

Empowering Trust. Unleashing Biotech.

## OUTLINE CO-CREATION TRAJECTORIES

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### DELIVERABLE 2.1 (V3)

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WP2 – Co-creating for impact



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VALIDATION	
Authors	Reviewers
Alice – Veerle Rijckaert	FF – Emma Sidgwick
Alice – Charlotte Boone	FF – Laura Vantornout



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## LIST OF ABBREVIATIONS AND ACRONYMS

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B-Trust - Co-creation methodology for biotechnology trust-building measures for improved innovation uptake in the bio-based innovation system.

D - Deliverable

EC - European Commission

HEU - Horizon Europe: the 9<sup>th</sup> EU Framework Programme for Research, Technological Development and Innovation Activities

WP - Work package

RBA – Risk-Benefit Assessment

5H – Quintuple Helix

ToC - Theory of Change

DoA – Description of Action

TRL – Technology Readiness Levels

NGO – Non-Governmental Organization



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# 1 INTRODUCTION

## 1.1 Framing of the co-creation trajectories and the objectives

The effective application of biotechnology plays a crucial role in building a sustainable future for a thriving European industry, contributing to not only the growth of the European economy, but also to sustainable development, and the safeguarding of public health and environmental protection. Its range of applications comprises various industrial domains including pharmaceuticals, animal health, chemicals, plastics, paper, fuel, and food and feed production.

Although benefits have been widely demonstrated, achieving broad public acceptance and implementation is proving difficult due to consumer perceptions and concerns. Despite the overwhelming scientific evidence supporting the application of biotechnology, especially when talking about the controversial areas such as vaccinations, genetically engineered food or embryonic stem cell research, consumers are reluctant to its adoption due to its perceived potentially adverse effects on environment, health and ethics (Sax, 2017).

The B-Trust project will provide a systemic governance model as a key enabler for boosting the innovation uptake of biotechnology in the bio-based & agri-food sectors based on a three-tiered approach:

1. encouraging collaboration of key stakeholders from the quintuple helix (5H);
2. fostering consumer trust, promoting transparency and ethical practices to reduce public concerns about safety and effectiveness of biotech applications and products, and
3. providing a comprehensive framework of trust-building measures and underpinning principles to reduce uncertainties and associated (perceived) risks facilitating the adoption of biotechnology.

This approach is translated into practice via co-creation trajectories, which are at the core of the methodological approach of the B-Trust project and generate several crucial outputs (Figure 1).

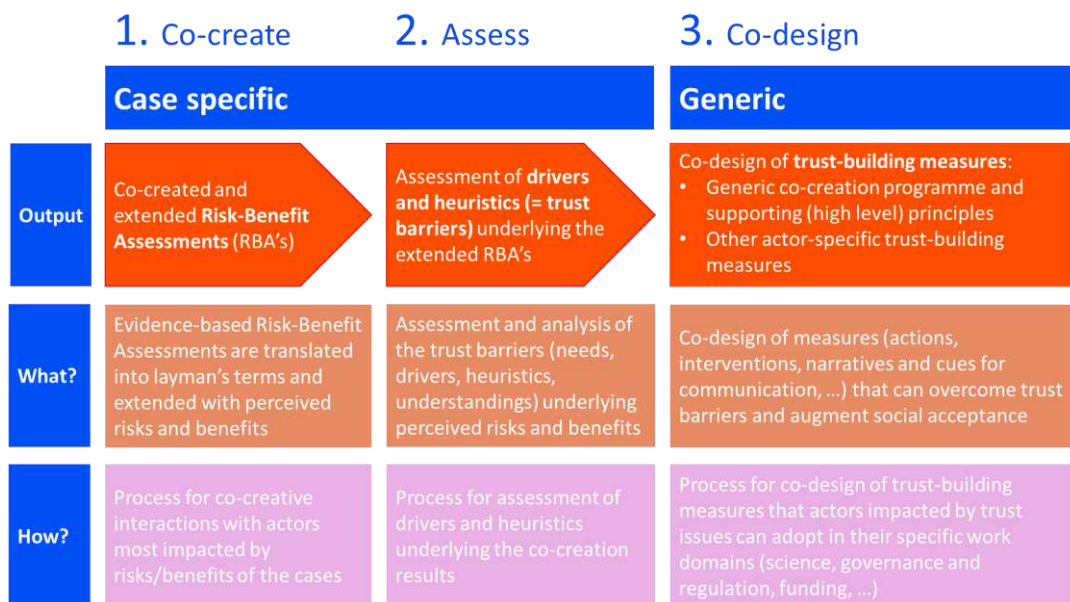


Figure 1. Objectives of the co-creation trajectories

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## 1.2 Link with previous D1.3 and D1.4

In the framework of D1.3 an overarching methodology is described to set up and deploy these co-creation trajectories.

The co-creation trajectories and programme from WP2 start from a selection of six Biotech Co-Creation Cases that have clear application potential for the bio-based and agri-food sectors. They serve as testbeds for the development of the co-creation activities related to the B-Trust governance model (WP2). The Biotech Co-Creation Cases were selected as described in D1.4 from a longlist, considering their impact, key beneficiaries of final outcomes, application types, sectors and purposes. The cases were chosen for their potential impacts, but aim to include a wide range of critical parameters and aspects in order to have a broad variety of cases, rather than similar ones.

For each case, evidence-based Risk-Benefit Assessments (RBAs) of the Cases were developed along scientific, technical and sustainability axes, as methodologically described under D1.4. As (perceived) benefits and risks of a new technology lie at the basis of trust in this technology (Oloo, 2020), these RBAs will be further explored and extended with potential real and perceived risks and benefits for different stakeholders. This is done throughout an inclusive process, forming the starting point of the co-creation methodology. The trajectories, and the resulting extended RBAs of the Biotech Co-Creation Cases serve as tools to assess the trust barriers of the actors most affected by the implementation of the technology (affect) and/or having the most impact on the market uptake and acceptance of these specific cases (influence).

## 1.3 Scope of the current deliverable 2.1

This deliverable will describe in detail the case- and context-based trajectories from phase 1 in Figure 1 (which will be analysed in phase 2) and the general planning for phase 3. The set-up for phase 3 can not be described in detail at this point, as it depends on the results and outcomes of phase 1 and 2.

### 1.3.1 Phase 1 and 2: co-create and assess



How the co-creation trajectories are set up is dependent on the stakeholders involved, how these stakeholders are involved, the TRL level of the technology, how well-known the case, and the general acceptance of the public towards the case, among other parameters. Thus, the generic co-creation methodology described in D1.3 was translated into a specific set-up for each case and adapted to the local context if necessary. For each case-specific trajectory, the set-up was tailored to fit:



- The main beneficiaries of the technology and their needs and motivations as assessed first via the RBAs;
- The development stage of the technology;
- Previous interactions with stakeholders;
- The public awareness linked to the case;
- Other relevant criteria.

With the regional clusters, it was determined which Biotech Co-Creation Case would be deployed in each of the involved member states and the format of the co-creation methodology was tailored to the national/regional context. As also explained in D1.3, a design thinking methodology is implemented in these co-creation trajectories. The iterative nature of this methodology is considered when developing these trajectories.

The co-creation sessions and other means of interaction with specific actors will result in different stakeholders' perceptions, newly perceived potential risks and benefits, and the underlying fears, needs, drivers, heuristics and understandings.

### 1.3.2 Phase 3: co-design trust-building measures

The case-specific and regional co-creation trajectories described above will provide relevant and insightful information on the parameters and aspects determining acceptance and trust in these technologies from different stakeholders, linked to the innovation uptake of the biotechnological solutions.

#### Generic

Co-design **trust-building measures** with stakeholders responsible for regulation & implementation

- Generic co-creation programme and supporting (high level) principles
- Actor-specific trust-building measures

These insights will be transformed into proposals of measures and underpinning principles that could overcome the trust barriers, augment social acceptance and in the end support market introduction and uptake. These drafted measures and principles by the B-Trust consortium partners will then be challenged and further co-designed during co-creation sessions with stakeholders of the 5H that are responsible for implementing the technology and are thus impacted by the trust issues, such as companies from the bio-based & agri-food sectors (incl. investors), biotechnology researchers & experts, public authorities (incl. funding agencies) & policy makers.

### 1.4 Link with following D2.2 and D3.1

The case specific first phase of the co-creation trajectories (co-create) will gather data from the stakeholders who are highly impacted by the implementation of the technology, whilst also having a significant influence on the uptake of the technologies applied in each case. These data and information will be reported in D2.2, based on the reports of the individual co-creation sessions.



Deliverable 3.1 will contain the result of the co-creation trajectories (all three phases) described in WP2, in the form of a draft co-creation programme with underpinning principles and actor-specific trust-building measures. This co-creation programme will follow a similar approach as the one followed in the project, but with a few distinct differences:

- The co-creation programme is meant for evaluation of a single case, while the B-Trust project uses six cases with different types of beneficiaries, technologies, results, TRLs and applications;
- This implies that the first phase of the co-creation trajectory will be ‘run’ six times in order to get enough data to compile a generic programme that covers different situations for a new case;
- The co-design phase of the project will result in a draft co-creation programme with underpinning principles and actor-specific trust-building measures, codesigned with the stakeholders responsible for implementation and regulation of the technology. For the actual programme, this co-design phase will obviously not result in a co-creation programme, but will lead to a set of guiding principles and measures for regulation, communication and inclusive implementation of the case.

The difference between the co-creation trajectories deployed for the project versus the co-creation programme that will be described under D3.1 is visualised in Figure 2 below.

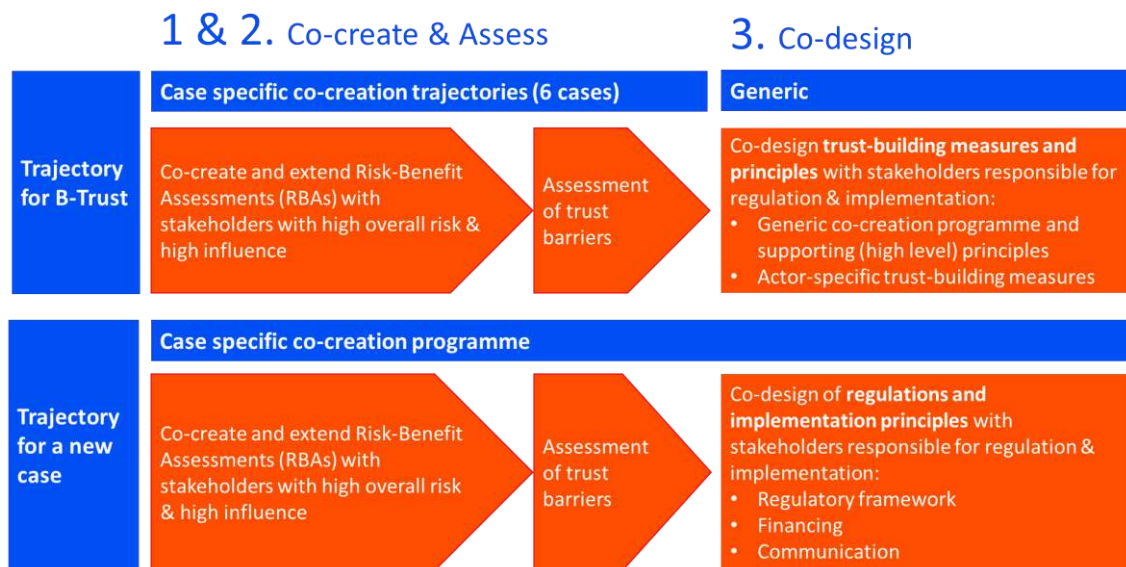


Figure 2. The comparison between the trajectory followed within the framework of B-Trust versus the trajectory for a new case, as included in the co-creation programme



## 2 SET-UP OF THE CASE- AND CONTEXT-BASED CO-CREATION TRAJECTORIES (PHASE 1 & 2)

### 2.1 The selected Biotech Co-creation Cases

As described in D1.4 and as an important starting point to set up the co-creation trajectories, 6 Biotech Co-Creation Cases were selected via an intensive and collaborative process involving all the partners of B-Trust (Table 1).

*Table 1. Selected Biotech Co-Creation Cases*

Biotech Co-Creation Case	Main benefit(s)	Preliminary detected beneficiaries
<b>1. 'Cell factories'</b> <b>Food ingredients/additives obtained through precision fermentation</b>	Sustainably sourced ingredients and additives	Climate and environment Consumers Industry
<b>2. Bio-based materials</b> <b>Plastics, textiles, cleaning products, etc.</b>	Sustainable alternatives to fossil-based materials and ingredients for applications in the bio-based industry	Bio-based industry Climate and environment
<b>3. Crop biostimulants &amp; biofertilizers</b>	Improved environment, crop yield and crop quality	Climate and environment Farmers
<b>4. Climate-resilient crops</b> <b>Obtained through New Genomic Techniques (NGTs)</b>	Food security	Farmers Consumers Climate and environment
<b>5. 'Eating the cells'</b> <b>Cultured cells as meat alternatives</b>	Sustainably sourced products and ingredients	Climate and environment Consumers
<b>6. Bacteriophages</b> <b>As antimicrobial agents in animal husbandry</b>	Food safety	Farmers Consumers Climate and environment

### 2.2 Assigning the co-creation trajectories to the different partners

The initial set-up as described in the B-Trust DoA was to spread the cases over 3 different countries where the clusters in the consortium are based, more specifically: Belgium (Flanders' FOOD; FF), Spain (Cluster de Alimentación food+I; Food+I) and Denmark (Food & Bio Cluster Denmark; FBCD). It was also initially agreed upon that the majority of cases, and their respective co-creation trajectories would be executed in Belgium, as Alice, being the expert in co-creative



approaches, is based there. The cases were assigned considering the regional specificities, interest and differences of each country and their participating cluster. Regional specificities including aspects like expertise, regional biotech companies, agri-food and bio-based companies implementing the biotechnological solutions, regional legislation, traditional industry and their strengths and weaknesses, etc.

Each cluster representing the country ranked the cases according to their interests and expertise of the stakeholders in their country. Also, it was decided that each country was responsible for at least one case from their top 2. Duplication of a case was also an option, and even preferable, as it might be useful to have at least one case with inputs from 2 different countries. The division of the cases over the countries/partners is outlined in Table 2.

*Table 2. Assignment of the Biotech Co-Creation Cases to the partners*

Biotech Co-Creation Case	Assigned partner(s)	Rationale
<b>1. Cell factories</b>	Alice (FF) FBCD	The research community for both countries is very active in this field and so is their biotech industry looking to produce products like milk proteins, feed proteins, and different types of flavourings and specialty ingredients or additives.
<b>2. Bio-based materials</b>	FBCD	FBCD has, besides the agri-food industry, a strong focus on the bio-based industry e.g. biomaterials.
<b>3. Biostimulants &amp; biofertilizers</b>	Alice (FF)	In Belgium, over-fertilization, eutrophication and nitrogen pollution are high on the political agenda and well covered in media, making the broad public very aware of this issue.
<b>4. Climate-resilient crops</b>	Alice (FF)	Belgium has had several test fields with climate-resilient GMO crops, which are highly contested and have been repeatedly destroyed by action groups.
<b>5. Eating the cells</b>	Food+I	While Italy decided to ban cultured meat due to the lobby from farmers and meat industry, and despite also having a strong meat industry engrained in tradition and vast international outreach, Spain decided to strongly invest in the cultured meat industry.
<b>6. Bacteriophages</b>	Alice (FF)	Pork production and the linked meat industry is one of the main food sectors in Flanders. Intensive animal husbandry and overuse of antibiotics (also in human medicine) has led to actions from the government to reduce the use, and raise public awareness.

### 2.3 The generic methodology of the co-creation trajectories (phase 1)

The overarching, generic methodology for the co-creation trajectories is described in D1.3 in detail, as outlined in Figure 3. In addition to the generic methodology already described in D1.3,



we describe the step-by-step approach we followed for the different cases in general below, including minor adaptations to the initial approach.

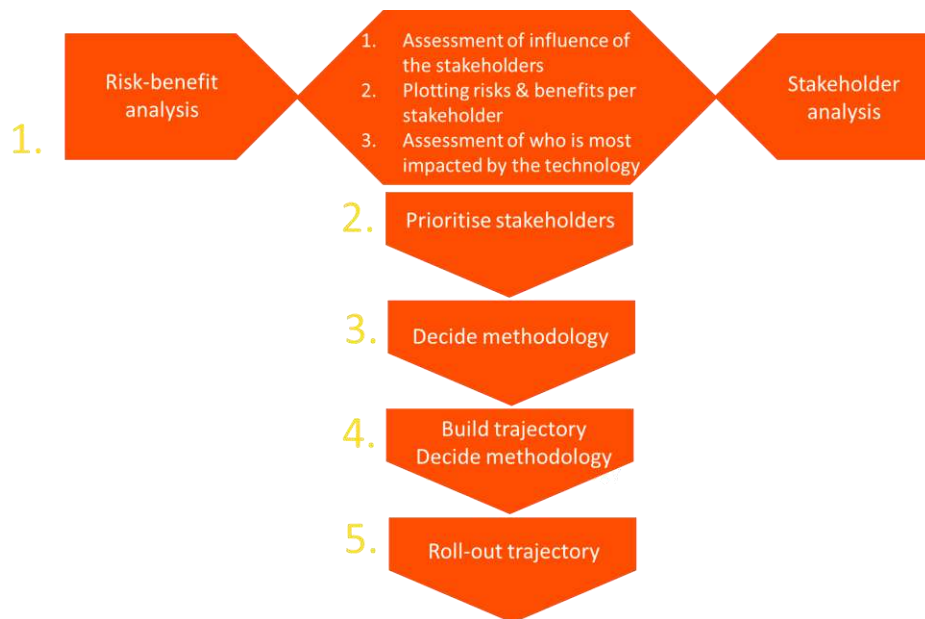


Figure 3. Overview of the different steps in the co-creation trajectory

### 2.3.1 Step 1: Plotting of influence, risks & benefits per stakeholder

Step 1 in the set-up of the co-creation trajectories consists of two parallel tasks, the set-up of the RBAs and a detailed stakeholder mapping, that come together in the plotting and assessment of the risks & benefits per stakeholder, as shown in Figure 4.

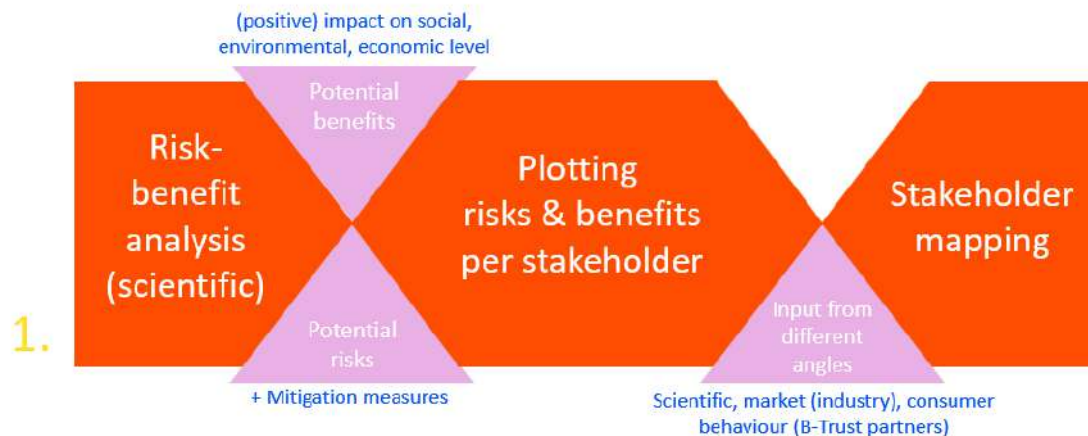


Figure 4. Plotting of the evidence-based RBAs per stakeholder

When going through the trajectories for the different cases, we noticed that the stakeholder mapping was more efficient and more stakeholders could be identified when the RBAs were done prior to the stakeholder mapping. We thus slightly adapted the trajectory to a more consecutive order, resulting in the steps visualised in Figure 5.





Figure 5. Adjusted consecutive steps linked to the RBAs, stakeholder mapping and assessments

### Risk-Benefit Assessments

Starting from scientific literature, evidence-based RBAs were developed for each case. The listed risks included also possible mitigation measures. Risks, mitigation measures and benefits were each time translated into layman’s terms in close collaboration with the members of the Advisory Board. This translation is necessary for proper understanding by consumers and other stakeholders during the co-creation sessions (or other communications and contact points).

### Stakeholder mapping

Each case has a number of actors that are directly or indirectly impacted by the technology, or can play a significant role in acceptance and uptake of it. These were the stakeholders that needed to be identified during the stakeholder mapping. The strong involvement of the relevant B-Trust partners (linked to the Case) was crucial in this step as it must be avoided to get a one-sided view on who the actors are that need to be involved. The different profiles, representing and/or having a strong affinity with the different stakeholders of the 5H, are represented within the B-Trust consortium, making a complete stakeholder mapping process possible.

The stakeholders considered are part of the quintuple helix (5H), as listed in Figure 6 **Fout!** **Verwijzingsbron niet gevonden.** below.



Figure 6. Stakeholders from the 5H, as considered in the stakeholder analyses for the different cases

Academia: Non-profit research facilities (H1)

Industry: economic system (H2):

- Primary, secondary and tertiary production
- Production, retail and wholesale, and consumer services
- Sectors: agri-food and bio-based sector

Legislators: government, authorities, policy makers and funding agencies (H3)

Society: citizens/consumers and civil society organisations (H4)

Environment and representatives thereof (H5)

In a brainstorm with representatives from the relevant (linked to the Case) consortium partners, the stakeholders were listed per category (H in 5H). For each stakeholder was discussed what their relation is to the case, with a focus on the stakeholders that have a possible influence on the acceptance and thus adoption and success of the technology. After the brainstorm, all stakeholders were listed in an excel, with some examples for clarification (see Annex 1).

### Stakeholder evaluation

The stakeholder evaluations were done in 2 steps.

#### *Step 1. Evaluation of stakeholder influence*

This step took place right after the stakeholder mapping, in the same brainstorm, involving the different B-Trust partners that will be involved in that concrete co-creation trajectory. In the evaluation of the influence of stakeholders on the implementation and success of the technology, we first assessed how different stakeholders influence each other. Stakeholders can greatly affect each other and have direct or indirect influence on the acceptance and trust (Figure 7). This discussion sometimes led to the identification of new stakeholders or subcategories of stakeholders.

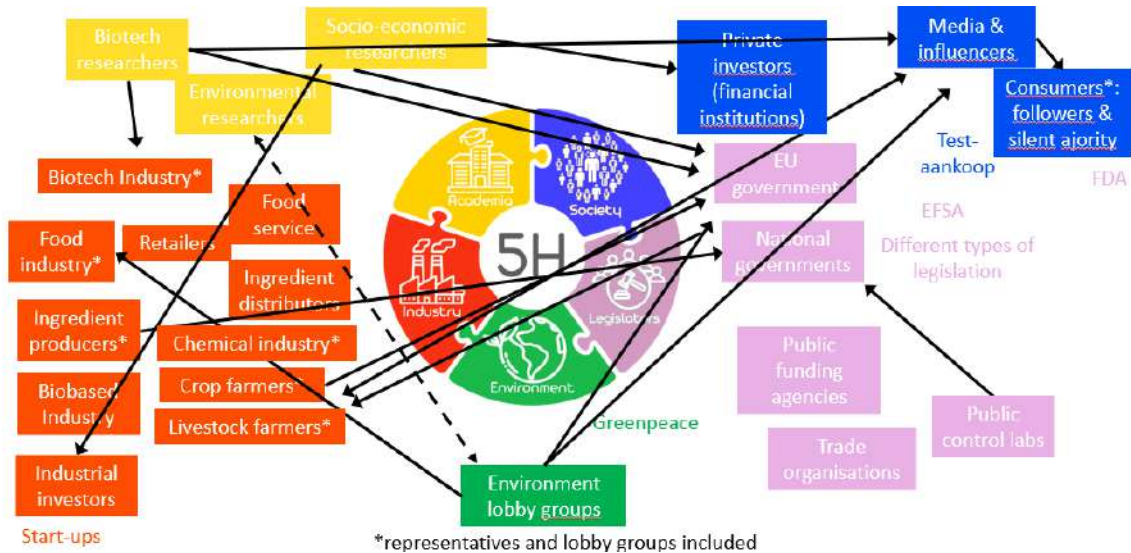


Figure 7. Example of a stakeholder mapping, with indications of stakeholders influencing each other

When assessing the influence of the stakeholders, both the ‘positive’ (how they push the technology) as well as the ‘negative’ aspects (how they hold the technology back) were taken into consideration. These aspects and their main arguments were added to the excel file in Annex 1 with the stakeholders, as shown in Table 3 below for the stakeholder group ‘retailers’.

Table 3. Example of stakeholder group, its influence on the technology, on other stakeholders and who they are influenced by

Stakeholder	Examples	Technology push	Hold back technology	Stakeholder has influence on	Stakeholder is influenced by
<b>Retailers</b>	Colruyt, Carrefour, COOP	Sell the products	Restrictions on suppliers' use of biotechnology	Consumers (all)	Government (regulations), food industry, consumer trends

The next step was to assess for each stakeholder how great their potential impact on the development and uptake of the technology could be, while considering their interest (i.e. how important is it for them whether this technology is implemented or not? The stakeholders were plotted on a graph of interest (X-axis) versus influence (Y-axis), as shown in the example for the case ‘Cell factories’ in Figure 8.

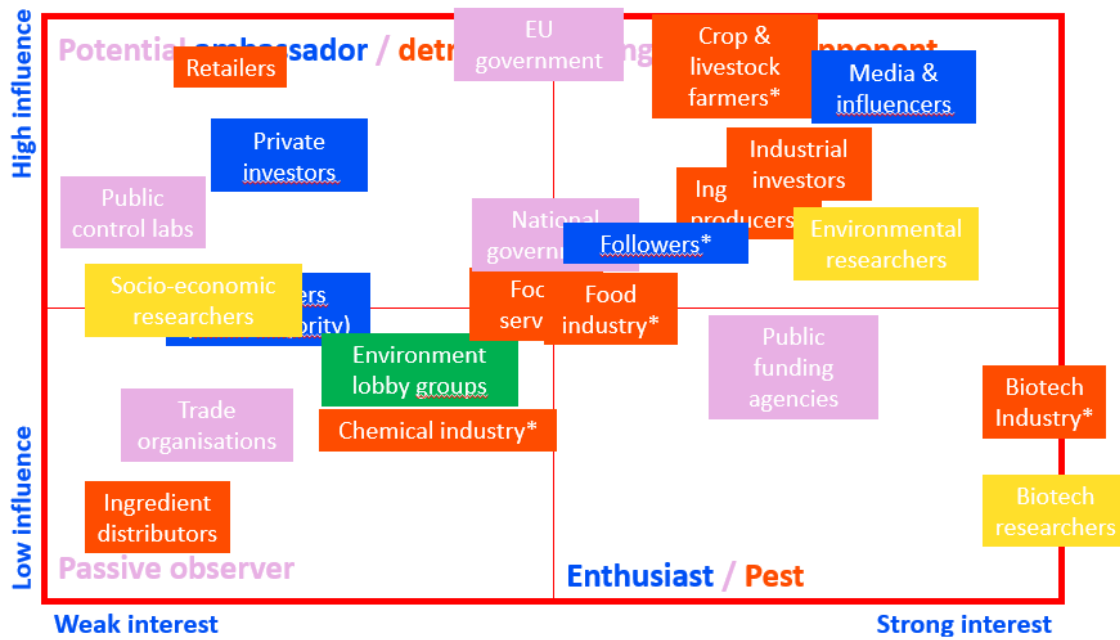


Figure 8. Plotting of the mapped stakeholders along the interest/influence axes

For each stakeholder, the assessment, taking into account both the interest and their potential influence on other stakeholders, was translated into a number ranging from 1-5 (1 being least influential, 5 being most influential; Figure 9 shows an example for the case ‘Cell factories’).

	★	★★	★★★	★★★★	★★★★★
Academia		Biotech researchers	Socio-economic researchers	Environmental researchers	
Industry	Ingredient distributors	Chemical industry*	Food service, Food industry*	Biotech Industry*, Retailers	Farmers*, Industrial investors, Ingredient producers*
Environment		Environment lobby groups			
Society			Consumer: (silent majority), Private investors	Followers and consumer organisations	Media & influencers
Legislators	Trade organisations	Public funding agencies		Public contr, National governments	EU government

Figure 9. Assessment of the influence (including interest) of the mapped stakeholders

Note that this is a preliminary assessment, based on the available information and expertise among the partners, which serves as a starting point to build the trajectories. These assessments can and should be adjusted throughout the trajectories, when more information becomes available.



### *Step 2: Assessment of the extent to which the different stakeholders are affected by the implementation of the technology*

This assessment is based on the evidence-based RBAs, that list the potential risks on a socio-economic, environmental (including health & safety) and techno-scientific level. During a second brainstorm with all consortium partners, we discussed for each risk and benefit who the affected stakeholders were (to whom is this a risk or benefit?).

We then evaluated and determined per stakeholder an overall risk and an overall benefit score (again on a scale from 1-5, 1 being low risk/benefit and 5 being high risk/benefit), considering their different respective risks and benefits and the estimated importance of each of these (for example: a direct competition with current business model and income or a direct threat for health, are more important than a labelling burden).

As stated before, this is a theoretical evaluation of how the different stakeholders are affected by the biotechnological solutions, starting from literature. By stepping into the subsequent co-creative process, with the different stakeholders, the RBAs will be enriched with the (perceived) risks and benefits of the stakeholders, how they look at these cases from an emotional, social and economic point of view. This should allow for further refinement of the importance of different risks and benefits, and how they affect trust in each stakeholder. Also new risks and/or benefits could be identified by the different stakeholders.

#### 2.3.2 Step 2: Prioritise stakeholders

The most crucial stakeholders and thus the prioritisation is determined by assessing the identified stakeholders per Biotech Co-Creation Case along the following three variables as described above:

- Who will have the highest impact on the general acceptance/market uptake (influence)?
- Who is most impacted by the technology/case (affect), comprising of:
  - Who is at the highest risk of being negatively impacted? Evaluating the combined and relevant risks per stakeholder (group) on a scale from 1 to 5;
  - Who will potentially benefit the most from the technology? Evaluating the combined and relevant benefits per stakeholder (group) on a scale from 1 to 5.

For prioritisation, the three variables (influence, overall risk and overall benefit) are plotted, per Biotech Co-Creation Case, in a diagram (a 'bubble plot') showing the combined benefits on the X-axis vs. the combined risks on the Y-axis. The size of the spheres represents the level of influence on trust and acceptance of the technology. Figure 10 below shows an example of such a diagram related to the 'Cell factories' case.

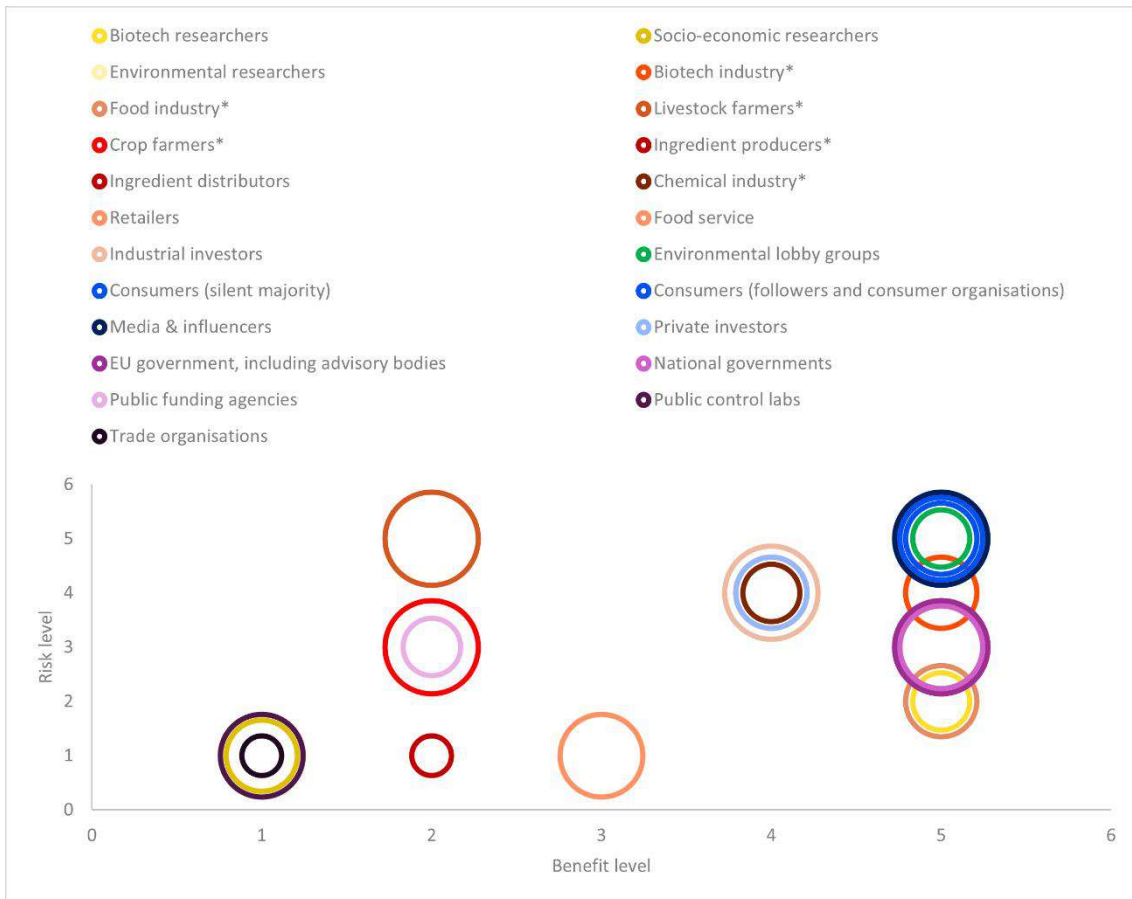


Figure 10. Bubble plot related to the 'Cell factories' Biotech Co-Creation Case showing the assessed stakeholders' influence and affect

All stakeholder mappings and (translated) RBAs, evaluations for influence, overall risk and overall benefit and plots can be found in Annex 1.

As we want to determine the parameters that form the basis of trust and acceptance (or may hinder it), the first stakeholders to involve are the ones who are highly affected by the risks and consequences of the implementation of the technology whilst also having the highest or a high direct influence (thus scoring high on all three of the parameters).

Stakeholders who are directly threatened by the technology (high risk) with fewer benefits to balance, whilst having a high influence, are also considered crucial for involvement.

For the B-Trust project, it was decided that consumers should be involved in the trajectory for all cases. This because this is a test environment, where we want to explore whether they react differently to cases with different beneficiaries, technologies, results, TRLs and applications.

Stakeholders who mainly benefit from the implementation of the technology, but without significant direct risks that lie beyond the normal risks of trade interactions are not considered crucial for assessing the barriers of trust. However, these actors play an important role in the implementation of the technology and should therefore be involved when codesigning regulations and implementation principles. In the context of this project, they will be involved in phase three (see Figure 1) of the overarching trajectory, the co-designing of measures and principles.



The order of involvement is thus determined by the size of these parameters. The order is, however, subject to constant re-evaluation throughout the trajectory as each interaction unlocks new information so that the importance of other stakeholders may turn out higher or lower than initially determined.

### 2.3.3 Step 3 and 4: Decide on the methodology and build the trajectory

With the most important stakeholders identified, it is then determined how each stakeholder will be involved, bearing in mind the principles of design thinking (as explained in D1.3). In the context of B-Trust, trajectories were built for six different cases, whereas in practice, a trajectory will revolve around a single case. Considering this, and also the time and budget constraints, only the crucial stakeholder groups are intensively involved, while making smart combinations or 'lighter' interaction types, to create trajectories that are feasible but as complete as possible. However, a trajectory for a single case, in a real situation, should be given sufficient time and budget for a focused and detailed approach.

Consumers are preferably involved in a co-creative manner, as co-creation is a means to go beyond expected answers and outcomes and gather truly bottom-up input, instead of the often preformatted, top-down and steering nature of many surveys and focus groups. This also goes for stakeholder groups that have many players sharing the same risks and benefits.

Stakeholders with only few representatives and different (official) positions on certain themes, like lobby groups and NGOs, are best involved via in-depth interviews, as not being able to divert from an official statement can interfere with the co-creation process.

Based on the prioritisation and type of interaction, but also the consortium partners involved and possible duplication of interactions (in different countries), a timeline was set up for each case with the different interaction points (see Chapter 4 for initial timeline).

A set-up was drawn out for each case and each interaction point using the toolbox proposed and based around the central questions described under chapter 2.4.2 of D1.3, as recapitulated below:

1. What is your general perception of the technology and the specific case?
2. What is the potential (direct and indirect) impact of the technology both in general as on you specifically? (in general + on the specific stakeholder):
  - Positive (benefits)
  - Negative (risks)
  - Neutral (changes)
3. What are alternative ways to solve the same problem, and what are the risks and benefits of this solution, compared to the biotech solution presented?
4. Are the proposed mitigation measures adequate according to you?
5. What types of communication would work for you? What type of messages, wordings or narratives and through which channels?

How each trajectory is constructed, including the set-up of the different interaction moments with the prioritized stakeholders is described in Chapter 4.



### 2.3.4 Step 5: Roll-out of the trajectories

Besides Alice (B), who manages and guides the different co-creation trajectories and their set-up, and executes the co-creation sessions with consumers in Belgium, the cluster partners Flanders' FOOD (FF; B), Cluster de Alimentación food+I (Food+I; ES) and Food & Bio Cluster Denmark (FBCD; DK) will also roll-out and execute co-creation sessions, either with consumers or with other stakeholders. As mentioned earlier, the trajectories and the linked co-creation sessions are adapted for/by each partner to the local context.

To ensure all partners are sufficiently prepared to lead this process, Alice has foreseen support for the clusters related to the application of the methodology, approach and outline of the co-creation sessions and other interactions, as well as a training for the execution (ensuring the right communication and proper moderation) and support with the analysis of the resulting qualitative data and information.

After each interaction point the results and outcomes are thoroughly analysed and discussed with the different B-Trust partners and adaptations to the set-up and order of other interaction points are made if necessary.

## 2.4 Assessment of trust barriers (phase 2)

The set-up of the interactions specifically focuses on finding perceived risks and benefits, both direct and indirect, to the use of the considered technology (or in the context of B-Trust the discussed Biotech Co-Creation Case). The result is quite straightforward, and will allow for the extension of the linked Risk-Benefit Assessment with new and perceived risks and benefits, adding thus emotional aspects and cues to the evidence-based RBAs.

Finding the reasoning and thinking patterns behind these risks and benefits, whether real or perceived, will become evident during the interactions with the different stakeholders, like feelings commonly associated with concepts and words, likes and dislikes, fears and hopes, what people understand and what not, etc. And also gaps in knowledge and misconceptions, and the reasons for these misconceptions. These form the basis of the drivers and heuristics that people use when making decisions, and can present as barriers for trust in and acceptance of the new technology.





### 3 SET-UP OF THE CO-DESIGN TRAJECTORY (PHASE 3)

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In this 3<sup>rd</sup> phase, at first, trust-building measures and underpinning principles will be drafted by the B-Trust partners, based on the assessment of the trust barriers in phase 2 (see paragraph 2.4). These will be challenged and co-designed with the 5H actors impacted by the trust issues, and responsible for implementation, financing and regulation of the technologies. These co-design sessions will be set up and rolled out under the lead of the three clusters involved in B-Trust.

During these sessions the compiled results and outcomes of the co-creation sessions and the measures and principles drafted by the B-Trust partners, will be presented. In addition the draft measures and principles will be challenged, enriched and finetuned, by adding input, viewpoints and ideas of the involved actors (in the different countries). An initial timeline and course of the complete trajectories is described in Chapter 4 hereafter. Bearing in mind the principles of design thinking, adjustments can be made regarding with whom and how many of these co-design sessions will be executed. This will become clear upon analysing and evaluating the co-creation sessions and interactions in the 1<sup>st</sup> and 2<sup>nd</sup> phase (see Figure 1). It is however envisaged to conduct the co-design sessions in different countries, to ensure that we capture the possible regional differences and specificities, and implement these aspects in the measures and principles

Upon co-designing the trust-building measures, principles and narratives with the 5H actors impacted by the trust issues, a comprehensive and intensive validation loop will be executed involving different actors and by various means.



## 4 INITIAL TIMELINE AND FOLLOW-UP OF THE STAKEHOLDER INTERACTIONS LINKED TO PHASE 1 & 2 AND PHASE 3

In the DoA and linked to T2.2 (with Alice as task leader) and T2.3 (with FF as the task leader), 16 workshops have been foreseen in the framework of these co-creation trajectories. To be precise, 6 co-creation sessions with consumers were foreseen in T2.2 and 10 co-creation/co-design sessions with the other actors of the 5H in T2.3. As described in Figure 1, phase 1 and 2 focus on interactions (co-creation sessions and other means of interaction) with the actors that are most affected by the implementation of these biotechnological solutions, while phase 3 focuses on discussing the learnings and first ideas of measures and principles with the actors playing a direct role in the implementation of these technologies (legislators, researchers, industry, etc.).

From the assessments of the influence of the different stakeholders and to what extent they are impacted by the implementation of the technologies linked to the 6 Cases, it became clear that besides consumers, other actors like farmers and environmental lobby groups are highly affected and could have a lot of influence on the implementation of the technology. Therefore, the B-Trust partners decided to redistribute the co-creation/co-design sessions as follows:

### 6 co-creation sessions with consumers:

- The cases on ‘Biostimulants & biofertilizers’ and on ‘Bacteriophages’ will be addressed in 1 session as for consumers this is further away from their daily lives; they do not come into direct contact with it.
- The ‘Cell factories’ case will be done twice: once in Belgium and afterwards repeated in Denmark to assess the impact of possible regional differences and specificities.

This results in the following planning and timing of the consumer co-creation sessions (Table 4).

*Table 4. Overview of timing and planning of consumer co-creation sessions*

Partner (location)	Biotech Co-Creation Case	Timing
1. Alice (B)	Cell factories	9 <sup>th</sup> of July ‘24
2. FBCD (DK)	Cell factories	29 <sup>th</sup> of October ‘24
3. Food+I (ES)	Eating the cells	November ‘24
4. Alice (B)	Climate-resilient crops	December ‘24
5. Alice (B)	Biostimulants & biofertilizers Bacteriophages	February ‘25
6. FBCD (DK)	Bio-based materials	February ‘25



#### 4 co-creation sessions with other highly affected stakeholders

As mentioned earlier it became clear from the already executed assessments, the RBAs and the development of D1.3 on the generic co-creation methodology, that not only consumers are often highly affected, having also a lot of influence, but also other actors of the 5H. More specifically, linked to the following Biotech Co-Creation Cases the actors outlined hereafter should be involved in co-creation sessions:

- The cases on ‘Cell factories’, ‘Biostimulants & biofertilizers’ and the case on ‘Climate-resilient crops’: for these cases we assessed that crop producing farmers are highly affected and have a lot of influence on the acceptance and market uptake. However, since there are no potentially affected crop producers present locally linked to the ‘Cell factories’ case, the crop producing farmers will only be involved for ‘Biostimulants & biofertilizers’ and ‘Climate-resilient crops’.
- The cases on ‘Cell factories’, ‘Eating the cells’ and ‘Bacteriophages’: for these cases we assessed that livestock farmers are highly affected and have a lot of influence on the acceptance and market uptake.
- The co-creation session on the ‘Cell factories’ and ‘Eating the cells’ cases with livestock farmers will be done in 2 countries (both Belgium and Spain) to assess regional impact. In Spain also the meat industry (+ slaughterhouses) will be involved in this co-creation session.
- The case on ‘Bio-based materials’: we assessed that the companies producing chemicals, plastics and materials (for various applications) will be highly affected as a direct competitor to biobased chemicals, biomaterials and biochemicals.
- The cases on ‘Biostimulants & biofertilizers’ and ‘Bacteriophages’ also have stakeholders that are highly affected as these technologies provide solutions that are in direct competition with their current business. More specifically and respectively the producers of pesticides and chemical fertilisers, and the pharmaceutical industry. Due to time and budget constraints we assessed their role and point of view to be similar to the role of the chemical industry in the case for ‘Bio-based materials’, and evaluated this last case to be set as an example for the other cases. No co-creation sessions were planned with these stakeholders.

The involved clusters, FF, Food+I and FBCD, will be responsible for the set-up and execution of these co-creation sessions. Alice will provide support from a methodological perspective and will function as sounding board.

This results in the following planning and timing of the co-creation sessions with other 5H actors that are highly affected (see Table 5).

*Table 5. Overview of timing and planning of co-creation sessions with other highly affected actors*

Partner (location)	Biotech Case	Co-Creation	Actors involved	Timing
1. FF (B)	Biostimulants & biofertilizers Climate-resilient crops		Crop producing farmers	January '25



<b>2. FF (B)</b>	Cell factories Eating the cells Bacteriophages	Livestock farmers	January '25
<b>3. Food+I (ES)</b>	Cell factories Eating the cells	Livestock farmers Meat industry	November '24
<b>4. FBCD (DK)</b>	Bio-based materials	Companies producing chemicals, plastics and materials	December '24 – February '25

When mapping and assessing the stakeholders per case we evaluated that the environment is in all cases highly affected by the implementation of the different Biotech Co-Creation Cases and that environmental lobby groups, that are seen as representatives for the environment, have a lot of influence on the market acceptance of these biotechnological solutions. Considering the remark stipulated earlier, that these environmental lobby groups have (official) positions on these cases, from which they can not/will not deviate, we determined to involve the representatives of these organisations via in-depth interviews. Next to these representatives also other critical voices will be interviewed, like for example representatives of organic farmers.

These in-depth interviews will be done by Alice and are now planned from December '24 till February '25.

### 6 co-design sessions with stakeholders from the 5H

Upon executing the co-creation sessions as described above, the outcomes and results will be thoroughly analysed and based on this analysis, trust building measures and principles will be drafted by the B-Trust partners. The drafted measures and principles will then be discussed, challenged and refined via so-called co-design sessions with the stakeholders of the 5H that are responsible for implementing these biotechnological solutions and are thus impacted by the trust issues, such as companies from the bio-based & agri-food sectors (incl. investors), biotechnology researchers & experts, public authorities (incl. funding agencies) & policy makers. In Table 6 below an overview is given of the planned co-design sessions.

*Table 6. Overview of timing and planning of the co-design sessions*

Partner (location)	Actors involved	Timing
<b>1. FF (B) (*)</b>	Investors (private/industry) and funders	March – July '25
<b>2. FF (B)</b>	Agri-food industry & bio-based industry	March – July '25
<b>3. Food+I (ES)</b>	Agri-food industry & bio-based industry	March – July '25
<b>4. FBCD (DK)</b>	Agri-food industry & bio-based industry	March – July '25



<b>5. FF (B)</b>	Biotechnology researchers & experts and policy makers	March – July '25
1 co-design session remaining: TBD if relevant + with which stakeholders and where		

(\*): It will be evaluated if this session should be repeated in another country

This is a first planning and timing of the co-design sessions, considering what we know at this point. As mentioned before and bearing in mind the nature of design thinking, we constantly collect more insights and information, which we take into account in the further roll-out of the co-creation trajectories.



## 5 SET-UP OF THE TRAJECTORIES FOR EACH CASE

### 5.1 Case 1: 'Cell Factories'

The case of 'Cell Factories' is in essence about having a sustainable alternative to ingredients that are currently difficult to source (demand largely exceeding production capacity) or come from sources with a high impact on climate and environment. This means the case will primarily benefit the climate and environment, which is also beneficial for the people ('consumers'). As it can also result in cheaper and more sustainable ingredients, it is also very interesting for industry, as well as consumers.

Due to the high ranking of the case by all partners during the assignment of the cases to the partners (see Chapter 2.2), and the following duplication of stakeholder involvement in two countries (Belgium and Denmark), this is the longest trajectory in time, which is why this was the first trajectory that was set up and rolled-out.

#### 5.1.1 RBA and prioritisation of stakeholders

The initial stakeholder mapping, including the relations of influence between different stakeholders is shown in Figure 11. In Figure 12, each stakeholder is shown plotted on the diagram of influence (power) versus interest, making it easier to evaluate their importance.

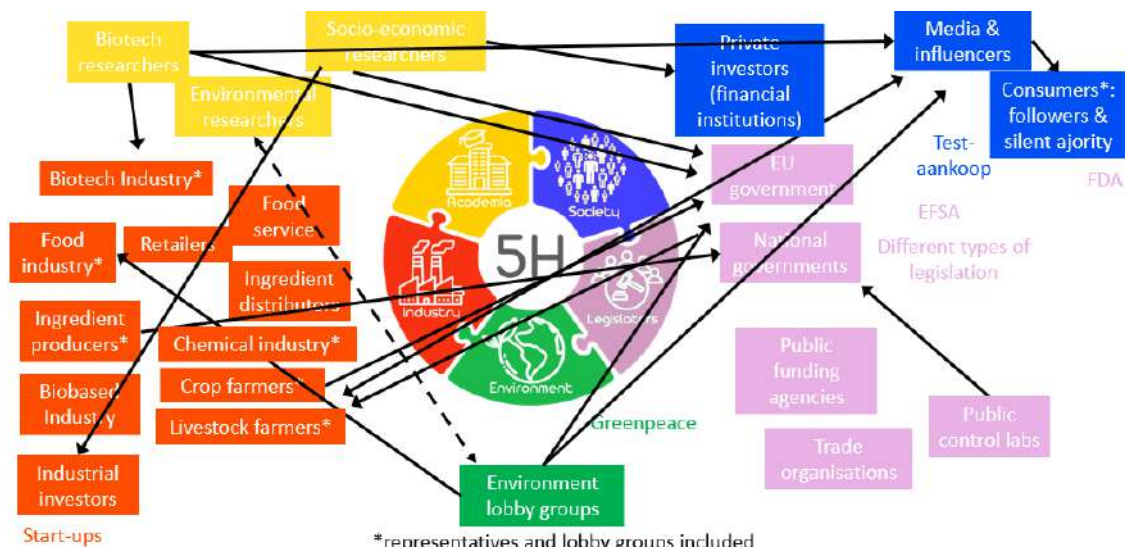


Figure 11. Stakeholder mapping and interactions between them for 'Cell factories'

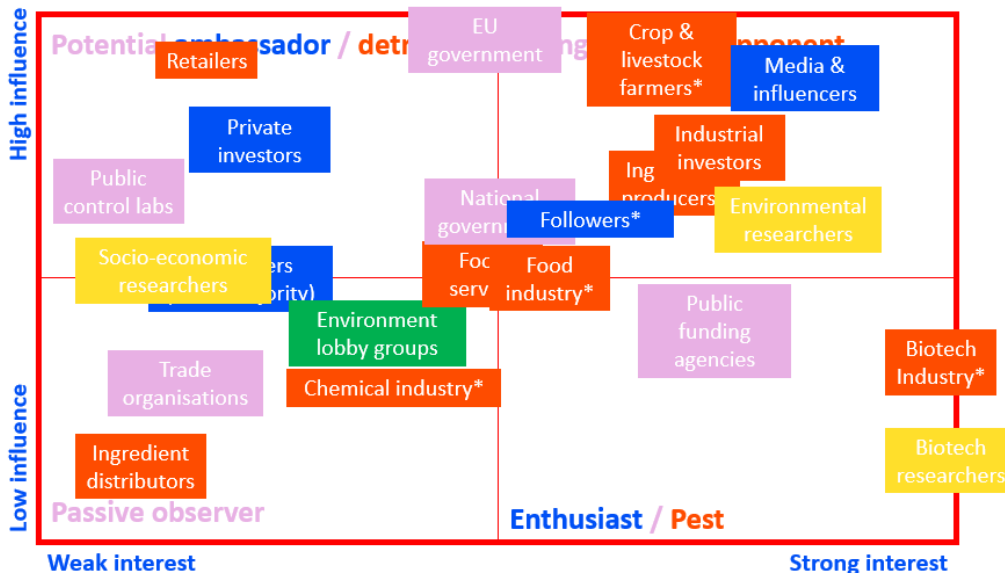


Figure 12. Plotting the influence (power) versus the interest of each stakeholder

A synthesis of this information, including the argumentation of the influence, but also the RBAs and how the identified risks and benefits are assigned to each stakeholder, and the evaluations of influence, overall risk and benefit can be found in the excel file in Annex 1. The plot leading to the prioritisation is shown in Figure 13.

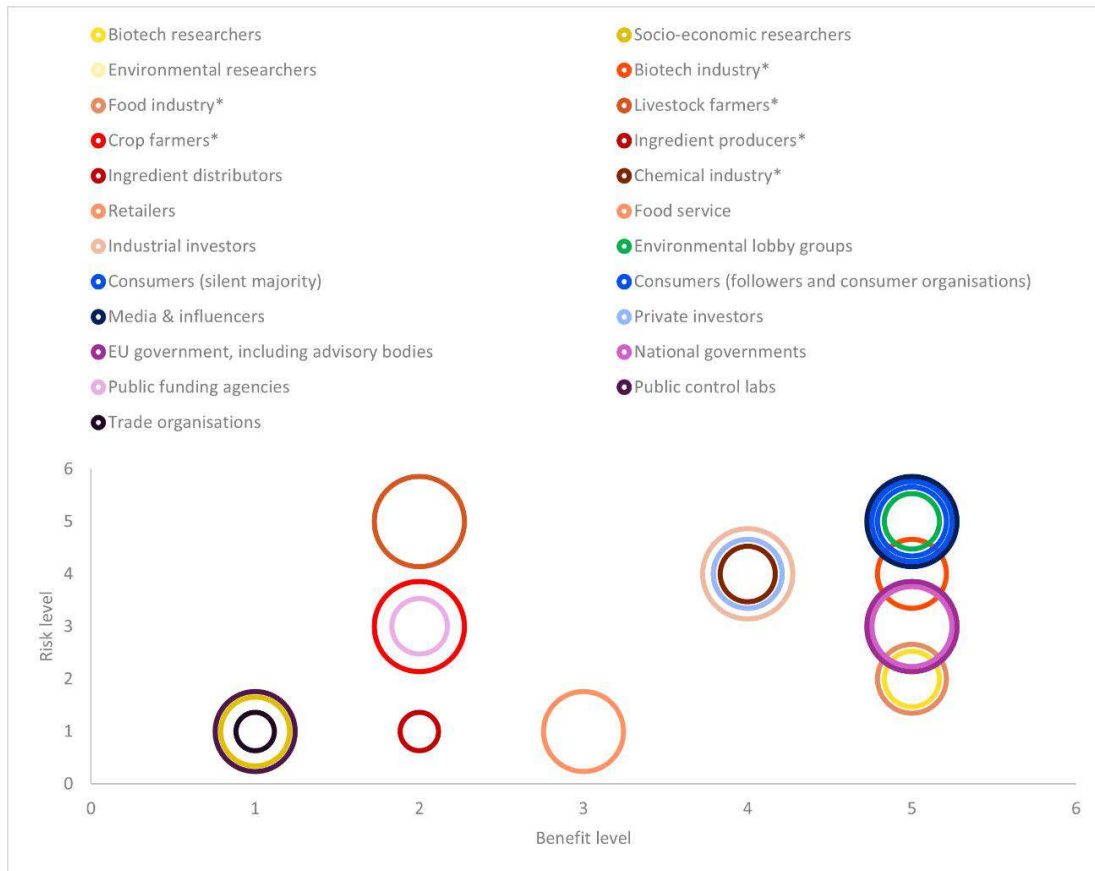


Figure 13. Plotting the overall benefit (X-axis) & risk level (Y-axis) and influence level (size of the bubble) per stakeholder group for the case 'Cell factories'.

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This led to the following prioritisation:

1. **Consumers:** They are the final deciders for adoption of the technology (through buying behaviour) and are highly involved because of the potentially high benefits, but also (perceived) potential risks (inherent to food products, which are ingested). Within this stakeholder group there are different subgroups. The influencers are the most influential, but also the most polarised, making it harder to involve in co-creation. The target group for the co-creation session was therefore set to ‘followers’, which tend to follow the opinions of others to make up their mind. They end up having a firm opinion on matters, but this opinion is still open for discussion and can be revised based on new information. Profiles were selected to have both conservative (traditional) and more progressive voices present, and have a majority that has no scientific background. People with a background in biotechnology or that are active in the biotech industry were excluded from the session.
2. **Farmers:** The farmers (both crop producing farmers and livestock farmers) are potentially threatened in their livelihood and therefore have the highest risk with only few benefits to balance. Their influence on governments and authorities and thus regulation is often high, making them a potentially powerful opponent. However, a co-creation session needs to have both traditional and more progressive farmers on board in order to get potential benefits and opportunities discussed as well as the risks. As these co-creation sessions have now been foreseen to take place in Belgium and Spain, a focus will be on the livestock farmers for this case, as the crops that are most at risk of being replaced by this technology (such as Stevia, cocoa, coffee, vanilla and other spices) are not produced in Belgium or Spain.
3. **Environmental lobby groups:** There are potential benefits for the environment, as well as potential risks. Different groups however can have very different opinions on ‘modifying organisms’ and are therefore tackled in in-depth interviews.

### 5.1.2 Consumer co-creation sessions

The dates for the consumer sessions were set for July 9<sup>th</sup> (Belgium) and October 29<sup>th</sup> (Denmark). The set-up for the session was slightly adapted after the session in Belgium, based on the feedback from participants and our own evaluation. The set-ups for both sessions, and the evaluation from the session in Belgium can be found below.

#### Set-up co-creation session in Belgium (July 9<sup>th</sup>, 2024)

##### *18:30 Welcome, introduction & warm-up*

- Presentation round – everyone briefly introduces themselves (creative)
- Mission of the evening: what do we want to know from people?
- Presentation of the rules
- Warm-up exercises (‘Black stories’)

##### *19:20 Part 1 - How is it done today?*

Shortly explain the general scope of the evening: Discussing new methods to produce food components like.

- Protein (for meat alternatives);
- Nutritional elements, like omega-3 fatty acids;





- Sweeteners, flavours and colours (e.g. steviolglycosides, vanilla and red colouring);
- Enzymes (for consumers limit to the example of rennet).

Explain each of these cases in terms of value for them and role in the foods they eat.

Questions to be asked:

- How do we currently produce these products/ingredients according to you?
- What are the benefits for this production method, and what are the negative implications?

*Remark: use direct and indirect questioning: not only ask for the pros & cons they see, but also the ones others might see.*

### Group exercise (Q3)

Answering the questions above:

- 3 tables – per table 1 moderator who stays at the table;
- All participants choose 1 case to deep-dive into and discuss with the other participants at the table;
- After this round all participants move around and can add remarks/comments/questions to the other tables/cases (the moderator at the table explains if something that was written, drawn, etc. is not clear);
- The results from the different tables are presented to the whole group by the moderators of the table, and listed on a flipchart.

*Remark: no mention of biotechnology (from our side) up to this point!*

### 20:00 Part 2 - The future of our food? Biotechnology as a solution?

*Remarks: Only now we move on to biotechnology and also provide some additional information on the impact of the current production/sourcing methods of the cases above. Specifically if current hurdles, downsides, risks, etc. were not identified yet by the participants in the previous part.*

*Related to the biotechnological solutions, neutral statements will be made, like “One of the ways researchers want to tackle some of the downsides and hurdles of the current production is the use of biotechnology” (not 'we think', or 'we believe').*

### Association exercise (Q1)

How do you feel about biotechnology?

What are your feelings, ideas, questions, etc. linked to the following words:

- Biotechnology
- GMO
- Precision fermentation

Write these words in the centre of big, white papers. People can write words, make drawings, build on what already has been written by others and discuss amongst each other.

When writing has stopped, we'll go through the highlights of what has been written and stimulate further discussion. If necessary, triggering statements can be made.



### 20:30 Part 3 - Cell factories

#### Further explanation (Q1, Q2)

Explain the cell factories as an alternative production method. At this point we don't present the evidence-based risk-benefit assessments yet. We first let the participants come up with potential risks, benefits, concerns, etc.

Upon presenting the 'cell factories' time is foreseen for some questions and discussion.

#### Scenario exercise (Q2)

Work in groups and first start with an AB camp question to assess whether they consider this a dystopia, an eutopia or take a more neutral position related to the biotechnological solution(s).

Make groups with people that have the same (gut) feeling about this and let them work around the following questions:

- Imagine a world where this is the main production method for food ingredients. Would you want to live in this world? Why (not)? What are the risks you see? Or do you see specific benefits?

#### Discussion (Q2, Q5)

With the following questions:

- Do you feel differently about the different cases presented at the beginning? If yes, why?
- How can we turn around this scenario? (make negative scenarios positive, or turn positive scenarios into a nightmare)?

#### Discussion on evidence-based RBAs (Q2, Q4)

The risks, linked mitigation measures and benefits are explained in detail. Discuss and make additions to the evidence-based RBAs. Discuss per case what is better and worse about new production methods versus the old ones.

### 21:30 Part 4 - How would you explain it?

#### Exercise in small groups (Q5)

A communication canvas will be provided to be filled out:

- Explain this technology in your own words (or what you understood from it);
- Why/how could this help with a more sustainable future? What would you put forward as main USPs or main assets?
- If you do not agree it could help with a sustainable future, state why you feel this way. What has to be done to convince you? Or is that simply not possible?

### 22:00 Mentimeter survey

Linked to the ToC and the MEL framework a short survey was done using Mentimeter to assess if and how their perception on biotechnology has changed due to the co-creation session. After each co-creation session (consumers, but also the other highly affected stakeholders) this type of short surveys will be done.

The following multiple choice questions were asked:



- After tonight, do you have a better idea of the impact of our current way of producing food?
  - Yes, for sure
  - Yes, fairly
  - A little
  - Not really
- Do you now better understand what biotechnology is, and what the 'cell factories' could do and how they work?
  - Yes, it was very clear
  - I think I more or less understand it now
  - I'm starting to get it a little bit
  - Not really
- Do you now have a better view on the potential of this technology, and the possible risks?
  - Yes
  - More or less
  - A little bit
  - Not really
- Did this session change your views on biotechnology?
  - Yes, I'm totally impressed now
  - Yes, I do look at it more positively now
  - Not really
  - Yes, it made me a bit more sceptical
  - Yes, I'm much more worried now

## Evaluation of consumer session in Belgium and attention points for other sessions

### *Participants and flow of the workshop*

The requirements for the participants were to have people from different ages and both men and women, but most importantly to have both progressive and conservative voices, and to have a majority of people without a scientific background. In addition, people with a background in biotechnology or working in the biotech industry were not invited to this session. In total 16 persons fitting the requirements described above, participated in the co-creation session. We had both men and women, one teenager and mostly people in their forties and fifties.

The types of participants ranged from the regular consumer, over the progressive eater who likes to try new things and the very conscious citizen who tries to live as sustainable as possible, to the 'die hard' activist, who has very strong beliefs about the way food should be. One participant was extremist to a degree that it seriously interfered with the flow of the workshop. He presented himself as expert and dragged other participants along with his beliefs and theories.

The heated discussions led to problems with the timing, and very little time to go over the techno-scientific risks and mitigation measures, and benefits. The last part, about the communication, was skipped and afterwards mailed to the participants as a form. This also gave us some feedback and reflections afterwards.



## *Evaluation of the set-up and improvements for the workshop*

### *Framing of the workshop*

The session should be framed clearly from the very beginning, linking it to the B-Trust project and the objectives stipulated therein. Wordings should be carefully selected during this framing and explanation, as it may influence the participants' mindset. Make it clear that it is about the process of involvement in research and regulations for new technologies, and biotechnology is the case study. Now some of the participants had the feeling we were promoting biotechnology and felt misled about the topic of the workshop. With the current set-up, some people felt a bit 'tricked' into 'us trying to convince them' 'us trying to promote biotech'.

### *Biotechnology as one of the possible solutions*

Although biotechnology should be put forward quite early on in the workshop, the wording should be neutral. Afterwards we evaluated that we were still too enthusiastic about the technology and thus not neutral enough. Also, it is preferably put forward as one of the possible solutions to the problems we are up against, alongside other solutions like short and local value chains, micro- and macro-algae, organic farming, vertical farming, to name a few. B-Trust is not about promoting biotechnology as such and this should be clear from the framing and set-up.

Not enough participants linked the issues, problems and impact there are with the current way of producing our food and food ingredients/components, with the possible solutions that could be provided with biotechnology. The idea of the first exercise was to make the participants think about the current production methods, instead of only bombarding them with numbers. Starting from the hypothesis that when people come up with their pros, cons and possible solutions, they are more likely to stick better. In the end we had the feeling that this first exercise took too long. It could be replaced with indeed presenting the impact and problems of the current food production system and letting the participants think of possible alternative approaches and solutions. Considering the importance given to the social consequences of biotechnology (concentration of power, etc.), there should also be given attention to the current social issues in our food production system (slavery, child labour and oppression, lack of transparency, etc.). After this exercise we can zoom in on biotechnology, clearly referring to it as one of the possible solutions to the problems we have created with the way we are doing it now.

### *What about biotechnology experts or representatives?*

We explicitly avoided the presence and participation of biotechnology experts/representatives in the session and also didn't present ourselves as being experts in this matter or representatives of the technology. Nevertheless, due to the fact that we were giving the presentation and guiding the session, we were (somewhat) seen as experts in food and biotechnology specifically. We didn't have the impression that the participants were intimidated by our expertise, but since we are used to presenting information to regular citizens, we tend to not use difficult language or scientific terminology. Most important aspect in this is to be as neutral as possible and best to have no affiliation with a specific company, industry and/or lobby group.

### *Avoid activist personalities*

Several more activist persons were present during our session, which was a true eye-opener for us. Depending on their personality they proved easier or more difficult to have a constructive



discussion with. In this perspective, having some expertise present is useful to counter blatant falsehoods and to prevent activist voices from steering the discussion and dragging the rest of the group into a scientifically incorrect discourse. Moderating and managing these antagonistic voices is very challenging, especially when a constructive discussion seems impossible. It should be avoided to have this type of personalities in a co-creation session.

#### Other adjustments to the slides and concrete wording

In the third part of the workshop the participants were asked to perform a scenario exercise. Prior to this exercise people were divided into three groups, linked to how they look at biotechnology in this perspective (eutopia, dystopia or more neutral position). Due to the wording on the slide, where biotechnology was presented as the main route of producing food and food components, a fairly large proportion of participants (7 to be more precise) opted for the dystopic scenario. If the wording would have been more neutral and if biotechnology would be presented as one of the possible solutions, the dystopic group would have been smaller and the tone less negative.

Also we forgot to mention on the slide that they also should think about reversing the scenario (utopia → dystopia and dystopia → utopia). This was mentioned orally in all groups, but for the 'dystopic group' it seemed impossible to discuss and think about this. Some participants (basically one) proofed so stuck in their own ideas that they couldn't see and/or imagine the other scenario and possible solutions to come there.

### Revised set-up for the session in Denmark (October 29<sup>th</sup>, 2024)

#### 18:30 Welcome, introduction & warm-up

- Presentation round – everyone briefly introduces themselves (creative)
- Mission of the evening: what do we want to know from people?
- Presentation of the rules
- Warm-up exercises (e.g. 'Black stories')

#### 19:20 Part 1 - Why do we need solutions? And why discuss them with you?

##### Introduction of the project

Explain the framework of the evening and the project

- Session is done in the framework of an EU project;
- The project seeks to better include the public (and other stakeholders) when a legislative framework needs to be set up and other measures linked to the implementation of these new technologies, in this case biotechnology.

##### Association exercise (Q1)

At this point we dropped the term 'biotechnology', so we want to immediately capture their intuitive responses.

What are your feelings, ideas, questions, etc. linked to the following words:

- Biotechnology
- GMO
- Precision fermentation



Write these words in the centre of big, white papers. People can write words, make drawings, build on what already has been written by others and discuss amongst each other.

When writing has stopped, we will go through the highlights of what has been written and stimulate further discussion. If necessary, triggering statements can be made.

### Explain the scope (Q3)

Why is the EU looking at biotechnology?

- We need to feed a lot of people with enough healthy foods: Protein (for meat alternatives), nutritional elements, like omega-3 fatty acids and vitamin B12 and D, other components, like sweeteners, colourings, flavourings, enzymes
- Current agricultural practices have a serious impact on climate, the environment and biodiversity: Where do we get our protein, and what is the impact? Where do we get much-needed nutritional elements? (Focus on animal-derived ones) How are colourings and flavourings made, and what is their impact

### 20:00 Part 2 - What are possible solutions? Could biotechnology be one of them?

#### How could we do it better? (Q3)

Group work: divide in three groups according to the topic they are interested in most. Ask people to join another group if there is too much unbalance between groups (at least 3 people in every group). Every group works at a separate table with a moderator at each table.

- Protein
- Nutrition (omega-3, vitamine B12 and D, etc.)
- Other (flavours, enzymes, sweeteners, colourings)

They are free to come up with alternative, more sustainable methods. Biotechnology can be one of them, but is certainly not necessary to include

Questions to be asked:

- What could be a more sustainable method to get these?
- Could the use of biotechnology be an option?

When sufficient alternatives are listed, they are free to check what the other groups have done, and make additions if they want.

Finish the exercise with going over a few of the things discussed in each group (by the group moderator) and allowing for a short group discussion.

### Explain the possible solutions (Q3)

Explain a few (other) sustainable, alternative production methods:

- Plant proteins / nutritional elements / components: often not sufficient nutritionally / taste-wise;
- Vertical farming / aquaponics & combined farming practices;
- Organic farming and short-chain concepts;
- Chemical / enzymatic production of components;
- Bacterial / algal production of nutritional elements.



Explain the cell factories as an alternative production method

- Explain the definition of biotechnology as stated in B-Trust, and link fermentation and precision fermentation;
- Use insulin as an example in medical context;
- Use vitamin B12 as an example for food.

At this point we do not present the evidence-based Risk-Benefit Assessments yet. We first let the participants come up with potential risks, benefits, concerns, etc.

Upon presenting the 'cell factories' time is foreseen for some questions and discussion.

### *20:45 Part 3 - Cell factories!*

#### *Scenario exercise (Q1, Q2)*

Imagine a world where biotechnology is a common production method for certain food ingredients. Would you want to live in this world?

Let everyone stand up and stand together according to their answer: 'Yes', 'no' or 'maybe/not sure'. Make groups with people that have the same (gut) feeling about this (balance if necessary) and let them work around the following questions:

- What makes you think this is (not) a good world to live in?
- What are the risks you see?
- Do you see benefits?
- Do you feel differently about the different cases? If yes, why?
- How can we turn around this scenario? (make negative scenarios positive, or turn positive scenarios into a nightmare)?

#### *Explain and discuss (Q2, Q4)*

So why is the EU looking at this technology as a possible solution?

- Explain the identified benefits (+ explain this is the scientific viewpoint);
- Discuss and make additions based on scenario exercise.

And how can possible threats be avoided?

- Explain the identified risks and their mitigation measures (+ explain this is the scientific viewpoint, could be missing risks with a more social dimension = the reason why public is involved)
- Discuss and make additions based on scenario exercise

### *21:40 Part 4 - Outro*

Explain that it is normal to be slightly (or even a lot) overwhelmed or even confused. It is now time to let the information sink in. Recapitulate on the framing in an EU project and information on further steps and what will be done with their input.

Explain you will now ask a few simple questions to conclude, and that you will also send them a few extra questions in the coming days about what they have learned from this session after the information has sunk in a bit.



Proceed with the MEL questionnaire (see higher).

### *Follow-up*

#### Questionnaire (Q5)

A few days after the session, send out a questionnaire with the following questions:

- How did you understand that this technology works? Can you explain it in your own words?
- Can this technology help make our future more sustainable? What are the most important arguments for you?
- Or do you still find the idea a bit creepy? What scares you about it? Are there circumstances or conditions where you might consider this an option as a production method?
- Is there anything else you would like to say?

#### 5.1.3 Co-creation sessions with the farmers

In this case the farmers mostly affected are the livestock farmers and the linked fresh meat industry. As mentioned earlier, although crop producing farmers are also highly affected, as the farmers producing these types of crops are not located in Europe, they will be excluded from these co-creation sessions. Co-creation sessions with the livestock farmers will be set up and executed in Belgium and Spain, under the lead of the clusters (FF and Food+I).

The central questions are in line with the linked consumer co-creation sessions. Considering this also the set-up and outline will be comparable to the outline of these consumer co-creation session(s). The risks and mitigation measures will sometimes deviate, as the farmers are often economically affected by the introduction of the biotechnological solution.

#### 5.1.4 Interviews with environmental lobby groups and other critical voices

As stated earlier, the environment was mentioned as highly affected 'actor' linked to all 6 Biotech Co-Creation Cases. It was decided to involve the representatives of these environmental lobby groups, but also other critical voices (e.g. representatives of the organic farmers) via in-depth interviews.

### **Actors to be involved**

As preliminary overview of actors to be interviewed we are considering:

- [Greenpeace](#)
- [Rikolto](#)
- [Friends of the earth](#)
- [ProVeg](#)
- [Bioforum](#)
- [Velt](#)
- [Bond Beter Leefmilieu](#)
- [GAIA](#)
- ...

This list will be further completed with additions of the partners. A selection will be made of the organisations/actors to be interviewed after discussion with the partners.





## Questions

For the interviews of the environmental lobby groups a questionnaire is already drafted. The questions will be further finetuned upon discussion with the partners and the members of the Advisory Board.

### *Framing of the project*

- Session is done in the framework of an EU project
- The project seeks to better include the public (and other stakeholders) when a legislative framework needs to be set up and other measures linked to the implementation of these new technologies, in this case biotechnology.

### *General questions*

Biotechnology can be interpreted in different ways. What do you (your organisation) understand as biotechnology? Do you have a working definition? What aspects/processes/technologies fall within this definition and what is excluded?

- What is your organisation's position on the use of biotechnology?
- Are there any acceptable applications or not? Or are there specific prerequisites under which the application of biotech is acceptable for your organisation?
- Which types of biotechnology (in the broad sense) are acceptable and which are not?

What is the rationale behind this position (the acceptable versus unacceptable types and applications)?

- What are the main risks that form breaking points in this positioning?
- If largely opposed: Do you see situations where an exception can be made to your opposition against the use of biotechnology?
- If view is more nuanced: In which situations do you see potential benefits to the use of biotechnology?

### *Case-specific questions*

Explain the cases: focus on main beneficiaries and drivers (benefits; the challenge that the case is tackling) for the case.

Per case:

- What do you see as alternative solutions that could be used to tackle this challenge? Are these combined solutions sufficient to tackle the challenge?
- What do you see as the most important risks in the use of biotechnology in this case?
- Do you see this biotechnology case as one of the solutions that may play a role in tackling the challenge? Could it have any advantages over the other solutions?
- If open to the technology: what are the circumstances and preconditions that need to be met to address the potential risks? Are there any regulatory (or other) interventions that could limit the risks?

### *Concluding question*

Are you open to collaborating with researchers or industry representatives to develop safer and more sustainable biotechnological applications?



## 5.2 Case 5: 'Eating the cells'

Case 'Eating the cells' is about cellular agriculture in the context of meat replacement, comprising both the culturing of animal cells ('cultured meat'), as well as microbial cells for direct consumption. The main goal is replacing meat, thus reducing its impact on climate and environment, making it the prime beneficiary. It also has a large impact on animal welfare, making the consumer also an important beneficiary in terms of ability to make moral food choices.

### 5.2.1 RBA and prioritisation of stakeholders

The initial stakeholder mapping, including the relations of influence between different stakeholders is shown in Figure 14. In Figure 15, each stakeholder is shown plotted on the diagram of influence versus interest, making it easier to evaluate their importance.

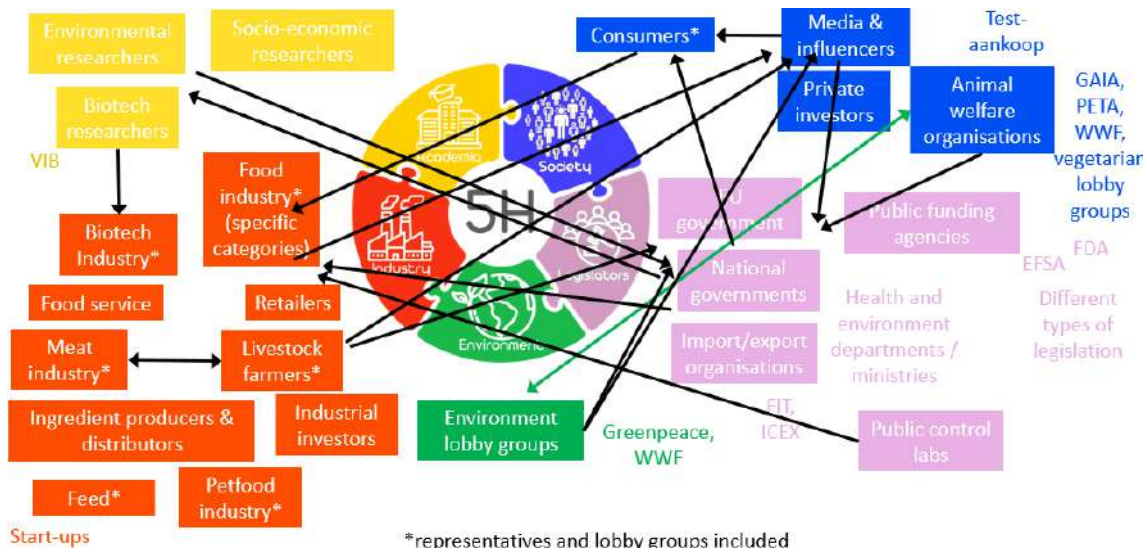


Figure 14. Stakeholder mapping and interactions between them for 'Eating the cells'

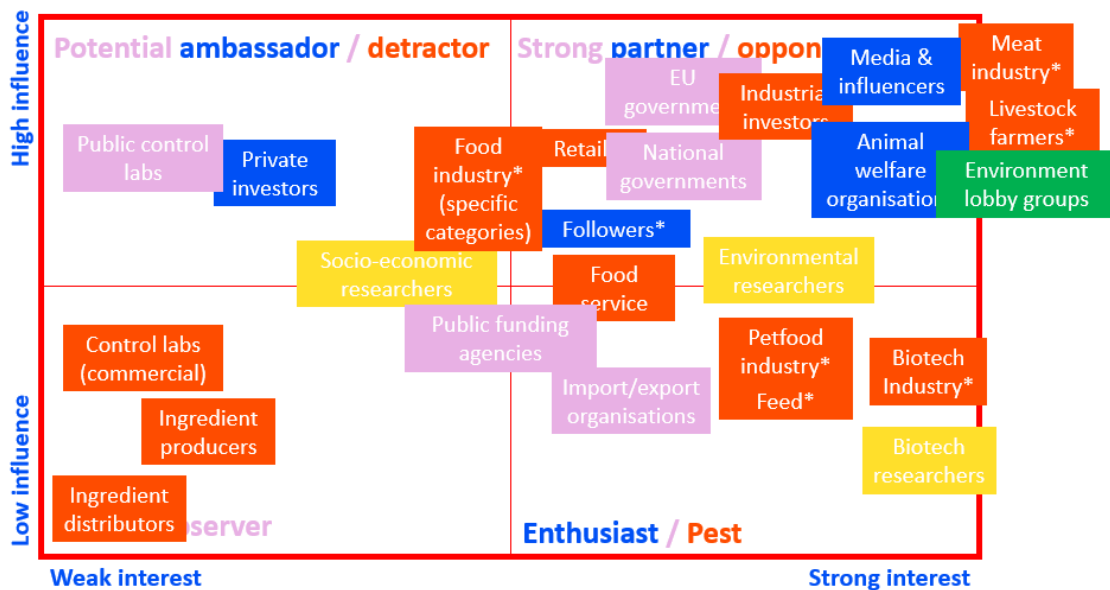


Figure 15. Plotting the influence (power) versus the interest of each stakeholder



A synthesis of this information, including the argumentation of the influence, but also the RBAs and how they are assigned to each stakeholder and the evaluations of influence, overall risk and benefit can be found in the excel file in Annex 1. The plot leading to the prioritisation is shown in Figure 16.

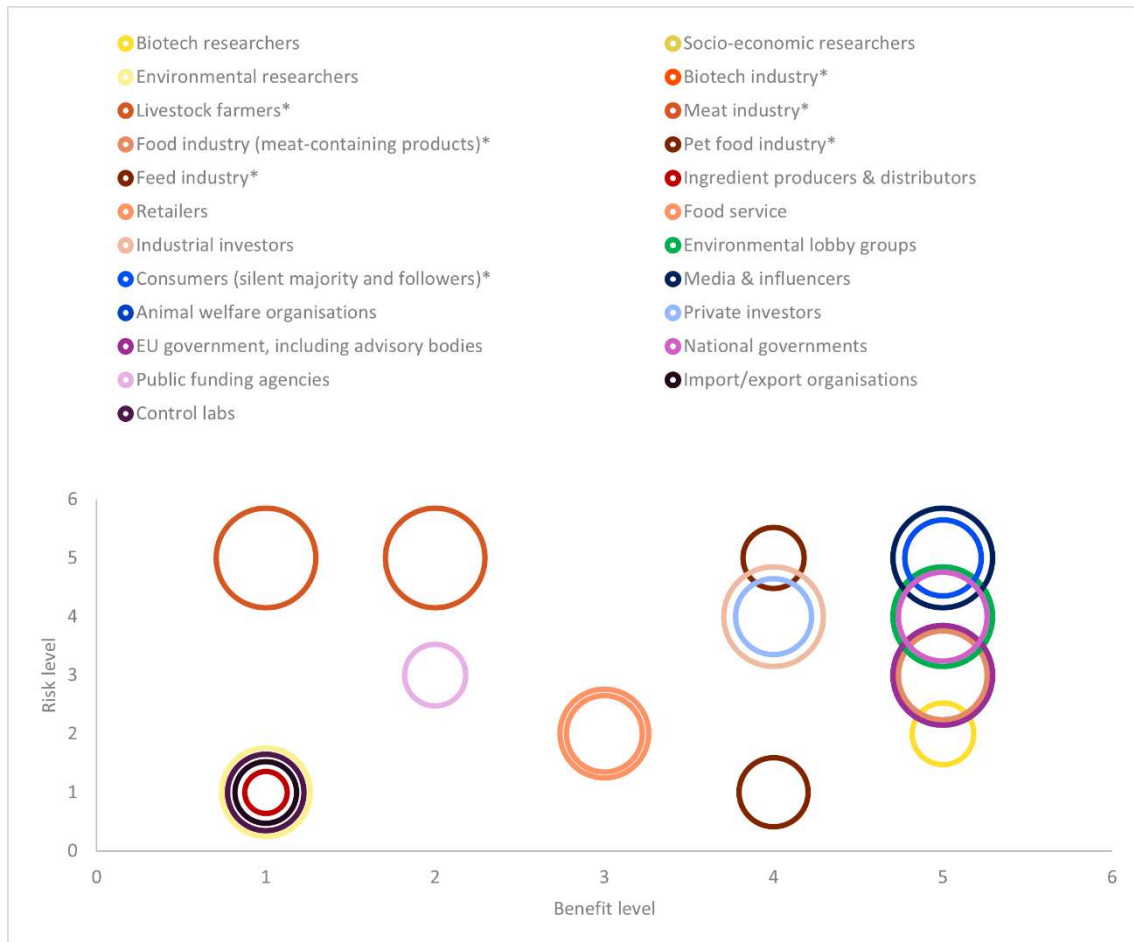


Figure 16. Plotting the overall benefit (X-axis) & risk level (Y-axis) and influence level (size of the bubble) per stakeholder group for the case 'Eating the cells'.

This led to the following prioritisation:

1. **Consumers:** They are the final deciders for adoption of the technology (through buying behaviour) and are highly involved because of the potentially high benefits, but also perceived potential risks (inherent to food products, which are ingested). In this stakeholder group different subgroups can be identified. As for the case of 'Cell factories', the target group for the co-creation session was set to 'followers' without a background in biotechnology and/or a link to the biotech industry.
2. **Livestock farmers:** These farmers are potentially threatened in their livelihood and have therefore the highest risk with only few benefits to balance. Their influence on governments and authorities, and thus regulation is often high, making them a potentially powerful opponent. However, a co-creation session needs to have both traditional and more progressive farmers on board in order to get potential benefits and opportunities discussed as well as the risks. In addition and highly linked to the livestock farmers, the fresh meat



industry is also highly affected by the implementation of this technology. It will be evaluated if they can/will also be involved in the co-creation sessions of the livestock farmers.

3. Environmental lobby groups: There are potential benefits for the environment, as well as potential risks. Different groups however can have very different opinions on 'modifying organisms', and are therefore tackled in in-depth interviews.

### 5.2.2 Consumer co-creation session

#### 18:30 Welcome, introduction & warm-up

- Presentation round – everyone briefly introduces themselves (creative)
- Mission of the evening: what do we want to know from people?
- Presentation of the rules
- Warm-up exercises (e.g. 'Black stories')

#### 19:15 Part 1 - Meat production and its alternatives: how is it and what could it be?

##### Introduction of the project

Explain the framework of the evening and the project

- Session is done in the framework of an EU project;
- The project seeks to better include the public (and other stakeholders) when a legislative framework needs to be set up and other measures linked to the implementation of these new technologies, in this case biotechnology.;
- Today we talk about the possibility of using biotechnology for making the transition towards meat replacement and a more sustainable meat production.

##### Association exercise (Q3)

Give participants a different coloured pen based on their meat eating habits (green for vegetarians, blue for meat eaters and black for flexitarians (no red as it is seen as bad/negative)).

What are your feelings, ideas, questions, etc. linked to the following words? What would you want it to be?

- Meat production;
- Animal husbandry;
- Fisheries;
- Soy? (can be interpreted both as the meat replacer as the animal feed)

Write these words in the centre of big, white papers. Divide each paper in two, and put 'what it is' on the left, and 'what it could be' on the right. People can write words, make drawings, build on what already has been written by others and discuss amongst each other.

When writing has stopped, go through what has been written down in the association exercise and encourage discussion using questions.

*And what do the animals eat?*



Write this question on another paper. Let them write down answers, and associations that they make with the answers. Use references/input from the association exercise to help them built on answers given before.

### 20:00 Part 2 – Comparing alternatives

#### Listing alternatives (Q3)

What do you eat when you don't eat meat or fish? Why do you choose these alternatives? Do you know what they are made of?

Let them list several meat replacers and write the most important ones down on a large piece of paper. Structure based on main ingredient(s), like 'soy', 'grains, nuts & legumes', 'vegetables', 'cultured meat', 'mushrooms', 'micro-organisms'.

#### Pro/con exercise (Q1, Q2, Q3)

Let them work in small groups (2-3 people) on different alternatives AND meat/fish production. Each group chooses a different (protein) source.

*What are the assets and disadvantages of this protein source, including its production method?*

Let each group present their findings and discuss all alternatives.

### 20:45 Part 3 – The case of cellular agriculture explained

#### Explain and discuss (Q1, Q2)

Explain how cellular agriculture works:

- Cultured meat
- Eating micro-organisms

Leave the opportunity to ask questions and discuss.

#### Camp division and scenario exercise (Q2)

If you get to choose: which of these speaks most to you (cultured meat or eating micro-organisms):

- None, it's downright creepy;
- I can see cultured meat happening, but do not like the idea of eating microbes;
- I don't mind eating microbes, but I find it hard to believe meat can be grown in a tank;
- I think both of them have great potential for the future.

Divide in four groups based on their answers and let them think about the following (use a canvas to guide them):

- Do you believe these technologies can be potential solution for the challenges we are facing? Do you see certain advantages or assets to this system?
- How about the risks? What do you think could go wrong with this technology?
- Visualise a future where these technologies are common goods. What are the consequences to our landscape, social structures, food culture, environment, health, ...

Let each group moderator give a short summary of the identified consequences, risks and benefits.



#### Discussion of risks and benefits (Q2, Q4)

Present the risks & benefits identified beforehand (each risk/benefit has one slide + mitigation measures of the risks). and discuss using the answers from the previous exercise.

#### 21:45 Part 4 - Outro & MEL

Explain that it is normal to be slightly (or even a lot) overwhelmed or even confused. It is now time to let the information sink in. Recapitulate on the framing in a EU project and information on further steps and what will be done with their input.

Explain you will now ask a few simple questions to round off, and that you will also send them a few extra questions in the coming days about what they learned from this session after the information has sunk in a bit.

Proceed with the MEL questionnaire

#### Follow-up

#### Questionnaire (Q5)

Follow-up questions will be very similar to the questions related to the 'Cell factories' case.

### 5.2.3 Co-creation sessions with the farmers

In this case the farmers mostly affected are the livestock farmers and the linked fresh meat industry. Co-creation sessions with these farmers will be set up and executed in Belgium and Spain under the lead of the clusters (FF and Food+I).

The central questions are in line with the linked consumer co-creation sessions. Considering this also the set-up and outline will be comparable to the outline of the linked consumer co-creation session(s). The risks and mitigation measures will sometimes deviate, as the farmers (and linked fresh meat industry) are often economically affected by the introduction of the biotechnological solution.

### 5.2.4 Interviews with environmental lobby groups

See higher 'Cell factories'.



### 5.3 Case 4: Climate-resilient crops

In the case of 'Climate-resilient crops', the main goal is to secure food production under the pressures of a changing climate. The main beneficiaries are therefore the people, the consumers, and by extension the entire food chain.

#### 5.3.1 RBA and prioritisation of stakeholders

The initial stakeholder mapping, including the relations of influence between different stakeholders is shown in Figure 17. In Figure 18, each stakeholder is shown plotted on the diagram of influence (power) versus interest, making it easier to evaluate their importance.

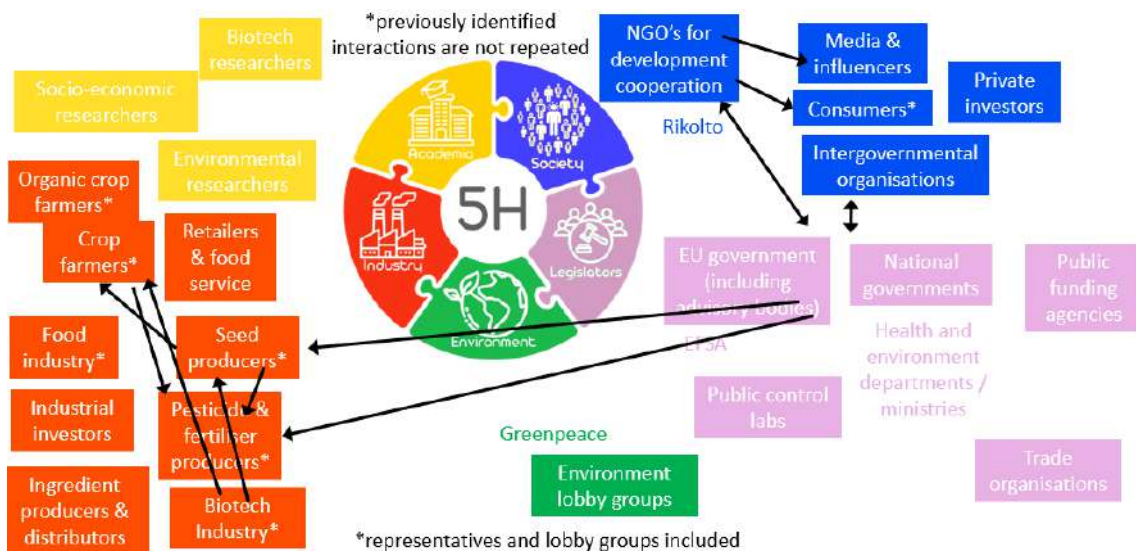


Figure 17. Stakeholder mapping and interactions between them for 'Climate-resilient crops'

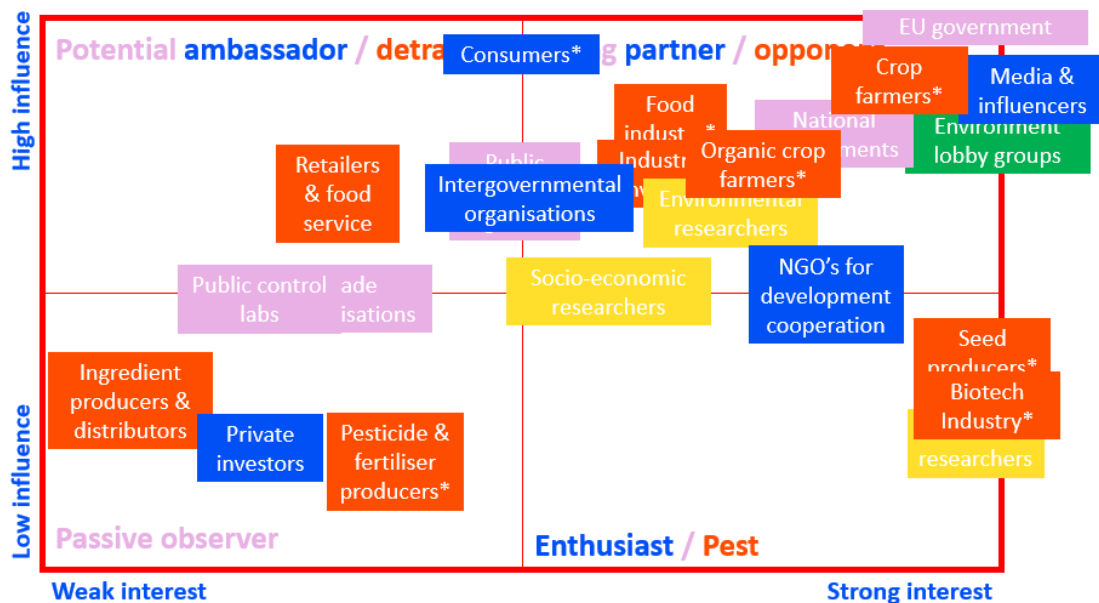


Figure 18. Plotting the influence (power) versus the interest of each stakeholder



A synthesis of this information, including the argumentation of the influence, but also the RBAs and how they are assigned to each stakeholder and the evaluations of influence, overall risk and benefit can be found in the excel file in Annex 1 The plot leading to the prioritisation is shown in Figure 19.

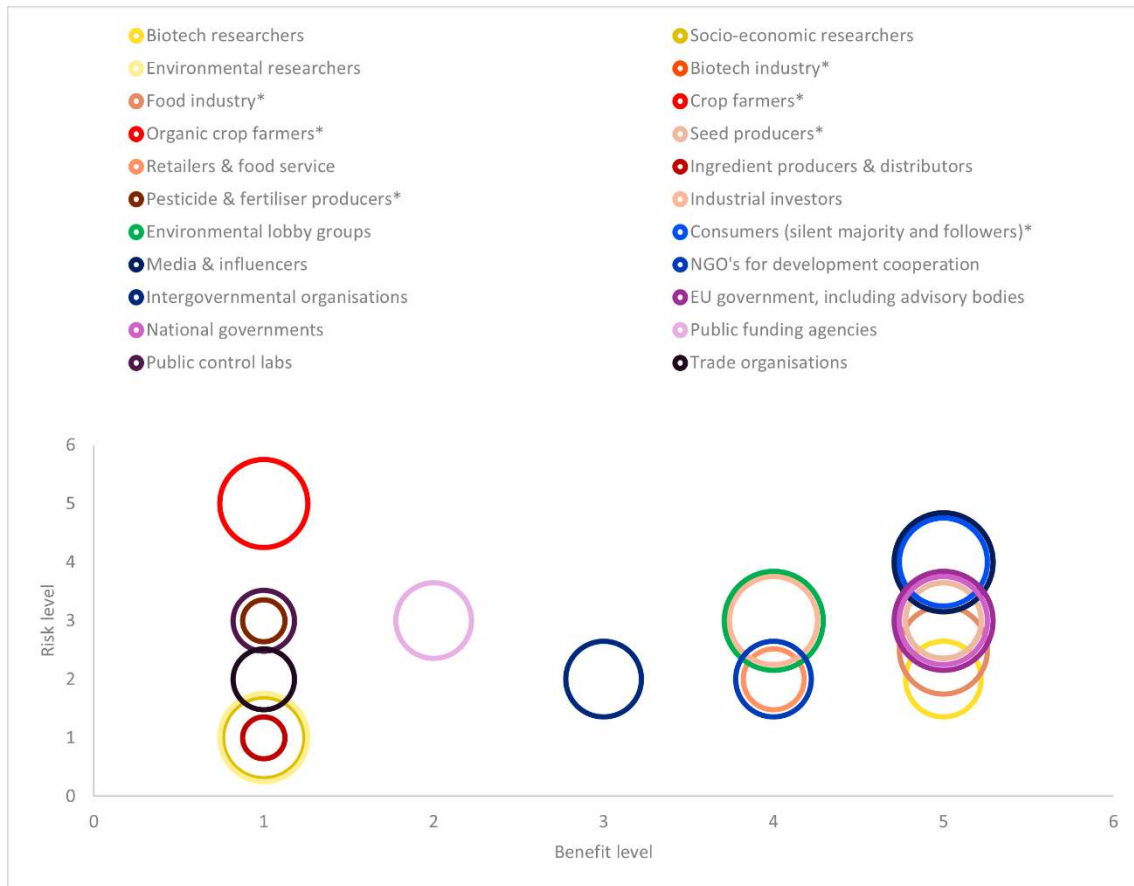


Figure 19. Plotting the overall benefit (X-axis) & risk level (Y-axis) and influence level (size of the bubble) per stakeholder group for the case 'Climate-resilient crops'.

This led to the following prioritisation:

1. Consumers: They are the final deciders for adoption of the technology (through buying behaviour) and are highly involved because of the potentially high benefits, but also perceived potential risks (inherent to food products, which are ingested). In this stakeholder group different subgroups can be identified. As for the cases of 'Cell factories' and 'Eating the cells', the target group for the co-creation session was set to 'followers' without a background in biotechnology and/or link to the biotech industry.
2. Farmers: The crop producing farmers can safeguard their income and thus livelihood via the introduction of these climate-resilient crops. So for them the potential benefits are very high. On the other hand there are also some risks linked to this technology that have to be considered and assessed how the farmers perceive them. Their influence on governments and authorities, and thus regulation is often high, making them a potentially powerful opponent. A co-creation session needs to have both traditional and more progressive farmers on board in order to get potential benefits and opportunities discussed as well as





the risks. A co-creation session with these crop producing farmers is foreseen to be organised in Belgium.

An important subgroup within the farmers are the organic crop producing farmers, who are not allowed to grow these crops. So this highly influential group of farmers is left with a high risk level and basically no benefits to compensate. At this point we have foreseen to organise in-depth interviews with the representatives (and/or lobby groups) of the organic famers.

3. Environmental lobby groups: There are potential benefits for the environment, as well as potential risks. Different groups however can have very different opinions on 'modifying crops', and are therefore tackled in in-depth interviews.

### 5.3.2 Consumer co-creation sessions

#### 18:30 Welcome, introduction & warm-up

- Presentation round – everyone briefly introduces themselves (creative)
- Mission of the evening: what do we want to know from people?
- Presentation of the rules
- Warm-up exercises (e.g. 'Black stories')

#### 19:15 Part 1 – Framing and how do they look at biotechnology

##### Introduction of the project

Explain the framework of the evening and the project:

- Session is done in the framework of an EU project;
- The project seeks to better include the public (and other stakeholders) when a legislative framework needs to be set up and other measures linked to the implementation of these new technologies, in this case biotechnology.;
- Today we talk about what is happening to our climate, and how it affects our food production? Can biotechnology play a role in adapting to a changing climate?

##### Association exercise (Q1)

What are your feelings, ideas, questions, etc. linked to the following words? What would you want it to be?

- Biotechnology;
- GMO;
- New Genomic Techniques;
- CRISPR-CAS

Write these words in the centre of big, white papers. People can write words, make drawings, build on what already has been written by others and discuss amongst each other.

When writing has stopped, go through what has been written down in the association exercise and encourage discussion using questions.

#### **Why is the EU looking at biotechnology?**

Explain the scope: What is happening to our climate, and how does it affect food production?



### 19:45 Part 2 – Comparing alternatives

#### Group exercise (Q3)

Part 1: How could the increasing difficulties with food production affect your daily lives?

- How will it change our eating patterns?
- What effect will it have on food prices?
- Will we have to give up certain foods? Which ones are you willing to give up? Which ones do you think are the first ones we will have to miss?

Part 2: How can we arm ourselves against this scenario?

- How can we anticipate in changing our food patterns?
- And as a consequence, how can we anticipate in changing our agricultural patterns?

#### The alternatives and possible solutions (Q3)

Explain a few of the options to secure food production in a changing climate (not too extensive). Highlight that we had sessions on several of these in the past, so all of these are important for us:

- Drastically reduce meat production (link to previous work on this topic);
- Increase biodiversity in agriculture and the used of mixed agricultural models;
- Vertical (indoor) farming & urban farming;
- Sea farming: seaweed & algae;
- Bacterial / algal production of nutritional elements (including 'Cell factories', explain that a session on this has been done already);
- Selective breeding of more climate resilient plants.

Leave room for questions and discussion.

#### Challenges (Q3)

Explain and discuss the challenges linked to some of these solutions:

- Some require drastic shifts in dietary patterns, which might pose nutritional challenges;
- Biodiversity is a great weapon against climate change, it is also very challenged by climate change;
- Selective breeding is a slow process;
- Etc.

### 20:45 Part 3 – Biotechnology as solution: the case of climate-resilient crops

#### Explain the technology and discuss (Q1)

Introduce biotechnology as one of the possible solutions:

- Speed up the process
- Sustain biodiversity

Leave room for questions and discussion.

How?

Technical explanation:



- Comparison of selective breeding and NGT-based enhancement;
- Explain there are many ways to enhance or adapt these crops;
- Explain the difference between transgenesis and cisgenesis;
- Explain the scope (and EU interest) is now primarily on cis-genesis;
- Explain the characteristics of the end result.

*Remark: answer technical questions during the explanations, but keep discussions for the exercise afterwards.*

#### Scenario exercise (Q1, Q2)

What will happen if we introduce this biotechnological?

Distribute post its (green = good, red = bad; yellow = neutral) to put on 4 whiteboards with the following questions:

- How do you see it affecting our food, health and safety?
- How do you see it affecting our agricultural landscape and the environment?
- How do you see it affecting our social structure and economy?
- Other?

Cluster the post its according to the risks and benefits identified beforehand linked to the RBA.

#### Discussion of risks and benefits (Q2, Q4)

Present the risks & benefits identified beforehand (each risk/benefit has one slide; including the mitigation measures for the risks) and compare with the results (post its) of the previous exercise.

#### 21:45 Part 4 - Outro & MEL

Explain that it is normal to be slightly (or even a lot) overwhelmed or even confused. It is now time to let the information sink in. Recapitulate on the framing in a EU project and information on further steps and what will be done with their input.

Explain you will now ask a few simple questions to round off, and that you will also send them a few extra questions in the coming days about what they learned from this session after the information has sunk in a bit.

Proceed with the MEL questionnaire

#### Follow-up (Q5)

The follow-up questionnaire is very similar to the one for the cases for 'Cell factories' and 'Eating the cells'.

### 5.3.3 Co-creation sessions with the farmers

In this case the farmers mostly affected are the crop producing farmers and specifically also the organic crop producing farmers. A co-creation session with the regular crop producing farmers will be set up and executed in Belgium by FF. Alice will provide support from a methodological point of view. The organic farmers and their lobby groups will be involved via in-depth interviews.



The central questions of the co-creation session with the regular crop producing farmers are in line with the linked consumer co-creation session. Considering this, also the set-up and outline will be comparable to the outline of the linked consumer co-creation session. The risks and mitigation measures will sometimes deviate, as the farmers are often economically affected by the introduction of the biotechnological solution.

#### 5.3.4 Interviews with environmental lobby groups

See higher 'Cell factories'.



## 5.4 Case 3: Biostimulants & biofertilizers

The case of 'Biostimulants & biofertilizers' strives to find alternatives to chemically produced fertilizers and reduce the use of pesticides, therefore benefitting mainly the farmers and the environment.

### 5.4.1 RBA and prioritisation of stakeholders

The initial stakeholder mapping, including the relations of influence between different stakeholders is shown in Figure 20. In Figure 21 each stakeholder is shown plotted on the diagram of influence (power) versus interest, making it easier to evaluate their importance.

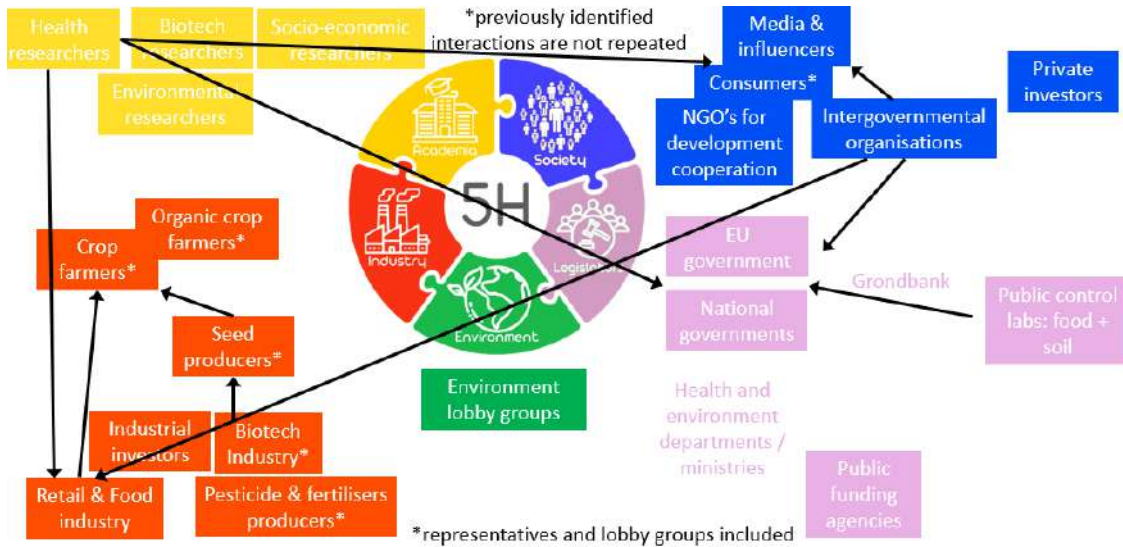


Figure 20. Stakeholder mapping and interactions between them for 'Biostimulants & biofertilizers'

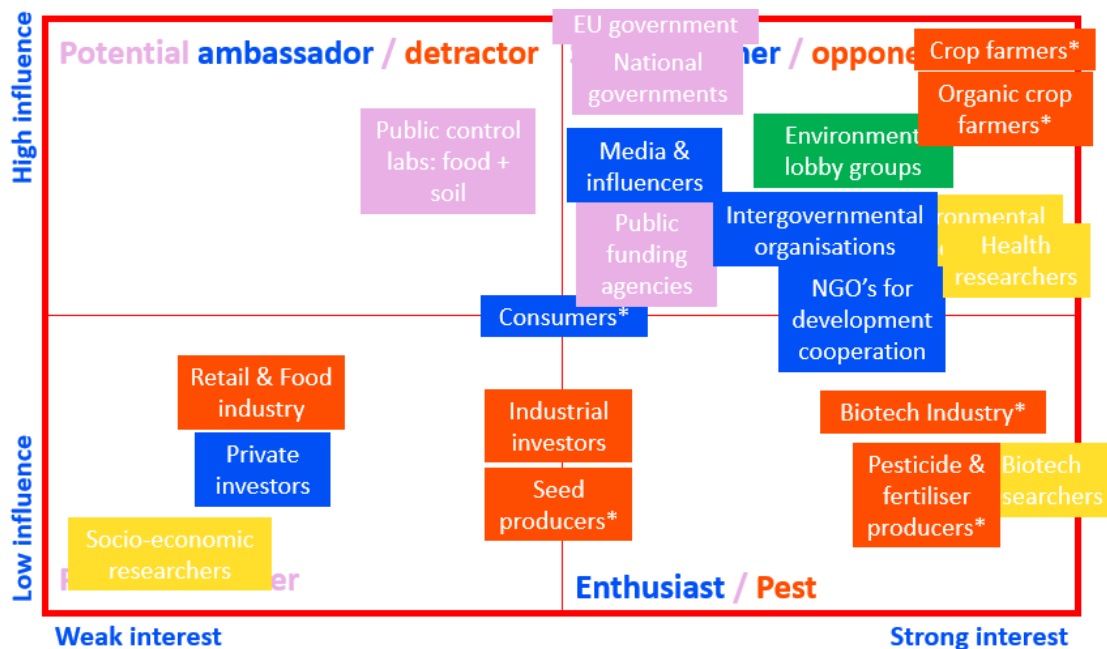


Figure 21. Plotting the influence (power) versus the interest of each stakeholder



A synthesis of this information, including the argumentation of the influence, but also the RBAs and how they are assigned to each stakeholder and the evaluations of influence, overall risk and benefit can be found in the excel file in Annex 1. The plot leading to the prioritisation is shown in Figure 22.

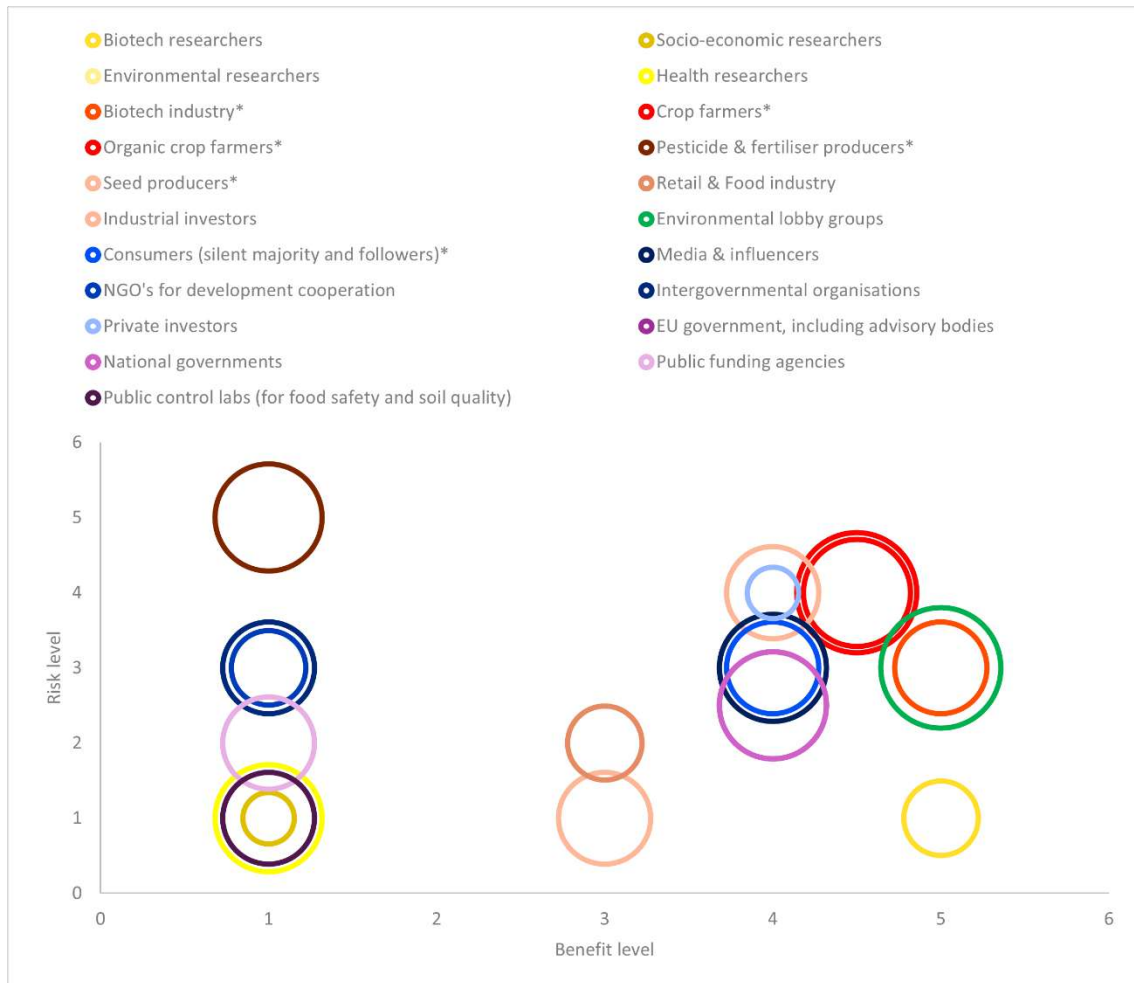
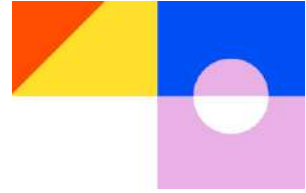


Figure 22. Plotting the overall benefit (X-axis) & risk level (Y-axis) and influence level (size of the bubble) per stakeholder group for the case 'Biostimulants & biofertilizers'

This led to the following prioritisation:

1. Farmers: The technology serves mostly the farmers, but differences in effectivity compared to conventionally used products and/or unintended effects on soil and environment will also mostly reflect on their business and income. Their influence on governments and authorities, and thus regulation is often high, making them a potentially powerful opponent. A distinction can be made between organic farmers, who do not have the alternative of conventional products, and conventional farmers. The latter are expected to feel a larger impact, and will therefore form the focus of this co-creation session. Also this co-creation session needs to have both traditional and more progressive farmers on board in order to get potential benefits and opportunities discussed as well as the risks. The views of organic farmers will be addressed with in-depth interviews with organic farming representatives (lobby groups).



2. Environmental lobby groups: There are potential benefits for the environment, as well as potential risks. Different groups however can have very different opinions on 'modifying organisms', and are therefore tackled in in-depth interviews.
3. Consumers: They are the final deciders for adoption of the technology (through buying behaviour), and are affected by the residues of conventional pesticides on their food and the effects of human-made fertilizers in their environment. It is however less likely to have a great effect on their daily lives as for some of the other cases, where their food, and the way it is produced is directly altered. More involved consumers are targeted for this co-creation session, as the bulk of consumers have little knowledge on, and thus interest in, this subject.

As explained under Chapter 4, the producers of pesticides and chemical fertilizers were deemed to have similar views on this case as the chemical industry related to the case on 'Bio-based materials', and were therefore not actively involved in a co-creation session, despite their high risk and relatively high influence.

#### 5.4.2 Co-creation sessions with the farmers

In this case the farmers mostly affected are the crop producing farmers and specifically also the organic crop producing farmers. A co-creation session with the regular crop producing farmers will be set up and executed in Belgium by FF. Alice will provide support from a methodological point of view. The organic farmers and their lobby groups will be involved via in-depth interviews.

The central questions of the co-creation session with the regular crop producing farmers are in line with the linked consumer co-creation session. Considering this also the set-up and outline will be comparable to the outline of the linked consumer co-creation session. The risks and mitigation measures will sometimes deviate, as the farmers are often economically affected by the introduction of the biotechnological solution.

#### 5.4.3 Consumer co-creation sessions

*Preliminary remark: in this consumer co-creation session the case of 'Biostimulants & biofertilizers' and the case on 'Bacteriophages' are combined, as explained under Chapter 4.*

##### 18:30 Welcome, introduction & warm-up

- Presentation round – everyone briefly introduces themselves (creative)
- Mission of the evening: What do we want to know from people?
- Presentation of the rules
- Warm-up exercises (e.g. 'Black stories')

##### 19:15 Part 1 – Framing and how do they look at biotechnology

###### Introduction of the project

Explain the framework of the evening and the project

- Session is done in the framework of an EU project;



- The project seeks to better include the public (and other stakeholders) when a legislative framework needs to be set up and other measures linked to the implementation of these new technologies, in this case biotechnology.;
- Today we talk about if biotechnology can be a solution to problems associated with current agricultural practices like the use of pesticides, fertilizers and antibiotics.

### Association exercise (Q1)

There are two types of biotechnology we want to zoom into today:

- The use of micro-organisms as an alternative to pesticides and chemical fertilisers (called biostimulants and biofertilizers);
- The use of bacteriophages as an alternative to antibiotics.

We realise these terms are probably new to you. But when we put these technologies into practice, we want to know from you whether there could be possible opposition against their use, and why.

So start of with an association exercise around the following words:

- Biotechnology
- Biostimulants & biofertilizers
- Micro-organisms
- Bacteriophages

Write these words in the centre of big, white papers. On the top of the paper you write the following questions:

- What do you think it means?
- Do these words trigger any feelings or associations?

### 20:00 *Part 2 – Problems caused by our current way of working*

#### How do they feel about the current way of working (Q3)

As mentioned, these are potential solutions to problems associated with current practices in food production. What do you know about these problems?

Group work (2-3 participants) with three templates on the following topics:

- Pesticides
- Chemical fertilisers
- Antibiotics

Answer the following questions:

- Why do we use them in food production?
- What problems do they bring?
- Are there other solutions?

Use the results to further explain why they are being used, and the problems we face with the use of pesticides, fertilisers and antibiotics.





*20:45 Part 3 – Biotechnology as solution? How do they feel about that?*

Explain and discuss (Q1)

Explain the concept:

- Explain good and bad bacteria, microbiomes and bacteriophages
- Explain how they are identified (researched) and grown to be put in practice

Leave plenty of time for questions and discussions.

Comparing scenarios (Q2, Q3)

- What happens if we apply this technology versus what if we keep doing the way we are doing it now?

Two groups with a moderator that stays at the table:

- Biostimulants & biofertilizers
- Bacteriophages

The moderator will ask the following question:

- Is there a third scenario?

When the idea generation and input has stopped, the groups will switch tables and they can add on what has been written by the previous group.

When writing and discussions have stopped the moderators will report on the results on their table.

Discussion of risks and benefits (Q2, Q4)

Present the risks & benefits identified beforehand on both cases ('Biostimulants & biofertilizers' and 'Bacteriophages'). Each risk/benefit has one slide; including the mitigation measures for the risks. There will be room for questions and additional discussions.

*21:45 Part 4 - Outro & MEL*

Repeat of the association exercise (Q1, Q5)

Giving the opportunity to compare before and after:

- Biotechnology
- Biostimulants & biofertilizers
- Bacteriophages

Outro & MEL

Explain that it is normal to be slightly (or even a lot) overwhelmed or even confused. It is now time to let the information sink in. Recapitulate on the framing in a EU project and information on further steps and what will be done with their input.

Explain you will now ask a few simple questions to round off, and that you will also send them a few extra questions in the coming days about what they learned from this session after the information has sunk in a bit.

Proceed with the MEL questionnaire



### *Follow-up (Q5)*

The follow-up questionnaire is very similar to the one for the cases for 'Cell factories' and 'Eating the cells'.

#### 5.4.4 Interviews with environmental lobby groups

See higher 'Cell factories'.



## 5.5 Case 6: Bacteriophages

Bacteriophages have the potential to replace or at least reduce the use of antibiotics in keeping animal disease and contaminations at bay, thereby securing food safety without the potential threat of antibiotic overuse on human health. Retaining animal health benefits mainly the farmers, but the effect of minimising antibiotic use also benefits consumers and environment.

### 5.5.1 RBA and prioritisation of stakeholders

The initial stakeholder mapping, including the relations of influence between different stakeholders is shown in Figure 23. In Figure 24, each stakeholder is shown plotted on the diagram of influence (power) versus interest, making it easier to evaluate their importance.

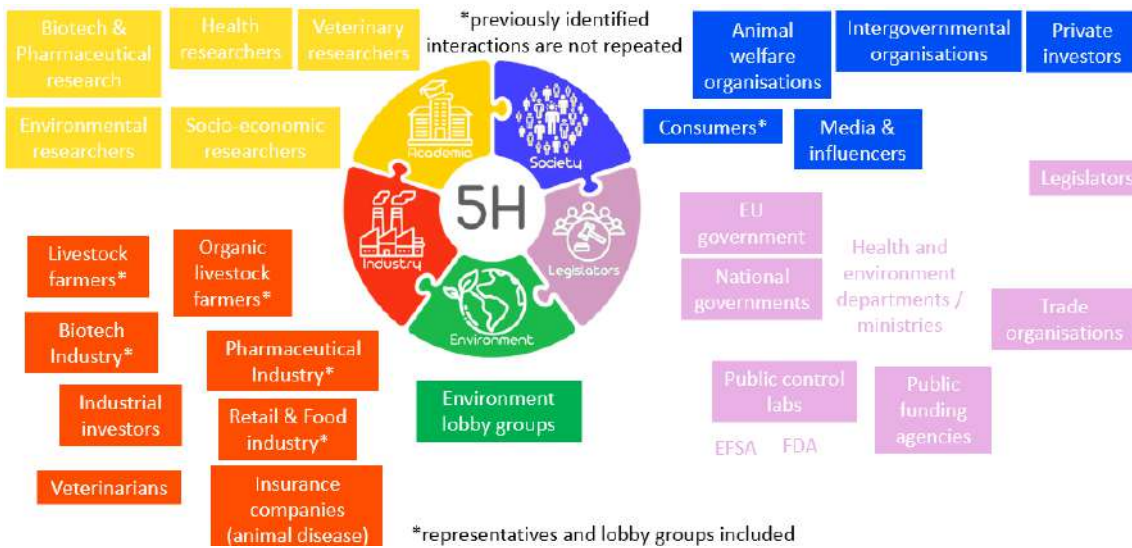


Figure 23. Stakeholder mapping and interactions between them for 'Bacteriophages'

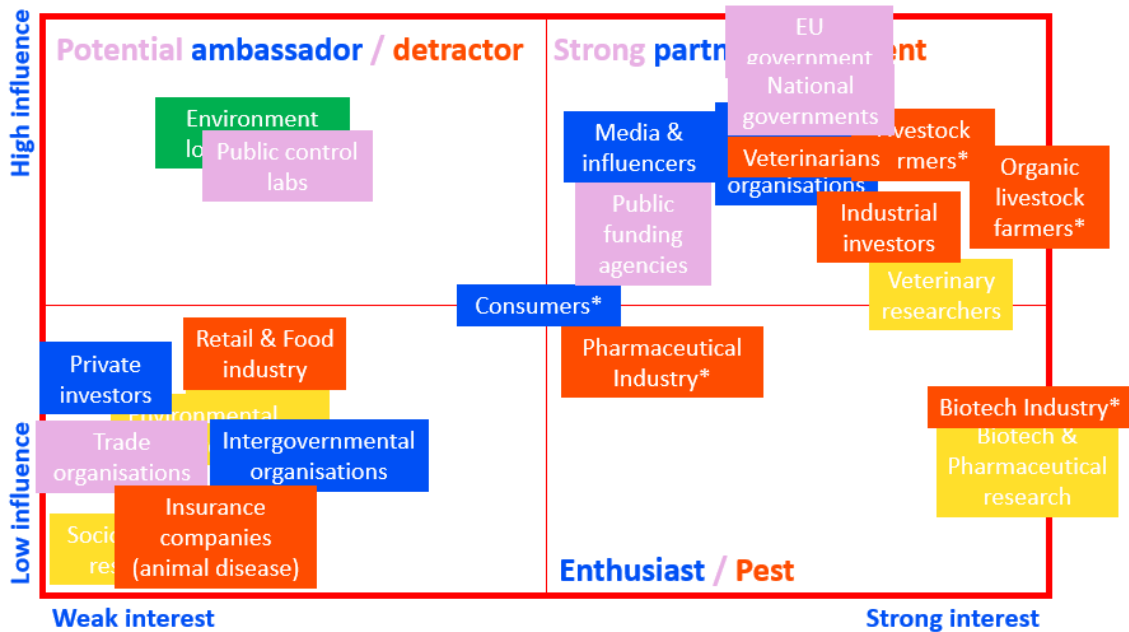


Figure 24. Plotting the influence (power) versus the interest of each stakeholder



A synthesis of this information, including the argumentation of the influence, but also the RBAs and how they are assigned to each stakeholder and the evaluations of influence, overall risk and benefit can be found in the excel file in Annex 1. The plot leading to the prioritisation is shown in Figure 25.

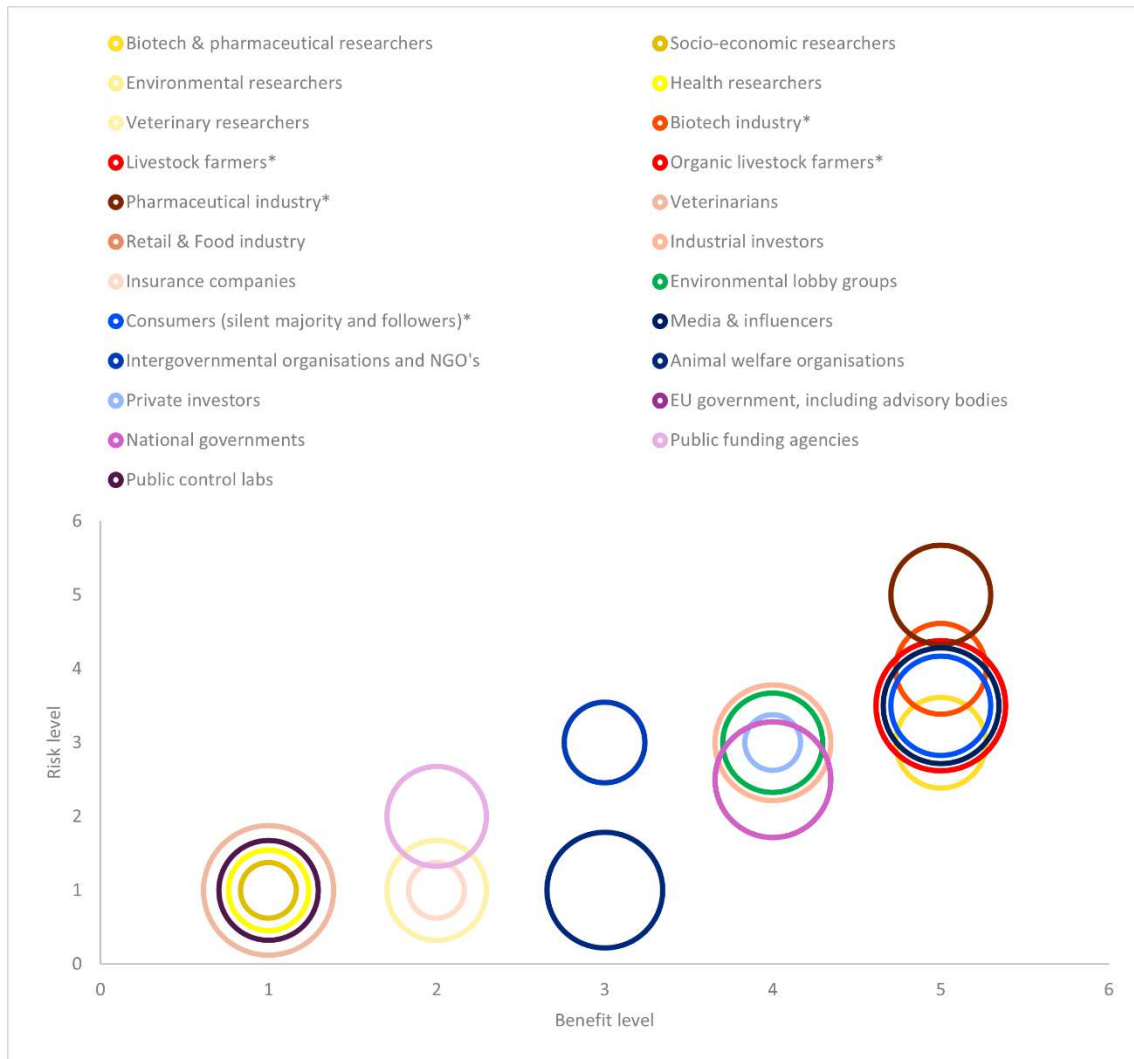


Figure 25. Plotting the overall benefit (X-axis) & risk level (Y-axis) and influence level (size of the bubble) per stakeholder group for the case 'Bacteriophages'

The evaluation led to the following prioritisation:

1. Livestock farmers: The technology serves mostly the farmers, but differences in effectivity compared to conventionally used products and/or unintended effects on animal health will also mostly reflect on their business and income. Their influence on governments and authorities, and thus regulation is often high, making them a potentially powerful opponent. A distinction can be made between organic farmers, who have the alternative of conventional products to a lesser extend (not to be used in a preventive manner only when absolutely necessary), and conventional farmers. The latter are expected to feel a larger impact, and will therefore form the focus of this co-creation session. Also this co-creation session needs to have both traditional and more progressive farmers on board in order to



get potential benefits and opportunities discussed as well as the risks. The views of organic farmers will be addressed with in-depth interviews with organic farming representatives (lobby groups).

2. Consumers: They are the final deciders for adoption of the technology (through buying behaviour), and are affected by the residues of antibiotics in their food and the effects of overuse on their health. It is however less likely to have a great effect on their daily lives. More involved consumers are targeted for this co-creation session, as the bulk of consumers have little knowledge and thus interest on this subject.
3. Environmental lobby groups: A reduction of antibiotic use has definite benefits for the environment, and animal as well as human health. However, the risks for large-scale application are largely unknown, and therefore to be considered relatively high. Different groups can have very different opinions on the concept, and are tackled in in-depth interviews.

As explained under Chapter 4, the pharmaceutical industry was deemed to have similar views on the case as the chemical industry for 'Bio-based materials', and was therefore not actively involved in a co-creation session, despite their high risk and relatively high influence.

#### 5.5.2 Co-creation sessions with the farmers

In this case the farmers mostly affected are the livestock farmers. A co-creation session with these farmers will be set up and executed in Belgium by FF. Alice will provide support from a methodological point of view.

The central questions are in line with the linked consumer co-creation session. Considering this also the set-up and outline will be comparable to the outline of the linked consumer co-creation session. The risks and mitigation measures will sometimes deviate, as the farmers are often economically affected by the introduction of the biotechnological solution.

#### 5.5.3 Consumer co-creation sessions

See consumer co-creation session on 'Biostimulants & biofertilizers' (see Chapter 5.4.3); as explained these cases were combined for the consumers.

#### 5.5.4 Interviews with environmental lobby groups

See higher 'Cell factories'.



## 5.6 Case 2: Bio-based materials

The main outcome of the 'Biomaterials' case is having sustainable alternatives to the current fossil-based, non-biodegradable materials. The non-toxic and biodegradable nature of these materials primarily benefits the environment, but is obviously also a great opportunity for the bio-based industry.

### 5.6.1 RBA and prioritisation of stakeholders

The RBA, mapping of the stakeholders and assessments of influence (interest), overall risks and benefits are planned for October '24. In this perspective the co-creation trajectory of this case could not be set up yet.



## 6 DEVIATIONS

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The deadline of this deliverable was originally set at M8 (as described in the DoA), so by the end of July '24. For practical reasons, as intense interactions and discussions with all the partners are required to develop the place- and context based co-creation trajectories, it was decided to postpone the deadline with 2 months to the end of September '24. This deferment also ensured the inclusion of detailed outlines of 5 of the co-creation trajectories linked to the selected Biotech Co-Creation Cases.



## 7 REFERENCES

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- [1] Oloo, B., Maredia, K. and Mbabazi, R. (2020). Earning trust and building credibility with a new paradigm for effective scientific risk-benefit communication of biotechnology innovations. *African Journal of Biotechnology*; Vol. 19(9), 684-693.
- [2] Sax, J. K. (2017). *Biotechnology and Consumer Decision-Making* (Vol. 47). California, US: *Seton Hall Law Review*; 47: 433-486.





## 8 ANNEXES

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- Annex 1: Detailed overview of the assessments of the influence, overall risks and benefits of the different, mapped stakeholders per Biotech Co-creation Case