



Deliverable 4.2

Report on key success factors for realisation of breakthroughs

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Report on key success factors for realisation of breakthroughs

Summary

The second phase of the FIT4FOOD2030 project aims at contributing to an agenda to transform the Food and Nutrition System in integrating the results of the analysis of showcases and breakthroughs. Picking up the work of Deliverable 4.1, the inventory of R&I breakthroughs, further literature study, a workshop and input from City Lab multi-stakeholder workshops aiming at the identification of pathways that innovation take in their implementation and diffusion, deliverable 4.2. describes

- Conceptual background of (R&I) breakthroughs
- Analysis of potential breakthroughs in different areas
- Clusters and overall patterns of success factors for potential breakthroughs

FIT4FOOD2030 has defined R&I breakthroughs as potential, significant achievements that may lead to an increased impact of the current initiatives in the field of FNS, the food and nutrition system, and a step towards or radical change of the food system, making it more sustainable and resilient. Breakthroughs of any kind are a notable change to some previous point of reference.

For the discussion of breakthrough criteria identified from the database generated in WP1, further literature study and in collaboration with the platform structures (WPs5&6), a workshop was organised on February 21st, 2019.

Moreover, multi-stakeholder workshops were also performed by some City Labs (Budapest, Tartu, Sofia, Athens, Milan, Barcelona) as part of the WP6 activities between September 2018 and January 2019 (with a similar aim as that described in this deliverable). However, although some outputs were incorporated to the discussions in this deliverable, an in-depth analysis will be made further on in Deliverable 4.4: Appropriate instruments for the identification of R&I breakthroughs for the future (M28-M32). The methodology employed for working on this topic, as well as details on how the City Labs adapted this to their local stakeholder context, are already available in annexes 8.3 and 8.4 of this deliverable. The workshop reports on stakeholder inputs from the City Labs are incorporated as Annex 8.4. of this deliverable, so the reader can understand also the complexity and diversity of the overall results.

As D4.1 grouped potential breakthroughs in four areas we selected our potential breakthroughs that exemplified the four areas:

- AQIculture 4.0 which means new, non-conventional forms of agriculture and aquaculture
- Integration of consumer perspectives in production & distribution where production and logistic companies have incorporated the values of empowered consumers in their business models

- Consumption of alternative proteins which means achieving a change of dietary habits through rising awareness, a higher diversity of food accepted by consumers, reduced meat consumption, etc
- Smart, Traceable and Sustainable Packaging, meaning packaging enables new forms of logistics, but also makes recycling or re-use more efficient.

As these four potential breakthroughs are very diverse they have to be seen in their overlaps as well as in their complementary nature to achieve system transformation in the FNS. Following this, we clustered drivers and barriers and provided the gist in a common storyline.

Introducing novelty: (Social) start-ups are important drivers for technological, social and economic change. They are important vehicles in **introducing new artefacts for new practices**. However, we can see **differences in the role of start-ups across the four areas**. Start-ups and crowdsourcing have a different role in reducing plastic packaging compared to e.g. AQLculture or alternative proteins: They themselves are not the drivers of change in a sector or the proponents of a new sector, but they have a “reactive” role, in trying to eliminate the damage done by established practices. **Major uncertainties: Large uncertainties go along with young technologies.** The variety of possibilities to turn technologies into products is huge, there are no dominant designs, consequences of choices and scaling up are often unclear. Consumers must learn about the new products and their features and functions and what to use them best for.

Role of citizens: Involvement of consumers, education of citizens and raising awareness are central factors for breakthroughs. RRI plays a critical role here – RRI should be well devised to make sure that citizen concerns are taken into consideration during the scaling up from niche level (e.g. in case some practices prove problematic; to consider social equity issues), and that communities that might feel threatened about the change are involved, accept the process and receive the support they need in the transition.

Role of research, NGOs and media: NGOs and research help to destabilize current practices that lead to many environmental and health-related practices. **Statistical evidence** and studies on food behaviour, waste amounts, waste disposal, health, state of oceans, dying of animals, climate change etc. initiate **public discourse, education**, link up different actors, and raise awareness in general (e.g. images of plastics in oceans endangering animals brings the issues closer to consumers who otherwise do not perceive the impacts of their behaviour). Social media can be helpful, but dangerous as well because of fake news.

Regulation: Existing regulation is nearly always perceived to work in favour of incumbent regime. Policy is often seen as being too hesitant. The expectation is often the consumer choice on its own driving change and transformation. This view may put too much pressure on the consumer.

Inertia: What would be necessary is a **mix of education, empowerment, and regulation**, which leads to the question: Why isn't change taking place? Inertia is naturally embedded in systems (regime, landscape levels are hard to affect).



The gist

Even though some overall patterns that lead to actual breakthroughs were identified they still differ in their characteristics or roles of focal actors. When introducing novelties, we sense large uncertainties that go along with young technologies. Initiating public discourse and education, linking different actors and strong involvement of policy, NGOs, research and consumers was considered a great incentive on the way to a breakthrough. Existing regulation is considered to work in favour of present regimes, where educated consumers and citizens can put pressure on. The appropriate mixture of education, empowerment and regulation leads to success of breakthroughs over time.

1 Introduction

The second phase of the FIT4FOOD2030 project aims at contributing to an agenda to transform the Food and Nutrition System in integrating the results of the analysis of showcases and breakthroughs. Insights from the system analysis, trends, showcases and past breakthroughs provided input to the work in task 4.2., which was dedicated to the analysis of critical success factors for potential future breakthroughs.

This deliverable aims to cover the second objective of WP4, which is the identification of key drivers and key barriers, which have had or will have most impact on the development of these breakthroughs.

Picking up the work of Deliverable 4.1, the inventory of R&I breakthroughs, further literature study, a workshop and input from City Lab multi-stakeholder workshops aiming at the identification of pathways that innovation take in their implementation and diffusion (see annex 8.3. and 8.4.) , deliverable 4.2. describes

- Conceptual background of (R&I) breakthroughs (Ch 2)
- Analysis of potential breakthroughs in different areas
- Cluster and find patterns of success factors for potential breakthroughs (Ch 4)
- Cluster success factors of potential breakthroughs (Ch 5)¹

The process to analyse success factors started from the work of task 4.1. and the already identified potential future breakthroughs. Success factors are factors that determine the success or failure of a novel solution, they include drivers of the novel solution and barriers for the novel solution to become effective. As this list comprises a variety of potential breakthroughs from different areas, from new approaches of primary food production and distribution to engaged and healthy consumer issues, we selected one example in each area on the basis of expert discussions. Further in-depth literature study focused on the dynamics of breakthroughs and innovation pathways. The selected breakthrough cases were used to address barriers, actors who steer developments (focal actors) and incentives in a workshop organised in February 2019. Also, the dynamics and possible related policies to R&I breakthroughs were discussed.

Furthermore, the concept of breakthroughs was used in six City Lab multi-stakeholder workshops carried out under WP 6 between September 2018 and January 2019 and parts of the results of the discussion are integrated in this deliverable. Annex 8.3. outlines the methodology used in this context. The outcomes from City Lab workshops were too broad to be included at this stage, so Annex 8.4 includes the reports submitted by the City Lab coordinators.

As a conclusion the overall patterns of breakthroughs and factors which were considered to be crucial for success or act as barriers of change are outlined in this deliverable.

¹ Please note that we clustered success factors for potential breakthroughs but did not rank the clusters as was originally envisaged when writing the proposal. We see the clusters of success factors as complementary, it would be very difficult to introduce a ranking between e.g. social and environmental factors.

2 Breakthroughs - conceptual background



Image source: Schartinger

FIT4FOOD2030 has defined R&I breakthroughs as potential, significant achievements that may lead to an increased impact of the current initiatives in the field of the food and nutrition system and a step towards/radical change of the food system, making it more sustainable and resilient. (see also D4.1, p 1)

Breakthroughs of any kind are a notable change to some previous point of reference. Any innovative solution starts with a low number of users and probably low technological maturity (in case it has technological components at all). This is called the seed or infancy phase of an innovative solution. Most innovative solutions never go beyond this initial phase. However, if the new solution survives this first phase it becomes a key solution/technology which means that it has been taken up by many users and is actually supplied by a number of firms in the marketplace. Finally, in case of great success it then converts to a mainstream solution/basic technology that is used widely, but where it is also very difficult or expensive to develop this solution pathway further. Limits have been reached and possibilities of new approaches emerge (Foster 1986; Geroski 2000; Adner & Kapoor 2016).

As breakthroughs involve some deviation from previous solutions they are often described as situations in which an economic sector is shaken up and previously successful established actors stumble. This can happen through “disruptive innovations”, i.e. those where new solutions enter either because disruptors provide good enough products for less demanding customers while established providers serve the most demanding and most profitable customers (*low-end foothold*). Or because disruptors establish a market where demand and supply have not met before, i.e. they convert non-users into users (*new market foothold*). When mainstream customers then start purchasing the new solution in volume, disruption has occurred (Christensen 1997; Christensen *et al.* 2015).

Breakthroughs: Common factors from the past

The clearest point on breakthrough definition is to have an impact at the regime level of knowledge. Regime is the state of the art established in a system, the *status-quo* achieved in a sociotechnical environment with a shared area of knowledge.

One of the main common points of R&I breakthroughs is that they are all recognised through time. There was no way back, they were not forgotten, they became mainstream.

Breakthroughs have a transversal impact on different areas, they do not stay in a niche.

Still, breakthroughs require niche innovations and trends that provide the appropriate context for the step forward (see Geels 2004).

Breakthroughs need time to happen. (Domestication of plant and animal varieties took an evolutionary stage ranging from 1,000 to 5,000 years, vs the breeding technology applied on the Third agricultural revolution just took some years of research.)

There are different outcomes and paths to achieve an R&I breakthrough. In some cases, we observed a casual discovery, in others an applied research, in some there was a transfer of knowledge, in others a brilliant insight, some had a great competitiveness, and in other cases there were a certain amount of milestones through an innovation necessary to achieve an overall impact.

Single individuals or organisations [focal actors] are possibly one of the main keys for an R&I breakthrough, we have cases in history of key personalities.

Source: D4.1 (p13ff)

The breakthrough of some new solutions needs time and has to be seen as a process. As pointed out already in D4.1 this can be viewed in relation to the multi-level governance perspective originally introduced by (Geels 2002; Geels 2004; Schot & Geels 2008) and further developed to become an omnipresent framework on the EU level, see Bache *et al.* (2016) and Getimis (2016). FIT4FOOD2030 pays tribute to this in its research design with analysing showcases as small, individual innovations representing the niche level, and furthermore researching breakthroughs and trends as the levels of regimes and landscapes.

But what are factors that have shown to be relevant for breakthroughs to happen? This line of questioning is informed by past breakthroughs, factors are often unique because of the specific context.

As breakthroughs describe forms of diffusion particular attention has to be paid to users.

We can refer here to a model of innovation diffusion established by Rogers (2003) based on his work since 1965. It builds on research that was done on new strains of seed potatoes adopted by American farmers in the 19th century. This is interesting in the FIT4FOOD2030 context although the principles of adopting a new solution can be generalized to other forms of markets and clients as well (e.g. private end-users) (Moore & Benbasat 1991). The general model proposes a bell curve of innovation adoption starting with innovators and early adopters, followed by early majority, late majority and finally laggards. But often this process of innovation diffusion is far from smooth.

The reason for this is that these groups of adopters have different characteristics so that transition happens neither automatically nor smoothly.

When early adopters buy some novel products, they expect a radical discontinuity between the old ways and the new, they are also prepared to deal with the inevitable bugs and mistakes that are part of any new solution coming to the market.

In contrast, the early majority looks for a productivity improvement of existing operations, with a minimal disruption of their old ways of coping with things. They want a new solution to enhance, not overthrow, their established ways and, they definitely do not want to debug other people's products. So the needs and expectations of early adopters and early majority are very different, which creates a *chasm* (Moore 2002: 19).

References (testimonials) are essential for early majority to adopt, but due to their special characteristics early adopters may not serve as references. In avoiding disruption, no potential early majority member will adopt the technology without having consulted several others with similar preferences.

Di Benedetto and Crawford define diffusion of innovation as “the process by which an innovation is spread within a market, over time and over categories of adopters” (Crawford & Di Benedetto 2009: 241). Furthermore, Rogers (2003) proposed and investigated several attributes of innovations [in our wording: relevant factors] which influence its rate of diffusion:

There are several attributes of innovations that influence their rate of diffusion

- First, **relative advantage** of the innovation compared to its competing products, existing practices or ideas it supersedes. Examples are economic advantages, social prestige, savings in time or satisfaction. For the diffusion of insect-based food for example, which has been in the process of “emerging” for some years now without quite living up to expectations, Shelomi (2015: 312) argues that inconvenience seems a major disadvantage: Insect-based food is quite difficult to access on the market, meaning that people mostly have to buy at a different location from that of their local food store. Inconvenience in general acts against relative advantage of an innovative solution.
- Secondly, **compatibility** of the innovation with users existing values, past experiences and needs of potential adopters. According to Rogers an innovation that is not compatible with users values norms and practices will not be adopted as fast as a compatible innovation. Di Benedetto (2010) emphasizes microwaves as an example, which did not sell well at the beginning due to the fact that they prepared food in a very different way compared to traditional cooking.
- Thirdly, **complexity** is another important attribute that significantly influences the rate of diffusion. The easier a product is to understand and to use, the more likely is a high diffusion rate. This may also be the case for necessary equipment or infrastructure as was the case with freezing. Users did not buy frozen food because complex storage and investment was necessary, i.e. users had to have a freezer at home. Until WWII it did not become mainstream because of expensive adaptations in many households (see also D4.1).
- Fourth, **trialability** indicates how easy it is for users to experiment with an innovation. It is for instance very easy for users to play around with a downloaded software trial with limited functions. An innovation that allows experimentation represents less uncertainty for users and is therefore generally adopted more rapidly. In contrast, a lack of trialability acts as a barrier of diffusion. Adoption of high

pressure processing took time to diffuse in the market due to the high investments without real possibilities to try out in advance (see D4.1).

- Fifth, **observability** refers to the extent users can easily see results of innovations. The easier it is for users to see benefits from new products, the more likely it is that they will adopt.

Relevant factors we can learn from a non-food example

As an example from the non-food sector the introduction of defibrillators for public users is given here. This health care service innovation incorporated the aims of i) creating a physical infrastructure of affordable handheld defibrillators in Austria, and ii) to involve an entire nation in the activity in order to set up public access defibrillation (PAD) services (Fleischhackl *et al.* 2006). Before the project, the notions and functions of handheld defibrillators were widely unknown in the Austrian population. Major relevant factors in the setting up of a new service nationwide were (Schartinger 2013; Windrum *et al.* 2016):

- **New scientific knowledge:** The discussion about handheld defibrillators started on the scientific level in the US at the end of the 1990s.
- **Transfer of knowledge:** These first seminal publications were highly noticed by the international medical scientific community and diffused to the Austrian Red Cross (ARC) as there is a high degree of permeability between the ARC and the medical scientific community in Austria: Members of the ARC (paramedics and other health professionals) receive education and training from the medical universities and hospitals, whereas people from the universities, university clinics and other hospitals work for the ARC on the different levels, from daily emergency service to leading positions..
- **First applications, trials:** There were first international projects, trials. They stopped early and were hardly comparable. However, they increased awareness and sharpened the edges of what to try to accomplish in a new project and what not.
- **New regulation:** A legal amendment as well as a judicial clarification from the Ministry for Health were necessary to allow paramedics and lay persons to apply handheld defibrillators, before this only medical doctors were allowed to do so. (**New users**)
- **Changes in user practice:** It led to the installation of handheld defibrillators in ambulance cars introducing a new group of users (paramedics).
- **Failure, disappointment:** The realisation that handheld defibrillators still arrive too late, even if they are installed in every ambulance car, was new at the time.
- **Learning, logical consequence:** The compelling consequence was that handheld defibrillators have to be available in public, this is where cases of emergency happen.

- **New artefacts:** This caused changes in the product market of handheld defibrillators - firms had the incentive to start the development of handheld defibrillators for lay persons.
- **Focal actor:** Based on the understanding that the application of handheld defibrillators by lay persons is desirable and important and within its core competency, the Austrian Red Cross looked for allies. They enrolled a highly influential cooperation partner (Austrian Broadcasting Corporation).
- **Networks** Together, they assembled a critical mass of allies.
- **Design of an innovation strategy:** The institutional innovation strategy followed was to invent and establish markets to enable the offering of the new service, first the establishment of a product market for handheld defibrillators as a product, and secondly, the establishment of a service market for public access defibrillation as a service. In including private actors (firms) in the functioning of the new markets, it was possible to provide the new service independently from the public social health care insurance fund system. Complementing **statistical research (evidence-based medicine)** was part of the strategy from the beginning.
- **Human resources:** First, a nation-wide media campaign raised awareness and informed the public. Secondly, they created human resources in terms of **trained people**. Defibrillator training is now part of every first aid training.

This example inspired the discussion in the workshop as outlined in the following chapter 3.

3 Methodology

For the discussion of breakthrough criteria identified from the database generated in WP1 and in collaboration with the platform structures (WPs5&6), a workshop was organised on February 21st, 2019 (see annex 8.2.). There were 17 project members present at the workshop, including those representing stakeholder groups. The notion of breakthroughs was also used in some City Labs and was introduced to Policy Lab organisers as well. The inclusion of project level coordinators of the City Labs and Policy Labs allowed the integration of their perspectives already in the workshop discussions in February.

Content-wise we started from the inventory of potential breakthroughs undertaken in task 4.1 and described in D 4.1. Here, breakthroughs were bundled in four groups: 1) the new approach of primary food production and distribution 2) an engaged and healthy consumer 3) the tools of a future proof food system and 4) a sustainable and dynamic value-based food system.

From each of these groups we selected one potential breakthrough and sharpened it to make it as concrete as possible, see



Table 1. With the selection of the four examples we aimed at addressing the whole food system as well as the four objectives of FOOD 2030, Nutrition, Climate, Innovation and Circularity. Despite their concreteness, these are still potential breakthroughs, the discussion on their particular success factors hence has speculative elements. We use a vision of the future to discuss what should actually happen in the presence and near future.

We asked participants to form four groups and worked with these breakthroughs in the following two sessions:

Session 1 **Group work on breakthroughs** was dedicated to the following questions:

- Imagine the goal of the breakthrough has been successfully achieved: Which factors were decisive for the achievement? Consider all STEEPV²
- Who were the focal actors? Who/what were driving forces?
- Which incentives were helpful? Which barriers had to be overcome?
- Which new relations/interactions were necessary?

Session 2 **Dynamics of and policies for breakthroughs** elaborated further on the breakthroughs and worked on the issues of:

- **PATTERNS**
Which were relevant interactions and interdependencies/synergies
Which factors are connected, influence each other?
- **DYNAMICS**
Was there a timeline (important first steps, critical events, etc.)
- **POLICY**
What can the role of research and R&I policy be to achieve success in breakthrough?
How and where can RRI be a main factor to achieve success?
Where can R&I policy have the highest impact?

Both group results were presented in the plenary.

Session 3 was then dedicated to the **linking up of further steps in WPs**. For a detailed agenda of the whole day, please see the Annex.

² STEEPV is a framework to group factors of influence. It is an acronym adding from social, technological, economic, environmental, political and values.

Table 1: Four potential breakthroughs for discussion

Name of breakthrough	What does it mean?	Objective reached if
AQIculture 4.0	<p>AQIculture means new, non-conventional forms of agriculture and aquaculture, such as</p> <ul style="list-style-type: none"> • vertical farming • Hydroponics • Agroecology • Permaculture • Urban farming • Advanced fish farms • New feeds <p>AQIculture has lower impact on environment, organic awareness and comprises new approaches to fertilizers, pesticides and antibiotics and leads to less intensive land and water use and higher sustainability of the AQIcultural ecosystem.</p>	50% of food products come from AQIculture by 2050
Integration of consumer perspectives in production & distribution	<p>The empowered consumer is actively involved in Living Labs, co-creation processes etc. by companies in production and distribution. New methods in education are well established and accepted through all ages, they also lead to a changed innovation and entrepreneurial behaviour. There is space for innovative ways to empower consumers in a supply driven innovation chain.</p> <p>Specific topics are</p> <ul style="list-style-type: none"> • Innovation in social sciences • Living labs • Fab labs • Optimised use of big data • Personalised nutrition • Personalised education • Massive Open Online Courses (MOOCs) 	60% of all production and logistic companies have incorporated the values of empowered consumers in their business models.
Consumption of alternative proteins	<p>A change of dietary habits has been achieved with more awareness of health habits. This also comprises a higher diversity of the diet, which is visible especially in a higher consumption of proteins from non-meat sources, such as plants algae or even insects,... The impact is a healthier population with all the consequences this enables (less communicable diseases, healthier ageing...) and a positive impact on sustainability and land use.</p>	80% of protein intake come from non-meat sources like insects, algae or plants by 2030 ("protein transition").
Smart, Traceable and Sustainable Packaging	<p>Through traceability packaging also enables new forms of logistics, but also makes recycling or re-use more efficient. Higher rates in recycling and better use of resources and waste streams lead to higher sustainability and less environmental impact.</p> <p>Smart, Traceable and Sustainable Packaging includes</p> <ul style="list-style-type: none"> • New packaging materials • Biodegradable materials • New recycling methods • Reduction of packaging 	reducing food and plastic packaging waste by 80% until 2030



	<ul style="list-style-type: none">• New models in the food system	
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4 Breakthroughs in different areas

In the following, drivers and barriers are presented that were derived from the literature and discussed and deepened in an expert workshop in February 2019 (see minutes in annex 8.2.). We started from the work of task 4.1. and the already identified potential future breakthroughs. As D4.1 grouped potential breakthroughs in four areas the stories of drivers, barriers and patterns are diverse in the four areas. However, the next chapter (5) tries to cluster drivers and barriers and provide the gist in a common storyline.

4.1 AQIculture 4.0

Objective reached if: 50% of food products come from AQIculture by 2050.

4.1.1 Relevant factors

The term AQIculture 4.0 encompasses new, non-conventional forms of agriculture as well as aquaculture, like vertical farming, hydroponics, agroecology, permaculture, urban farming, advanced fish farms, new feeds etc. Examples can be categorised in 2 groups: new techniques (hydroponics, advanced fish farms, new feeds) vs. modernised techniques (vertical farming, permaculture, urban farming).

In this area, nor so much the lack of technologies acts as a barrier rather **their diffusion and adoption among larger numbers of users**. Furthermore, there are farming techniques included that might not be useful to feed a large number of people (e.g. vertical farming, urban farming), but might have an essential '**secondary**' purpose: e.g. education, raise awareness.

*Change agents*³ for the breakthrough to happen could be [users] 1) farmers, traditional farmers using updated techniques, 2) 'new' farmers (**start-ups**) who represent a new generations of famers and use new farming techniques, 3) municipalities, government and **regulators** who provide the ideal policy background to allow growth of non-conventional agriculture and aquaculture, 4) **retailers** who deliberately provide to citizen more items produced through AQIculture 4.0 to **enable new practices also at the level of the final consumer**, and 5) suppliers of technologies and methodologies who give **access** and thus **enable change processes**.

Key driving forces could be **population growth** [megatrend] because traditional farming techniques will not suffice to feed an ever-growing population. Urbanisation plays a role as people live more in or in close periphery to city: On the one side, this makes vertical spaces available, on the other side higher density makes diffusion of new products more likely. Land use is a relevant factor (*zoning*, use land for habitation vs. farming [**regulation**]). **Public discourse** is important, traditional farming has been increasingly criticised for its negative environmental impacts. In order to provide incentives, subsidies in the form of monetary advantages given to alternative farming techniques and to products from these techniques would be effective. Diffusion of **user services based on technologies like**

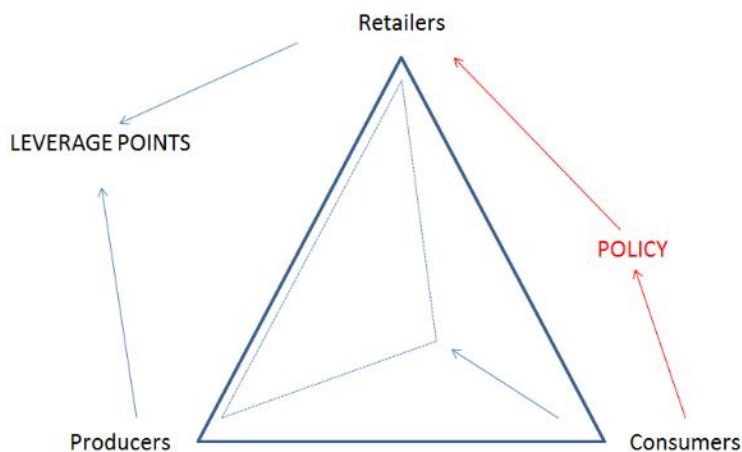
³ These results also reflect the discussions reported from the City Lab Sofia, see Annex 8.4..

artificial intelligence/big data among the wider population would **enable a better consumer choice** between food of different provenience /ecological aspects of it.

Multiple barriers would need to be overcome: 1) Yields would go down, mass production would thus become hardly possible. 2) Some new techniques/technologies are only applicable for a small number of legumes/herbs which makes **scale economies disappear**. Implementation of new techniques/technologies is therefore hampered as new techniques are still a niche market and don't allow mass production. Furthermore, the general public might not be aware of these new farming techniques, and how to use them (**Availability and new practices**). **Education and awareness** is essential to create 'new farmers'. For new technology adoption, **often high initial investments** are necessary which in turn result in **low rates of return**, at least in the first years. **Regulation favours incumbent practices**, i.e. traditional farming.

Key players to introduce novelty are retailers, producers and consumers. **Consumers** play a critical role. They might be able to influence retailers (to make more widely available items from new farming methods). This can only happen through **policy changes**. If **retailers** feel pressure from the consumers (via policy or not) they will change their relation (or create new ones) with producers. Both retailers and producers seem important leverage points to achieve this breakthrough.

Figure 1: Relationship between consumers, retailers and producers.



Source. Workshop February 2019.

Consumers can influence retailers via policy (or not) to force retailers to offer more items from AQIculture. Retailers will then have to work with new producers or force producers to change their production line. Retailers and producers are viewed as leverage points to ensure that the breakthrough is reached.

4.1.2 Patterns over time and interactions

Relationships between the regime and the niches:

New forms of agriculture compete with traditional agriculture (and fisheries) to gain dominance i.e. market space, at the expense of traditional agriculture; here, traditional agriculture has the advantage for now as its products are better integrated in retail than novel methods. Retailers (= **enablers/change agents**, through their contracts with suppliers) could make room for products coming from AQiculture 4.0.

Certain trends (value changes, trends related to climate and the environment) acting at the landscape level impact negatively on traditional practices while shifting the **attention** to novel methods. Technology is currently more supportive of traditional agricultural practices, and not e.g. the use of Artificial Intelligence. Having said that, at the niche level, some niches might benefit from the use of big data, i.e. hydroponics, others such as permaculture might not.

Farmers have an established way of using land and there are economic structures in place e.g. subsidies to help them re-create these structures; A.I. also helps support large-scale land use. But the current legal and technological practices (**incumbent practices**) currently disadvantage AQiculture methods.

Knowledge exchange: Traditional agriculture (including fisheries) is acquiring some new knowledge (e.g. buying start-ups and innovative technologies), but the same holds true for promoters of the novel approaches in AQiculture 4.0.

Relationship between niches:

Niche-niche competition, e.g. permaculture **competing for funding** with hydroponics, but also value competition as the different methods comprised in the category stand differently towards high versus low technology. Support from **value changes among consumers** are pushing forward niches as a whole. There is a land use conflict, as these technologies are inherently land-intensive and hence compete for land. Value competition between the niches (i.e. several good ideas competing) may get in the way of scaling up single good ideas.

4.2 Integration of consumer perspectives in production & distribution

Objective reached if: 60% of all production incorporates the values of empowered consumers

4.2.1 Relevant factors and driving forces

A change of dietary habits has been achieved with more awareness of health habits. This also comprises a higher diversity of the diet, which is visible especially in a higher consumption of proteins from non-meat sources, such as plants algae or even insects and others. The impact is a healthier population with all the consequences this enables (less communicable diseases, healthier ageing...) and a positive impact on sustainability and land use.

Technological drivers and barriers **Platforms, online and physical**, to translate and enable consumers to choose, co-create, influence the food they want. These platforms reconnect consumers to their food, improve understanding about food R&I and influence food production – a barrier is the technological gap to bridge information & citizens in

convenient ways, establishing consumer corners (at retail etc) to facilitate feedback mechanism. Living labs could be important here. Personalised nutrition is also a driver, **non-availability of personalized nutrition data and apps** counteracts informed choices of consumers. Apps for personalized nutrition solutions should be here and now. Although data privacy is an issue, we assume this may be solved, although on the political level. Personalized nutrition is important to empower consumers. Personalized nutrition should be coupled with personalized education.

Social drivers and barriers Social innovation initiatives often show **alternatives to current practices**, as well as opinion leaders, testimonials and social media. Transparency as a concept and motivation: **Transparency of production processes behind** is important, uncovering how food is produced and brought to the table, this could lead to informed choices by citizens. BSE crisis made a lot of information available on how beef/milk products is produced (see also City Lab report Budapest).

Social barriers are lack of consumer motivation, knowledge and interest. Overcoming **consumer disinterest** will be necessary. **Modern lifestyles** with little time available to think about food, buy food and prepare food are also barriers. Issues of **equity**⁴ and access to food are not solved. The importance of “Empowered and conscious consumers” was also discussed in the City Lab Budapest. Lack of consumer awareness was seen as a critical factor there.

Education⁵ should on the one hand start at an early age to be able to impact on habits, on the other hand **life-long learning, problem-oriented learning** is crucial. **Early-age educational interventions** acts as a driver of healthy eating. Education gaps and lack of information do not support active citizenship (see also City Lab Athens).

Access plays an important role, **access drives demand**. Consumer corners in supermarkets: if supermarkets and local stores play such a crucial role, there could be special areas in supermarkets for novel products, as trial zones, and to listen to consumers’ needs, to place novelties and see what sells and why (not)

Policy / regulation drivers and barriers There exist food R&I ecosystems that aim at transforming the food system as a whole and supporting its ecosystem members. Policy barriers are big data regulations (big data issues/privacy has to be solved on the political level), **power dynamics in favour of incumbents**, a disintegrated and non-systemic food policy, need for evidence (food consumption is often driven by ethical values and beliefs, these should be substantiated/replaced by evidence) and the need to **strengthen role of consumer organisations**.

Financial drivers / barriers: Funding to RRI Prices and **transparency** should serve as an encouraging factor for change, as a concept and motivation.

Change agents are industry, but also start-ups showing new ways. **New actors, like start-ups** are important because novelty often comes from outside the established actors. Unlikely that the incumbent firms have the revolutionary ideas, rather they buy/integrate

⁴ City Lab Budapest Report, 2019, Annex 8.4. – focus on social innovation

⁵ City Lab Athens Report, 2018, Annex 8.4. - focus on education



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small novel actors who come up with ideas. (City) **Labs**, as new actors, are an attractive tool for engaging industry as well. Public authorities are definitely important, on all levels. **NGOs** bring on the agenda issues based on independent information, e.g. in the past on trans fats. **Social movements** act on some of this information.

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4.2.2 Patterns over time and interactions⁶

Figure 2: Actors of importance in the food systems and selected interactions



Change will be necessary in parallel in different realms, if one subsystem gets blocked, change cannot unfold. The food system can be too democratic as well as too fundamentalistic, an **integrative approach will be necessary to have citizens** on board, as well as science and industry.

There will have to be **mutual learning exercises** between consumers and stakeholders (industry etc.), not to act upon fake news. Collaborative education is necessary, and labs are needed to provide these intermediary spaces for co-creation. Holistic approaches will be necessary, research not only on proteins, but also on citizen skills.

Source. Workshop February 2019.

In general, power relations in favour of incumbents act as a barrier for change. Shared value economy and social entrepreneurship will be important vehicles to break patterns. Importantly, prices should reflect negative externalities for better choices.

Food labelling is another crucial vehicle, in order to document social cost and environmental cost of different food choices. Consumers want their choice to be based on social and environmental cost, at the moment the relevant information is not yet available (is a locally-grown tomato more environmentally friendly than one transported from another country even if it was grown in a glass house with heating and/or cooling?)

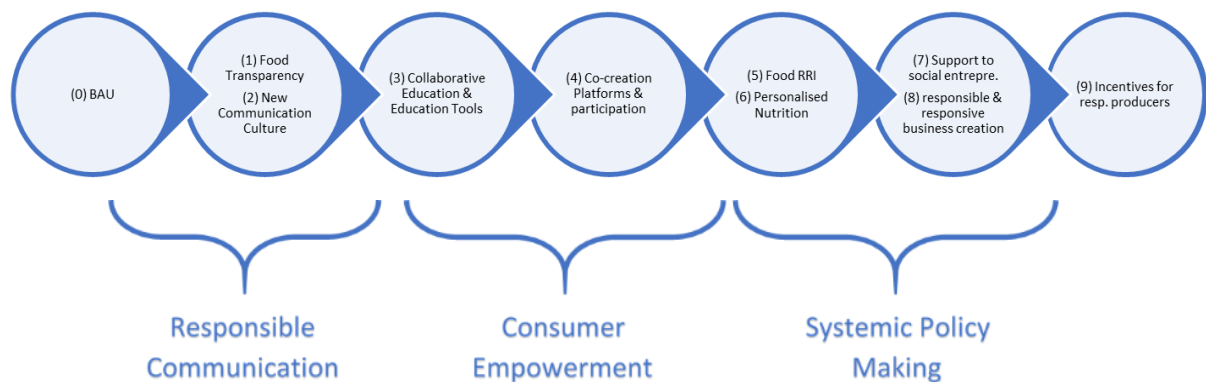
However, there is also a danger that all responsibility is put on to the consumer (Policy statement: “We don’t want to regulate – the consumer shall decide. But in our sense.”). Although consumer choice is an important vehicle, we have to bear in mind that a lot of information is not available to the consumer and the choice of consumers is generally driven by their own needs, limited resources and objectives.

The timeline in Figure 3 gives a further perspective on patterns and interactions. In a first step responsible communication will be most relevant as a step towards system transformation. This will be necessary to inform and empower consumers to make responsible food choices. Systemic policy making will be most relevant for incentives, to

⁶ See also City Lab Milan report, Annex 8.4.

set the ground for personalized nutrition applications and support social entrepreneurship. Of course, all phases overlap, it may be more a perspective of what is feasible in what time frame.

Figure 3: A tentative timeline of measures and initiatives



Source. Workshop February 2019. The figure starts with the presence and assumes that systemic policy making which is necessary for FNS transformation lies in the future and has to be preceded by responsible communication and consumer empowerment.

4.3 Consumption of alternative proteins

OBJECTIVE reached if: In 2030, 80% of proteins is from non-meat sources (note that current levels of intake from different sources vary greatly among EU Member States)

4.3.1 Relevant factors

Among the *technological barriers* uncertainty around sustainability and price is mentioned prominently. Is insect/algae production really energy-efficient, especially when we consider up-scaling and mass production (**uncertainty about advantages**)? There may be **new legislation necessary** to allow for a wider diffusion of products building on new technological solution which makes it hard for new solutions to be implemented and come out of an academic research context. Current established actors (**incumbents**) and current technological infrastructure (machinery, factories, facilities) enable the current meat-regimes (**technological interrelatedness**).

Technological drivers on the other side are increased **knowledge and education on new technologies** which allows a new role of consumers (**new practices**). Knowledge about consumer wants and needs enables industry to initiate projects that are aligned with consumer preferences and consumers' capacities (**social acceptance by end users/buyers**).

Focal Actors are hard to identify in advance, there should be new actors integrated in the (scientific) knowledge transfer between start-ups + industry + universities etc.

Among the *social barriers* are religious practices that hinder diffusion of several new protein source (e.g. insects are non-halal) (**incompatibility of values**). There could be **social medical factors** influencing the tolerance of certain types of food (like the enzyme responsible for digestion of milk is not as much distributed in Asia as in Europe). **Affordability** plays a huge role of course in the diffusion of new products: Will these novel products be affordable in societies with increasing inequalities? Will it be cheaper than meat-proteins (meat-production is heavily subsidized)? (**Advantage of the new solutions not clear**). There is a lack of education on how to use these new protein sources, relating to **consumer skills and habits** on how to cook non-meat proteins such as insects, algae and legumes which results in a lack of acceptance within (parts of) society (**complexity of new products**). Some protein sources (insects, algae) scare or disgust consumers or might be seen as elitist.

Social drivers include **novel lifestyles**, where consumer groups (such as vegetarians/vegans) push for novel solutions such as cultured meat, consumers drive change here (**bottom-up/grassroots movements, social innovation, social pioneers**). **System pressures** threaten the current regime with population growth, increased life expectancy increasing pressure on unsustainable meat-protein regime. **Openness of modern societies** favours the consumption of novel foods. This is enhanced also by social media (influencers) and emerging (online) that communities push for change. *Change agents* particularly associated with the above social drivers are universities and research institutes, schools and educators, governments (agencies and ministries); national + EU, consumers, CSOs, philanthropic organizations (e.g. Bill & Melinda Gates Foundation), emerging (online) communities.

Environmental barriers include the current land-use (**incumbent institutional framework**) where value-chains are locked-in. In today's perspective it seems difficult to break this practice on the regime level.

Environmental drivers are consumer awareness and the widespread opinion that non-meat protein sources generally have less environmentally negative impacts than meat. (e.g. water use, land use, biodiversity degradation, antibiotic use). Landscape trends (climate change, water scarcity, land-competition, biodiversity degradation etc.) put pressure on current meat-regimes. Non-meat protein sources benefit animal welfare which corresponds to today more widespread **consumer values like animals' rights**. Legumes are an important factor in crop rotation and soil management (**advantages for agricultural practices**). *Change agents* in this particular area are environmental research organisations, governments on all levels, CSOs, farmers and fishermen, and nature conservation organizations.

The main *legal barriers* refer to the **current laws which seem to benefit the incumbent meat-regime**. Current legislations allow little room for experimentation/flexibility/learning, which hinder development of non-meat protein sources. There are different dynamics in conflict with an overall negative impact on the dynamic of the novel: the legal-political processes (slow) versus technological development (fast). Food safety analyses (no **statistical evidence**) is often missing; there need to be new procedures (**missing guidelines**,

protocols, procedures) e.g. for insects. **Labelling** legislation is missing as well, or too slow in reacting to novel products.

Legal drivers are **consumer laws and environmental laws** which are in the process of being tightened, this might favour non-meat proteins. (Nutritional laws: non-meat protein sources might help reach health-targets, Paris Agreement COP21, FOOD 2030, Horizon Europe).

From a macro-economic perspective, economical barriers to this transition include considerations of job security for people working in the meat-regime (**=incumbent**) **labour market**, and perceived **risks** for industry /large producers **to invest in uncertain novel proteins**. Subsidiary systems (such as CAP) work in favour of current meat-regime.

4.3.2 *Patterns over time and interactions*

There are different expected timelines for the various alternative protein-sources: 1) legumes and other available vegetable protein sources are already a niche product, 2) algae appear as an interesting source and new products are under development, 3) insect protein is starting to stand out and new start-ups and entrepreneurs start to study the possible business models, and 4) further technologies are under research, such as the cultured meat, cultured fish, fermented new proteins, which would be at the end of the timeline.

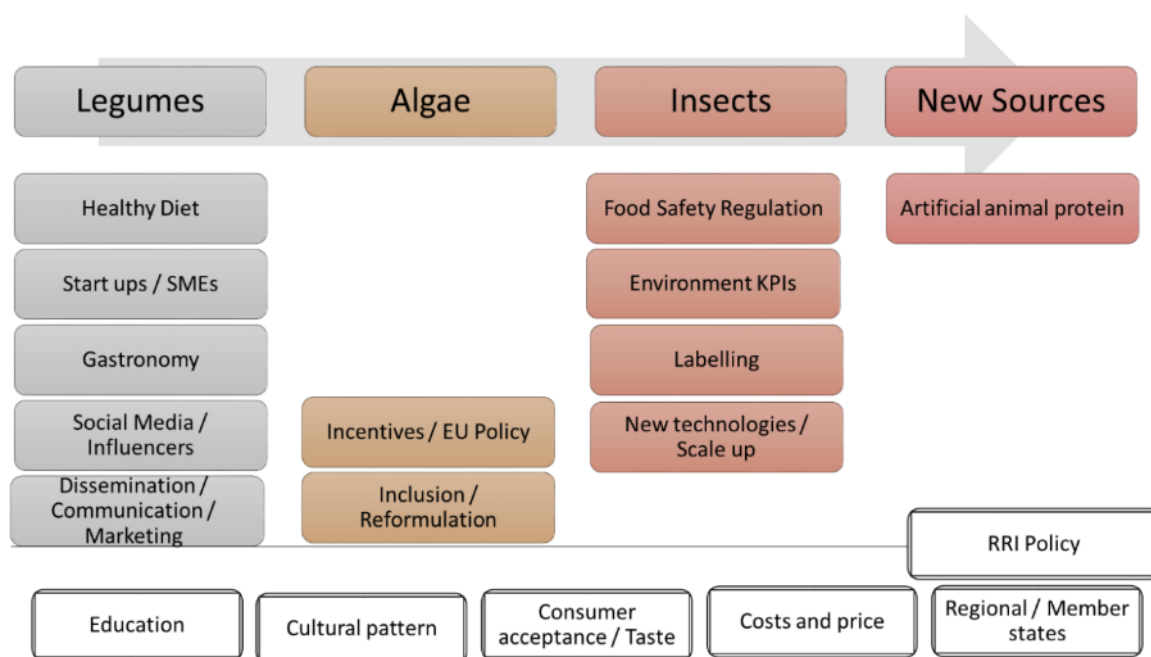
The legumes and other protein-based solutions based on vegetable protein sources require further implementation, consumer acceptance of new products, reformulation. Communication, dissemination, marketing, social media, influencers are key for market penetration. Also gastronomy and food services could add dynamic for implementation. Usually, SMEs, including start-ups, are a vehicle for these products.

Algae and other innovative solutions which have not reached the market yet very often require reformulations or inclusion in day to day products to have consumer acceptance. As is the case for legumes and other already available plant protein sources, incentives and policy might help to reach consumers.

Insects start to be introduced by SMEs, mainly start-ups. Nevertheless, we lack data to know if it might become a breakthrough. Impacts on allergies and health in general is still under research, this will affect future policies and a new food law regulation is still pending. How this product will be labelled, what species would be permitted, what would be the key processes is still under much academic discussion.

New sources such as artificial animal protein sources: the use of cellular technology to obtain cultured meat and fish, the use of fermentation as a mean of obtaining new proteins (such as milk proteins) is under research. New information is being gathered on the sustainability and environmental impact of these new technologies, as well as the health impact. Much research is needed before this becomes a viable alternative.

Figure 4: Alternative protein sources – relevant factors.



Source: Workshop February 2019. There is a timeline with different requirements for research and implementation. Wrapping all this R&I, we can set up a common ground of RRI policy, which does define some of the needs that would be needed from this perspective (see bottom line of figure): Education, cultural patterns, consumer acceptance (taste), business model feasibility and final price would be key to launch and enable any of this innovations to reach the market with a clear impact. Above all, the RRI will be crucial for the achievement of a successful breakthrough and the successful factors are defined accordingly. Finally, and related to policy, regional and member state differences should be accounted for how these barriers would be defined.

4.4 Smart, traceable and sustainable packaging



Source image: Schartinger, Penzance/Cornwall 2018

Objective reached if: reducing food and plastic packaging waste by 80% until 2030

4.4.1 Relevant factors⁷

Smart, traceable and sustainable packaging is likely to lead to a reduction both in food and plastic packaging waste by 80%. As such a development would include a diversity of technologies and approaches it may be difficult to be tackled as one single path. Different parts must fit together like a puzzle, but the major issue and driver will be most likely the creation of **awareness** within society, **changing the values** and thus **increasing pressure on incumbent industry**.

Key driver behind this breakthrough is the pressing environmental issue and the rising **awareness** of population of plastic pollution and food waste. But awareness did not arise on its own! **Statistical evidence** on this was developed by scientists and the communication of the problematic issues was largely driven by environmental organisations, **media and large NGOs**. This factor was considered to be overarching and forms the parenthesis over the diversity of topics contributing to this breakthrough.

Change agents for this breakthrough are on one side the **consumers** with their increasing awareness, on the other side **supermarket chains and food producers**, who want to avoid negative marketing. **Media** act as strong influencers in this regard, creating awareness and educating consumers and society.

Technological drivers: Novel artefacts replacing plastic packaging have to ensure that **food safety standards** are maintained with regard to shelf-life in addition to being environmentally friendly. This includes substitution of materials with more beneficial

⁷ This includes the discussions reported particularly from the City Lab Tartu, see Annex 8.4.

products, but also consideration of environmental impact, recyclability or re-use possibilities when designing products. **Smart product design and packaging** design in order to reduce empty spaces rationalising parcel and packet sizes as well as **smart logistics** are part of the success factors.

Legal regulations for **recycling rates** differ even within countries. **EU wide regulation**, such as pricing plastic bags, makes it easier for people to change their behaviour and accept such measures. Thus, **taxation and regulations** can be strong drivers for recycling rates, they induce changes in consumer behaviour given the policy changes are regulated on a national or international/EU level.

The main economic driver behind the success of smart and sustainable packaging will no doubt be the **cost factor**. This has two aspects: 1) Current practices incorporating high amounts of plastic waste impose **high external costs** on the environment. However, this can also imply that other cost factors could be included in the calculation of prices, be it environmental impact or recycling or cleaning costs in case of re-use. 2) **Costs of adopting new solutions** in packaging influence firm decisions what to invest in. Changing pricing for packaging could also be regulated through new policies, this way making policy a focal actor for changing behaviour and awareness. Examples could be the introduction of new pricing systems (real/honest or fair prices), introducing “penalties” for packaged and unused/unsold products from retailers.

The changes in packaging behaviour and systems (**new practices**) will be driving forces themselves for new solutions in food production and packaging as well as for new business models. The introduction of re-usable packaging, such as vegetable nets or re-fillable glass water bottles, are some examples for this, but the ideas also go to creation of **new jobs** like shop assistants for vegetables to avoid self-service and hygienic issues from the consumers. New business models can emerge, as can already be seen in the trend of community-based systems or local productions for local markets. Smart logistics (**new technologies**) will also play an important role in achieving the breakthrough.

As this breakthrough is strongly connected with environmental issues **changes in values** were considered one of the main success factors and drivers. New human values include not only a change in environmental awareness, but **also a change in profit-oriented thinking**. The public image of companies is changing from being modern when using plastic to being modern when avoiding it. Also profit orientation is not regarded as the main focus of economy, as the values of society are more oriented towards environmentally friendly solutions. However, the **change in consumers’ attitudes and (shopping behaviour)** cannot only be achieved through education, but also through legislation and implementing (high) fines for violation of the law, like charging people when spitting chewing gum on the streets in some countries.

As stated above the **creation of awareness** not only in consumers but also in industry, retailers, logistics and financing are crucial to lead to success of this breakthrough. Education from primary school to life-long learning is one of the factors, but also (social) media play a major role as influencers in this, not only focusing on creation of environmental awareness but also teaching recycling possibilities. **Educated consumers**

will change their habits of consumption, resulting in less packaging and food waste. Knowledge transfer between sectors to induce new innovations is regarded as another success factor.

4.4.2 Patterns over time and interactions

Stemming from a number of technologies and approaches the patterns and interactions over time were not so easy to tackle for this breakthrough. Overall the awareness of society about a problem that is too big to be ignored is considered as the trigger for changes, and this includes consumers, producers, retailers and other stakeholders along the whole food system. In this example the environmental issue regarding food waste and packaging waste is the seedling to induce change and allow innovation. **Science and research play an important role in the change creating science based and ideally neutral evidence, that is picked up by influencers from media, NGOs, industry or finance.** New legal regulations might encourage innovative solutions for packaging or retail systems, while it may also be the other way around that legislation follows innovations or research results (e.g. recycling rates may be changed if new technologies become available, like more re-fill bottles).

As plastic waste has become a major problem the need for change is quite urgent. Legislation at EU level regarding plastic has already started to become more active, media are increasingly aware and companies have taken up zero-waste initiatives, recycling and circularity in their strategy. **Start-ups and crowd-funding initiatives** such as “The ocean Clean Up” or other cleaning the ocean or beaches projects have emerged also increasing awareness amongst citizens. Note that start-ups and crowdsourcing here have a “reactive” role, in trying to eliminate the damage done by incumbent practices, i.e. offerings by incumbent firms (products in plastic in the past) and associated practices by consumers (too little recycling).

Avoiding packaging and food waste will be at the junction of avoidance of unnecessary packaging material, use of recyclable and reusable material, and smart labelling indicating food expiry. Involvement of stakeholders can also be induced via the instruments of this projects, especially the City labs, policy changes through the Policy Labs.⁸ For this also the educational system can support the transition and slow introduction of new systems. This was confirmed in various City Lab discussions, see e.g. Tartu where, regarding changes in labelling system towards smart best-before labelling, participants identified the following relevant factors as potential incentives: a slow introduction and transition period, getting people and stakeholders involved through City Lab-like groups, as well as the need to keep a better track of the supply chain of food.⁹

⁸ Suggestions for changes were made in different City Labs in Tartu, Budapest, Milan, Athens and Sofia. A strong emphasis was on education, short supply chains, and smart, urban farming. See Annex 8.4.

⁹ City Lab Tartu Report, 2019, see Annex 8.4.

5 Clusters and overall patterns of breakthroughs

In the previous chapter (4) four potential breakthroughs were discussed and with a focus on their success factors. As these four potential breakthroughs are very diverse they have to be seen in their overlaps as well as in their complementary nature to achieve system transformation in the FNS. This chapter thus tries to cluster drivers and barriers and provide the gist in a common storyline based on the scientific background as outlined in D4.1 and chapter 2 and expert knowledge within the project team. Still, it also pays tribute to mutually enhancing perspectives.

5.1 Introducing novelty

(Social) start-ups are important drivers for technological, social and economic change. They are important vehicles in **introducing new artefacts for new practices**. Given their highly innovative products and/or business models, their strive for growth and also their role as **first movers of new technologies**, startups have to develop their strategy, business model and explore their technological opportunities within new areas and markets or vis-à-vis incumbent firms within a limited time period in an efficient way. Although successful startups are among the fastest growing companies in a number of industries, more than half of all startups (56 per cent) exit the market across the European Union within their first three years after foundation (Eurostat 2016).

However, we can see **differences in the role of startups across the four breakthrough topics** analysed in the previous section. Start-ups and crowdsourcing have a different role in reducing plastic packaging compared to e.g. Aqlculture or alternative proteins: They are not themselves the drivers of change in sector or the proponents of a new sector, but they have a “reactive” role, in trying to eliminate the damage done by incumbent practices, i.e. offerings by incumbent firms (products in plastic in the past) and associated practices by consumers (too little recycling). Social start-ups shall find new ways and present viable alternatives to citizens and consumers in creating new products, new services, new business models, etc.

5.2 Major uncertainties

What we sense very often in the previous section is **the large uncertainties that go along with young technologies**. They are related to the **relative advantages of the new solutions, their compatibility with values and other practices, their complexity and unknown side-effects etc.** The variety of possibilities to turn technologies into products is huge, there are no dominant designs, consequences of choices and scaling up are often unclear. Consumers must learn about the new products and their features and functions and what to use them best for, and, in the process, they will in theory come to discover which of their characteristics are of most value. However, we are not near yet. At the moment, uncertainty prevails and hampers moving forward.

However, we should challenge the fact that what we are pursuing is the demise/complete collapse of the current regime. Where we want to be: the integration of best practices both from the niches and the current regime, leading to a diverse production system.

5.3 Role of citizens

From theory and from all discussions, also from the City Labs we know that **involvement of consumers, education of citizens and raising awareness** are central factors for breakthroughs. RRI plays a critical role here – RRI should be well devised to make sure that citizen concerns are taken into consideration during the scaling up from niche level (e.g. in case some practices prove problematic; to consider social equity issues), and that communities that might feel threatened about the change are involved, accept the process and receive the support they need in the transition. A rise in minimum wages - connected with food poverty which still exists in Europe and the importance of pricing in determining consumer choices - could result in more people affording food from niche methods despite their higher cost.

5.4 Role of research, NGOs and media

NGOs and research help to destabilize current practices that lead to many environmental and health-related practices. **Statistical evidence** and studies on food behaviour, waste amounts, waste disposal, health, state of oceans, dying of animals, climate change etc. initiate **public discourse, education**, link up different actors, and raise awareness in general (e.g. images of plastics in oceans endangering animals brings the issues closer to consumers who otherwise do not perceive the impacts of their behaviour). Social media can be helpful, but dangerous as well because of fake news and the channelling of attention on certain topics while forgetting others. The role of NGOs in shaping the discourse is huge, in putting **topics on the agenda** (through images and campaigns) and also in **assembling critical masses of allies**. Also **media** have a critical role in **raising awareness**/disseminating good practices around FNS (see also City Lab Athens).

5.5 Regulation

Existing regulation is nearly always perceived to work in favour of incumbent regime. Policy is often seen as being too hesitant. The expectation is often the consumer choice on its own drives change and transformation. This view may put too much pressure on the consumer. Steps need to be taken towards the economic sustainability of new practices, namely subsidies, either newly created or being redirected from conventional agriculture.

5.6 Inertia

What would be necessary is a **mix of education, empowerment, and regulation**, which leads to the question: Why isn't change taking place? After all, our project is hardly the first to think of these steps/factors as being necessary/important. Some thorny factors seem to prevail

- Inertia is naturally embedded in systems (regime, landscape levels hard to affect)
- Mindset change happens only with new generations
- Power struggles: power is embedded in geographical and economic scale (contrast conventional agriculture being available at every neighbourhood corner & land use at a massive scale by conventional agriculture).

6 Conclusions

Where do we come from in the project

A potential breakthrough is a significant achievement that may lead towards a step for change or radical change of the food system, making it more sustainable and resilient. From the original list of several potential breakthroughs representative examples were selected and defined to make the discussions on critical success factors, their patterns, interaction and focal actors more tangible. In the course of the further project, insights from the system analysis, trends, showcases and breakthroughs shall provide input for developing tools and instruments to induce transformation.

What have we done in task 4.2

Any innovative solution starts with a low number of users and probably low technological maturity (in case it has technological components at all). Addressing the potential breakthroughs identified in D4.1. in a standardised format proved to be impossible as these breakthroughs differed in their nature. Also, their thematic focal point varied largely from agricultural matters to consumer integration. Thus, we proceeded as follows:

- On the basis of existing literature (also in non-food areas) and the work carried out in D4.1 we conceptually framed the term “breakthrough”. (Ch 2)
- On the basis of expert knowledge and information we analysed potential breakthroughs in different areas, especially those factors that determine their becoming successful (drivers and barriers). We then grouped these factors to identify patterns of success factors for potential breakthroughs (Ch 4).

This way we ensured that the specificities of different potential breakthroughs are taken into account, but also similarities and interactions¹⁰.

How is this being used in the project

In order to support system transformation and in order to make newly generated knowledge operational, the results of WP 4 were integrated in the concrete instruments of the FIT4FOOD2030 projects, namely in some City Labs in WP 6 (Budapest, Tartu, Sofia, Athens, Milan, Barcelona) and Policy Labs (WP5). In the City Labs, Deliverable 4.1 and WP1 methodology related to breakthroughs were used as basis for multi-stakeholder discussions (see outline in Annex 8.3.). For WP 5 the interactive exercise “Policy Pathways to Breakthroughs” has been developed to help Policy Lab coordinators in mixing R&I policy instruments to achieve path-breaking policy goals.

Policy Lab exercises focus on the basic idea and characteristics of transformation-oriented R&I policy-making. Different potential policy R&I instruments were introduced in the Policy Lab discussions which integrate several types of societal stakeholders. With a view on breakthroughs four path-breaking policy goals associated with the Food2030 agenda were discussed then. In the course of building transformation pathways, teams came up with

¹⁰ A ranking as envisaged in the original project plan did not seem meaningful as our approach in this task 4.2. was to include examples from the whole food system addressing the four objectives of FOOD2030.

knowledge gaps (to be addressed by R&I), investment opportunities as well as unintended effects to be explored further.

The City Labs use the idea of breakthroughs in their exercises to explore barriers and drivers around particular domains which the participants chose from the mapping of potential breakthroughs or their own added domains. The materials from WP2, 3 and 4 offered different ideas and tools to be considered and possibilities to prioritize domains, areas etc. based on previous discussions and what would be relevant to the City Lab vision. The “ranking” that was originally planned in the outline of the project proposal was taken up as prioritisation exercise by the City Labs and Policy Lab groups selecting the breakthrough topics that seemed most relevant and important to the participants or fitting the visions from previous sessions. The chosen topics differed as the respective labs have different objectives and outlines. The outcome of the City Labs has been included as Annex 8.4 of this deliverable. Some interesting insights are already arising from these workshops, namely the diversity of stakeholder perspectives (e.g. civil society, policy making, industry, or academia) that enriches the outputs and opinions that arise from the perception of breakthroughs and the exploration of barriers and drivers at local and regional level. One of the first differences to be outlined, comes from the performance of the breakthrough exercise by different cities and regions and groups of experts engaged at the workshops. The same outline for discussion (Annex 8.3.) was provided but the results are not necessarily aligned. This would be expected thinking on how the social, cultural, and regional differences enrich the food sector in Europe, also the business and industrial structures bring diversity into the perceptions and the priorities at regional level. Much of this information requires further analysis and this will be discussed in Deliverable 4.4, ‘Appropriate instruments for the identification of R&I breakthroughs for the future.

The gist

Even though some overall patterns that lead to actual breakthroughs were identified they still differ in their characteristics or roles of focal actors. When introducing novelties, we sense large uncertainties that go along with young technologies. Initiating public discourse and education, linking different actors and strong involvement of policy, NGOs, research and consumers was considered a great incentive on the way to a breakthrough. Existing regulation is considered to work in favour of present regimes, where educated consumers and citizens can put pressure on. The appropriate mixture of education, empowerment and regulation leads to success of breakthroughs over time.

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8 Annex

8.1 List of workshop participants from Workshop on 21st February 2019

Name	Company
Barbaros Corekoglu	EIT Food
Beatrix Wepner	AIT
Bettina Schelkle	EUFIC
Chiara Pontillo	UNIBO
Cristina Paca	Ecsite
Gemma Tacken	WEcR
Jolien Wenink	ZON
Jonas Lazaro	FoodDrinkEurope
Kathleen Meharg	ILSI Europe
Kris Kok	VU
Maria Vasile	EC
Matthieu Flourakis	ILSI Europe
Monique Axelos	INRA
Petra Wagner	AIT
Doris Schartinger	AIT
Rosina Malagrida	IrsiCaixa
Thom Achterbosch	WEcR

8.2 Workshop agenda and minutes for identification of critical success factors on 21st February 2019

Table 2: Agenda

Time	Agenda	Responsibility
09:00-09:10	Welcome & Introduction to the day and Food 2030	FoodDrink Europe
09:10-09:25	Input to critical success factors: How does a breakthrough help to transform the food system to achieve the vision of Food2030? – from two the examples: non-food: defibrillator, food: proteins from insects	AIT
09:25-09:35	Session 1: Critical success factors along potential breakthroughs - Introduction of group work 1	AIT
09:35-11:15	Group work 1: “success factor analysis”	AIT
11:15-12:00	Plenary 1: presentation of group results	AIT
12:00-12:30	Lunch break	
12:30-12:35	Session 2: Dynamics of and policies for breakthroughs - Introduction of group work 2	AIT
12:35-13:30	Group work 2: Looking at the different breakthroughs: where are similarities of critical success factors? Which factors are connected, influence each other? Which role can R&I and R&I policy take to support the breakthroughs? Where can R&I policy have the highest impact? How and where can RRI be crucial and one of the main factors to achieve success?	AIT
13:30-14:00	Plenary 2: presentation of group results & next steps	AIT
14:00-14:15	Short break	
14:15-14:30	Session 3: Linking up further steps in work packages - Introduction (Orientation of where we stand in each WP, results that are already there, needs from other WPs)	WP 5&6
14:30-15:45	Parallel working groups 3	WP 5&6
15:45-16:30	Plenary 3: Linking up and further steps incl. task 4.3	WP 5&6, Gemma

● WORKSHOP METHODOLOGY

As potential breakthroughs for the discussion four cases were selected from D 4.1.:

● **AQIculture 4.0**

AQIculture 4.0 - New aquaculture, Smart farming, Non-conventional production systems (50% of food products come from aqiculture by 2050)

AQIculture means new, non conventional forms of agriculture and aquaculture, such as

- vertical farming
- Hydroponics
- Agroecology
- Permaculture
- Urban farming
- Advanced fish farms
- New feeds

AQIculture has lower impact on environment, organic awareness and comprises new approaches to fertilizers, pesticides and antibiotics and leads to less intensive land and water use and higher sustainability of the aqicultural ecosystem.

OBJECTIVE: 50% of food products come from AQIculture by 2050

● **Integration of consumer perspectives in production & distribution**

Integration of consumer perspectives/values in the production & distribution system (60% of all production and logistic companies have incorporated the values of empowered consumers in their business models).

The empowered consumer is actively involved in Living Labs, co-creation processes etc. by companies in production and distribution. New methods in education are well established and accepted through all ages, they also lead to a changed innovation and entrepreneurial behaviour. There is space for innovative ways to empower consumers in a supply driven innovation chain.

Specific topics are

- Innovation in social sciences
- Living labs
- Fab labs
- Optimised use of big data
- Personalised nutrition
- Personalised education
- MOOCs

OBJECTIVE: 60% of all production and logistic companies have incorporated the values of empowered consumers in their business models.

● Consumption of alternative proteins

Change of dietary habits & Diversity of the diet – **consumption of alternative proteins** (80% of protein intake come from non-meat sources like insects, algae or plants by 2030)

A change of dietary habits has been achieved with more awareness of health habits. This also comprises a higher diversity of the diet, which is visible especially in a higher consumption of proteins from non meat sources, such as plants algae or even insects. The impact is a healthier population with all the consequences this enables (less communicable diseases, healthier aging,...) and a positive impact on sustainability and land use.

OBJECTIVE: 80% of protein intake come from non-meat sources like insects, algae or plants by 2030 (“protein transition”).

● Smart, Traceable and Sustainable Packaging

Smart, Traceable and Sustainable Packaging (reducing food and plastic packaging waste by 80% until 2030)

Through traceability packaging also enables new forms of logistics, but also makes recycling or re-use more efficient. Higher rates in recycling and better use of resources and waste streams lead to higher sustainability and less environmental impact.

Smart, Traceable and Sustainable Packaging includes

- New packaging materials
- Biodegradable materials
- New recycling methods
- Reduction of packaging
- New models in the food system

OBJECTIVE: reducing food and plastic packaging waste by 80% until 2030

● Questions for and Structure of Session 1

Groups of 4-5 people were working on each topic answering the following questions:

- Imagine the goal of the breakthrough has been successfully achieved:
 - Which factors were decisive for the achievement?
- Consider all STEEP(L)V

- Who were the focal actors?
- Who/what were driving forces? Which incentives were helpful?
- Which barriers had to be overcome?
- Which new relations/interactions were necessary?

STEPPV factors were considered so that all aspects of influencing factors were addressed (figure 1).



Figure 5: Overview of STEEPV factors

In the following plenary session the results were presented and similarities as well as potential for RRI discussed.

• Questions for and Structure of Session 2

In the second session the dynamics of and policies for breakthroughs were addressed working on the same thematic potential breakthroughs as in Session 1:

Aim: in a food system perspective, find the

- PATTERNS
 - interactions and interdependencies/synergies
 - Which factors are connected, influence each other?
- DYNAMICS
 - Timeline (important first steps, critical events, etc.)
- POLICY
 - What can the role of research and R&I policy be to achieve success in breakthrough?
 - How and where can **RRI** be a main factor to achieve success?
 - Where can R&I policy have the highest impact?

• RESULTS

AQICULTURE 4.0

• Session 1: discussion on barriers and drivers

General discussion:

Obejctive: 50% of food products come from AQIculture **by 2030**.

Examples can be categorised in 2 groups: new techniques (hydroponics, advanced fish farms, new feeds) vs. modernised techniques (vertical farming, permaculture, urban farming).

The technologies are more or less already available at this stage. The lack of technologies is thus not a barrier.

It was agreed that some of the farming techniques might not be useful to feed a large number of people (vertical farming, urban farming), but might have an essential 'secondary' purpose: e.g. education, raise awareness.

Questions:

Who are the focal actors?

Key actors were identified:

- Farmers: traditional farmers using updated techniques
- 'New' farmers: new generations of famers who use new farming techniques
- Municipalities, Government and Regulators: provide the ideal policy background to allow growth of non-conventional agriculture and aqualculture
- Retailers: provide to citizen more items produced through AQIculture 4.0

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- Suppliers: they give access to technologies and methodologies

Who/what were the driving forces? Which incentives were helpful?

Key driving forces were identified:

- Population growth: traditional farming techniques will not suffice to feed to ever growing population
- Urbanisation: people live more are more in or in close periphery to city
- Land use: use land for habitation vs. farming
- Environmental impact: traditional farming is been more and more criticised for negative environmental impact.
- Subsidies: policy impact and monetary advantage given to alternatives farming techniques and to products issues from these techniques
- Technologies: although technologies are more or less already available (Artificial intelligence, use of big data), they should be made available to the general public. The public should also have the knowledge to use these techs.

Which barriers had to be overcome?

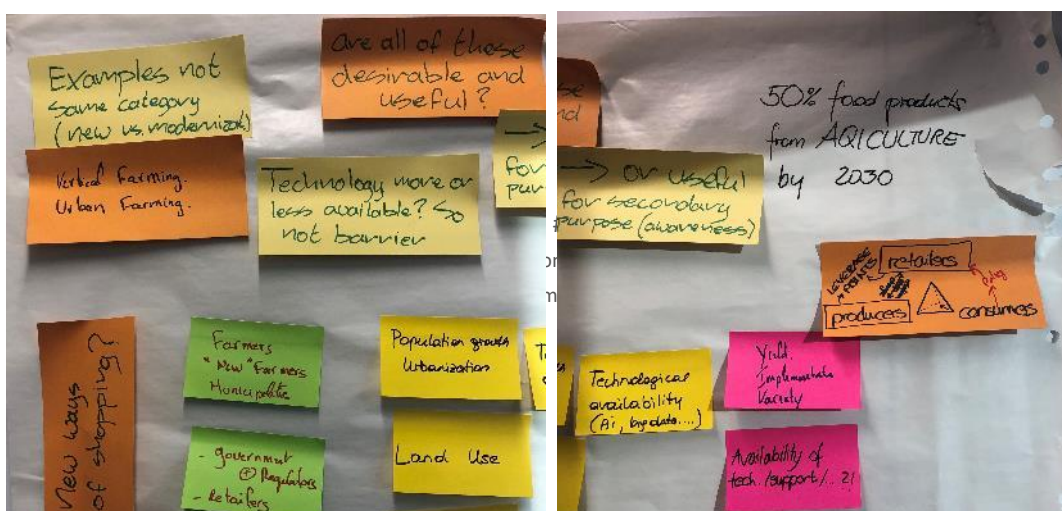
Multiple barriers would need to be overcome:

- Yield: low yield prevents mass production
- Variety: some new techniques are only applicable for a small number of legumes/herbs
- Implementation: new techniques are still a niche market and don't allow mass production
- Availability of technologies and or support to use them: the general public might not be aware of these new farming techniques, and how to use them. Education and awareness is essential to create 'new farmers'
- Cost effectiveness: high price to access technology with a low return on investment
- Regulation: at this stage they give an advantage to traditional farming. New farming techniques should be given the advantage.

Which new relations/interactions were necessary?

Key players were identified: retailers, producers and consumers.

Consumers play a critical role. They might be able to influence retailers (to make more widely available items from new farming methods). This can only happen through policy changes. If retailers feel pressure from the consumers (via policy or not) they will change their relation (or create new ones) with producers. Both retailers and producers seem leverage points to achieve this breakthrough.



● Session 2: Dynamics of and policies for breakthroughs

PATTERNS

Relationships between the regime and the niches:

- New forms of agriculture **compete** with conventional agriculture (and fisheries) to gain dominance i.e. market space, at the expense of conventional agriculture; here, conventional agriculture has the advantage for now as its products are better integrated in retail than newer methods. Retailers (through their contracts with suppliers) can make room for products coming from Aquiculture.
- **Certain trends (value changes, trends related to climate and the environment)** acting at the landscape level impact negatively conventional practices while supporting new methods
- **Technology** is currently more supportive of conventional practices, e.g. the use of AI. Having said that, at the niche level, some niches might benefit from the use of big data, i.e. hydroponics, others such as permaculture might not.
- Farmers have an established way of **using land** and there are **economic structures** in place e.g. subsidies to help them re-create these structures; A.I. also helps support large-scale land use. These **legal and technological practices** currently disadvantage aquiculture methods.
- **Knowledge exchange:** Conventional agriculture (including fisheries) is adapting some **learnings** from the niches (e.g. buying start-ups and innovative techniques) but the same holds true of the new methods, maybe just by different means

Relationship between niches:

- **Niche-niche competition**, e.g. permaculture competing for funding with hydroponics, but also value competition as the different methods comprised in the category stand differently towards high versus low technology
- Support from **value changes among consumers** are pushing forward the niches as a whole

Land use conflict:

DYNAMICS

- Steps towards the **economic sustainability of new practices**, namely **subsidies**, either newly created or being redirected from conventional agriculture – also linked to changes in **regulation**, especially CAP
- **Rise in minimum wages** - connected with food poverty which still exists in Europe) and the importance of pricing in determining consumer choices - it could result in more people affording food from niche methods despite their higher cost
- **Change in relationship with work:** more time for citizens to get involved with new methods of aquiculture

- On the technical side, process appears relatively well advanced. We feel that tech to support the new methods of aquiculture will ‘get there’ eventually even though at the moment we might be missing some aspects.

Moreover, we should **challenge the fact that what we are pursuing is the demise/complete collapse of the current regime**. Where we want to be: the **integration of best practices both from the niches and the current regime, leading to a diverse production system**.

Ideally, we would see several parallel developments:

- **Support for rural areas**; a safety net. What is good about mainstream practices should be preserved and it must be ensured that the displacement caused by the scaling up of niches & hardship in rural communities are minimised.
- **R&I at the niche level to enable scaling up**
- **RRI** in place to make sure that citizen concerns are taken into consideration during the scaling up at niche level (e.g. in case some practices prove problematic; to consider social equity issues), and that communities that might feel threatened about the change are involved, accept the process and receive the support they need in the transition

R&I FOCUS – SOME IDEAS

- **Value competition between the niches** (i.e. several good ideas competing): how this can be minimized so as not to get in the way of scaling up
- Taking care of the system as a whole: ensuring that both the regime and niche developments are coming along in a **co-adaptation process**
- How best to **merge practices from niche and regime level**

OTHER REMARKS

It is clear that what needs to happen is know: a mix of education, empowerment, and regulation, so the conclusions of the group appear quite repetitive after a while. Why isn't change taking place? After all, our group is hardly the first to think of these steps/factors as being necessary/important. Some thorny factors discussed by our group:

- Inertia embedded in systems
- Mindset change happening only with new generations
- That the discussions are coming back to power struggles: power is embedded in geographical and economic scale (contrast conventional agriculture being available at every neighbourhood corner & land use at a massive scale by conventional agriculture)

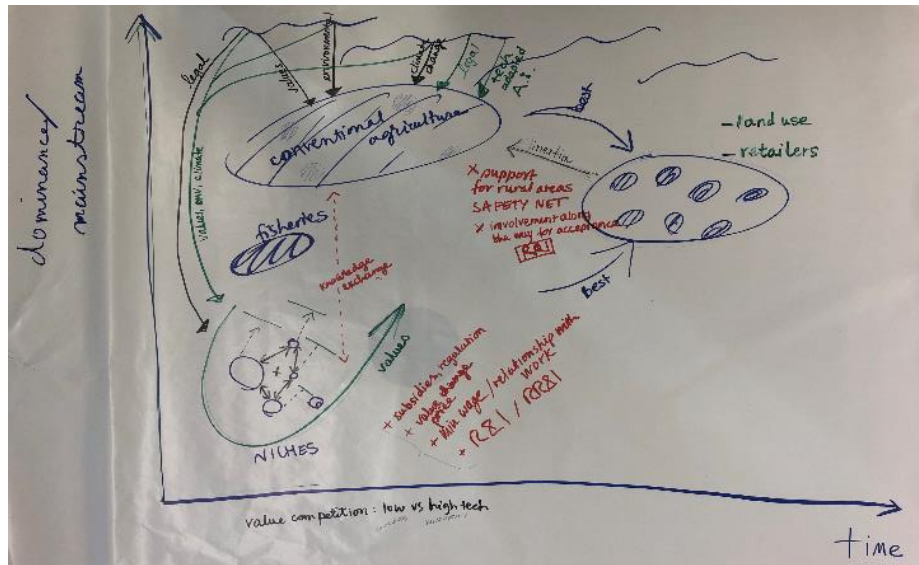


Figure 6: Aqiculture 4.0 Session 2

INTEGRATION OF CONSUMER PERSPECTIVES IN PRODUCTION & DISTRIBUTION

• Session 1: discussion on barriers and drivers

Objective: 60% of all production incorporates the values of empowered consumers

Focal actors identified:

- Industry and sectors at all levels
 - As they are transposers
- Funding Agencies, Universities & Research
 - As they are tool developers
- Start-ups
 - As they generate ideas and novel approaches
- Communities of practice
 - As they ensure presence and serve as intermediaries
- Government & Public Institutions
 - As they transpose international commitments and agendas at local level
- NGOs
 - As they work on trends & create movement
- Social entrepreneurs
- All actors above are part of the R&I processes and must promote problem-based learning (ref. personalised education) when it comes to educational activities

Driving forces:

- Online platforms that reconnect consumers to their food, improve their understanding about food R&I and enable consumers to co-create and influence food production
- Early-age educational interventions
- Transparency (as a concept and motivation)
- Uncovering food technology and innovation to tackle the trust crisis
- Social innovations and innovators
- Food R&I ecosystems that aim transformation and transition and support its ecosystem members
- Social media

Incentives:

- Funding to RRI
- Systemic research
- Price & transparency (to serve as an encouragement factor)
- Establishing consumer corners (at retail, etc.) to facilitate feedback mechanism
- Personalised nutrition to empower consumers to make conscious decisions
- Involving every actor in consultations

Barriers:

- Information and the way information is presented (nutrition, etc.)
- Consumer interest (lack of)

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- Consumer knowledge (lack of)
- Education gaps which do not support active citizenship
- Absence of food, food technology and food innovation education programmes
- Absence of education and industry engagement & collaboration
- Lifestyles and inequities
- Technology related:
 - Technological gaps to bridge information and citizens in convenient ways
 - Non-availability of personalised nutrition
- Lack of support or no access to enabling innovation & technology platforms
- Cost of externalities
- Politics:
 - Big data regulations
 - Power dynamics
 - Disintegrated and non-systemic food policy
 - Need to strengthen role of consumer organisations
- Values:
 - Data privacy
 - Informed decision making -> linked to lack of education

Relations & Interactions:

- Collaborative education modules accessible to everyone
- Food R&I ecosystems accessible to all food system players
- Online platforms that facilitate food, food tech and food innovation learning and enable co-creation
- Changed communication culture (and maybe a new role for consumer organisations)
- Mutual learning between system actors





Figure 7: Interactions between actors

● Session 2: Dynamics of and policies for breakthroughs

KPIs identified for measuring transition to breakthrough:

- Food and food technology literacy level
- Engagement rate
- Consumer needs addressed
- Trust of consumers in food and food system actors

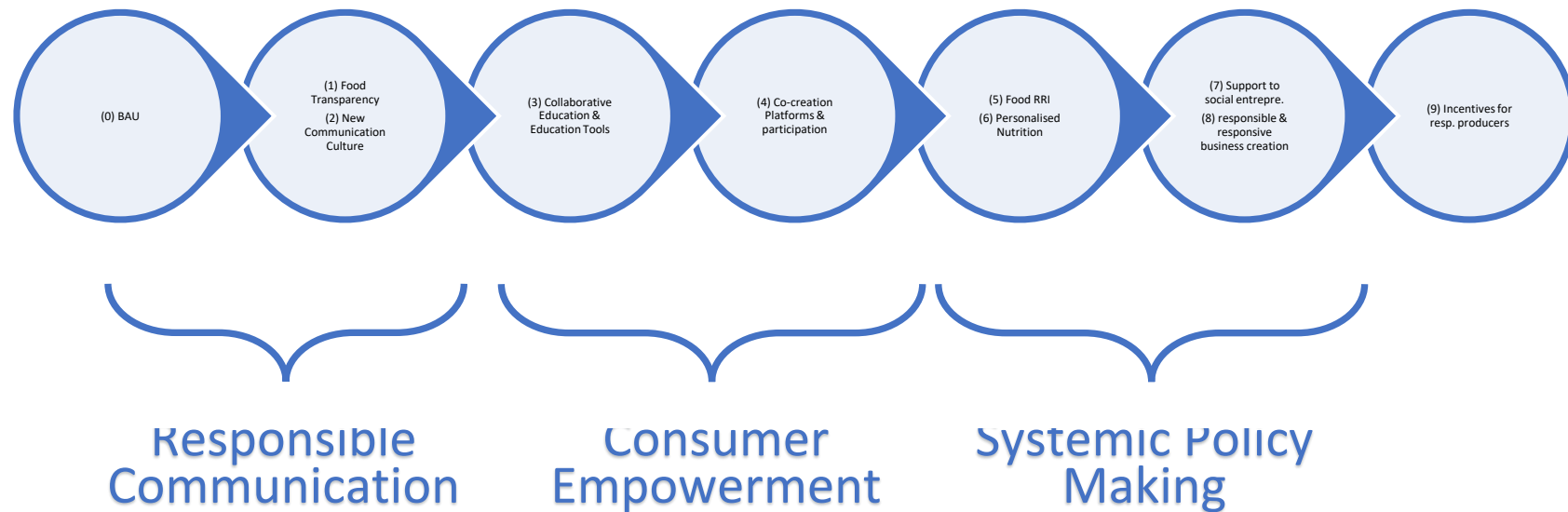


Figure 8: Time dimension and dynamics

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CONSUMPTION OF ALTERNATIVE PROTEINS

Theme: transition towards alternative protein sources

Mission: in 2030, 80% of proteins is from non-meat sources (note that current levels of intake from different sources vary greatly among EU Member States)

● Session 1: discussion on barriers and drivers

Technological Factors

Barriers

- Technological development of new non-meat protein sources: trade-offs between and uncertainties around sustainability and price (e.g. is insect/algae production energy-efficient?)
- Technology (on research level) might be ready for implementation, but policy environment does not allow this (policy is slower than technology)
- Uncertainty about technological dimensions of mass production/up-scaling
- Current technological infrastructure (machinery, factories, facilities) enable the current meat-regimes
- Limited reliability, efficiency of some new protein sources

Drivers

- ➔ increased knowledge and education on new technologies → role of consumers
- ➔ industry able to create product (during the innovation/design phase of R&I/RD) that the consumer wants; alignment with current consumer practices
- ➔ more efficient technologies through R&I

Focal Actors and Interactions

- co-creation and cooperation with different (new!) actors for scientific knowledge transfer between start-ups + industry + universities etc.
- meat industry
- start-ups
- combined Public Private Partnerships

Social Factors

Barriers

- religious practices hinder diffusion of several new protein source (e.g. insects are non-halal)
- products might provoke allergies (link to social-medical factors)
- affordability issues: will these novel products be affordable in societies with increasing wealth inequalities? Will it be cheaper than meat-proteins (meat-production is heavily subsidized)
- lack of education on how to use these new sources, relating to consumer skills to cook non-meat proteins such as insects, algae and legumes
- Consumer habits, routines enable meat-consumption, but not novel protein sources
- Lack of acceptance within (parts of) society of non-traditional protein sources might hinder diffusion of novel protein-sources

Drivers

- ➔ Novel lifestyles, consumer groups (such as veganism/vegans) push for novel innovations such as cultured meat: consumers driving change
- ➔ Socio-demographical landscape trends such as population growth, increased life expectancy increase pressure on unsustainable meat-protein regime
- ➔ Open mindset in modern societies changes in favor of novel foods; such as novel protein-sources (possibly related to processes such as globalization, multi-cultural societies)
- ➔ Social media influencers and emerging (online) communities push for change
- ➔ Increased awareness among consumers of social issues

Focal Actors and Interactions

- Universities and research institutes
- Schools and educators
- Governments (agencies and ministries); national + EU
- Consumers
- CSO's
- Philanthropic organizations (e.g. Bill & Melinda Gates Foundation)
- Emerging (online) communities
- Interactions between all these actor

Environmental Factors**Barriers**

- Novel protein-niches are more sustainable in most aspects (water use, land use, biodiversity degradation, antibiotic use), but it is less clear for other environmental dimensions (e.g. energy use in insect production) → does it then counts as a breakthrough
- Uncertainty about environmental effects of upscaling
- Current land-use value-chains are locked-in; difficult to break this regime-practice

Drivers

- ➔ Non-meat protein sources are considered to generally have less environmental negative impacts than meat. (e.g. water use, land use, biodiversity degradation, antibiotic use)
- ➔ Landscape trends (climate change, water scarcity, land-competition, biodiversity degradation etc.) put pressure on current meat-regimes
- ➔ Non-meat protein sources benefit animal welfare
- ➔ Legumes are an important factor in crop rotation and soil management

Actors and Interactions

- (meat) industry
- Environmental research
- Governments on all levels
- CSO's
- Farmers and fishermen
- Nature conservation organizations

Legal Factors

Barriers

- Legislation related to proteins is currently aligned with incumbent meat-regime
- Current legislations allows little room for experimentation/flexibility/learning, which hinder development of non-meat protein sources
- Two different timescales conflict: legal-political (slow) versus technological development (fast)
- Food safety evidence; procedures for insects?
- Labeling legislation
- Allergy policies not yet developed for novel protein sources

Drivers

- ➔ Consumer laws, environmental laws are being tightened, which might favor non-meat proteins
- ➔ Nutritional laws: non-meat protein sources might help reach health-targets
- ➔ Paris Agreement COP21
- ➔ FOOD 2030
- ➔ Horizon Europe

Focal Actors and Interactions

- Governments (national + EU)
- Regulatory agencies
- Lobbyists
- CSO's

Other (final round of factor identification)

Barriers

- Current meat-cultures
- Some protein sources (insects, algae) scare or disgust consumers or might be seen as elitist
- Power dynamics is in favor of the meat-regime (interests, inertia of the regime (actors))
- Economical barriers to this transition might include:
 - ➔ job security for people working in the meat-regime
 - ➔ investment risk for industry /large producers to invest in uncertain novel proteins
 - ➔ subsidiary systems (such as CAP) work in favor of current meat-regime

Drivers

- ➔ Transparency
- ➔ (Science) Communication
- ➔ Investments
- ➔ Taxing on unfavorable proteins
- ➔ Horizon Europe

● Session 2: Dynamics of and policies for breakthroughs

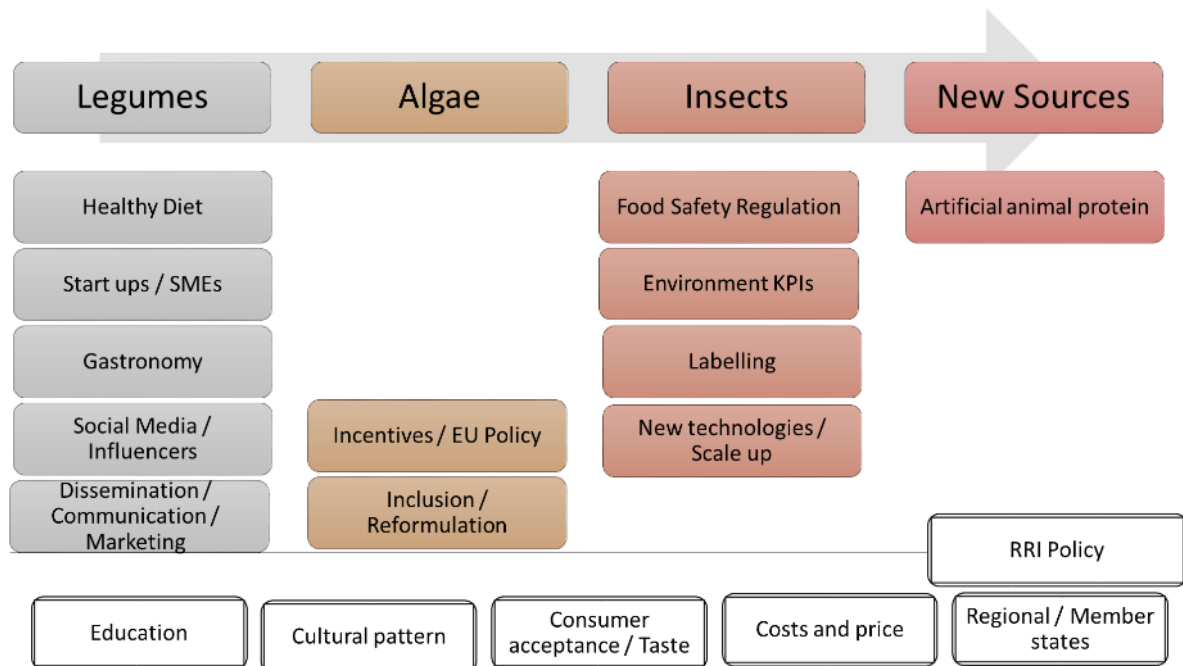
The working group included people from the following institutions: ILSI, ZON, EC and ETP F4L. The discussions centred on the following points:

- The protein transition includes different available products and technologies which have different time to market (or TRL). We could plot a timeline on reference to the time to market and we could have the suggestion to plot the following market penetration: 1) legumes and other available vegetable protein sources are already a niche product, 2) the algae appear as an interesting source and new products are under development, 3) insect protein is starting to stand out and new startups and entrepreneurs start to study the possible business models, and 4) further technologies are under research, such as the cultured meat, cultured fish, fermented new proteins, which would be at the end of the timeline.
- The legumes and other protein based solutions based on vegetable protein sources which are available (such as pseudo-cereals) are already in the market and start to have penetration. These solutions require further implementation, consumer acceptance of new products, reformulation. They are also perceived as part of a healthy diet. For this level of innovation on protein transition, communication, dissemination, marketing, social media, influencers are key for market penetration. Also gastronomy in the hands of restaurants and food services provides dynamics for implementation. Usually, SMEs, including startups, are vehicular for this products.
- Algae and other innovative solutions which have not reach the market, very often require reformulations or inclusion in day to day products to have consumer acceptance. As well as legumes and other already available plant protein sources, incentives and policy might help to reach consumers.
- Insects start to be inserted by SMEs, mainly startups, on the feasible possibilities. Nevertheless we lack data to know if it might become a breakthrough. Knowledge on allergies and impact on health is still under research, this will affect future policies and a new food law regulation has still pending to be defined. How this product will be label, what species would be permitted, what would be the key processes is still under much academic discussion. Also, the scalability at industrial levels of some of the already implemented processes and the impact on environment, are still under a lack of knowledge.
- New sources such as artificial animal protein sources: the use of cellular technology to obtain cultured meat and fish, the use of fermentation as a mean of obtaining new proteins (such as milk proteins) is under research. New information is being gathered on the sustainability and environmental impact of these new technologies, as well as the health impact. Much research is needed before this might become even a feasible possibility.
- We can distinguish a timeline with different requirements for research and implementation. It would be difficult to rank the priority needs from the point of which will be the breakthrough of the future, but we can differentiate what are the research needs and some of the expected impact. Wrapping all this R&I, we can set

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up a common ground of RRI policy, which does define some of the needs that would be needed from this perspective: Education, cultural patterns, consumer acceptance (taste), business model feasibility and final price would be key to launch and enable any of this innovations to reach the market with a clear impact. Above all, the RRI will be crucial for the achievement of a successful breakthrough and the successful factors are defined accordingly. Finally, and related to policy, regional and member state differences should be accounted for how these barriers would be defined.





- **SMART, TRACEABLE AND SUSTAINABLE PACKAGING**
- **Session 1: discussion on barriers and drivers**



Research in all topics,
environment is overarching and also in all topics

Society Consumers

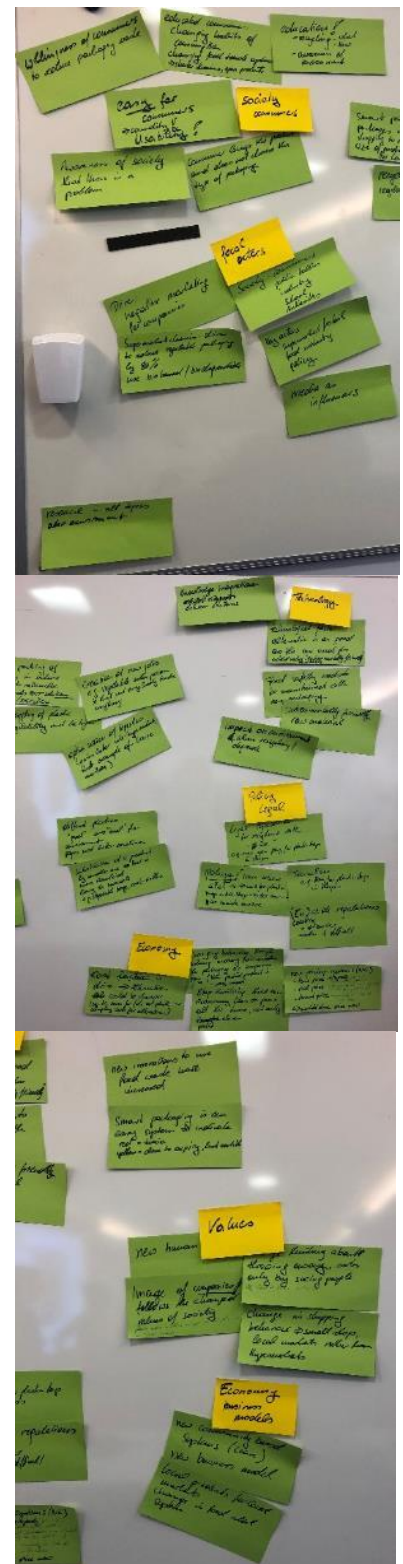
- Willingness of consumers to reduce packaging waste
- Educated consumers: changing habits of consumption, changing food trade system => shorter supply chains, open/unpacked products
- Easy for consumers => commodity, usability!
- Awareness of society that there is a problem
- Consumer buys the products because of the content and does not chose it because of the packaging
- Education! -recycling: what/how; _ awareness of environment

Focal actors

- Driver: negative marketing for companies (“plastic soup” is avoided, nobody wants to be in the media with negatively connoted news)
- Supermarket chains: driver to reduce vegetable packaging by 80%, use biodegradable or biobased, reuseable packaging, paper bags... offered to the consumers for no or low fee
- Society: consumers/ public bodies / Industry /schools / Authorities
- Key actors: Supermarket/retail; food industry; policy
- Media as influencers

Technological Factors

- Different plastics: “good” ⇔ “Bad” or environment, paper might not be the better solution if you take everything into account
- Substitution of a product by another one that is more beneficial, easy to handle e.g. free reusable vegetable net in supermarkets, refill individual water bottles, that are now “in fashion” while one-way water bottles are “out”
- Knowledge integration between sectors
- alternative is as good as the one used plus added value of being environmentally friendly or recyclable
- food safety needs to be maintained with new technologies
- environmentally friendly raw material
- impact on environment when recycling /degradation



- Logistics: Smart packaging of packages in online shopping to rationalize size of parcels => IT solutions
- Recycling of plastics: recyclability must be high
- Creation of new jobs e.g. vegetable sales person to avoid everybody touching the loose, unpacked goods
- Optimisation of logistics (works better with hypermarkets, but also examples of smaller markets like Louve market in Paris)

policy/ legal

- legal regulations for recycling rates + use e.g. now you pay for plastic bags in shops => reached everyone, so people changed their behaviour and now bring their own bags, policy can achieve a lot
- taxation
- (EU) wide regulations – now recycling differs even within countries, makes it difficult

Economy

- Cost factor is a driver => alternatives could be cheaper (example: plastic boxes used in fish production, needs to be used in very low and possibly cleaned in high temperatures, alternatives are sought by companies as they cannot be recycled or reused, one factor for new boxes is to make them more environmentally friendly)
- Changing behaviour through asking money for the packaging of then unused products, e.g. companies or trade or supermarkets pay if the packed product was not used
- Stop thinking that the economy has to grow all the time, that the only value is profit driven companies
- New pricing systems: Example Netherlands are talking about fair price / real price /honest price; now: market /competition driven price

Innovation

- New innovations to use food waste have increased
- Smart packaging is an easy system to indicate e.g. red = toxic / yellow = close to expiry, but still edible, please use quickly

Values

- New human values
- Image of companies follows the changed values of society (plastic created a “modern image” in the 80s and was necessary, now in is “green image”)
- Change thinking about throwing away, works only by suing people, e.g. spitting out chewing gum in china => high fines for that; or have “alarm systems”, when someone throws away the waste into the wrong bin => red light flashing...
- Change in shopping behaviour => small shops, local markets rather than hypermarkets

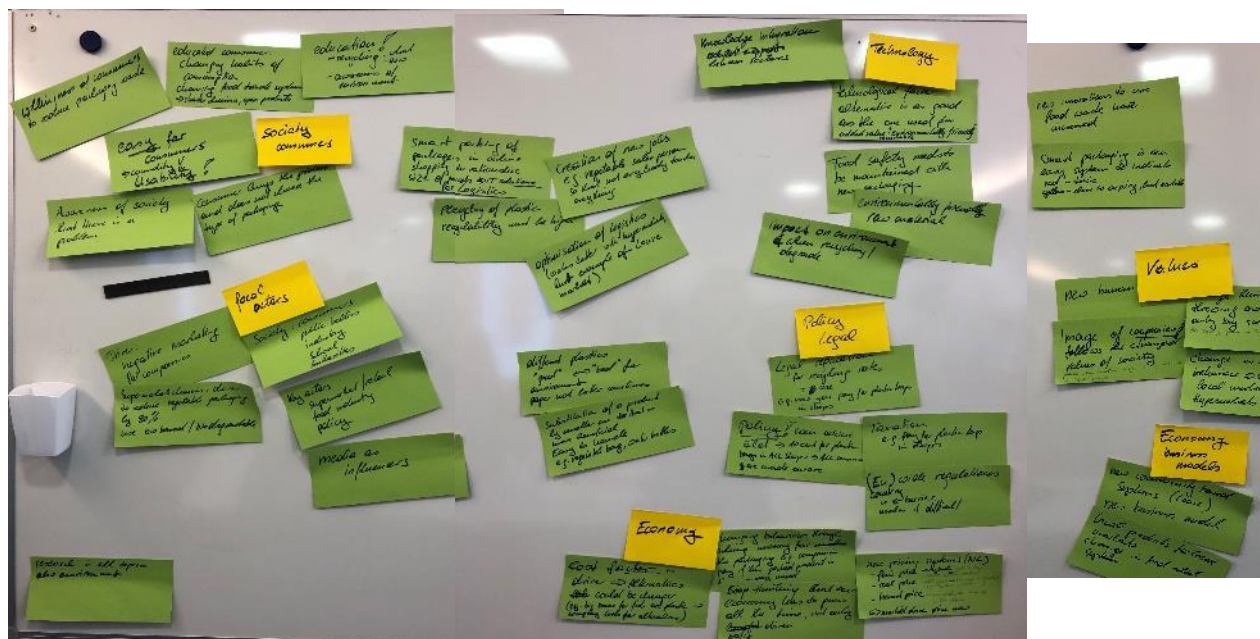
Economy, business models

- New community-based systems (Louve), new business models
- Local products for local markets => change in food retail system

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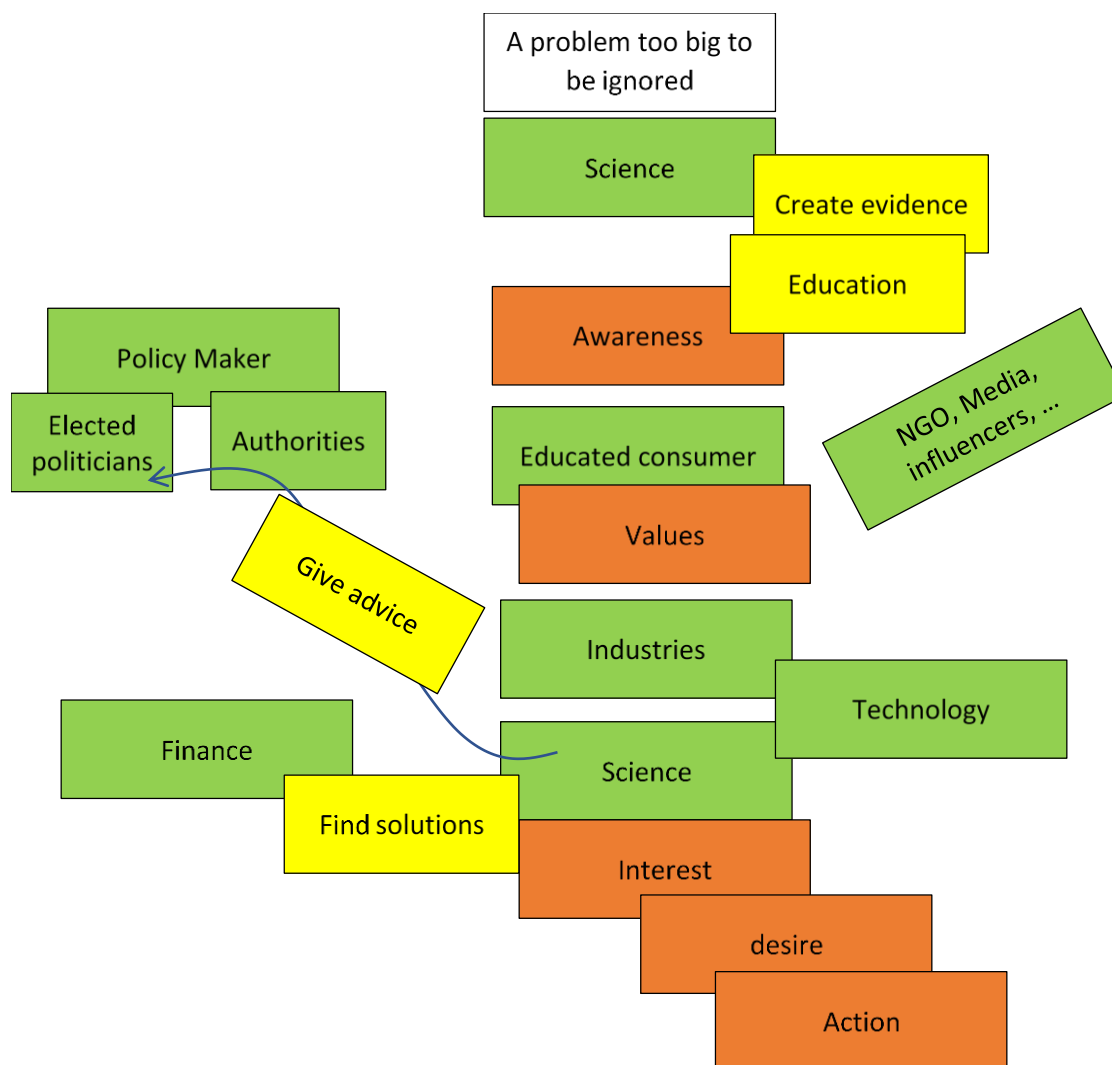


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• Session 2: Dynamics of and policies for breakthroughs

The dynamics and patterns for the potential breakthrough were difficult to tackle for this group. The general approach was that the driver behind it is a problem “too big to be ignored”, like the plastic waste polluting the oceans and land. Relevant stakeholders that need to be involved to solve the problem were noted on green cards, their actions in yellow, the expected outcome and results in orange. Science has different roles, i.e. providing evidence for the problem and contributing to education, thus creating awareness and laying a foundation to create (new) values in consumers. Again, later on, taking up these new consumer values, science in connection with industry can develop new approaches or products. Science then can create interest, desire and action. The role of science is also to give advice to policy or authorities, who also influence policy. Educated consumers will have different values, thus putting pressure on industry, policy makers etc. Media, NGOs and influencers can support this change in values. Science and/or industry together with finance need to find solutions to solve the problems. Science in all this plays a major role and has influence in different stages of the development, also influencing R&I policy.



8.3 Outline of the exercise on breakthroughs in the City Labs

This document was produced by WP6 in collaboration with WP1 and WP4 to guide a set of “system understanding” workshops in the FIT4FOOD2030 City Labs that took place between November 2018 to January 2019.

Breakthroughs in the City Labs

GENERAL COMMENTS

- **Working with the concept of breakthroughs:** the project is very much aware that this might be an unfamiliar concept in your national and local context, and perhaps untranslatable in the City Lab’s working language. We recommend focusing directly on the content of the exercises and avoid delving into a theoretical discussion with the participants themselves.
 - Nevertheless, a theoretical perspective on the concept is available in the “WP1 Theoretical Background Paper”.
- **Role of the facilitator:** advance preparation on the eventual topic of the discussion and an active role of the facilitator are particularly important in guiding discussions around breakthroughs.
 - If you need further insights into particular topics, don’t hesitate to get in touch with Ecsite and WP4.
- **Exercises:** below, you’ll find three possible exercises, including one that has been presented at Training #2 in Brussels, in May 2018. We recommend choosing the combination that works best in the context of your City Lab while also keeping in mind the questions that the reporting template asks.
 - This can be discussed further in the call with Ecsite.
- **Connection with visioning:** the future-looking character of the exploration of breakthroughs could connect with visioning on the role of the R&I system and competences.
- **Reporting:** Please prepare the workshop materials in a way that makes it possible to record the type of stakeholders who produced each contribution, e.g. by using a sticker of a different colour for each participant. Alternatively, should you have concerns about this method, you can also label each contribution with the type of stakeholder that produced it, right after the event, based on the notes taken during the discussion.

Exercise 1: A map of potential future breakthrough domains, specific areas and more concrete directions

Map out on a large flipchart sheet **the table of potential future breakthroughs created by WP4** (attached to email).



Figure 1. Capture of the table of potential future breakthroughs created by WP4

Moreover, in the current version of the table, for each “domain”, **related trends and showcases** gathered by the FIT4FOOD project have already been identified. Potentially, this offers you additional tools to introduce the domain you consider most interesting and prime later discussions.

Based on this “map”, options for exercises with participants include:

- exploring the map and the possibility to add (with post-its, or writing directly on sheet) other domains, areas, specific breakthroughs that they do not see represented but which they think could be promising (or potential) directions for change
- making a selection (of several more specific breakthrough pathways, perhaps combining technological and social breakthroughs) that would be needed to arrive at the City Lab vision

- prioritizing domains, areas etc. based on previous discussions and what would be relevant to the City Lab vision

Expected outcomes:

- insights on the domain/area that can be explored in the subsequent exercise (“Exploring barriers and enablers around a particular domain”)
- new suggestions and insights into priorities will be taken on board by WP4

Exercise 2: Exploring barriers and enablers around a particular breakthrough domain

Materials

- Flipchart (A3 or larger) with the City Lab vision developed in previous workshops
- Flipchart (A3 or larger) labelled with the domain/area being discussed
- Pens and markers
- Post-its (approx. 3 per participant, coded as to allow the identification of the stakeholder category of the participant who make the contribution)
- Optional: set of slides to introduce the exercise – see the model provided by WP4 (attached to email)

Advance preparation by the facilitator

Based on previous discussions in the City Labs, coordinators are encouraged to **select and prepare an area/domain to propose for discussion** in the workshop. This can be selected from the table of potential future breakthroughs created by WP4. Broad headings such as “new agriculture”, “new packaging”, “new tools to improve nutrition and health (personalized nutrition)”, “social innovation in FNS”, “nanotechnology in foods”; “distribution and logistics: new perspectives”. However, if your City Lab has shown interest in a specific development in the past, this can also be considered.

If you decide to work in several groups, they can consider the same breakthrough area or different areas. If in doubt, consult Ecsite and WP4 on the topic you would like to prepare.

Prepare in advance a brief introduction of the breakthrough area in the form of a **script of future scenario**. A potential example for “new tools to improve nutrition and health (personalized nutrition)”¹¹ could be:

Imagine it's 2050: supermarket shelves are stocked with functional foods. Instead of just a baby food section, we have products tailored to every segment of the population--foods optimized for women, men, and the elderly. Food science is capable to formulate the best nutritional profile for each demographic group, as well as for each individual...

You can also use a **video**. For some of the breakthrough domains/areas, videos can be found (although, predominantly, they present a version of the development skewed towards a single stakeholder perspective).



“How well do we know our food?”; produced by IBM Food Trust and related to **the use of blockchain in food**



Harvard University's RoboBee; related to **the use of applied mechatronics in smart farming**.

¹¹ Source: <https://www.forbes.com/sites/forbesinternational/2015/11/13/foods-of-the-future-what-will-we-be-eating/>

This is our starting point for the innovation.

HEIRRI training video on food; aims to connect different areas such as organic chemistry, new technologies, gender, innovation in ingredients, culture, nutrition, society and food sustainability

The exercise

Introduction (10 min)

Use a future scenario script or show a video to introduce the breakthrough domain or area to be discussed (“It’s 2050 and...”) seeking to bring participants to a frame of mind where they imagine the potential breakthrough has become a reality and has had an impact on the City Lab vision.

Proceed to introduce the first question that will guide the discussion.

1. What ideas come to mind when talking about this example of a breakthrough (big change) in relation to our City Lab vision? (10 min)

Guiding questions that the facilitator could ask: How does this future appear to you? To which aspect of our vision could this breakthrough have contributed the most? In what way? What changes and what path would have taken us there?

Provide participants with 3 post-its each and ask them to place their ideas and considerations on post-its, one idea per post-it. Collect ideas in a plenary within each group.

2. What challenges/obstacles/barriers would we have had to overcome? Which actors were involved, and what interactions were needed? (15-20 min)

Provide participants with 3 post-its each and ask them to place their ideas of challenges/obstacles and barriers on post-its, one idea per post-it. Advise them to think along the lines of STEEPV (Social, Technological, Economic, Environmental, Political and Values-based).

Collect ideas in a plenary within each group, clustering them along STEEPV lines. Participants can also suggest other clusters if they feel something is missing. Also in the plenary, discuss as a group which actors were involved and what interactions were needed to overcome the barriers.

3. What incentives/enabling factors supported the development of this change? Which actors were involved, and what interactions were needed? (15-20 min)

Provide participants with 3 post-its each and ask them to place their ideas of challenges/obstacles and barriers on post-its, one idea per post-it. Advise them to think along the lines of STEEPV (Social, Technological, Economic, Environmental, Political and Values-based).

Collect ideas in a plenary within each group, clustering them along STEEPV lines. Participants can also suggest other clusters if they feel something is missing. Also in the plenary, discuss as a group which actors were involved and what interactions were needed to overcome the barriers.

4. [Optional: to transition to visioning on competences] What competences are necessary/need to be developed to arrive there? (10 min)

Guiding questions that the facilitator could ask: What competences do future professionals in the field of FNS need? What need to change in education to meet the required changes?

This brief reflection can be continued with **visioning on competences for future-proof food systems**.

Exercise 3: Breakthroughs exercise tried at the Training #2 in Brussels, May 2018

Aims of this exercise

The objective of this exercise is to identify the breakthroughs necessary to change the food system/R&I system in the direction of the formulated Lab vision (on the food system and competence building). To this end, system awareness is created by linking up the breakthroughs with showcases and trends.

Materials

- Templates (see figures below)
- Markers
- Post-its
- A4s

The exercise (75 min)

For this exercise, information on the Lab's vision is crucial. Information on trends and showcases is highly recommended, but not essential to think of potential R&I breakthroughs. Labs will need to adjust the exercise and templates to the information that is available.

Introduction of exercise (3 min)

The facilitator introduces the exercise: *“This exercise will focus on the identification of breakthroughs that are related to the Lab’s vision. To this end, system awareness is created by integrating insights in the Lab’s vision, the trends that influence the realisation of the vision, and the showcases that can be learned from. These insights are already summarized in a template. Based on this information, you will think of the breakthroughs that are necessary to realise the aspired vision: what (radical) changes are necessary to come to the Lab’s vision? These insights are further translated into R&I needs, required changes on R&I system level, and educational needs (competences). Based on these insights you will do an outcome mapping exercise. Outcome mapping helps a project team or in this case a Lab, to be specific about the actors it intends to target, the changes it hopes to see and the strategies appropriate to achieve these. Based on outcome mapping, possible roadmaps to R&I breakthroughs can be constructed.*

The facilitator split the group into groups of four. To ensure that all groups start from the same perspective, all groups receive a template that summarizes the Labs vision, influencing trends, and relevant showcases (see for template figure 2). The groups also receive several empty A4s that can be used to answer the questions and make notes.

Step 1: Creating System Awareness (3 min)

The facilitator asks the participants to have a close look to the template. What is the Lab's vision? What trends do have a positive or negative influence on this vision? From what showcases can we learn? If necessary, participants can ask clarifying questions to each other, but also to the Lab coordinator. It is important that all participants are (more or less) on the same page, especially regarding the Lab's vision.

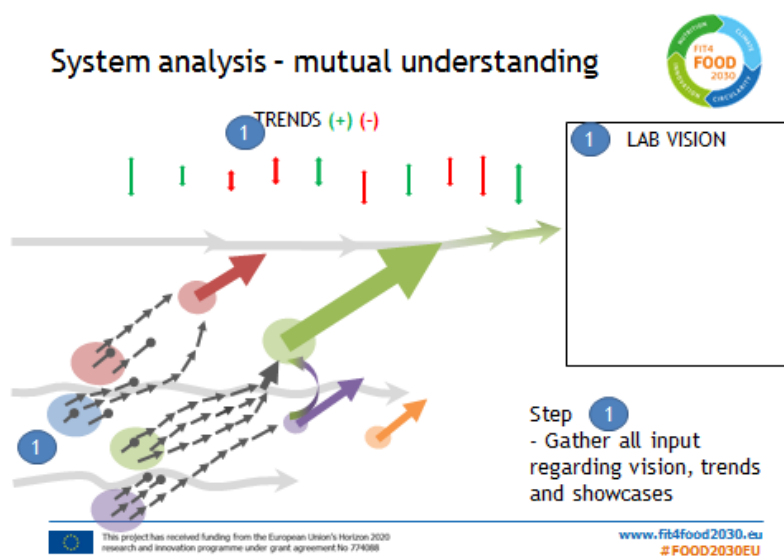


Figure 2. Template to summarize the Lab's vision, the trends that influence the realization of this vision, and relevant showcases to learn from.

Step 2: Formulating breakthroughs to realise the aspired vision (30 min)

In this step, the facilitator asks the groups to think of breakthroughs that are necessary to realise the aspired vision. What really needs to change to be able to realise the vision? Breakthroughs can be anything; technologies, norm and values, systems, cultures, financial structures, etc. These breakthroughs can be written down on an A4 sheet.

From these necessary breakthroughs, the groups are encouraged to think of/discuss what these would mean for R&I and the R&I system. How should the R&I system look like? What changes of the R&I system are required? But also: What topics need to be studied? And 'What are leverage points in our City Lab context? The answers to these questions can also be written down on the A4 with breakthroughs.

Step 3: Identifying educational needs (20 min)

In this step, participants translate the required changes on R&I system level into educational needs. Questions that the facilitator could ask to help the participants to think of educational needs: what competences are necessary/need to be developed to achieve the required changes? What competences do future professionals in the field of FNS need? What need to change in education to meet the required changes? Educational needs can be written down on a post-it. Each educational need is to be placed on a new post-it.

Step 4: Plenary discussion on breakthroughs and educational needs (15 min)

The groups shortly present the outcomes of their brainstorm session regarding breakthroughs. After each presentation, the other groups are invited to reflect on the outcomes and/or ask clarifying questions.

The post-its with the educational needs are collected. The facilitator asks 1 group to name the educational needs. The facilitator asks why questions, especially with regard to the link with the Lab's vision. After each post-it, the facilitator asks the other groups whether they have similar needs on their post-its. The facilitator repeats this till all post-its are collected. The post-its are clustered into themes, and the facilitator asks the participants to name the different clusters.

Step 5: Outcome mapping (45 min)

This step can be done in the same workshop as step 1-4, but can also be the subject of a separate meeting. The starting point of the exercise is the educational needs as clustered in step 4.

The facilitator explains what outcome mapping is (based on slides) and how it can be useful to the Labs.

The participants are divided into groups of four. All groups receive the outcome mapping table as reflected in Figure 3. The facilitator asks the groups to fill in the table based on the educational needs clustered in step 4. From the impact on competences, participants can think of concrete outcomes, output and activities. Questions that the facilitator could use to help the participants to fill in the table: What should be the output of the Lab? What concrete activities need to be done to cover the educational needs?

The tables show what Lab activities need to be undertaken to have impact on the educational needs. In other words, from the tables, possible pathways to the realisation of the educational needs emerge.



After sharing and reflecting upon the tables, the pathways can be prioritized with e.g. stickers, so that a decision can be made regarding the Lab activities.

Outcome mapping



Lab activities	Output (deliverables)	Outcomes (direct consequences of city lab)	Impact (longer term effects)



Figure 3. Table for outcome mapping



8.4 Reports from the City Lab workshops on breakthroughs

The following documents present the raw data from 5 workshops carried out in the FIT4FOOD2030 that touched wholly or in part on the concept of “breakthroughs” and, more specifically, barriers or enablers around the implementation of selected breakthrough areas. Part I of each report presents general details about the workshop while Part II presents first, if applicable, deviations from the methodology proposed in Annex 8.3, the rationale behind the choice of breakthrough areas, and stakeholder input on those areas.

City Lab workshop on breakthroughs - Athens

PART I: CORE REPORT

Practical details

City Lab	Athens
Event title	Fit4Food2030 Workshop: Future-proofing the European food systems through Research & Innovation
Date	19/12/2018
Duration	Whole event: 4.5 hours
Location	Ellinogermaniki Agogi
Number of participants	19

Participant profiles

Participant ID (a simple identifier #1, #2 etc. or code used during the workshop)	Professional background	Stakeholder category Choose from: NGO/Citizen Organisation/Business/ Knowledge/Research institute/ agency/Other (please explain)	Area of work Choose from: Agriculture, Fish, Food distribution, Health, Environment, Other	Gender
1	Psychologist, Head of Education Dept. at municipality-level	Policy maker, Municipality	Health/Education	Female

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2	Project Manager	Association of businesses	Food	Female
3	Manager/administrator	Business	Chemist engineer, Responsible for Food Quality Assurance, Responsible for new products development	Female
4	Project Manager	NGO	Food distribution/waste	Female
5	Cultural Manager/researcher	NGO	Research	Female
6	Educator (secondary)	Private school	Other (Environmental & financial/entrepreneurship) education	Female
7	Manager/Vice-president	NGO	Other (Sustainable Development for Greece)	Female
8	Advisor/Health at work/ Public Health Doctor	Knowledge/ Research institute	Health	Female
9	Clinical Dietician/Nutritionist	Knowledge/ Research institute	Health	Female
10	Project Manager/Administrator	NGO	Food distribution/food waste	Female
11	Educator	Private school	Other (physical education)	Male
12	Project Manager/Environmental Studies	Research /Policy maker	Environment, Renewable Energy Technologies	Female
13	Educator/ Deputy-major of Public Health at municipality-level	Policy maker	Health & Education	Female
14	Project manager/Administrator at Municipality-level	Policy maker	Other (Administration)	Female

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15	Student HE (Member of the Entrepreneurial Team working on Food-related Product)	Student	Other	Male
16	Student HE (Member of the Entrepreneurial Team working on Food-related Product)	Student	Other	Female
17	Student HE (Member of the Entrepreneurial Team working on Food-related Product)	Student	Other	Male
18	Educator (secondary)- Responsible for teacher trainings (educational policy)	Policy maker, Public Education	Other (Environmental education)	Male
19	Researcher/project manager	Private school/R&D	Other	Female

Event description

Context of the event (if special)	The workshop took place on 19/12/2018 @ Ellinogermaniki Agogi Premises.
Description of how the workshop was run	<p>Participants presented shortly themselves as well as the activities they are personally or institutionally involved with as an ice-breaking activity and in order to get to know each other, since it was a heterogeneous group of people; while in parallel doing an introductory activity towards showcases. Then, a short presentation of the EU Food 2030 Policy Framework and the Fit4Food Project goals followed by the facilitator.</p> <p>Then, the facilitator presented the vision of the Athens City Lab as it has been formulated in the previous workshops; endorsement and positive reactions followed.</p> <p>Presentation of project definitions of the terms and the Multi-level Perspective around FNS: trends, showcases and breakthroughs as an introduction to the next exercises followed.</p> <p>Then facilitator presented shortly the categories of and main trends around FNS and mentioned the conclusion of the previous workshop discussion, that the ways that we address them might define whether they are supporting or hampering the implementation of the vision (as a potential stimulus for the upcoming sessions).</p> <p>Elaborate discussion on showcases and criteria followed. Some of the participants have communicated via phone before the workshop with the facilitator to ask whether a presentation would be needed by their side regarding best practices/showcases as a follow-up to the preparation instructions that were sent beforehand. It was explained that this was needed; just to be aware/prepared to discuss on the topic.</p> <p>The facilitator had selected showcases printed (project input) in order to support the discussion, if needed. However, in the end, they were not used, since after being proposed for the discussion it was agreed that it would make more sense to focus on local more relevant practices. Discussion on local practices was that fruitful that there was no time for elaborate discussions on the project input.</p> <p>Regarding Criteria for Showcases, participants were asked to brainstorm on which criteria are important for them towards the definition of a show case. Then they worked initially in groups of two on the list with selected criteria provided by WP3. Participants were asked to rank them in duos and reflect on them. Finally, all the input was presented/discussed in the plenary with use of a flipchart where the facilitator took notes.</p> <p>Regarding breakthroughs; since Education has been brought up in the discussions a lot, this domain has been proposed for discussion and there has been consensus. Exercise 2: Exploring barriers and enablers around a particular breakthrough domain has been selected.</p>

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The showcases (project input) related with the selected breakthrough, were just briefly mentioned by the facilitator in order to further trigger discussion.

Finally, wrap-up and planning for next actions took place.

Please paste below the agenda of your workshop

Fit4Food2030 Workshop: Future-proofing the European food systems through Research & Innovation (R&I)

- *Welcome - Tour de table (10 min)*
- *FOOD2030 policy & FIT4FOOD2030 Project (15 min)*
- *Visioning a future-proof food system, presentation of the outcomes of previous workshops (90 min)*
- *EU food system trends, Research & Innovation policy frameworks (00 min)*
- *Coffee Break (20 min)*
- *Discussion around Best Practices/Showcases (60 min) - Criteria for Showcases (30 min)*
- *Breakthroughs (60 min)*
- *Wrap-up /Action Plan (20 min)*

PART II: BREAKTHROUGHS

In this section, we are interested in the various suggestions that were made by the participants in the workshop **about breakthroughs and barriers and incentives for their implementation.**

Did the breakthrough-related work you did follow one of the breakthrough exercises proposed by the script?

☒ Yes, I used Exercise #2

☐ No, I made some adaptations to an existing exercise. What was different?

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☐ No, I used a completely different exercise. Explain briefly method used.

If participants could contribute with suggestions of potential future breakthroughs or reflect on the potential future breakthroughs identified by WP4 WP4 was used:

Input in the table below additional breakthroughs/directions of change suggested by participants or their reflections on already identified breakthroughs.

Breakthrough/Big change needed to achieve the City Lab vision	From table (T) or new (N)	Reflections, thoughts, if available	Proposed by (Stakeholder category/ Participant ID)
<p>After the free discussions which inevitably take place during the workshops, education has been mentioned a lot as a critical enabler. Therefore, from the deliverable 4.1 Education and New Methods has been selected to be further discussed on as potential Breakthrough.</p>	T	<p>Nutrition to be inserted in a multi-disciplinary way in the school curriculum</p> <p>(history, chemistry, biology, mathematics: calories calculation)</p> <p>Combination of Top-down with bottom up approaches to this end,</p> <ul style="list-style-type: none"> e.g. of a top-down: the thematic week on Health and Nutrition on Secondary schools by Institute of Educational Policy (IEP) is an opportunity for such a multi-disciplinary integration example of a bottom-up: Open Schooling approach: Municipalities can contribute/support the dissemination of good practices/projects among local schools, as well as schools of other regions 	<p>Plenary discussions</p> <p>Almost all participants mentioned education at some point in the discussions</p>



		<ul style="list-style-type: none">• Exploit of national and international teacher training opportunities (e.g. 5 days teacher trainings/summer courses) in order to raise awareness, stimulate the adoption and adaptation and dissemination with use of online repositories of educational activities regarding the FNS <p>Pedagogical Innovative approaches (such as Open Schooling and the Learning City approach) can contribute positively (bottom-up approaches combined with top-down approaches such as the Food 2030 Policy Framework, the 17 SDGs and the Guidelines by the Ministry of Education</p> <p>Innovation and entrepreneurial behaviour (e.g. Innovation through Contests with Entrepreneurial Teams of Students Products regarding FNS design and production)</p> <ul style="list-style-type: none">• New models of collaboration in these teams, e.g. Social entrepreneurship, Company responsibility (linked with reducing food waste) <p>Multidisciplinary approaches, such as Robotics and ICT contests on the field of Nutrition and Environmental issues (indicatively the National WRO (World Robot Olympian)</p>	
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		<p>contest of previous years had as topics: Green Energy and Entrepreneurship;</p> <p>Sustainable Development and Entrepreneurship; Reduce Food Waste (for the category: Elementary schools)</p> <p>Wider adoption of technology in educational approaches (e.g. use of sensors/IoT (Internet of Things) with school gardens)</p>	
<p>Media has a critical role in raising <u>awareness</u>/disseminating good practices around FNS. A discussion on the motto that could be appealing and meaningful took place and the outcomes are:</p> <ul style="list-style-type: none"> • “Think globally, act locally” • “Change your diet to improve your health” • “We eat in order to live and not vice versa” (psychologists mentioned that taste is an important factor and products have been based on this factor) • “Consume less meat and adapt a plant-based diet” • Return to the roots (or tradition-> Mediterranean diet) 			Plenary discussions
<p>Cultural change needed; the value of food is lost (when wasting food is not only its cost also the value of lost natural resources, cost of waste disposal, etc.) all these concepts need to be disseminated via education; connection with land and resources lost; the motive to change is not known awareness is missing</p> <p>It takes time to have a change in behavior (resistance); repetition and education needed in order to establish new behaviours</p>			8,9, 3



There needs to be a change in psychology, e.g. the social acceptance of smoking has changed during the last years; something equivalent needs to take place with food			
We need to find opportunities, even during Crisis times, there is now a tendency for people to exercise out in the open; now is a golden time for decisions in order to change mentality			(P. 11)



If a discussion of barriers and enablers around a particular breakthrough domain was carried out, for each group involved in the discussion, input:

Topic selected for discussion: **Education/New methods in Education**

Brief explanation of the selection: The topic has been constantly mentioned in the discussions in the specific as well as in the previous workshops and has been specifically named in the Lab vision formulation. It was proposed and agreed to discuss on it

Brief description of how participants imagined the topic in relation to the City Lab vision No particular differences in vision were recorded with the discussions taking place in the previous workshops.

Factor identified	Challenge (C) or Incentive (I)	STEEP/Cluster	Actors and Interactions considered
Age of stakeholders (there is a gap for the ages 30-45) and maybe less for the elderly due to their participation in common activities via municipalities	Challenge (C)		1, 8, 13, 14 The following factor (Training at work place) has been suggested as potential way to address this Challenge This has been addressed from the psychologist point of view (also from the municipality side as well as a research/medical approach) but from the discussion afterwards almost all agreed that this is an important social & community issue also due to long hours of work that usually lead people to unhealthy habits Students can act as multipliers (for their families, etc.) thus education is key
Training at the work place	C or I (the way we see things can define whether a factor is a challenge or an incentive- in the specific case it was mentioned that the factor is missing and thus taking actions towards its		8, 1, 13, 14 This has been addressed from the psychologist point of view (also from the municipality side as well as a research/medical approach) but from the discussion there seemed to be consensus that this would help to alleviate the problem

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	<i>implementation would be an enabling factor)</i>		
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City Lab workshop on breakthroughs - Budapest

PART I: CORE REPORT

Practical details

City Lab	ESSRG-Budapest City Lab
Event title	Fit4Food Budapest first meeting of the year – Making our food system more sustainable via competence development
Date	2019. January 14th
Duration	7 and a half hours
Location	Impact HUB Budapest
Number of participants	18

Participant profiles

Participant ID (a simple identifier #1, #2 etc. or code used during the workshop)	Professional background	Stakeholder category Choose from: NGO/Citizen Organisation/Business/Policy-maker/ Knowledge/Research institute/Funding agency/Other (please explain)	Area of work Choose from: Agriculture, Fish, Food distribution, Health, Environment, Other	Gender
P6	Public catering and school canteens	Business	Health	F

P9	Food product development and optimization, food physics, education	Knowledge/Research Institute	Other	M
P10	Gastrobiology	Knowledge/Research Institute	Health	F
P11	Food safety and nutrition	NGO	Health, Food distribution	F
P12	Consultancy, Entrepreneurship	Business	Food distribution	F
P14	Social, economic, aesthetic and political impact of food choices made by individuals and groups	Knowledge/Research institution	Other	F
P17	Private labels, Food production and processing	Policy-maker, Research Institute	Agriculture	M
P4	Food waste	NGO	Food (re)distribution	M
P5	Food quality and safety	Policy-maker	Health	F
P7	Nutritionist	Knowledge/Research institution	Health	F
P29	Community organization	NGO/Citizen Organisation	Other	M
P23	Agricultural policy, small farmers	Policy-maker	Agriculture	F
P30	Short Supply Chain Expert, rural development	Policy-maker	Agriculture	M
P8	Gastronomy	Knowledge/Research institution	Other	F
P15	Small farmers, CSAs	NGO/Citizen Organisation	Agriculture, Food distribution	F
P31	Public procurement	Policy-maker	Agriculture	F

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FIT4FOOD2030

Towards FOOD 2030 – future-proofing the European food systems through Research & Innovation



P32	Biodiversity, Ecosystem Services	Business	Environment	F
P33	Logistics, business development	Business	Food distribution	F



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Event description

Context of the event (if special)	-
Description of how the workshop was run	<p>The workshop was facilitated by the CL coordinator and had an interactive format. A member of our organization took notes during the entire day, and we also recorded all discussion that happened in the small groups. After the introduction, setting the expectations for the day and a short exercise using the trend cards we focused on the potentially most relevant breakthroughs in small groups. After the breakthrough exercise we continued with the two prototyping exercises for module development. The vision developed in the previous workshops, as well as, the results of the breakthrough exercise were used as starting points for identifying the most relevant competences that the modules should focus on, then we carried out a brainstorming process regarding module development. Finally, we had a more loosely moderated discussion about how the evolving network can live on, what should be the next steps, as well as, who would like to be further involved in the process and in what form.</p>

Please paste below the agenda of your workshop

Program	
8:50 – 9:00	Registration, Arrival
9:00 – 10:00	<ul style="list-style-type: none"> • Opening, Introduction of participants, Sharing expectations regarding the workshop • Introduction of the Fit4Food2030 project and the role of the Budapest CL. Where are we now? What have we done so far? What is next? • Ice breaking exercise with trend cards
10:00 – 11:00	Potential breakthroughs in the light of our City Lab's vision <i>Challenges and Incentives</i>
11:00 – 12:30	Identifying the competences that are not well represented in the local system and are urgently needed

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12:30 – 13:30	Lunch and networking
13:30 – 15:00	Brainstorming about educational module development
15:00 – 16:20	What are the next steps? Possibilities of creating an innovation ecosystem and sustaining the transformative network in the region of Budapest
16:20 – 16:30	Closing circle

PART II: BREAKTHROUGHS

In this section, we are interested in the various suggestions that were made by the participants in the workshop **about breakthroughs and barriers and incentives for their implementation.**

Did the breakthrough-related work you did follow one of the breakthrough exercises proposed by the script?

☒ Yes, I used *Exercise 2, Exploring barriers and enablers around a particular breakthrough domain*

☐ No, I made some adaptations to an existing exercise. What was different? Explain briefly.

☐ No, I used a completely different exercise. Explain briefly method used.

If participants could contribute with suggestions of potential future breakthroughs or reflect on the potential future breakthroughs identified by WP4 was used:

Input in the table below additional breakthroughs/directions of change suggested by participants or their reflections on already identified breakthroughs.

Breakthrough/Big change needed to achieve the City Lab vision	From table (T) or new (N)	Reflections, thoughts, if available	Proposed by (Stakeholder category/ Participant ID)

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If a discussion of barriers and enablers around a particular breakthrough domain was carried out, for each group involved in the discussion, input:

Topic selected for discussion: ***New value systems – with a specific focus on new business models (e.g.: Short Supply Chains)***

Brief explanation of the selection: *The selection was carried out by the following process: I have prepared a separate card for each breakthrough from the table and placed it on the wall around the room. Participants were asked to vote on the breakthroughs that they considered the most relevant in relation to our CL's vision by going around and placing small stickers on the cards.*

Brief description of how participants imagined the topic in relation to the City Lab vision *Several aspects of the CL's vision emerged as to be compatible/ rather similar to how they envisioned the changes in this breakthrough area. However, found it hard to conceptualize a viable pathway to get there. During the plenary discussion it surfaced that some participants considered the focus we have had in the project so far too one-sided, focusing too much on the attractive vision, while discussing less the potential threats and crises situations.*

[They imagined the transition to new value systems to be rather difficult, characterizing it as a “shock”, where many enterprises will go bankrupt, and several people will lose their jobs. The transition would be catalyzed by the increasing environmental and social pressures (e.g.: climate change, rapid population growth, “oceans of trash”). As the main players disappear, although not without a fight, the actors that dominate the field and the type of jobs available will be completely different compared to now. The role of the government might change, initially taking part intensely in the transition enforcing supporting measures (tax cuts, subsidies, etc.), then gradually taking a less central role as consumers/citizens become more empowered and environmentally and socially conscious. The new business models that emerge are even more consumer-driven, placing high emphasis on easy, comfortable and quick access. Social relationships will become once-again more tight-knit and trust based, having direct contact between producers and consumers. Cooperatives and various forms of cooperation among small actors will play a central role. The “less is enough” mentality will prevail both as a consequence of higher level of consciousness and out of necessity.]

Factor identified	Challenge (C) or Incentive (I)	STEEP/Cluster	Actors and Interactions considered
			Mention the stakeholder category/participant ID, if the participant who brought a certain input is known.
Supporters of the status quo	C	Social, Political, Economic	<i>“It is inevitable that some actors will be the beneficiaries of the transformation, while for others it will be a threat.”</i> Actors identified as potentially challenging the process:

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			large (multinational) corporations, intermediaries, marketing & sales professionals (P17, P23)
Disappearance of jobs	C	Social, Economic	Stakeholders: employees of the previously mentioned large corporations, etc. (P23)
Ensuring access to food	C	Social, Technological	P32
Ensuring that there is enough food for everybody	C	Social, Environmental, Technological, Economic	P32
Lack of consumer awareness	C	Social, Value based	<i>“The consumer is the key actor in the process, can take the role of producer, distributor”</i> (P32)
Social innovations	I	Social, Economic, Environmental	(P31) <i>“social innovations will pave the way, not corporations”</i>
Population Growth	I	Social	(P11) This is going to be an incentive for more effective production systems, as well as, increased self-provisioning
Climate change	I	Environmental	<i>“the pressure of climate change will push policy makers to bring on drastic measures”</i> (P32, P31, P11)
Supportive regulatory environment	I	Political	P17
Subsidies	I	Economic, Political	(P17), <i>“the government need to provide subsidies and tax cuts in order to aid the transformation, and support the various actors in the uncertain transitional period”</i>
New technologies	I & C	Technological	(P11, P31, P32, P17) SSC, sustainable production, more efficient production and distribution, highly developed infrastructure for logistics and distribution. <i>“research is needed for developing the necessary technological infrastructure”</i> (P31) <i>“new technologies need to follow the transformation of the attitude of consumers”</i> (P17)
Change of consumer/social expectations	I	Social, value based	<i>“less is enough”</i> (P32) (P31, P17, P11, P23)

Cooperatives, cooperation of a lot of small actors	I	Social, value based	(P32, P17, P11)
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Topic selected for discussion: ***Empowered and conscious consumers***

Brief explanation of the selection: *The selection was carried out by the same process that is explained with regards to the first breakthrough area.*

Brief description of how participants imagined the topic in relation to the City Lab vision *This area received almost unanimous support from participants, and it also emerged as one of the main themes in all the previous workshops.*

[They also envisioned a “difficult, but beautiful path” to lead up to the breakthrough with a longer transition period where a hybrid system exists. Everyone is a stakeholder regarding this breakthrough area, from all parts of the food system. One of the main dilemmas that surfaced was the ability to influence the local reality versus the global systems. They envisioned a system where the individualist, self-centered approach changes to a “we-centered approach” Education plays a crucial role in the transition.]

Factor identified	Challenge (C) or Incentive (I)	STEEP/Cluster	Actors and Interactions considered Mention the stakeholder category/participant ID, if the participant who brought a certain input is known.
Media and influencers	C & I	Social, Political	(P10, P30)
Misconceptions and myths widespread among the members of the population	C	Social	(P10, P5) <i>“consumers are easily influenced by new trends, even if these are not beneficial, such as super foods, etc.”</i>
Inadequate regulatory system (SSC)	C	Political, Economic	(P30)
Dichotomy of biotechnology vs. ecology	C	Value based, Social, Technological, Environmental	(P10)

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Dichotomy of natural vs. artificial	C	Value based, Social, Technological, Environmental	(P10)
Simplification of the available choices	I	Political, Economic	(P30)
Change and extension of the national curricula for public school	I	Political, Social	P5, P30 (focusing on both children and their parents), <i>“Integrating in all subjects, not as a separate theme once a year”</i>
Simultaneous top down and bottom up approach	I	Political, Economic, Social, Value based	Conscious cooperation and network building (P5), various events, “green festivals”, etc. (P29) and political and economic restructuring (P30)
Tax benefits	I	Economic	P5
Tender opportunities	I	Economic	(P5, P29)
<i>“minimalist approach”, “self-restraint”</i>	I	Value based	P10
Stricter regulations	I	Political	Regarding transportation, travel, choice, food marketing (P10, P30)
New community-based applications	I	Technological, Social	(P30) Increasing consumer trust (sending pictures, informations about certain producers, etc.)
Health consciousness, diseases	I	Social	(P10)

Topic selected for discussion: ***Social Innovations – with a specific focus on social entrepreneurship and community driven social innovations***

Brief explanation of the selection: *The selection was carried out by the same process that is explained with regards to the first breakthrough area.*

Brief description of how participants imagined the topic in relation to the City Lab vision *While overall this area also supports the vision, similarly to the previously described areas, participants imagined the way towards the transformation rather difficult.*

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Factor identified	Challenge (C) or Incentive (I)	STEEP/Cluster	Actors and Interactions considered Mention the stakeholder category/participant ID, if the participant who brought a certain input is known.
Self-centeredness	C	Social, value-based	P7
Stereotypes, distance between different social groups	C	Social	P7
Scarcity of natural resources (water, land, etc.)	C & I	Environmental	P15
Social Media and Influencers	C & I	Social, Political	It can be both a hindrance, when propagating values, behaviors, etc. that go in opposition to our CL's vision, and at the same time an enabling factor for the transformation. (P9, P7) "pro science social media"
Lack of trust	C	Social	
Development in the field of robotics	C & I	Technological	P15
Political and power-based dependence	C	Political	P15, P9
Fear	C	Social	P14 "being afraid of food"
Migration	I	Social, Political	P9
Flexible regulatory system & supporting policies	I	Political, Economic	(P15) "food as commons"
Increasing transparency (and therefore, increasing trust)	I	Social, Value based	P14 (open innovation)



Education	I	Social, Value based	Changes both in the current formal education system, as well as, increase in informal courses and community education. (P9, P14, P7). “learning and teaching is valued by society, cultural heritage”, “
New platform that supports cooperation between the various sectors (public, private, civil sectors, as well as, research and education institutions)	I	Social (Technological?)	P9



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Description of the competences considered necessary:

We took the City Lab vision developed earlier, as well as, the discussions regarding the three breakthrough areas as the base for identifying what competencies the participants considered to be not well-represented enough and in need of urgent development. A long list of competencies was identified (please find them below), out of which the group decided to focus on the following four as the basis for the brainstorming of educational modules: 1) *Cooperation*, 2) *Analytical Thinking*, 3) *Ability to learn and change*, 4) *Future studies and responsible, long term thinking*.

Further competencies that were found to be the most important to focus on in the local context:

- Adaptability
- Ability to manage large amounts of information
- IT skills (special focus on the ability to use online forms and systems for task management)
- (Future oriented) ethical thinking / abilities, long-term thinking & Future studies abilities
- Navigating complexity or wickedness
- Involvement of stakeholders in research design and data collection
- Social Intelligence
- Empathy
- Analytical thinking
- Novel and adaptive thinking
- Sense-making
- Proactivity and agency
- Fundraising and financial knowledge
- Self-awareness
- Openness and transparency
- Critical thinking
- Conflict management

In addition, the personality traits of optimism, self-confidence and patience together with the ability to carry out organizational development processes were identified as crucial for achieving food system sustainability in the future. However, there was significant disagreement regarding whether they can be developed in the setting of the planned educational modules.

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FIT4FOOD2030

Towards FOOD 2030 – future-proofing the European food systems through Research & Innovation



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City Lab workshop on breakthroughs - Milan

PART I: CORE REPORT

Practical details

City Lab	Milan
Event title	<i>Training e competenze per l'innovazione sostenibile del Sistema Alimentare. Punti di svolta, barriere e incentivi.</i> <i>Training and competences for the sustainable innovation of the Food System. Breakthroughs, barriers and incentives.</i>
Date	28 th January 2019
Duration	14.45 – 18.00
Location	MUST
Number of participants	26 (18 stakeholders as public + 4 MUST + 3 MUFPP + 1 Cariplo Foundation)

Participant profiles

Group for the discussion	Participant ID (a simple identifier #1, #2 etc. or code used during the workshop)	Professional background	Stakeholder category Choose from: NGO/Citizen Organisation/Business/ Policy-maker/ Knowledge/Research institute/ Funding agency/Other (please explain)	Area of work Choose from: Agriculture, Fish, Food distribution, Health, Environment, Other	Gender
Group #1	#1	Consultant	Knowledge – Nutrition and Research	Nutrition	M
	#2	Food Policy expert	Policy maker – Local context	Urban Food Policy	F
	#3	Consultant	Policy maker – National context	Agriculture	F

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	#4	Consultant	Knowledge – Food Education	Food Education	M
	#5	Local Coordinator	Citizen and Consumers Organization	Food sustainability	F
Group #2	#6	Teacher	Knowledge – Scholar Education	Science and Mathematics	F
	#7	Consultant	Knowledge – Nutrition and Research	Food Education	M
	#8	Journalist	Knowledge – Web Journal	Agriculture	F
	#9	Consultant	Knowledge – Food Education	Food Education	M
	#10	Consultant	Policy Maker – National context	Agriculture	F
	#11	Researcher	Knowledge – National Research Institute	Food and Breeding	F
	#12	Science Educator	Knowledge – Science Education	Public Engagement with Science	F
Group #3	#13	Founder and Educator	Local NGO	Food Waste and Sustainability	F
	#14	Volunteer	Local NGO	Food Waste and Sustainability	F
	#15	Volunteer	Local NGO	Food Waste and Sustainability	F
	#16	Entrepreneur	Business – Start up	Urban Gardening	M
	#17	Consultant	Citizen Organization	Consumers' rights	F
	#18	Food Policy Expert	Policy maker – Local context	Urban Food Policy	F
	#19	Teacher	Knowledge – Scholar Education	Science and Mathematics	F

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Event description

Context of the event (if special)	<p>The workshop took place in the Museum as the third and last meeting of the mapping and analysis phase.</p> <p>The organization and the contents of the event were planned in collaboration with MUFPP Office, expert in matter of Food Policy, and a representative of Cariplo Foundation who contributed focusing and pointing the Responsible and Innovative Research issues.</p>
Description of how the workshop was run	<p>The workshop aimed to conclude the analysis and visioning phase, and to set the basis for the co-design process.</p> <p>The participants together identified breakthrough for the system transformation towards the vision and the competences needed in the future food system.</p> <p>All these elements will be helpful in the next phase, which will be about co-designing, developing and prototyping educational modules, in cooperation with some of the local stakeholders already involved in the project.</p> <p>Referring to stakeholder engagement, in this chance the Museum involved the teachers who contributed to develop the vision about school and food system during the dedicated workshop, as they will be important contributors during the implementation phase of the activities.</p> <p>Moreover, through the stakeholder engagement process, the Museum succeeded in adding new actors to the group. Among the new participants of the Milan City Lab, some of the represented the voices of the “unusual suspect”. It’s the case of the non-government local organization “Recup”. Founded in 2016, the association is based on purpose to counteract the food waste and the social isolation; it’s composed by more than 30 volunteers, among students, homeless, unemployed and retired people, immigrants, Italian, European and non-Community citizens. Led by some similar French experiences, this group recollects the food left in the neighborhood markets, which is going to be re-distributed to and eaten by the group of volunteers itself.</p> <p>This project aims to create cooperation among intercultural and intergenerational communities, through an ethic action and social responsibility.</p> <p>Below it is presented the agenda of the session:</p> <p><i>Introduction</i></p> <ul style="list-style-type: none"> From food system analysis to the development educational activities Matteo Villa (MUST) presented the program of the day. Since it was the first time that some participants joined the Milan City Lab, in order to align the knowledge and the awareness of each of them, he summed up what was done in the previous meetings.

In particular, he presented in depth the fundamental elements of the vision emerged in the process of system analysis, as action fields where the change will happen (Ecosystemic Approach, Communication, Social Innovation, Education and School role, Strengthening of R&I. See below).

Finally, Matteo Villa pointed the attention on the current topic of the third workshop and the next phases, which is Education as a stimulus for future change.

Presentations

- **Milano Food Policy: focus on the priority Education**

Chiara Pirovano (MUFPP) presented to the public how the Municipality of Milan and Cariplo Foundation elaborated the Food Policy, by integrating the perspectives and the contributes of several local actors (experts, municipality, funding institutes, business representatives).

The policy aims to create a more sustainable and inclusive city, starting from the food issues.

Pirovano underlined the importance of Food Education, as one of the five priorities declared in the Milan Food Policy.

- **Food Policy & RRI**

Valentina Amorese (Cariplo Foundation) spoke about the Responsible Research and Innovation (RRI) processes in the context of Milan Food Policy. She summed up the process, the actors and the items of RRI and showed the public how their application worked in the City of Milan (for example in the case of neighbourhood markets or schools).

Interactive Activity

- **Educational activity to deal with the themes of the food system**

The group moved to the Food and Nutrition Lab of the Museum, where Valeria Chiodini (MUST) led an interactive activity in which all the stakeholders were active participants. This phase had the aim to show the stakeholders how an interactive activity can be structured and how food education can be made through engaging moments (see annex # 9).

----- *Coffee Break*

Interactive Activity

- **Competences for the transformation – group discussion on breakthroughs and competences needed.**

In order to explore the concept of breakthrough with the City Lab Members, they were presented as “big changes” expected for 2050, possible only investing on new competences. Because of that, the identification of the competences needed to transform the Food System goes through the identification of breakthroughs themselves.

This moment was divided in to two parts:

1. Identification of expected big changes: the stakeholders, divided in three different groups, were asked to complete a conceptual map imaging and indicating what big changes they hope will happen before 2050, in matter of Ecosystemic Approach, Communication, Social Innovation, Education and School role, Strengthening of R&I (see annex # 4);
2. Identification of the new competences: once identified the expected changes, the participant were asked to choose among some given suggestions or to propose ex novo the skills they think are necessary to trigger the transformation of the Food System (see annex # 5).

Conclusion

- City Lab: next steps

The conclusive phase of the workshop aimed to summarize what was elaborated during the day and to prepare the City Lab for the next steps (co-designing ad prototyping phase).

All the participants had to place on a matrix the competences they had chosen or individuated as needed in the previous exercise (see annex # 6). They had to settle them choosing among different categories: more urgent/less urgent; underdeveloped by the educational resources available/ highly developed by the educational resources available.

A postcard was handed out to every participant, as a reminder of their future role of co-designer of educational modules (see annex # 9).

Please paste below the agenda of your workshop and evidence of attendance, if applicable.

Introduction

- **From food system analysis to the development educational activities**

Presentations

- **Milano Food Policy: focus on the priority Education**
- **Food Policy & RRI**

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Interactive Activity

- **Educational activity to deal with the themes of the food system**

----- *Coffee Break*

Interactive Activity

- **Competences for the transformation – group discussion**

Conclusion

- **City Lab: next steps**

PART II: BREAKTHROUGHS

In this section, we are interested in the various suggestions that were made by the participants in the workshop **about breakthroughs and barriers and incentives for their implementation.**

Did the breakthrough-related work you did follow one of the breakthrough exercises proposed by the script?

☐ Yes, I used Exercise

☒ No, I made some adaptations to an existing exercise. What was different?

During the first and the second workshop, thanks also to the activity led with teachers, the Museum, as coordinator of the City Lab of Milan, was able to draw a vision about five macro areas that need to be hit by a big change in the next decades. Each of them comprehends some items that need to be deepened in order to provide a common perspective on competences useful for transformation. They are:

- Ecosystemic Approach
 - Awareness to be part of a complex system;
 - Connection between different perspectives and languages;
 - Transversality of scales and purposes.
- Communication;
 - Dealing with communication issues and fake news;
 - Spreading scientific data;
 - Promoting attitude for information.

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- Research and Innovation;
 - o Promoting research-based thought and approach;
 - o Providing updated technological support;
 - o Strengthening training to contemporary technologies.
- Education;
 - o Scholar environment as place where directly experience food processes;
 - o Integrating in school programs the topics of the future challenges.
- Social Innovation.
 - o Set up a development sensible to disadvantaged categories;
 - o Promoting social innovation aware of sustainability topics.

In order to present the concept of “breakthrough” in a more approachable way for all the participants, they were presented as big changes expected to happen by 2050 in each of the described macro areas; the breakthroughs themselves are not considered as the results of the process, but such as big changes functional to the identification of the competences needed. For these reasons, the interactive activities done during the workshop were structured in two phases:

- First, divided in three groups, the stakeholders discussed on the expected big changes in each macro area;
- Then, the participants reflected on what competences are necessary to make those changes happen, choosing among some given suggestions or identifying some other new ones.

In the final exercise, the competences were placed on a matrix, according to the actual level of urgency and development. The results will be embedded in the process of co-design

☐ No, I used a completely different exercise. Explain briefly method used.

If participants could contribute with suggestions of potential future breakthroughs or reflect on the potential future breakthroughs identified by WP4 was used:

Input in the table below additional breakthroughs/directions of change suggested by participants or their reflections on already identified breakthroughs.

Group	Action Field	Breakthrough/Big change needed to achieve the City Lab vision
	Ecosystemic Approach	- Awareness about global citizenship
	Communication	- Hyper-segmentation



# 1	Research & Innovation	- Increase of the value of transfer
	Education	- Experience-based learning approach
	Social Innovation	- Increase of the value of social activism and social well-being
# 2	Ecosystemic Approach	- Unity of knowledge; - Multidisciplinary knowledge; - Complexity and value of diversity.
	Communication	- Cross communication
	Research & Innovation	- Universities able to listen and share; - Increase of social value of Science and Technology; - Open access to research results (no patent needed).
	Education	- Value of the experience; - Constructivist approach; - Competences able to transform, replacing transmitted information.
	Social Innovation	- Higher salaries for teachers and educators
# 3	Ecosystemic Approach	- Community cohesion; - No more plastic; - Public water; - No more junk food in vending machines.
	Communication	- Scientific-based and critic approached communication; - Simpler communication (e.g. Eufic – European Food Information Council); - Exhaustive food tracking in every detail.
	Research & Innovation	- R&I in schools or local context; - More funding.

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	Education	<ul style="list-style-type: none"> - New tools, e.g. food diary; - Adjustment of school timetable, to better fit nutrition needs; - Encourage Physical Education activities at school; - Increase the knowledge about global Food System; - Gardening at school.
	Social Innovation	<ul style="list-style-type: none"> - More fundings; - Recycle of domestic appliances, smartphones...; - Creation of local hub to prevent food, drugs and clothes wastage;

Annex # 4 – Example of Big Changes expected for 2050

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2050 - BIG CHANGE				
APPROCCIO 'ECOSISTEMICO'	NO VENDING MACHINE CON JUNK FOOD (EX. C&A SAN DONATO)	↑ USO ACQUA PUBBLICA EX CASE DELL'ACQUA	NO PLASTICA	SENDO D'A COMUNITÀ ↑
COMUNICAZIONE	COMPLETA TRACCIABILITÀ DEL CIBO (DETRACU)	COMUNICAZIONE CON BASE SCIENTIFICA E APPROCCIO CRITICO	EU FIC - EX UE COMUN. J. F. P. U. C. E	
RICERCA & INNOVAZIONE (RI)	R&I NON SOLO CON GRANDI / MEDIE AZIENDE MA ANCHE SCUOLE E REACTOR CITTADINE	AUMENTO FINANZIAMENTI		CONOSCENZA SISTEMA ALIMENTARE GLOBALE NEL BOSCO, GIARDINI, API INNOVATIVI,
EDUCAZIONE	STRUMENTI: - ES DIARIO ALIMENTARE	PRENDERE IN CONSIDERAZIONE ADEGUAMENTO ORARI SCOL.	INCENTIVO COME DI ATTIVITÀ FISICA DENTRO LA SCUOLA EX. ATTIVITÀ SCOL.	
INNOVAZIONE SOCIALE	HUB LOCALI X SPRECO CIBO FARMACI FRIGO, VESTI	EX SOLIDANDO FABBRICAZIONE SOLIDALI	AZIENDE PER RECUPERO TELEFONIA, FRIGO, LAVATRICI ELETTRICHE, ETC.	

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City Lab workshop on breakthroughs - Sofia

PART I: CORE REPORT

Practical details

City Lab	Sofia City Lab
Event title	Potential Breakthroughs – How will they improve our food system
Date	16 January 2019
Duration	2.5 hours
Location	Sofia, Joint Innovation Center
Number of participants	

Participant profiles

Participant ID (a simple identifier #1, #2 etc. or code used during the workshop)	Professional background	Stakeholder category Choose from: NGO/Citizen Organisation/Business/ Policy-maker/ Knowledge/Research institute/ Funding agency/Other (please explain)	Area of work Choose from: Agriculture, Fish, Food distribution, Health, Environment, Other	Gender
18	Secondary Teacher	Knowledge/Research institute	Other	F
7	Associate at NGO	Other	Other	M
6	Researcher	Knowledge/Research institute	Other	F
14	Secondary Teacher	Knowledge/Research institute	Other	F
13	Secondary Teacher	Knowledge/Research institute	Other	F

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22	Academic, Director	Knowledge/Research institute	Health	M
15	Secondary School Director	Knowledge/Research institute	Other	F
16	Secondary Teacher (biology)	Knowledge/Research institute	Other	F
9	Ass. prof. specialized in designing educational courses	Knowledge/Research institute	Other	M
23	Program Director	NGO	Other	F
20	Researcher	Knowledge/Research institute	Agriculture	F

Event description

Context of the event (if special)	<i>e.g. if co-hosted, if held as part of a larger event etc.</i>
Description of how the workshop was run	The workshop began with short introduction of Sofia City Lab work and its stakeholders, as there were a new stakeholder present. However, she was acquainted with the project as she is part of EU Think Tank. There was a brief comment on the vision for future-proof food system of the Lab. An exercise on breakthroughs was made, followed by a discussion. Stakeholders were given some time to make any comments they would like. At the end the group discussed future project activities and how to stay in touch.

Please paste below the agenda of your workshop and evidence of attendance, if applicable.

1. Short introduction of Sofia City Lab work and stakeholders;
2. Exercise on breakthroughs;
3. Discussion on the exercise;
4. Any comments from the stakeholders;
5. Wrap up and future steps.

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PART II: BREAKTHROUGHS

In this section, we are interested in the various suggestions that were made by the participants in the workshop **about breakthroughs and barriers and incentives for their implementation.**

Did the breakthrough-related work you did follow one of the breakthrough exercises proposed by the script?

☒ Yes, I used Exercise 2

☐ No, I made some adaptations to an existing exercise. What was different? Explain briefly.

☐ No, I used a completely different exercise. Explain briefly method used.

If participants could contribute with suggestions of potential future breakthroughs or reflect on the potential future breakthroughs identified by WP4 WP4 was used:

Input in the table below additional breakthroughs/directions of change suggested by participants or their reflections on already identified breakthroughs.

Breakthrough/Big change needed to achieve the City Lab vision	From table (T) or new (N)	Reflections, thoughts, if available	Proposed by (Stakeholder category/ Participant ID)
Smart farming	T	Smart farming could be very beneficial in some areas where the product cycle could be completed in the country, for example herb and spices processing, beekeeping...	P7, P18
Non-conventional production systems - Urban farming, Vertical agriculture	T	Some non-conventional production systems give a lot of possibilities for everyone to benefit from local production.	P16
A novel approach to biotechnology	T	This is a very big and complex theme, but a lot could be done in this direction.	P22

Art farming	N	Using abandoned buildings for farming and art, benefiting both from the production and better-looking landscape, also fighting air pollution.	P14
New use and popularizing superfoods typical for Bulgaria	N	New tendencies in nutrition, like the use of more superfoods, are step towards achieving the goal of healthier consumer habits.	P14

If a discussion of barriers and enablers around a particular breakthrough domain was carried out, for each group involved in the discussion, input:

Topic selected for discussion: **Smart farming**

Brief explanation of the selection: Some stakeholders found the topic interesting and offering a lot of opportunities.

Brief description of how participants imagined the topic in relation to the City Lab vision Basic production could be optimized; more products could be produced entirely in the country rather than resources being exported at low prices.

Factor identified	Challenge (C) or Incentive (I)	STEEP/Cluster	Actors and Interactions considered Mention the stakeholder category/participant ID, if the participant who brought a certain input is known.
Increase in the interest in using new technology in basic production, even in guarding planted areas	I	Economic	„Smart farming could improve the interest in using technology in basic production. It should attract producers and all kinds of farmers.” P14. “Technology could be used even considering guarding planted areas, which is an issue in Bulgaria, and entrepreneurs could benefit from providing such services as well” P7. Most participants agreed that innovation in agriculture should be supported by policy makers both at state and regional level. Young people, including students, would see more opportunities in a career in agriculture, which could be crucial and very important for our country.
Attract young specialists to the field, especially ICT professionals	I	Technological, Economic, Social	“Attracting young people in the field of agriculture and basic production is absolutely necessary” P18. It was commonly agreed that universities, especially ones specialized in food related areas, and educators will have main role in steering students towards the field. Again,

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			policy makers were seen as a leverage to make jobs and career opportunities more alluring. Even specialists who already work in agriculture could share their experience and needs. “Definitely such change towards use of technology in farming will lead to high demand of ICT specialists”. P6
Train ICT specialists to work in the field	C	Technological, Economic, Social	“And this higher demand for ICT specialists will have two sides – on the one hand there will be more work places, but on the other, such specialists should be properly trained. And here universities would have to adapt and expand their programs.” P9. “In order for this to happen again policy makers should support this line of education and think about training teachers as well” P9. It was discussed that business, in need of such specialists, could support education in this field by funding programs and/or offering work places for graduates.

Brief description of the competences considered necessary in relation to the topic: Higher ICT literacy among professionals in the field.

Topic selected for discussion: **Urban farming, Vertical agriculture**

Brief explanation of the selection: Participants found that these are practical approaches which could be easily adopted by the citizens.

Brief description of how participants imagined the topic in relation to the City Lab Some stakeholders thought that using such practices is a step towards innovative food system and is a sign for new type of consumers.

Factor identified	Challenge (C) or Incentive (I)	STEEP/Cluster	Actors and Interactions considered
			Mention the stakeholder category/participant ID, if the participant who brought a certain input in known.
Developing agroecology	I	Social, Environmental, Value-based	“Keeping in mind the current conditions agroecology is of great importance for the development of modern agriculture. It affects not only producers, but all consumers and in this regard the whole society.” P13 Agroecology has already influenced some farmers. It was seen as significant for the environment, in this regard developing and promoting it should be supported by environmentally

			conscious citizens. “In this case as well teachers, shaping young people’s mindset are actors who should be involved.” P14
Improving citizens awareness through making these practices more popular	I	Social, Environmental, Value-based	“People should be aware that their neighbors are actually using these practices. And that one can farm in their own apartment in the city center. Bulgarians have a lot of traditions in gardening and farming and I believe they could easily be revived with a little push in this direction.” P18 In this relation environmentally conscious citizens and NGOs were considered main actors who/which could help raise awareness.
More food safe from pesticides could be produced	I	Social, Environmental, Value-based	“If citizens take up the initiative in the households, they can have cleaner food or at least spices and herbs.” P6 “Small farmers could organize organic market weekly or local restaurants can use their own production.” P15 Policy makers at municipality level could support some initiatives related to citizens producing their own food.
Too many farmers should be involved to make a difference through these approaches	C	Social, Environmental, Value-based	“If such practices are to make a change a serious percentage of the population in the city should be involved.” P9 Participants commented that even small number will have a positive influence because it is important for the people to see personal example from neighbours, popular citizens, etc... and then adopt urban farming. In this direction NGOs and different initiatives towards change in food system could help increasing awareness and numbers of urban farmers.
Quality of products might be questionable because of the type of environment, for example honey	C	Social, Economic	“The quality of products might be questionable because of the type of environment, for example honey.” P20 Most participants agreed that honey is very particular example and, in most cases, conditions should not be serious concerns as far as eco-friendly technologies are used.

Brief description of the competences considered necessary in relation to the topic: more citizens should be better educated

Topic selected for discussion: **A novel approach to biotechnology**

Brief explanation of the selection: Many stakeholders were interested in different aspects of new biotechnologies and wanted to discuss the topic.

Brief description of how participants imagined the topic in relation to the City Lab The participants related this theme with sustainable and innovative food system for safe and quality food using the help of science.

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Factor identified	Challenge (C) or Incentive (I)	STEEP/Cluster	Actors and Interactions considered Mention the stakeholder category/participant ID, if the participant who brought a certain input is known.
Decrease in the use of pesticides	I and C	Technological, Economic, Environmental	“Decreasing the use of pesticides is a complex process. On the one hand farmers should have incentives, they may come as demand from the market, demand for cleaner food and/or as benefits granted by policy makers.” P20 Several stakeholders commented that researchers searching for and offering alternatives should be considered as well.
Improving production in an environmentally friendly way	I	Economic, Environmental	“Improving production in an environmentally friendly way must be a main priority if our agriculture would be part of a future-proof food system.” P6 Participants discussed that researchers would help on how to do so, but policy makers would have crucial role to influence producers, businessmen, etc. Ecologists and responsible citizens could raise awareness and support the positive change in production.
Biotechnological tools used for environmental sustainability	I	Environmental	“Researching the co-existence of different plants and animals might lead to decrease in the development of parasites.” P14 Again the role of the policy makers was seen as crucial.
Even if a new product is developed through biotechnologies, it might be difficult to produce it on a large scale and popularize it	C	Technological, Economic	“We should keep in mind that Even if a new product is developed through biotechnologies, it might be difficult to produce it on a large scale and popularize it, which would be a challenge.” P9 Participants discussed that priorities and aims should be clear and set in advance, state policy should be very well determined. It was commented that maybe there are investors interested in such projects.
Biotechnology has a lot of applications in many fields but time and funding are needed to achieve the desired outcomes.	C	Technological, Economic	“Another challenges to remember is that this kind of research is funds and time consuming.” P22 Again policy makers and the willingness of society to change were commented to be the first to overcome such challenge.
There are controversial issues.	C	Environmental, Political, Value-added	“There might be controversial issues.” P23 Stakeholders agreed that researches should be explained well, there should be open dialogue and the consumers have to be informed and state policy followed.



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Brief description of the competences considered necessary in relation to the topic: more educated professional in interdisciplinary fields



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City Lab workshop on breakthroughs - Tartu

PART I: CORE REPORT

Practical details

City Lab	Tartu
Event title	Fit4Food seminar – What kind of educational activities does the world of food need?
Date	29.11.18
Duration	11:00-15:00
Location	Tartu, Hektor Design Hostel
Number of participants	6

Participant profiles

Participant ID (a simple identifier #1, #2 etc. or code used during the workshop)	Professional background	Stakeholder category Choose from: NGO/Citizen Organisation/Business/Policy-maker/ Knowledge/Research institute/ Funding agency/Other (please explain)	Area of work Choose from: Agriculture, Fish, Food distribution, Health, Environment, Other	Gender
#1	Citizen activist	NGO	Agriculture, Health	F
#2	Educator	Knowledge institute	Other	F
#3	Tartu city government entrepreneurship department	Policy-maker	Other	F
#4	Tartu city government resources department	Policy-maker	Food distribution, other	F
#5	University scientist	Knowledge institute	Agriculture, Health	F

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#6	Citizen activist	NGO	Agriculture	M
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Event description

Context of the event (if special)	-
Description of how the workshop was run	<p>First, City Lab coordinator explained the Fit4Food project and previous City Lab activities to the newcomers. Also the plan of the day. Participants introduced themselves to everybody. Flipcharts filled with nicely drawn project explanations and summaries of previous work were visible on the walls of the seminar room at all times. Also, coffee, tea, water was available in the same room.</p> <p>Then we did the Breakthrough exercise #2 (~1 hour), then the Co-creating competences exercise (~1 hour), followed by lunch by in-house caterer (~30min). Then we concluded with the Co-creating modules exercise (~1 hour).</p> <p>Discussion often went further than the concrete questions at hand and the facilitator allowed this, but this time it was not seen as a hindrance at all. Participants were trying to answer the exercise questions first and then perhaps let the discussion go further.</p>

PART II: BREAKTHROUGHS

In this section, we are interested in the various suggestions that were made by the participants in the workshop **about breakthroughs and barriers and incentives for their implementation.**

Did the breakthrough-related work you did follow one of the breakthrough exercises proposed by the script?

☐ Yes, I used Exercise

☒ No, I made some adaptations to an existing exercise. What was different? I used exercise 2. Instead of “individually tailored foods” I used the vision of “smart best-before labels on all food items (time+temperature sensitive or other technologies)”

☐ No, I used a completely different exercise. Explain briefly method used.

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If participants could contribute with suggestions of potential future breakthroughs or reflect on the potential future breakthroughs identified WP4 WP4 was used: The discussion had common points with the identified breakthrough “Sustainable Packaging”

Input in the table below additional breakthroughs/directions of change suggested by participants or their reflections on already identified breakthroughs.

Breakthrough/Big change needed to achieve the City Lab vision	From table (T) or new (N)	Reflections, thoughts, if available	Proposed by (Stakeholder category/ Participant ID)
Smart best-before labelling	N	Seems realistic and feasible (participant #2 and #3). It could mean that food is healthier (#3). It only works if the system is simplistic, and still needs trainings (#5). Pessimism was also expressed, because it doesn't tackle the question of over-packaging and could be inefficient (#1, #5, #6).	Proposed by the coordinator, inspired by the previous City Lab meeting.
Sustainable packaging	T	People need to get smarter and reuse their own food containers so that the amount of packaging could be reduced. For example, fill a jar with products from the shop and pay by weight. Creating a new piece of packaging (a smart sticker or similar) is a step in the wrong direction.	#1, #6
Smart traceability in the food supply chain	T	Smart best-before labels would contribute to awareness and trust in the food supply chain and help to minimize risks involved. However, participant #6 called it “little music for a lot of money”, meaning that the added benefit (compared to existing systems) does not justify the different costs involved.	#2, #3

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If a discussion of barriers and enablers around a particular breakthrough domain was carried out, for each group involved in the discussion, input:

Topic selected for discussion: **Smart best-before labelling**

Brief explanation of the selection: **This idea was put forth during an earlier City Lab meeting, it found a lot of support and the coordinator decided to explore this one idea further. Two groups were discussing the barriers, incentives etc. of the same topic. But the two groups merged together rather quickly, sitting by different tables but discussing together, instead of repeating their ideas out loud multiple times. It seemed more efficient at the time, also because there were not so many people.**

Brief description of how participants imagined the topic in relation to the City Lab vision **Seems realistic and feasible (participant #2 and #3). It could mean that food is healthier (#3). It only works if the system is simplistic, and still needs trainings (#5). Pessimism was also expressed, because it doesn't tackle the question of over-packaging and could be inefficient (#1, #5, #6).**

Factor identified	Challenge (C) or Incentive (I)	STEEP/Cluster	Actors and Interactions considered Mention the stakeholder category/participant ID, if the participant who brought a certain input is known.
A good enough system is yet to be invented	C	Technological	Researchers #1
Approval of regulatory institutions	C	Political	Policy makers #4, #1; Researchers #5
Approval and adoption by consumers	C	Social	Citizens #2, #3
Approval and adoption by entrepreneurs	C	Economical	Entrepreneurs #4
Market research must show that people want to use such a system	C	Social	Citizens, researchers #6
Does not help the more important goal – to reduce packaging	C	Environmental	Policy makers #3

Adds another thing to produce – more use of resources, more cost and more waste	C	Environmental	Policy makers #3; Entrepreneurs #2
Use a transition period to gradually go from one label to another by using both at the same time	I	Social	Citizens #4
Get people and stakeholders involved through City Lab-like groups	I	Social	Citizens, researchers, policy makers, entrepreneurs #6
Possibility to implement the system without creating new waste, e.g. put the smart label inside the lid of a container	I	Technological	Entrepreneurs #4
Product and product development atmosphere open for innovation	I	Social	Researchers, entrepreneurs #3
Need to keep a better track of the supply chain of food	I	Economical	Citizens, Entrepreneurs #5