Ireland's 4th National Biodiversity Action Plan 2023-2027), which sets out a vision for an Ireland in 2050 in which "biodiversity is valued, conserved, restored, and sustainably used" we are told that:

"By 2023, the National Bioeconomy Action Plan contains recommendations for the sustainable use and protection of biodiversity and natural capital" and that:

"The High-Level National Bioeconomy Implementation Group, under DECC and DAFM, will make recommendations for the sustainable use and protection of biodiversity and natural capital as part of the National Bioeconomy Action Plan and ensure alignment with the National Policy Statement on the Bioeconomy"

I note here that the High-Level National Bioeconomy Implementation Group does not include experts from National Parks and Wildlife Service, within the Department of Housing, Local Government and Heritage. Given the central position of this agency in accumulating knowledge, and with responsibilities for protecting biodiversity in Ireland, surely this is also a huge oversight?

Additionally, I note that while a whole section is dedicated to Data Protection, outlining how this will be achieved; aside from a statement of intention to protect biodiversity, I see little in this document that outlines how protection of our native biodiversity might be achieved with relation to the bioeconomy.

"This pillar will develop actions to foster and protect our natural capital and biodiversity, including accounting for natural capital and ensuring the bioeconomy operates within ecological boundaries. "

In this submission, I would like to primarily focus on "high-tech, nature-based" solutions with relation to the release of lab-engineered microorganisms into the general landscape, as bioenhancers or biological controls for agricultural, horticultural and forestry use; and the protection given under such scenarios for our native biodiversity.

The Government's Strategic Policy Objectives for the Bioeconomy

I fail to see how the statements outlined here can be interpreted as objectives (i.e., aims or goals). For example, surely the following cannot be interpreted as objectives?

"***Sustainable economy and society*** *- Growing the bioeconomy can put Ireland's economy on a more sustainable footing by encouraging the efficient use and re-use of resources and materials to a much greater extent than hitherto*"

*"**Regional prosperity** - One of the advantages of the bioeconomy is that many of the businesses rooted in it are located in rural and coastal areas. Helping the bioeconomy to grow can assist in halting rural decline"*

I also note that there is no statement relating to the level of caution, and controls necessary, in the development of a bioeconomy.

Question 1: Are you satisfied the outlined Pillars represent the structure of the Irish bioeconomy?

Question 2: Are there specific key performance indicators and/or targets the bioeconomy should be setting out to achieve to measure its implementation?

Measurements of standards and monitoring associated with the safe release of lab-formulated microorganisms into the wider landscape.

Measurement of equitability in the distribution of associated profits. Please see the **NAGOYA PROTOCOL on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity.**
https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:22014A0520(01)&rid=5

Question 3: What other key issues should the Governance Pillar deal with?

Primarily, that our native biodiversity (habitats, species and genetic diversity) should be respected as more than simply "Natural Capital".

Additionally, perhaps a consideration of the following:
Eversberg et al. (2022). The bioeconomy and its untenable growth promises: reality checks from research. https://link.springer.com/article/10.1007/s11625-022-01237-5

"Fully substituting bio-based and renewable materials and energy for the enormous and still-increasing volumes of fossil resources currently used while remaining on a growth trajectory is assessed as unrealistic by many experts (Hausknost et al. 2017; Grunwald 2020; Gawel et al. 2019)."

Question 4: What key issues should the Research, Development & Innovation Pillar deal with?

I note the following here:

"This Pillar will link to the Industry & Enterprise Pillar and the Knowledge & Skills Pillar to ensure that funding pathways exist to move from research, development, and innovation to commercialisation, including how to best harness national and EU funding."

Independence of scientific research needs to underpin the development of any bioeconomy; especially technologies based on living organisms, where release of such organisms into the wider landscape has the ability to have a host of unforeseen ecological interactions.

Safety and strict regulation of the distribution of microorganisms into the wider landscape has to be to the forefront.

Significant State investment in universities to ensure capacity building to evaluate the potential risks of releasing any lab-engineered or lab-concentrated strains of biological organisms into the wider landscape.

Significant State investment in universities to ensure capacity building to monitor and regulate any future release of microorganisms into the wider landscape.

By ensuring that there is much increased government support for independent research into the study of native fungi and soil microorganisms in particular.

Question 5: How could the RD&I bioeconomy approach be best structured to support the enhancement, application and scaling-up of biological knowledge and bioeconomy solutions?

See above

Question 6: What key issues should the Nature, Climate & Circular Pillar deal with?

I would like to draw attention to the current focus by international global corporations to develop replacements for chemical fertilizers and pesticides, using "nature-based" solutions, such as bioenhancers and biological controls.

A quick survey of the literature will illustrate that "nature-based" solutions, are not always good for nature itself. Indeed, we have many instances in Ireland where nature-based solutions using biological organisms, have gone very wrong, inflicting a huge amount of damage on sensitive habitats, for example, the release of *Hippophae rhamnoides* and *Spartina anglica* as dune stabilisers.

Safety and regulation need to be paramount in considering the release of any microorganisms into the wider landscape.

We urgently need independent taxonomists and field biologists capable of identifying and understanding a lot more about the biology and biogeography of these organisms before we can begin to even think about releasing lab-engineered or lab-formulated strains into the wider landscape as bioenhancers or biocontrols.

In this respect, I would like to draw your attention to a recent collaboration between Coillte and a Scottish Company, Rhizocore Technologies:
https://www.coillte.ie/fantastic-fungi/

It is entirely naive from a biological perspective to consider distributing combinations of fungal strains when we lack even basic knowledge of the biology of these species, or their biogeography in Ireland. This is playing Russian roulette at the highest level. Our inability to control the fungus responsible for Ash Dieback should be a timely reminder of how we simply are incapable of rowing back once these organisms are released in the landscape.

Indeed, by their own admittance, the researchers involved in this exercise outline that we lack basic knowledge about fungi and their COMPLEX relationships in the natural world.

"This is a growing area of research, with new and exciting discoveries being made about these complex relationships between different elements of the natural world".

The fact that we haven't even got a basic inventory of fungal species on this island, or any real knowledge of the degree of genetic diversity that exists, and only possess a scant understanding of their range of ecological interactions, should flag the naivety of the exercise illustrated above, and points to an extreme lack of understanding of the potential risks associated with this approach.

It is well recognised that research into plant/fungal relationships is only in its infancy and we are only just beginning to understand the extent to which almost all plant species are likely to have fungal relationships.

We simply cannot predict the outcome of releasing different fungal species, or genetic strains, into new geographic locations; let alone the outcome of swamping habitats with a narrow selection of lab-formulated fungal strains. This latter approach is the direct antithesis of the meaning of the IUCN definition of biodiversity, and undoubtedly has the potential to contribute to biodiversity loss should fungal thugs/pandemic species take over.

Additionally, there are many documented examples of invasiveness when genotypes associated with different allopatric populations of the same species are brought together; be they plants, fungi or other microorganisms, such as the many phytophthoras that are decimating Irish trees and forestry presently. For example:
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5813172/
https://www.nature.com/articles/s41598-018-19922-w
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7017293/
https://imafungus.biomedcentral.com/articles/10.1186/s43008-021-00068-w

The rush to replace chemical fertilizers and pesticides needs to be highly regulated. Strict controls need to be in place before there is any release of lab-formulated bioenhancers or biocontrols into the landscape.

A much more sensible approach would be to support the study of agroecological methods which protect native biodiversity, and affords protection to habitats that are already rich in native biocontrols, e.g., appropriate management of hedgerows.

A bigger focus of investment in training in "low-tech" agricultural, horticultural and forestry methods is urgently needed; for example, continuous cover forestry or regenerative agriculture - rather than what might be perceived as an exploitative model.

The formulation of products based on biological organisms cannot simply be left to the hands of industry. We need substantial investment into independent research on the potential effects of releasing any such products on our habitats and species.

Additionally, it is well recognised that we urgently need to increase capacity in Universities in a number of fields relevant to this area, including mycology, entomology, plant pathology, taxonomy, field biology and risk-based surveillance. Please see:

O'Hanlon et al. (2021) Catalogues of pests and pathogens of trees on the island of Ireland
https://www.preprints.org/manuscript/202005.0168/v1

And Section 1.3 Knowledge and resource gaps in:

http://www.tara.tcd.ie/bitstream/handle/2262/97313/Final%20BioAudit%20report%2015.09.21.pdf?sequence=1&isAllowed=y

And:
https://dnfc.net/citizens-assembly-on-biodiversity-loss/

Question 7: What key issues concerning consumption patterns need to be examined to close the gap between sustainable supply of biological resources and demand?

Perhaps the connection between our economic growth drive (for example, The National Development Plan 2021-2030 and Food Vision 2030) and the environmentally sustainable supply of biological resources. For example, water quality – please see:
https://ec.europa.eu/commission/presscorner/detail/en/ip_23_166

Additionally, perhaps a consideration of the following:
Eversberg et al. (2022). The bioeconomy and its untenable growth promises: reality checks from research. https://link.springer.com/article/10.1007/s11625-022-01237-5

Question 8: What key issues should the Agriculture, Food & the Marine Pillar deal with?
The safety of distributing lab-engineered/formulated biological organisms in the landscape.

Question 9: What key issues should the Communities Pillar deal with?

Ensure equitability in the distribution of benefits from natural resources.

A very strong focus on preventing the corporatisation of our biological resources.

A campaign to increase public awareness of **the NAGOYA PROTOCOL on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity**.
https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:22014A0520(01)&rid=5

A significant increase in State support for Irish scientists to accumulate national expertise in understudied groups, for example, fungi – rather than supporting bioprospecting activities from abroad, e.g.: Coillte/Rhizocore Technologies partnership.

Question 10: Are local and regional policies ensuring the consideration of bioeconomy opportunities are in scope, and are coordinated approaches on such services in place at regional assembly and local authority level?
Question 11: What key issues should the Industry & Enterprise Pillar deal with?
Question 12: What lead market initiatives could support entrepreneurship, development, innovation and the commercialisation of bio-based products, processes, information, and services?
Question 13: Due to the requirement for capital and operational investment what innovations aimed at financing infrastructures and technical and economic evaluation of innovation are necessary to scale up the bioeconomy?
Question 14: What key issues should the Knowledge & Skills Pillar deal with?
Question 15: Can the regional skills and regional enterprise approaches better support bioeconomy development?
Question 16: An important part of developing the bioeconomy is to determine the most appropriate practices, treatments, technologies, logistics and business models to valorise

ecosystem services, primary and secondary biomass resources. What role do advisory systems play in addressing this challenge?
Question 17: Are there any further Pillars/Issues which this Action Plan should address?
Question 18: Indicate what the top five priorities for action in the bioeconomy over the next three years should be?

Once again, I thank you for this opportunity to contribute to this consultation.

Yours sincerely,

[redacted]
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