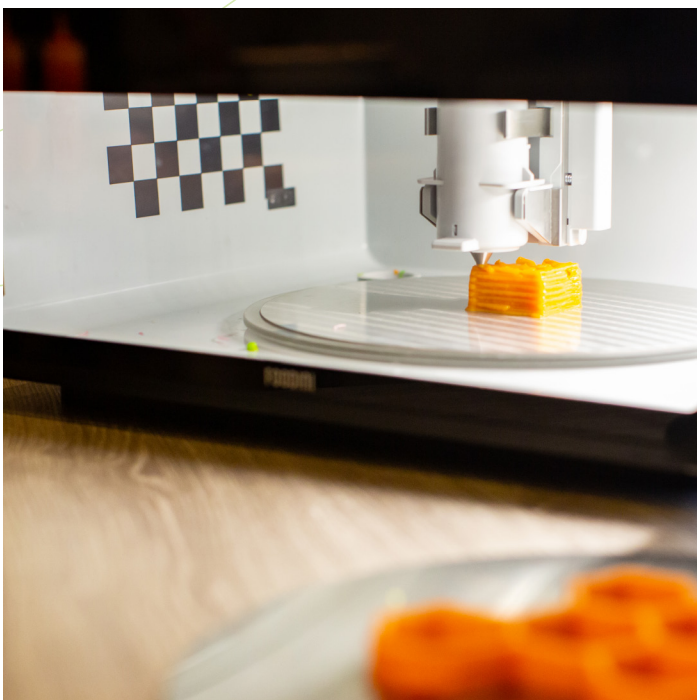


Four Plausible Futures of Food

Navigating the future for sustainable and healthy plant-based protein in Norway: A scenario approach

Katja-Maria Prexl & Antje Gonera



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<p><i>Summary and recommendations:</i></p> <p>FoodProFuture (FPF) is a research project aiming for innovative, healthy, and sustainable exploitation of plant-based proteins in future foods in Norway and serves as a catalyst and initiator for the industrial uptake of knowledge, model products, technologies, and sustainability approaches. The development of different plausible future scenarios challenges existing biases and assumptions about what is possible and engages curiosity and imagination. The four FPF scenarios describe various possible development directions for the food system until 2040 illustrating the following four possible scenario questions: "What if we ran out of food?"; "What if we made climate positive food?"; "What if we let technology fix our food?" and "What if we became food role models?". The scenario approach is an opportunity not only to prepare for change, reduce uncertainty, and jointly develop specific innovation ideas and concepts, but also to accelerate the shift towards more sustainable and profitable plant-based foods produced in Norway. We provide a tool that enables food system stakeholders to show and discuss alternative futures. We recommend using the scenarios to assess and renew the validity, robustness, and future-readiness of current strategies towards a more sustainable food system in Norway and to uncover new ideas for innovation.</p>	
<p><i>Summary and recommendations (Norwegian):</i></p> <p>FoodProFuture (FPF) er et forskningsprosjekt med mål om å øke innovativ, sunn og bærekraftig utnyttelse av plantebaserte proteiner i fremtidige matvarer i Norge og fungerer som en katalysator og initiativtaker for industriell utnyttelse av kunnskap, modellprodukter, teknologier og bærekraftighetsmetoder. Gjennom å utvikle forskjellige fremtidsscenarier utfordrer vi eksisterende tankemønstre og antagelser om hva som er mulig samt øker nysgjerrighet og kreativitet. De fire FPF-scenariene beskriver ulike mulige utviklingsretninger for matsystemet frem til 2040 og illustrerer følgende fire mulige scenariospørsmål: "Hva om vi gikk tom for mat?"; "Hva hvis vi lagde klimapositiv mat?"; "Hva hvis vi lar teknologien fikse maten?" og "Hva om vi ble mat rollemodeller?". Scenariotilnærmingen er en mulighet ikke bare å forberede seg på endring, redusere usikkerhet og sammen utvikle innovasjonsideer og konsepter, men også for å akselerere skiftet mot mer bærekraftige og lønnsomme plantebaserte matvarer produsert i Norge. Vi tilbyr et verktøy som gjør det mulig for aktører i matsystemet å vise og diskutere alternative fremtider. Vi anbefaler å bruke scenariene for å vurdere of fornye validitet, robusthet og fremtidsrettethet av eksisterende strategier mot et mer bærekraftig matsystem i Norge og for å avdekke nye ideer for innovasjon.</p>	

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1. Executive Summary

“The best way to predict the future is to create it.” – Peter Drucker

The need for a shift towards a more plant-based and sustainable diet is widely recognized. Despite the clear scientific evidence about the advantage of such dietary changes, there are several barriers to change on the production and consumer side. Food-ProFuture (FPF) is a research project aiming for innovative, healthy, and sustainable exploitation of plant-based proteins in future foods in Norway and is funded by the Norwegian Research Council’s (NRC) Bionær program (NFR BIONÆR 267858).

By interacting with the food-processing industry, FPF aims to serve as a catalyst and initiator for the industrial uptake of knowledge, model products, technologies, and sustainability approaches. The joint development of different plausible scenarios – possible pictures of the future – helps to challenge existing biases and assumptions about what is possible. It also engages curiosity and imagination in the FPF research collaboration, with food system stakeholders (e.g., farmers,

producers, sellers, NGOs, policy makers, and communities), and in the general public (e.g., students, citizens, food enthusiasts/foodies, and influencers).

We employed an iterative approach using different methods and formats of data collection and sense-making (e.g., workshops, expert interviews, reports, and desk research) to identify emerging forces of change that are reshaping the future Norwegian food system. We categorized and evaluated various indicators driving change, merged and integrated these into the scenario frame, and developed the scenario matrix for the four plausible scenarios for food in 2040+ (see Figure 1). The scenario approach is an opportunity not only to prepare for change, reduce uncertainty, and jointly develop specific innovation ideas and concepts, but also to accelerate the shift towards more sustainable and profitable plant-based foods produced in Norway.



Figure 1: Matrix of the four possible FPF scenarios
Source: FoodProFuture / WP5

Overview of the Four Developed FPF Scenarios of Future Food

The New Equilibrium

What if we became food role models? Happy Norway embraces a holistic view of food and happy animals. We are celebrating the good food life, the New Equilibrium. Norway is leading the global population to a balance with nature and has become a role model by increasing biodiversity and hardiness of Norwegian plant-based proteins. The #MoveTheDate movement has succeeded: The Earth Overshoot Day is now down to December 17th, and Norway is ranked as the country having not only the happiest people but also the smallest ecological footprint in the world.

Flying to the moon

What if we let technology fix our food? You are not in control of your food anymore; your body and the system control it. This is the digital age at its best: digital tools have taken over with full data transparency of the food chain and personal data. Is the kitchen we know dead? The Earth Overshoot Day is now October 22nd, which means we need only 1.2 Earths to sustain this way of consumption. Revolutionary technology is available for everybody, and optimized clean agriculture means we very soon might not have an Earth Overshoot Day anymore.

Noah's Ark

What if we ran out of food? It is not easy to get the food you want. The planet is out of control. Scarcity prevails; there is a water shortage, and we are watching the last animals of each species die and important resources being destroyed! There is no stable weather at all. The Earth Overshoot Day¹ is May 2nd, which means that we need three more Earths to sustain this destructive level of consumption.

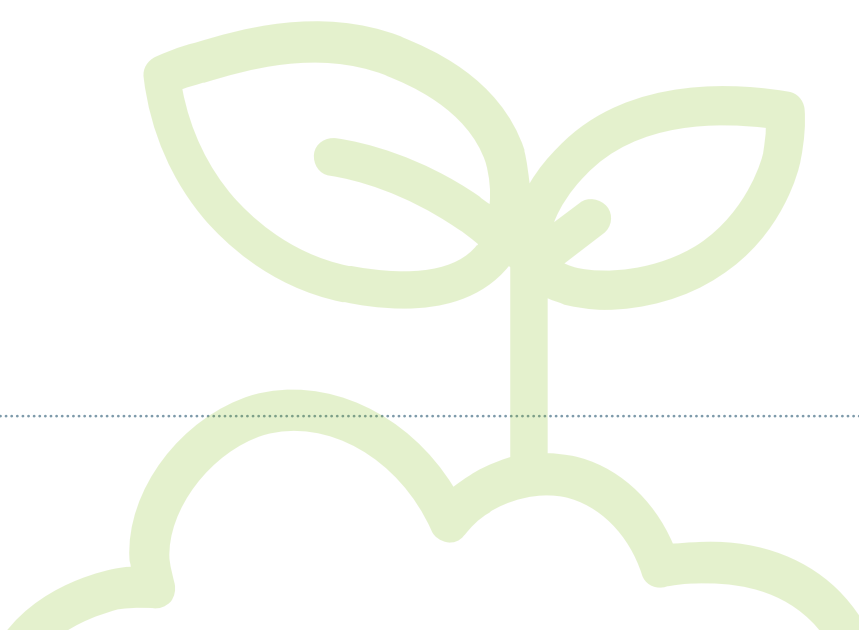
Blan B

What if we made climate positive food? Green is the new currency and produce-trading is the survival mechanism. We are giving more back to Mother Earth than we take away. Norway no longer wants to be dependent on somebody else, and every resource and opportunity is used in a responsible and circular way. Norway has so much to offer, and we can be proud to use what we have, what we grow and build. No Earth Overshoot Day anymore!

The aim of these four scenarios is to create awareness of and information about plant-based proteins. The scenarios are a new way to challenge and enable multidisciplinary collaboration and to communicate

scientific results. We invite you to dive deeper into the possible futures of food and get motivated to innovate and shape a better, more sustainable food system for Norway.

¹ <https://www.overshootday.org/>



2. Introduction

“The future we want to have needs to be invented otherwise we will have one we do not want to have.” – Joseph Beuys, artist

2.1 Background – The FoodProFuture Project

The need for a shift towards a more sustainable plant-based diet is widely recognized and is gaining attention due to public discussion and movements on climate change and environmental issues in politics and society (e.g., more than 7.6 million people in 185 countries have participated in global climate strikes). The neo-ecology movement asserts itself in news headlines around the world and will strongly affect the 2020s (Muntschick et al., 2019).

Despite the clear scientific evidence for the advantage of changing to a plant-based diet, there are several barriers to change on the production and consumer side (e.g., Austgulen et al., 2018; Gonera & Milford, 2018; Willett et al., 2019).² According to Gonera and Milford (2018), consumer education, political incentives, collaboration across the value chain, and research-based knowledge are all essential for increased production and consumption of plant-based food in Norway. In 2019, consumers and stakeholders in the food value chain (e.g. producers, restaurants, and investors) continued to embrace plant-based foods, confirming this way of eating is not just a fad. According to the biggest supermarket chain in Norway, Norgesgruppen, sales of vegetarian products grew by 50% from 2017 to 2019, and by 22% from 2018 to 2019.³ On a global level, the market for plant-based food and beverage alternatives is expected to reach \$80.43 billion by 2024, rising at a CAGR (compound annual growth rate) of 13.8% during the forecast period from 2019 to 2024, according to a new report by BIS Research.⁴ The industry is receiving investment from high-profile individuals, financial investors, and companies.

So far, \$17 billion have been invested in the industry, with \$13 billion in only the last two years.⁵ This food movement is continuously growing and will soon shift beyond the current new plant-based ingredients and technologies (e.g., Schaefer et al., 2019). The world today is marked by high dynamism and rapid change. Some trends point towards human development and highlight progress, others suggest an increasingly unsafe and dangerous projection for the planet and that climate change is real.

FoodProFuture (FPF) is an NRC Bionær-funded research project aiming for innovative, healthy, and sustainable exploitation of plant-based proteins in the future food of Norway (NFR BIONÆR 267858). The collaborative vision of this multidisciplinary research project is to increase the production and utilization of plant protein bioresources in food products, leading to a desirable shift to more plant-based diets with a positive environmental impact, improved sustainable food choices for consumers, and value creation in the Norwegian circular bioeconomy.

FoodProFuture is organized in six different work packages (WPs) addressing all dimensions important for understanding the potential for Norwegian plant-based proteins. The WPs are structured and numbered from WP1 to WP6 according to the workflow (see Figure 2).

By interacting with the food-processing industry, FPF aims to serve as a catalyst for the industrial uptake of knowledge, model products, technologies, and

² <https://www.nibio.no/nyheter/kan-norge-produsere-mer-planteprotein-til-mat>

³ <https://www.nrk.no/rogaland/slik-vil-kjotbransjen-kapre-fleksitarianarane-1.14880937#fact-1-14883899>

⁴ Report: Global Plant-Based Food & Beverages Alternatives Market, BIS Research 2019

⁵ Ibid.

sustainability approaches. The WP5 team focuses on consumer, innovation, and market opportunities and acts as facilitator and driver for establishing collaboration, co-creation, and innovation spaces.

The joint development of different plausible scenarios or pictures of the future helps to challenge existing biases and assumptions about what is possible, and it engages curiosity and imagination in the FPF research

collaboration, food system stakeholders (e.g., farmers, producers, sellers, NGOs, policy makers, and communities), and general public (e.g., students, citizens, food enthusiasts, and influencers).

This approach is an opportunity to jointly develop specific innovation ideas and concepts on how to accelerate the shift towards more sustainable plant-based foods produced in Norway.



Figure 2: Overview of FoodProFuture project;
Source: www.foodprofuture.no

2.2 Using Scenarios in Research Projects

To stimulate future thinking, we asked the FPF project members and stakeholders the following question:

“When you imagine reading a newspaper in 2040, what do you think the headlines about food, plant-based food, food consumption and culture, trends, or cooking would look like?”

They answered as follows:

“Many meat eaters feel stigmatized: ‘Why can’t they just leave me alone with my steak?’ says Kåre (57)”

“GROW YOUR STEAK IN ONE DAY! - With the new efficient method for stem-cell culture you may now grow your own Friday-steak in the kitchen from the day before.”

“Orkla’s SmartFood sold out in days - food with your personal optimal nutritional profile”

“New finding: Could plant-based proteins explain the explosion of cancer cases in Europe?”

“Last livestock farm to close in Europe as lab meat continues to soar.”

Source: Selected examples of possible newspaper headlines in 2040 from FPF Workshop and Survey 2018. For more details, see Appendix 1 about this thought experiment.

Scenarios help us to reduce uncertainty and difficulties when thinking and talking about the future, especially when imagining distant future perspectives, like 2040+.⁶ When developing scenarios – pictures of the future (POFs) – we provoke people to think differently and to imagine and question our assumptions and results (e.g., Andersen & Rasmussen, 2014; Bishop & Hines, 2012; Fahey & Randall, 1998; Ramirez et al., 2015; Reilly & Willenbockel, 2010; Rohrbeck & Gemünden, 2011, Rohrbeck, 2018; Spaniol & Row-

land, 2018; van der Heijden, 2005). According to Bell (2003),

No matter how it is constructed, how full and rich or meager and lean, how factual or fictional, how particularistic or universalistic, the ‘scenario’ gives methodological unity to futures studies ... [scenarios are] used by all futurists in some form or another and are, thus, by far the most widely shared methodological tool of the futures field. (p. 317)

We cannot expect perfectly defined futures, but tools can help us solve problems differently, develop different perspectives, and encourage further development of the FPF project scope or beyond.

By developing, building, and sharing scenarios, we can co-create visions of a future that are worth working towards. Being scared by fiction may be better than being harmed by facts. Feeling excited about what the future could be is better than feeling helpless. The intention of scenario work is to help us not only envision the future but also to appreciate the innovations and become more inspired, imaginative, creative, and thoughtful when developing opportunities for research, business, and innovation. By anticipating the future, we can make changes and influence what is going to happen and act today to prepare for a positive impact (e.g., Bishop & Hines, 2012; Burmeister & Neef, 2005; Christensen et al., 2014; Dumitrescu, 2011; Godet, 2001; Karlsson et al., 2018).⁷

We tailored a foresight and scenario approach to the specificities and scope of the FPF project and facilitated an interactive process comprising three main phases: (A) understanding the current situation and future drivers, (B) forecasting and scenario building, and (C) back-casting and scope adjustment. Figure 3 complements these three main phases with more detailed steps.

⁶ <http://www.oecd.org/site/schoolingfortomorrowknowledgebase/futuresthinking/scenarios/whyusescenarios.htm>

⁷ <http://www.oecd.org/site/schoolingfortomorrowknowledgebase/futuresthinking/scenarios/whyusescenarios.htm>

The FPF scenarios will help us (and our partners and stakeholders) to become immersed into future probabilities and possibilities, as well as to think of and develop aspirational outcomes for the future of food in Norway. These approaches enable the project to

show alternative futures and allow to assess the validity, robustness, and future-readiness of current strategies so we can uncover new ideas. With the FPF scenarios, we have developed a tool to envision, enable, prototype, and test possibilities for the future of food.

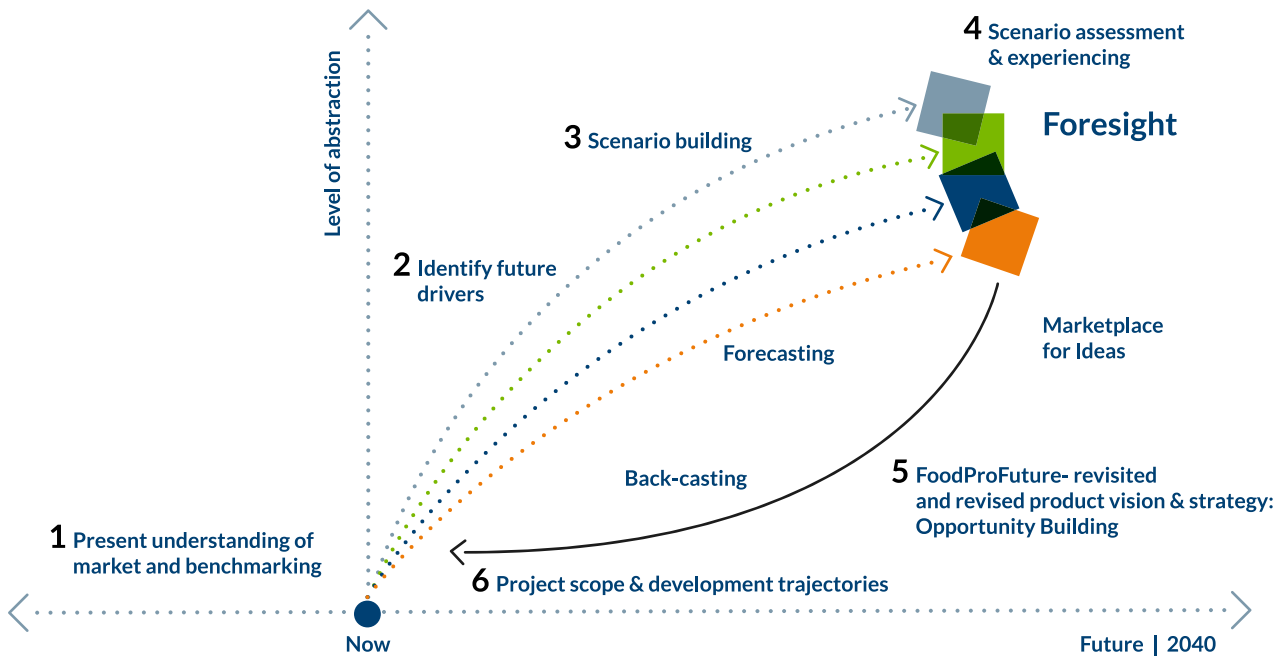
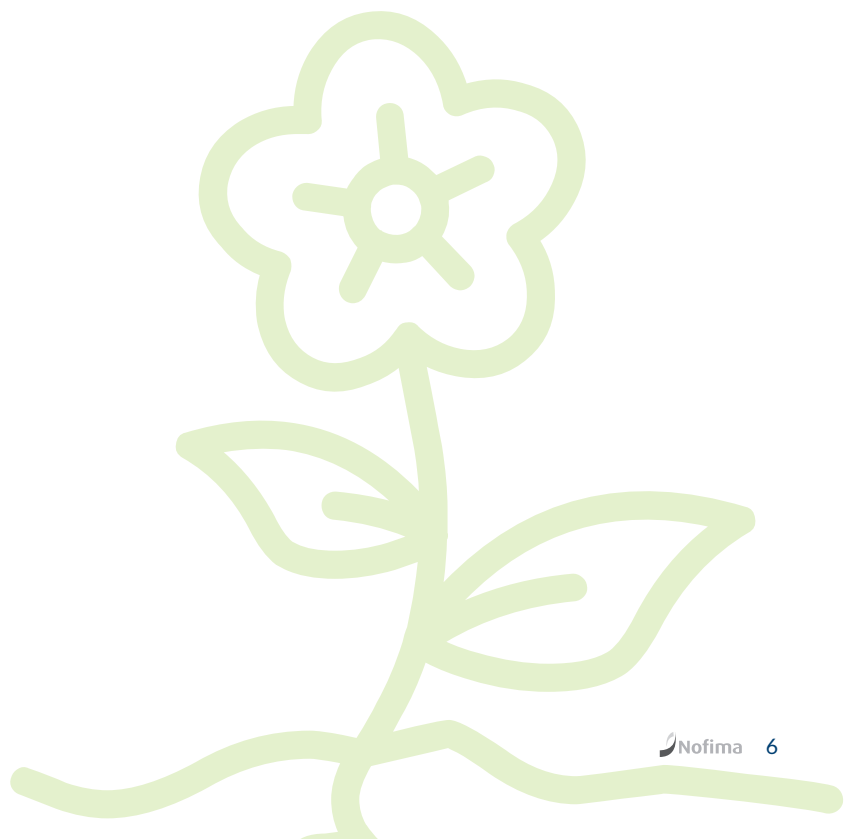


Figure 3: Scenario process in FPF;
Source: FoodProFuture, based on "A journey from here & now to here & now" by R. Normann, 2001.



2.3 The Future of Food in 2040

A short Overview of the four FPF Scenario Stories

Noah's Ark

What if we ran out of food?

IMAGINE it is 2040+ Norway is becoming warmer and warmer; it's the new southern Spain or South Africa. Water and land resources are scarce. Norway, once one of the happiest countries, is now under pressure and facing risk and anxiety on a social, economic, and environmental level: Unpredictable events like heat waves, floods, droughts, and thunderstorms are becoming more frequent. Agricultural land is shrinking due to a lack of water, and plant diseases are increasing after continuous hot, dry summers and long cold winter periods. Norway has become a country with overfished fjords. Imported goods must feed



the nation. Its animal and plant species are seriously endangered. Knowledge about plant varieties and their production needs to be preserved through saving seeds, vegetables, grains, and animals. The development asks for saving and protecting by evacuating species in seed vaults or other conservation efforts. In addition, people need to be aware of and understand what is happening. They need to use what they can save and overcome the situation of yield shortages by food imports. Companies introduce No Meat Weeks.

PlanB

What if we made climate positive food?

IMAGINE it is 2040+: The rise of urbanization and environmental challenges have transformed Norway into a radical, self-sufficient producer. "What we eat and use is what we grow and produce here." Norwegian raw materials and foods are protected by tax and food governance. Thus, realities are changing in Norway, and awareness of naturally sustainable and healthy foods leverage Plan B for Norway. "We don't want to be dependent on others." Norwegians start to boycott imported goods, especially in the food sector. Regional and local gardening and production

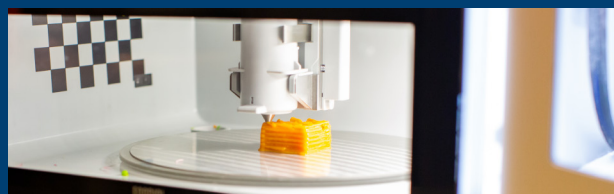


in small communities rises – circular economy at its best! Education of the senses and awareness of the value of goods and their environmental impact are featured by these activities. The eating culture is changing, and urban communities grow local partnerships. Norwegian companies exclude meat from their canteens and force people to eat plant-based diets. Innovation potential is high as Norwegians use only their own resources and possibilities.

Flying to the Moon

What if we let technology fix our food?

IMAGINE it is 2040+: We've entered the digital age. Total transparency of the food chain and personal data supports clean, sustainable food production and provides healthy, enjoyable food to individuals in optimal portions. Norwegians are always online; they live in a digital cloud and are profiled and monitored to rate their daily habits, activities, and status. During the week, food portions that are clean, convenient, snackable, and personalized are delivered by drones and self-driving cars. Radical innovation starts to dominate agriculture and food production,



and 3D food printing helps to create healthy and clean fast food. The personalized NEWtrition App transfers the data to the robot kitchen. Meat is grown in labs, and households can now afford a Meat-Lab Grower for their own kitchens. Plant-based proteins are extracted to make highly concentrated ingredients and powder products. Top chefs create extraordinary food experiences using molecular gastronomy. Ghost restaurants and Cloud kitchens pop up. Weekends and vacations are reserved for “real” food experiences celebrating the enjoyment of food.

The New Equilibrium

What if we became food role models?

IMAGINE it is 2040+: Norway has turned into an export country, and its food and food systems are in a period of rapid reinvention. It is self-confident and future oriented, with one of the best-ranked ecological footprints in the world. Norway is the first country to produce plant-based protein products on a larger scale for its own usage in food production and as an ingredient. Norwegians are rapidly changing their minds to embrace plant-based products as valuable, sustainable, and healthy. Increased seasonal land use determines a strong forward-look-



ing self-confidence. Norwegian-grown plant-based proteins are in high demand on the Norwegian and world markets. Old Nordic varieties brought back from the Seed Vault can be beneficial for the development of new varieties, leading to biodiversity, advanced varieties, and hardiness and contributing to old pea species. Sustainability and healthy diets on a natural basis foster a new equilibrium. Old recipes are newly interpreted and adapted to the varieties and the use of mainly local products and ingredients.

Scenarios help us envision possible future states and describe ways the food industry might develop potential futures to understand related stakeholders, such as consumers and partners. Scenarios represent one possible approach, but they become powerful tools when used by individuals and in groups.

3. Key Terms

We define the following selected key terms based on the FPF experience and existing literature (e.g., Amer et al., 2013; Andersen & Rasmussen, 2014; Bishop & Hines, 2012; Christensen et al., 2014; Dumitrescu, 2012; Godet, 2001; IFTF, 2018; Pillkahn, 2008; Ramirez et al., 2015; Rohrbeck & Gemünden, 2011; Rohrbeck, 2018; Spaniol & Rowland, 2019; van der Heijden, 2005).

Back-Casting is a method for planning the actions necessary to reach the desired future goals of the scenario(s). This approach is applied in FPF with project members and stakeholders to work backwards to the here and now and to determine necessary actions to reach the objectives of the goals identified in the first step.⁸ Look back to see forward, and look forward to see back.

Co-Creation is the collaborative development of new values (concepts, solutions, products, and services) with experts and/or stakeholders (e.g., customers and suppliers). Co-creation is a form of collaborative innovation: you share ideas with others and improve them or develop totally new ones together, rather than keep them only to oneself (individual or corporation).

Driving Forces are key forces driving change and shaping the future in organizations, institutes, politics, projects, universities, individuals, countries, cultures, and the world. The various drivers of change can have different degrees, such as unchanging, steady increase, or steady decrease of influencing change. Emerging futures are driven by unexpected change. The ones watching out for trends understand that if they rely only on conventional market research (i.e., data on yesterday's consumer choices and statements), they will risk missing powerful information about the future and future opportunities.⁹

Foresight is the practice and capability of anticipating and planning for the future. Foresight assumes that there are numerous possible futures and that the future is to be created through the actions interested stakeholders choose to take today. Experts are involved, and time horizons vary from the perspective of prediction (e.g., from 10 to 20 years). Foresight allows you to think systematically about the developments of the future and to anticipate in different ways the possibilities that others can't or won't see. That way, you won't be hit unexpectedly by what happens in the future. According to Jake Dunagan, "It is better to be surprised by a simulation than blindsided by reality" (IFTF, 2018). An example of a foresight tool for simulation is a scenario story.

Future Thinking is speculative thinking about the questions we ask in this project. It is a mindset for dealing constructively with the future, as a person and as an organization. We cannot predict the future, but we can see signs appearing on our way, some being more visible than others.

Pictures of the Future (POFs) refer to the scenario(s) and the related pictures (stories) a scenario presents. Scenarios create pictures of possible and plausible future situations.

Scenarios are decision-making tools that organizations or institutions can use to rehearse their decisions before being forced to take them. Scenarios are uncertain options of the future and projections that describe a complex picture of possible futures and possibly the path to them. The idea is to inspire and provoke an emotional response and then to motivate for action. Professional scenarios often rely on asking what changes in the present would be required for arriving at envisioned alternative future states (see Back-Casting).

⁸ WHO (AT & T 1950, Shell 1970s)

⁹ <http://trendwatching.com/x/wp-content/uploads/2014/08/2014-08-INSTANT-TREND-EXPERT2.pdf>

Signals are pieces of information (sometime a weak signal like a hint) about possible developments and events in the future. Signals are emerging issues that appear along the way and might be growing. A signal can be anything, such as a news story, personal observation, research project, prototype, or just a tiny piece of data. Signals are weaker than trends and help us to systematically think about what might happen in the future.

Trends are the general direction in which something tends to move. By observing (spotting) and synthesizing numerous signs, we can determine whether they follow any patterns or have linked characteristics that should be clustered into trends. Trends can change and adapt, but their core information does not. Trends have different timelines and intensities, like micro-, macro-, and megatrends. Trends are used as inputs for scenario building.

Triggerpoints, according to medical/physiological definitions, are sensitive spots in soft areas that, when stimulated, cause a reaction to occur in another part. This is comparable with the triggers we search for, evaluate, and describe as drivers or forces of change

during the whole process of development of scenarios in the project. Unlike signals, triggers cause a reaction in other, seemingly independent areas and on different levels after they have been detected and activated (pressed).

A **Vision** is simpler and less complex than a scenario and often represents a desired state or a result of something. Some visions might have already become to path, whereas others lie entirely in the future.

Wild Cards and **Black Swans**¹⁰ are events or developments that are entirely unpredictable but generate enormous impact (positive and/or negative) when they occur. This could be war, worldwide epidemics (latest example is the COVID-19), dramatic increase of climate refugees, and the dissolution of today's world order. Such conditions violate the logic of the created future scenarios. The possibility of such unforeseen changes is present in all four FPF scenarios and comes with high disruption and extreme instability. They can also be random, unpredictable events external to the food domain.

¹⁰ Taleb, N. N. (2008). *The Black Swans*. Penguin Books

4. Methodological Approach

According to Andersen and Rasmussen (2014), scenarios are characterized by “focusing on elements in the future that are unforeseeable (or difficult to foresee); structuring presently existing knowledge in a systematic way; identifying plausible alternative futures; ability to contain discontinuities; ability to be both qualitative and quantitative” (p. 25). A scenario accepts that the future is not deterministic and that alternative views of it are feasible.

We adapted and developed a multimethod approach using several techniques and tools to derive different views of the future (scenarios or POFs). In this approach, we start with the continuous involvement of FPF members, partners, and stakeholders in activities, and we invite them to work on tasks with different tools and approaches. Figure 4 provides an overview of the FPF project activities to develop future scenarios and innovation concepts:

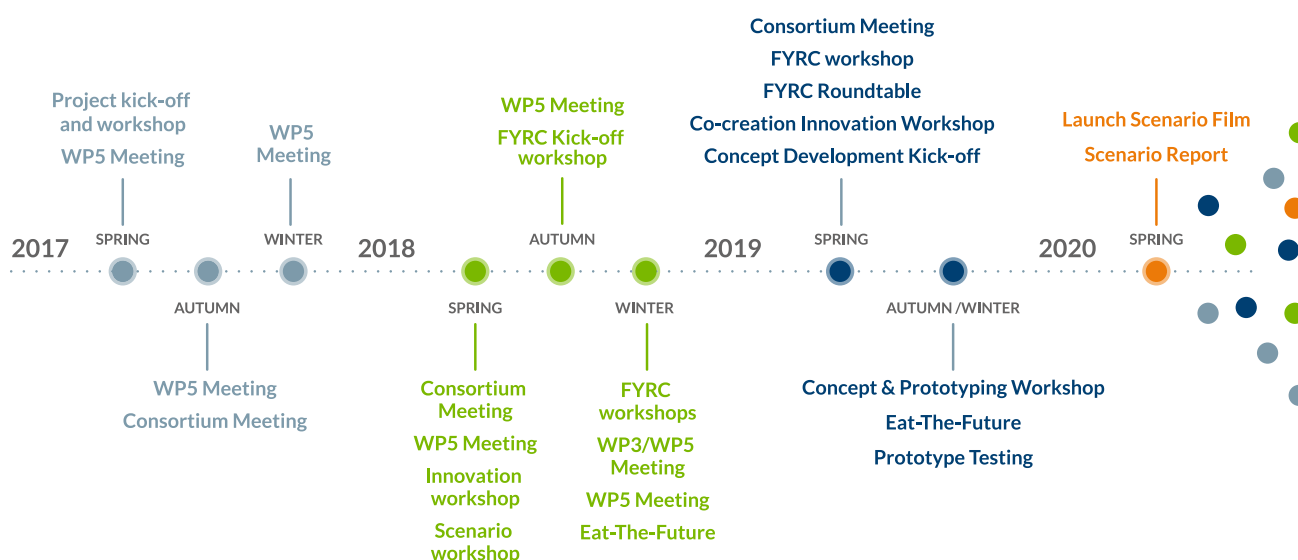


Figure 4: Overview of FPF project activities for the scenario development process;
Source: FoodProFuture WP5

The overall collaboration approach with the FPF project work packages, partners, and stakeholders is designed to foster collaboration and lead to and innovation concepts. Figure 5 presents this approach in a condensed manner. This model, based on the Double Diamond Model of the British Design Council,¹¹ consists of four main stages – diverging and converging – that are synthesized in the different phases of the process accordingly. This model has been slightly adapted and has five

stages to explain our co-creative and experience-based working approaches for the development of scenarios and innovation concepts in the FPF project: (1) Discover – Insight into the problem: Input – Data Collection; (2) Define – The area to focus on: Understand and Process; (3) Substantiate: Building scenarios; (4) Develop – Possible solutions: Marketplace of ideas; (5) Deliver – Solutions that work: Tailor the use of the scenarios and the different implications.

¹¹ <https://innovationenglish.sites.ku.dk/model/double-diamond-2/>



Figure 5: Co-creative and experienced-based working approaches for the development of scenarios and innovation concepts in the FPF project;
Source: FoodProFuture

For the particular task of building the scenarios, we identified important factors (future elements) that drive change forward and make the dynamics of change explicit. After understanding the current situation, we identified important factors that influence drivers and forces of change for a starting point of the context and the dedicated analysis of the elements and the possibilities (see Figure 6). By doing so we try to describe ways a sector or area might develop and envision potential futures. Thus, we can also develop understanding of how the user's needs might develop accordingly and discuss what decisions may be required to get to these latent

future forecasts.¹² This approach is an opportunity to jointly develop specific innovation ideas on how to accelerate the shift towards more sustainable plant-based foods produced in Norway. We have clustered forces into corresponding categories and summarized them in an overview of shifts and emerging trends that might influence a healthy, sustainable, and tasty plant-based diet in Norway. We categorized and evaluated the driving forces for change and integrated them into the scenario frame to select and develop four plausible scenarios of food in 2040+. We will discuss these phases in the following chapter in more detail.

“The best way to predict the future is to create it.” – Peter Drucker

¹² Related to OECD (<https://www.oecd.org/site/schoolingfortomorrowknowledgebase/futuresthinking/scenarios/>)ond-2/

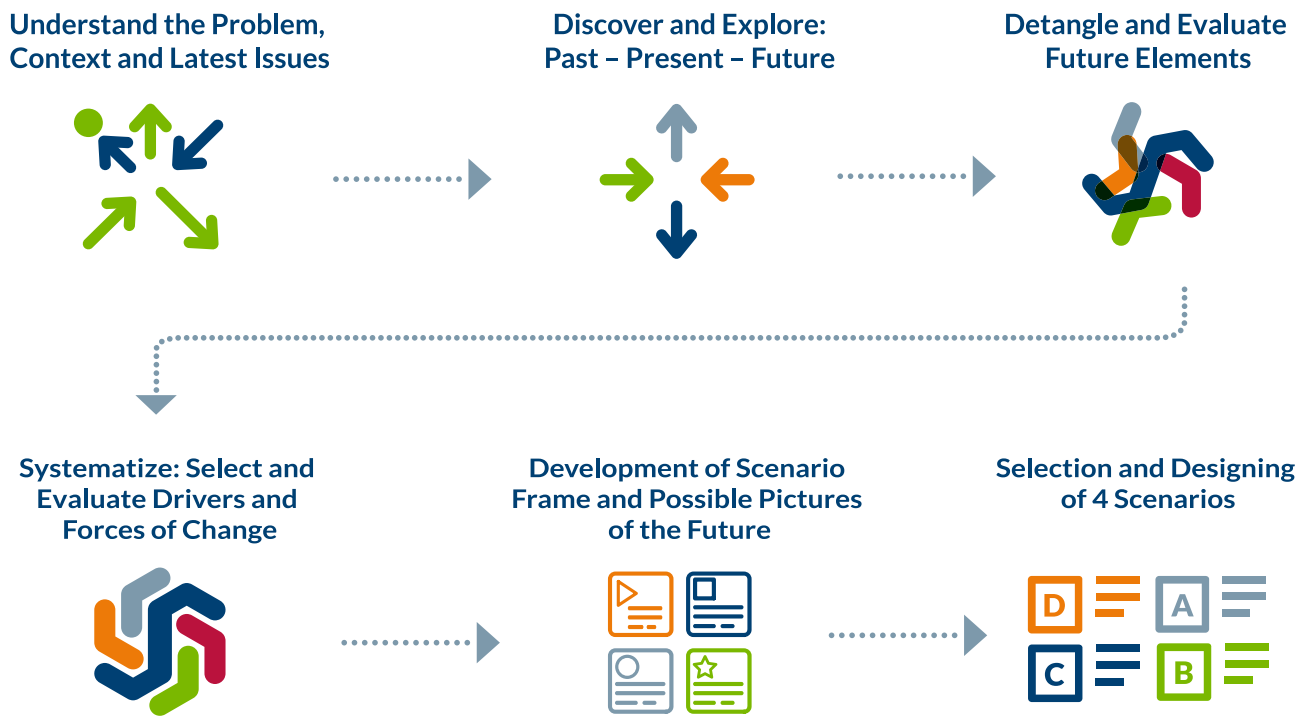


Figure 6: Overview of the scenario development approach;
Source: FoodProFuture / WP5



4.1 Key Questions the Scenarios Aim to Answer

In the scenario development approach, we suggest guiding questions on the specific project level and on a broader (food) system level. The questions were formulated to foster innovative, healthy, and sustainable exploitation of plant-based proteins in future foods in Norway and to draw on new perspectives and provoke further action. The developed questions offer guidance and inspiration, but they also help drive the FPF project on an operative, scientific, and practical level. In addition, the aim is to challenge, discuss, and use the scenarios to create strategic dialogue and then further develop and apply the project aim. In other words, the aim is to develop a knowledge platform as a garden for planting and growing concrete new ideas and innovation concepts on a short-, medium-, and long-term horizon.

*Main questions about the specific FPF project level:
What viable Norwegian food products may lead to a desirable shift towards more plant-based diets in the year 2040+?*

These diets will ...

- A. positively affect the environment,
- B. improve food choices for consumers, and
- C. create value in the circular bioeconomy.

Main questions about the general strategic level inside and outside FPF:

1. Which future do we envision for the Norwegian food system?
2. How can we utilize the drivers and trends to create the futures we want?
3. How can we grow more plant-based food in
4. How can we increase the production of grain legumes in Norwegian agriculture, improve crop rotation, and increase crop diversity?
5. How can we develop optimized and energy-efficient processing technologies?
6. How is it possible to increase sustainable production of food by valorizing protein- and fiber-rich waste and sidestream materials?
7. How can we influence consumer behavior for changes to a healthier and more sustainable diet?
8. How can we facilitate market opportunities for increased plant proteins in foods as part of a healthy diet?
9. How can we develop innovation and co-creation methods for product development in the circular bioeconomy?

“Life can be understood backwards; but it must be lived forwards.”

– Soren Kierkegaard

5. Identifying Future Drivers and Forces of Change

“Nothing is constant except for change.” – Heraclitus



When we start thinking about the future of food and related visions, we need to search, scan, identify, and evaluate the different kinds of in-

sights, issues, and trends that cause change in short-, medium-, and long-term future elements. We attempted to answer the following questions during the search and scanning process with all project partners and stakeholders:

1. What issues, signals, and/or trends cause change in our societies and markets, among others?
2. What might be next on a micro, macro, and individual level?
3. What is expected, and what could happen in case of an event or another development?

4. What developments are more likely and most surprising, and what developments might be important?

5. What developments could happen but are more unlikely (i.e., uncertain developments)?

We specifically focused on macro trends (political, economic, social, technological), micro trends (Norwegian plant-based food production, local markets, distribution dynamics), and user needs (choosing ingredients, preparing meals, sharing food experiences).

In addition, the following four dimensions help catalogue the driving forces of change: (1) From where? (2) For how long? (3) How fast? (4) In which shape? (e.g., Bishop & Hines, 2012).

Following these structural questions in our process model, we created a basic understanding about the future of food drivers and forces of change.

5.1 Forces of Change Reshaping The Future Food System of Norway

“The pace of change has never been this fast, yet it will never be this slow again.” – Justin Trudeau, World Economic Forum 2018



Through workshops, expert interviews, literature search, and desk research, we identified various emerging forces of change that are

reshaping future food availability in Norway, particularly healthy and sustainable plant-based protein products (e.g., GDI European Food Report 2019; Hanni Ruetzlers Food Report 2020; Euromonitor International “Top 10 Global Consumer Trends 2020, Euromonitor International: An extract of the report: Understanding the Five Drivers Shaping Megatrends;

Neo-Ecology Report Zukunftsinstitut, FAO “The future of food and agriculture – Alternative pathways to 2050; Barilla Center for Food&Nutrition: Eating in 2030: trends and perspectives; SINTEF Rapport: “Gull i grønne skoger? Analyse av muligheter innen bioøkonomi i Innlandet 2050”; World Economic Forum: The Global Risks Report 2020; Fjose and Voll Dombu (2019); wbcscd: “Future of Food – A Lighthouse for future living, today”; Stockholm Resilience Centre & Stockholm University: “Nordic food systems for improved health and sustainability”, March 2019).



We divided emerging forces of change into corresponding categories and summarized them in the following overview of shifts and emerging

trends which might influence a healthier, sustainable, and tasty plant-based diet in Norway related to their, e.g. time, intensity, maturity level and structure of change forces. The year 2019 showed that consumers and stakeholders (e.g., companies, restaurants, investors) worldwide continuously embraced plant-based

protein sources and the focus on mock meat, which suggests that this way of eating is not just a fad. This growing movement will see a shift beyond the current new plant-based ingredients and technologies. The various drivers of change can have different degrees of influence, such as unchanging, steadily increasing, or steadily decreasing. Emerging futures are also driven by unexpected changes we cannot yet imagine or observe but they are coming.

5.2 Overview of Future Drivers and Forces of Change



Forces affecting Norway's future development of population, food system, environment/context for plant-based food have been systematized

and categorized according to market and security, climate change, food demand, food and nutrition, and

health (e.g., Austgulen et al., 2018; Fjose & Voll Dombu, 2019; Manniche & Sæther, 2018; Ruetzler & Reiter, 2019; Schaefer et al., 2019; Sundbo, 2016; Willett et al., 2019) and will be presented in the following overview of selected and evaluated categories:

5.2.1 Market Dynamics and Regulations

- High degree of (distribution) dynamism
- Life cycles shorten and environmental change accelerates
- Shorter product life cycles require flexibility, development, and adaptation possibilities for change
- Increased price volatility
- Tightening of tax regulations and trade restrictions
- New regulations for novel foods to accelerate their market adoption in the EU
- New food-labelling regulations for naming dairy and meat alternatives
- Strong toll barriers and protection
- Possible tax increase on animal products and tax decrease on plant-based products

- Circular economy
- Increase of emerging policies to encourage healthier eating worldwide¹³

5.2.2 Climate Change

- Pressure on natural resources is high (e.g., increased water stress, unstable soil health, land degradation, reduced availability and use of land, decreased landownership and responsibility, decreased fish consumption, increased CO₂ emissions)
- Environmental changes (climate change) will shift diets and the variety of food and ingredients. Increased global warming and climate change, such as extreme weather causing extreme variation in agricultural production (estimates from 2018: 70–80%, according to NIBIO; e.g., Abrahamsen et al., 2019)

¹³ e.g., <https://www.wbcsd.org/Programs/People/Sustainable-Lifestyles/Resources/The-Future-of-Food-A-lighthouse-for-future-living-today>

- “Livestock is responsible for approximately 14.5% of greenhouse gas emissions; 70% of global deforestation takes place in order to grow animal feed.”¹⁴
- Changes in (agricultural) land use and availability, such as increased dynamism in the development and adaptation of plant-breeding varieties and the shortening of seasons¹⁵ (Abrahamsen et al., 2019; Manniche & Sæther, 2018), which results in animal feed shortages and decreased landownership, for example, due to availability and usability of land.

5.2.3 Growing Food Demand and Food Waste

- Increase of Norwegian population (both Norwegians and foreigners)
- Strong Norwegian family culture and traditions
- Lack of full-time farmers;¹⁶ increasing food waste and more than 10 billion people by 2050 worldwide (Willett et al., 2019). In Norway, food waste is reduced and on track with the reduction plan of 50% by 2030. The EAT-Lancet Commission on Food, Planet, Health¹⁷ determined that substantial dietary shifts must take place by 2050.¹⁸

5.2.4 Changing Food Behavior

- Rising urbanization, especially in the south of Norway in contrast to the north
- Changes in consumption patterns due to availability and awareness of nutritional aspects of food security and biodiversity
- Protein and other food alternatives, such as meat- and dairy replacers
- Production emphasis shifts from food quantity to food quality
- Rising popularity of seasonal and environmentally friendly products (Austgulen et al., 2018)
- Free-from products (i.e., products without additives)
- Steak 2.0: The most realistic plant-based steak revealed by Novameat¹⁹
- The world in 2050: According to Bruce Friedrich of The Guardian, “Growing live animals for meat will seem as archaic as taking a horse-drawn carriage from London to Brussels. ...The west’s overconsumption of meat and dairy continues to fuel global warming.”²⁰
- According to the EAT-Lancet report (Willett, 2019), panel experts state that “Global consumption of fruits, vegetables, nuts and legumes will have to double, and consumption of foods such as red meat and sugar will have to be reduced by more than 50%.”

¹⁴ <https://www.theguardian.com/commentisfree/2020/jan/08/lab-grown-food-destroy-farming-save-planet;environment-2050-flooded-cities-forced-migration-amazon-turning-savannah>

¹⁵ e.g., <https://www.theguardian.com/commentisfree/2020/jan/08/lab-grown-food-destroy-farming-save-planet;environment-2050-flooded-cities-forced-migration-amazon-turning-savannah>; <https://www.menon.no/megatrender-pavirke-landbruket/>; Landbruksbarometeret 2019. Agri Analyse, www.agrianalyse.no, www.landbruksbarometeret.no

¹⁶ Ibid.

¹⁷ <https://eatforum.org/eat-lancet-commission/d-a-lighthouse-for-future-living-today>

¹⁸ <https://www.regjeringen.no/contentassets/1c911e254aa0470692bc311789a8f1cd/matsvinnvartale.pdf> future-living-today

¹⁹ The Guardian, January 10th 2020: <https://www.theguardian.com/food/2020/jan/10/most-realistic-plant-based-steak-revealed-use-for-future-living-today>

²⁰ <https://www.theguardian.com/commentisfree/2020/jan/08/lab-grown-food-destroy-farming-save-planet;environment-2050-flooded-cities-forced-migration-amazon-turning-savannah> led use-for-future-living-today

5.2.5 Food and Nutrition

- Nutritious and safe food: Formulating and reformulating for well-being and food safety
- Balancing meat consumption by taking care of personal, animal, and natural resources
- Low visibility of domestic Norwegian (not Scandinavian) food and raw ingredients
- Variety and visibility of plant-based products is weak in rural areas.
- Changes in food and eating culture due to shifts in people's lifestyle (e.g., multilayered-biographies, increased possibilities and desires, digitalization vs. strong traditions, new working habits and possibilities)
- Undeniable and sustained interest in meat-free dishes extends beyond vegans and the vegan market.
- Increased political focus on eating in accordance with recommended dietary guidelines, such as the goal of eating 20% more vegetables, fruits, whole grains, and fish by 2021.²¹
- Meat without animals²²

5.2.6 Health

- Dietary changes due to healthy eating policies and increased warnings from Norwegian health authorities about chronic disease, allergies, and food sensitivity, such as to gluten.²³
- Increased consumer knowledge: Consumers make decisions which food to buy and/or eat before considering the price, especially in middle- and high-income households.

²¹ Nasjonal handlingsplan for bedre kosthold (2017–2021); Helse- og omsorgsdepartementet; Norsk Kostholdsråd 2019 Utviklingen i norsk kosthold 2019; Rapport IS-2866, Helsedirektoratet, <https://helsenorge.no/kosthold-og-ernaring/kostrad>

²² Technology Review, 03/2018; Norsk Landsbrukssamvirke: Nyhetsbrev | Grønne ressurser #34: Vil forbrukeren spise mindre kjøtt for å redde verden?: <https://www.landbruk.no/nyhetsbrev/nyhetsbrev-gronne-ressurser-34-vil-forbrukeren-spise-mindre-kjott-for-a-redde-verden/>

²³ see Footnote 19

5.3 Overview of Derived Emerging Trends

According to the forces affecting Norway's future development of population, food system, and environment/context for plant-based food we will provide an overview of identified emerging trends towards increased plant-based protein production in the following categories:

5.3.1 New Advancements

- Influence of digitalization on farming and agriculture (clean agriculture, precision farming)
- Increase of agricultural subsidies, areas for agriculture, and clean farming
- Switch to whole new eating system: Building food with microorganisms (e.g., fungi, bacteria) to directly produce proteins
- Advanced data analytics and approaches to define and reach sustainability goals
- Block-chain technology for transactions and full transparency in the food value chain
- From food quantity to food quality production of goods
- High dynamism requires faster development, adaptation, and change on various perspectives, such as farming or growing technologies.
- Smart, mindful, automated kitchens and cooking equipment
- 3D printing technology for food in homes and factories
- Cellular agriculture
- Genetic engineering (CRISPR technology)
- Micromobility solutions (drones, autonomous vehicles)

5.3.2 Shifting Value Drivers

- The rise of appreciation: Increased sustainability, responsibility, and environmental awareness (e.g., climate concern, animal and ecological welfare)
- Desired food self-sufficiency and increased urbanization
- Health and well-being ambitions: Personalized diets, nutrition, and meal planning
- Bio-, free-from, and vegan trends
- Convenience but also high culinary and seasonal enjoyment
- Sharing (the dugnad trust phenomenon) and cooking as sources of pride and joy
- Polarization: digitalization vs. tradition
- Contradiction: digitalization vs. sustainable food (i.e., can digitalization help us become more sustainable?)
- Socially responsible innovation and growth
- Questioning of long-term health effects and real environmental influence of radical plant-based food.²⁴

5.3.3 New Forms of Collaboration

- Consumer involvement and co-creation approaches
- Increased ecosystem engagement among citizens: Citizens as transition leaders
- Food accelerators and food hackathons
- Small and beautiful: The rise of Norwegian small giants – The hidden champions of communities of practice in Norway (e.g., “Kompetansenetteverk-Lokmat”)

²⁴According to FoodNavigator latest article: <https://www.foodnavigatorasia.com/Article/2020/02/12/Bubble-burst-Researchers-question-long-term-health-and-environmental-effects-of-plant-based-diet>

6. Development of FPF Scenario Frame



We bring together the indicators for change, such as trends, phenomena, and uncertainties, to understand their interdependencies and implications and to create alternative views of future scenarios. The developed insights are the basis for the scenario dimensions that represent the axis of the scenario matrix and as such represent the context and frame of the four developed scenarios. The scenario axis and related dimensions are needed to produce complex interactions which might occur based on the gathered set of future elements, including fu-

ture information, insights, and drivers of change. The FPF project suggests the consolidation into two main dimensions permitting the identification and description of four FPF scenarios. In addition, this normally helps to explain variations in the majority of driving forces and to develop possible future food scenarios for Norway. See Appendixes 3 and 4 for working versions of the axis development that consider input from all FPF project members. Figure 7 shows a common framework/context of clusters of variables that were identified as critical dimensions of change in determining the FPF food visions:

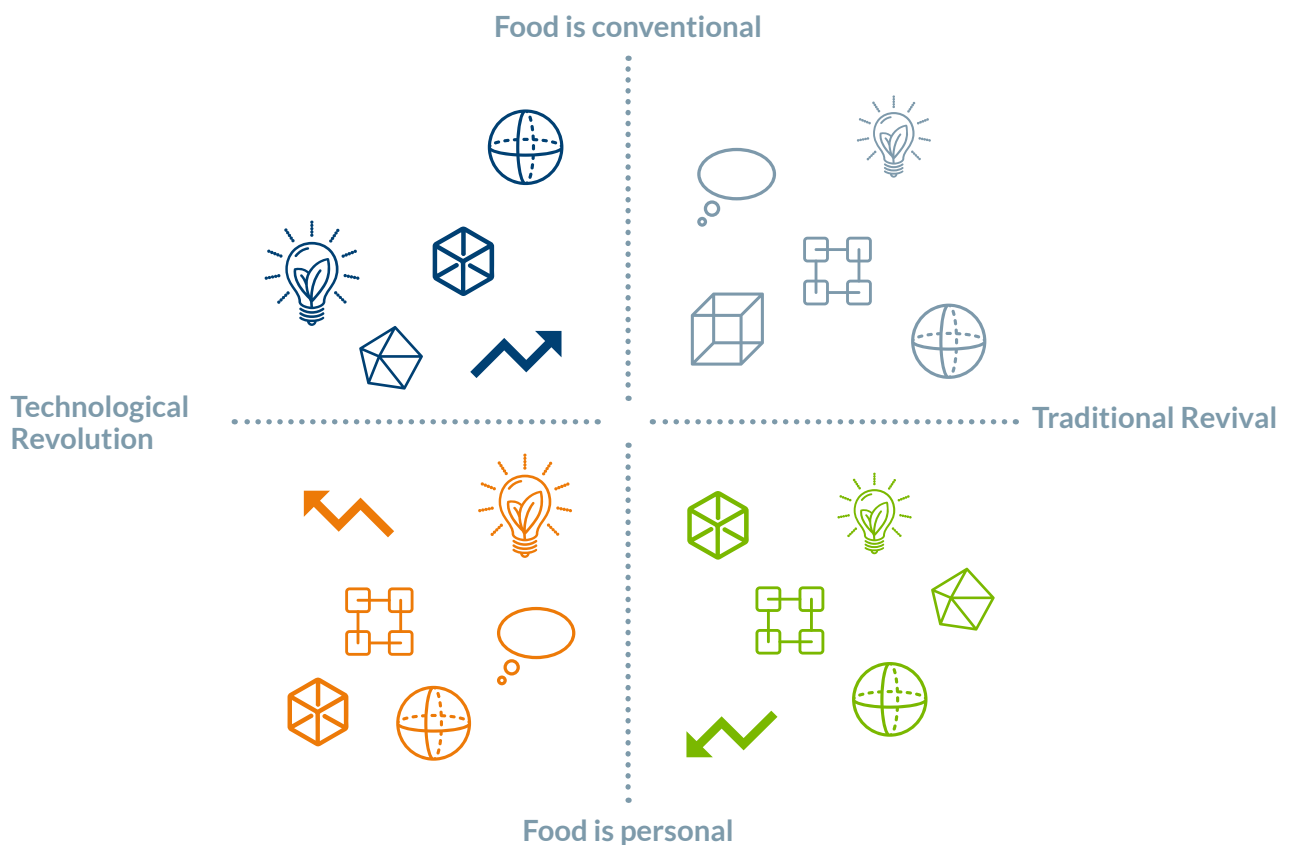


Figure 7: The four possible FPF scenarios;
Source: FPF project / WP5

7. Four Possible Future Scenarios for Plant-Based Food in Norway



The scenarios are described in more detail in the following sections, with factual descriptions and short stories about

the scenarios A, B, C, and D. The descriptions in this section are in a way fictitious stories derived from our research and observations from the past and present, written from the perspective of the year 2040+ to help imagine and experience the future.

The following data sources were used to identify the diverse forces of change and elements, and to evaluate (e.g. by cross-impact analysis), to further research, and to develop the scenarios in the case of the FPF project on two main dimensions permitting the identification and description of four scenarios: questionnaires, focus groups, workshops, continuous observations, expert interviews, literature review, and desk research (e.g., studies, reports).

C
Flying to the Moon
 Future Food Astronauts: Digital Food Revolution – (Is the kitchen dead?)

A
Noah's Ark
 From Overflow to Scarcity (only imported food and raw food ingredients)

D
Back to the Future
 The New Equilibrium (local&global: Norway as the exporter role model.)

B
Plan B
 Giving back to Mother Earth – Open-ecosystem (only local available food and raw food ingredients no imports)

Figure 8: The four possible FPF scenarios; Source: FPF project / WP5

The FoodProFuture scenarios illustrated in Figure 8 have been developed to help us (and our partners and stakeholders) to immerse ourselves into future probabilities and possibilities, as well as to think of and de-

velop aspirational outcomes. This approach enables the project to show us alternative futures so we can assess the validity, robustness, and future-readiness of current strategies and thus uncover new ideas.

“If you don’t know where you are going you may end up somewhere else.” – Yogi Berra, baseball player

7.1 Noah's Ark

From Overflow to Scarcity

Scenario Dimensions of Scenario A

Noah's Ark: Food is conventional / Traditional Revival



IMAGINE it is 2040+

Norway is becoming warmer and warmer; it's the new southern Spain or South Africa. Water and land resources are scarce. Norway, once one of the happiest countries, is now under pressure and facing risk and anxiety on a social, economic, and environmental level: Unpredictable events like heat waves, floods, droughts, and thunderstorms are becoming more frequent. Agricultural land is shrinking due to a lack of water, and plant diseases are increasing after continuous hot, dry summers and long cold winter periods. Norway has become a country with overfished fjords. Imported goods must feed the nation. Its animal and plant species are seriously endangered. Knowledge about plant varieties and their production needs to be preserved through saving seeds, vegetables, grains, and animals. The development asks for saving and

protecting by evacuating species in seed vaults or other conservation efforts. In addition, people need to be aware of and understand what is happening. They need to use what they can save and overcome the situation of yield shortages by food imports. Companies introduce No Meat Weeks.



Click here for a Link to FPF-Scenario Film

"Noah's Ark" - What if we ran out of food?

<https://vimeo.com/showcase/6845625/video/395954612>



Summary of Dominant Forces in the Noah's Ark Scenario

People/Consumers

- Rising uncertainty and fear of what might happen next
- Mindless consumption at peak level: this refers to the quantity, not the quality of goods.
- People trust the big players and believe that “designed in Norway” also means “produced in Norway.”
- Information overflow and fast news flow about where to get meat and vegetables for coupons and food tickets, for example.

Industry/Production/Market

- Need to rethink food production and availability
- Decrease of industrial meat production and high taxes on meat: the black market for meat
- The big industry players have the power
- Imports only; no domestic products available or good enough for standardization; high-priced domestic goods

Farmers/Cultivation

- Farmers are faced with land destruction and shrinking agriculture yields

- High reduction in animal farming due to lack of feed
- Norway is willing to increase imports, as domestic harvesting is low or completely destroyed; new varieties also arise and are resistant to climate change.
- Constraints for local producers due to imported raw materials

Politics

- No more toll barriers and turbulent developments; taxes based on greenhouse gas emissions
- Lowering of import tariffs to strengthen business partnerships and food availability
- Initiative collaborations to protect the climate and nature
- Norway loses its ranking in the World Happiness Report²⁵
- Labelling restrictions: designed vs. produced vs. origin of ingredients

Technology

- Most of the available new technology is not flexible enough for the changing soil conditions (e.g., during harvesting).

Triggerpoints and Accelerators of the Noah's Ark Scenario

Triggerpoints

- Diminishing yields in agriculture and disappearing supply of domestic goods
- Increased plant-based food alternatives, such as fake meat, due to continuous meat reduction and better animal welfare (consumers and environment, they both demand these changes)
- Specialized diets are required and high impact on nutritional facts are made by national authorities due to overconsumption, waste, and hunger in total disequilibrium
- Increasing engagement in world politics
- Demanding changes in production, safety, and security are required

Accelerators

- Mindless consumption is decreasing
- Strong need to save and protect Norwegian resources
- Increased awareness about animal product substitutes and decreased thoughtless consumption of animal products
- Rethinking of technologies
- Rising “green awareness” and responsibility
- Global focus on ecosystem

²⁵ <https://worldhappiness.report/>

7.2 Plan B

Giving Back to Mother Earth-Open Ecosystem

Scenario Dimensions of Scenario B

Plan B: Traditional Revival / Food is personal



IMAGINE it is 2040+

The rise of urbanization and environmental challenges have transformed Norway into a radical, self-sufficient producer. “What we eat and use is what we grow and produce here.” Norwegian raw materials and foods are protected by tax and food governance. Thus, realities are changing in Norway, and awareness of naturally sustainable and healthy foods leverage Plan B for Norway. “We don’t want to be dependent on others.” Norwegians start to boycott imported goods, especially in the food sector. Regional and local gardening and production in small communities rises – circular economy at its best! Education of the senses and awareness of the value of goods and their environmental impact are featured by these activities. The eating culture is changing, and urban communities grow local partnerships. Norwegian companies

exclude meat from their canteens and force people to eat plant-based diets. Innovation potential is high as Norwegians use only their own resources and possibilities.



Click here for a Link to FPF-Scenario Film
“Plan B” – What if we made climate
positive food?

[https://vimeo.com/showcase/6845625/
video/395954700](https://vimeo.com/showcase/6845625/video/395954700)



Summary of Dominant Forces in the Plan B Scenario

People/Consumers

- Mind changing: Preserving the planet mentality increases
- Norwegian trust
- Reducetarians (e.g., become vegan for a month, Veganuary)
- Flavor and food appreciation is back
- Increased willingness to pay more for higher quality

Industry/Production/Market

- Direct selling from the producers
- Decreased food processing
- Added value on local markets outside the traditional retail: Rise of the “Small Giants”

Farmers/Cultivation

- Increase of own land use: Farmers diversify and use land more efficiently
- Farmers’ markets are beating supermarkets
- Only seasonal and domestic goods
- Urban community building and growth of local partnerships

- Vertical farming opportunities are growing
- Increased openness for new ways of farming

Politics

- High tax policy on imported goods
- Norway is an export country for food
- Restrictions on artificial additives increases, and EU standards for shapes and size of fruits and vegetables disappear
- Higher subsidies and support for farmers to increase their self-sufficiency
- Radical local focus and new forms of collaborations

Technology

- Sharing of equipment
- Open-innovation ecosystems: Making own tools for adequate cultivation and low processing efforts
- Niche innovations in technology or inventions

Triggerpoints and Accelerators of the Plan B Scenario

Triggerpoints

- Development of fair food initiatives
- Increased plant-based food alternatives due to continuous meat reduction and improved animal welfare (consumers and environment)
- Change of desires and wishes: Interest in national and natural fresh (raw) materials is increasing.
- Plant-based protein self-sufficiency
- Production, safety, and security, for example, in need of natural and fresh products
- Urban community building and growth of local partnerships
- Approaches to develop, produce, and market local artisanal food
- Need to protect what we have security are required

Accelerators

- Non-meat revolution trend
- “Free-from” movement
- Circular economy and up-cycling
- Changes in food culture and eating habits
- Trust and passion
- Relatively high number of products protected underlabels based on criteria such as taste, raw materials, origin, and greenhouse gas emissions
- Sharing culture and economy for goods, equipment, machinery, knowledge, and so on
- Global focus on ecosystem

7.3 Flying to The Moon

Digital Food Revolution “Is The Kitchen Dead?”

Scenario Dimensions of Scenario C

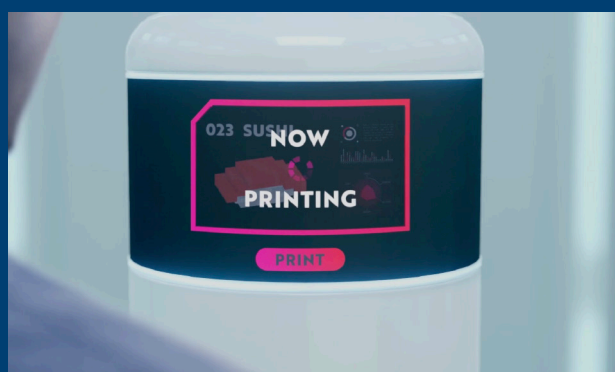
Flying to the Moon: Technological Revolution / Food is personal



IMAGINE it is 2040+

We've entered the digital age. Total transparency of the food chain and personal data supports clean, sustainable food production and provides healthy, enjoyable food to individuals in optimal portions. Norwegians are always online; they live in a digital cloud and are profiled and monitored to rate their daily habits, activities, and status. During the week, food portions that are clean, convenient, snackable, and personalized are delivered by drones and self-driving cars. Radical innovation starts to dominate agriculture and food production, and 3-D food printing helps to create healthy and clean fast food. The personalized NEWtrition App transfers the data to the robot kitchen. Meat is grown in labs, and households can now afford a Meat-Lab Grower for their own kitchens. Plant-based proteins are extracted to make

highly concentrated ingredients and powder products. Top chefs create extraordinary food experiences using molecular gastronomy. Ghost restaurants and Cloud kitchens pop up. Weekends and vacations are reserved for “real” food experiences celebrating the enjoyment of food.



Click here for a Link to FPF-Scenario Film
“Flying to the Moon” - What if we let
technology fix our food?

[https://vimeo.com/showcase/6845625/
video/395954745](https://vimeo.com/showcase/6845625/video/395954745)



Summary of Dominant Forces in Flying to the Moon Scenario

People/Consumers

- Food as necessity
- High focus on convenience products
- Time-pressed business life
- Becoming health-and-wellness warriors and fitness influencers
- Weekend cooking and the traditional holiday vs. business automation and food as need for energy
- Individual treatment

Industry/Production/Market

- Digitalization and automatization of the right portion of healthy food each day
- Increased lab-grown food
- Clean room approaches to food production

Farmers/Cultivation

- Gene editing and new raw-food materials
- New forms of growing and breeding on traditional

and and in the underground; molecular farming where microorganisms or single cell organisms produce our food or ingredients

- Increased use of hidden land and unused land and resources under controlled conditions

Politics

- Airspace regulation for drone deliveries
- New taxes on new delivery and support services
- Lab meat becomes affordable

Technology

- Robotics 6.0 and Industry 8.0
- Interaction and interface between humans and technology
- Radical innovation and digitalization start to dominate agriculture and food production
- New technological forces are highly dynamic and foster short, flexible product life cycles

Triggerpoints and Accelerators of the Flying to the Moon Scenario

Triggerpoints

- Trend toward rapid urbanization due to environmental changes
- Sustainable and healthy food depends only on social status and wealth
- Bio-, free-from, and vegan trends
- Automatized and tracked production, transportation, and food logistics to create, for example, clean supply chains that use block chain for food traceability
- Robotics 6.0 and Industry 8.0
- 3-D printing
- NEWtrition / personalized food / The (personal) Health-App

Accelerators

- Snackable and serialized content for consumers
- Consumers demand convenient, pre-scaled nutritional facts and insights.
- Health and well-being: personalized diets, nutrition, and meal planning
- Convenience coupled with high culinary enjoyment
- Gene editing
- Nutrition targeting

7.4 The New Equilibrium

Back To The Future

Scenario Dimensions of Scenario D

The New Equilibrium: Technological Revolution / Food is conventional



IMAGINE it is 2040+

Norway has turned into an export country, and its food and food systems are in a period of rapid reinvention. It is self-confident and future oriented, with one of the best-ranked ecological footprints in the world. Norway is the first country to produce plant-based protein products on a larger scale for its own usage in food production and as an ingredient. Norwegians are rapidly changing their minds to embrace plant-based products as valuable, sustainable, and healthy. Increased seasonal land use determines a strong forward-looking self-confidence. Norwegian-grown plant-based proteins are in high demand on the Norwegian and world markets. Old Nordic varieties brought back from the Seed Vault can be beneficial for the development of new varieties, leading to biodiversity, advanced varieties, and hardiness and

contributing to old pea species. Sustainability and healthy diets on a natural basis foster a new equilibrium. Old recipes are newly interpreted and adapted to the varieties and the use of mainly local products and ingredients.



[Click here for a Link to FPF-Scenario Film](https://vimeo.com/showcase/6845625/video/395954813)

“The New Equilibrium” – What if we became food role models?

<https://vimeo.com/showcase/6845625/video/395954813>



Summary of Dominant Forces in the New Equilibrium Scenario

People/Consumers

- “Preserving the planet” mentality increases
- Preference for unprocessed ingredients
- Increased interest in cooking
- Sustainably enhancing food consumption patterns
- Increased pride in own country and trust in food

Industry/Production/Market

- Transparency of nutritional information
- Support of environmental policy measures
- Improved local supply and logistics of food and raw food material
- Exclusive highly rated plant-based food products
- Increased scalability (economies of scale)
- Need to protect what we have and what we are proud of

Farmers/Cultivation

- Urban farming
- Improved resource use
- Adapted varieties of ancient seeds from Viking era
- Development of new advanced varieties and diversification of new plant-based bioresources and alternative production methods
- Self-sufficiency bonuses

Politics

- Agricultural policies support food specialties
- Stronger restrictions of food labelling and origin

Technology

- Technology is an enabler, not an enemy, of the “new good world.”

Triggerpoints and Accelerators of the New Equilibrium Scenario

Triggerpoints

- Increase of environmentally friendly policies, regional agriculture, and requirements of promoting fair trade and higher standards for the environment, food safety, food quality, and animal welfare
- Ability to innovate from old recipes leverages the interest in natural food products and ingredients
- Growing number of people refrain totally or partially from the consumption of meat or animal-based products, either as vegans, vegetarians, or meat reductarians
- Increasing Norwegian participation in sustainable practice and activities, such as buying from local food markets
- Protectionist and supportive agricultural policies-building the background for specialty food in Norway
- Transportation and food logistics: solving the last-mile challenge
- Ethical convenience
- Local culinary use of landraces of plant-based food (e.g., grey peas)

Accelerators

- Giving-up of mindless food eating and consumption, which increases knowledge
- Organic 3.0 with a new level of sustainability, stronger focus on systematic impacts, including health, ecology, fairness, and trade
- Search for threefold solutions that are ecologically and economically attractive and beneficial to health
- Popularity of superfoods is growing and therefore increases the consumer’s openness to learn about ingredients
- Transparency
- Norwegian remoteness
- New forms of food culture and eating food and ingredients
- Against so-called animal slavery

8. Concluding Thoughts: How to Use the Scenarios

“A plan is needed – not just a reaction to change, but also in anticipation of it.” – Idris Mootee, expert in design thinking

8.1 Using the Scenarios in FPF

In this project, we want to contribute a crucial understanding of the future of food and related trends and drivers as a competitive parameter to drive change, and as researchers we want to be prepared for the future. By seeing and understanding signals we encounter in the project, only then can we try to respond to them and to adapt, communicate, and ensure a higher probability for applied science in industry and further research and innovation. We use scenarios to uncover new information, possibilities, and challenges for food and food systems of the future – or for any other topic or critical issue. The scenarios help us (and our partners and stakeholders) to immerse ourselves into future probabilities and possibilities, as well as to think of and develop aspirational outcomes. This approach enables the project to show and discuss alternative futures, and allows us to assess the validity, robust-

ness, and future-readiness of current strategies and to uncover new ideas. We have used the FPF scenarios in various ways within the direct context of the project:

We held several events called **“Eat the Future”**. Here we installed the four alternative futures and offered a journey into the future of food to more than 160 participants. The participants were immersed in the scenarios by experiencing them with their senses through food, pictures, videos, and other scenographic means. We stimulated a dialogue between researchers, industry, citizens, farmers, and policy makers. The events received outstanding feedback as being a “call for action” and a “great means of communicating results and involving stakeholders.”

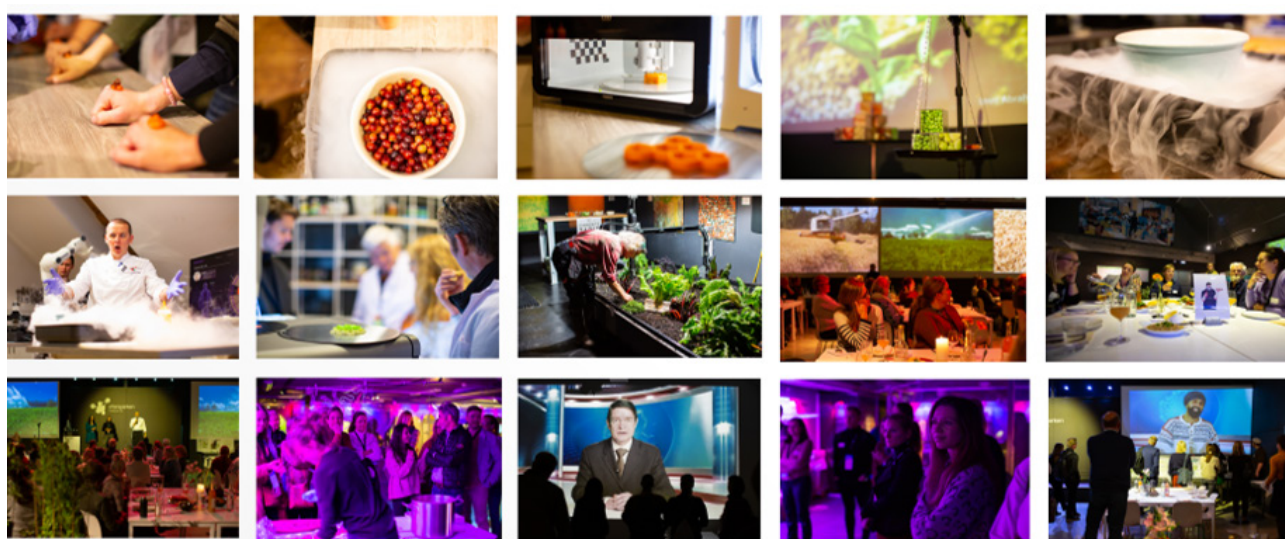


Figure 9: Some impressions of our journey through four possible futures of food in Norway; Source: Eat the Future, FoodProFuture project, WP5, Photos by Joe Urrutia

Personas / Norwegian Representatives

Good scenarios, according to the Institute for the Future (IFFT)²⁶, are those which elucidate the dynamics of the external world and environment. They allow us to experience what it might feel like to be a person in the possible scenarios. Personas, like the Norwegian representatives we developed in the FPF project, help bridge that gap and develop different possible solutions, concepts, and insights according to the different perspectives.²⁷ We developed the Norwegian representatives in the context of healthy and sustainable plant-based diets and on the basis of our work

rests on quantitative and qualitative research data from focus groups, expert interviews, observations, literature reviews and surveys.²⁸ The research we conducted during the two first years of the FoodProFuture project is what helped us cluster and describe them. The personas represent particular groups of people, based on socioeconomic and cultural backgrounds, interests and behaviors, and range of perspectives and generations. The characters develop throughout the project, just as people do in real life.



Figure 10: Overview of the developed FPF personas with very different values when it comes to food and life in general; see also the related article in Food-Navigator by Flora Southy (December 2019): <https://www.foodnavigator.com/Article/2019/12/13/Nofima-develops-personas-to-help-food-brands-think-like-consumer-groups>; Source: FPF / WP5

As we gain more insights and knowledge, the persona profiles become stronger. In direct relation with the scenarios, the personas are facilitators to show how different scenarios will impact different people or vice versa. They help us inside and outside the FPF project to uncover blind spots and broaden perspectives about alternative future environments in which today's decisions might play out (for farmers, industry, partners, and science). Challenging stakeholders to think in new ways about what the future may

bring will foster action to shape the Norwegian future food production with a high degree of self-sufficiency. When we work on research projects or with innovative companies, we often have difficulties thinking like the consumer or a specific target segment of the population; this is where the use of personas also can help the food industry see from different perspectives.

²⁶ <http://www.iff.org/home/>

²⁷ <https://www.foodnavigator.com/Article/2019/12/13/Nofima-develops-personas-to-help-food-brands-think-like-consumer-groups>

²⁸ e.g., FPF Project REPORT: Kjøttfrie spisevaner - hva tenker forbrukerne?, OsloMet, 2018

“The future is already here, it’s just not very evenly distributed.”

- William Gibson, science fiction writer

Scenario Films

We created short films presenting the four future scenarios. The films are shared within and outside the project for creating an immersive and emotional presentation of the scenarios. They have been used to trigger and stimulate discussions in response to the question, “What do we want the future to look like, and how do we (as a project or industry) get there?” Some of the scenarios were perceived as provoking, while others were seen as very realistic or motivating. This means the films help us to uncover uncertainty and engage in forward-thinking discussions that will be (re-)translated into citizen involvement and acceptance activities and into different categories of innovation opportunities. (<https://foodprofuture.no/future-food-scenarios/>. See Appendix 6.

Prototype Development

Based on insights of the scenario work, we engaged in transdisciplinary ideation and prototype activities to identify potential innovation opportunities for FPF and the stakeholders. So far, we have developed over 50 specific short-term and long-term ideas for products, packaging concepts, processes, services, education, behavioral economics, and educational interventions (separate project internal report). Several concepts have been tested with experts and consumers, and the portfolio and test insights will be shared and further developed with project partners and stakeholders.



8.2 Using the Scenarios to Inspire Change

“Truth passes through three stages before it is recognized: First, it is ridiculed, then it is opposed and then it is accepted as self-evident.”

– Arthur Schopenhauer, professor of philosophy

Food brings us all together on a common ground and represents a universal topic, a global language and a very critical driver for global economic prosperity. Food enables us to come together in a community. But food is also a catalyst for change and food players are often pioneers responsible for more than just a little part in the system or the bottom line. Their action and choices can have tremendous impacts on human health, world sustainability and economic growth. So how do we face the urgent issues of creating a more healthy and sustainable future of food while understanding technology’s role in closing the gaps in our food system?

The four FPF scenarios describe various possible development directions for the Food System until 2040. The scenarios will force us to think in the long term, and the year 2040 is far enough away to expect significant changes in society. We need to think about fantastic possibilities for the future and how we produce food, what we eat, and how we live. This might help to “predict” the future and future developments to navigate!

In the development approach of the FPF scenarios, we suggested guiding questions on the project-specific level and on a more general level. The food system and involved actors are very important in achieving social, economic, and environmental goals. We believe that the FPF scenarios can also stimulate the ongoing debate about a more sustainable food system in general and how food production and consumption will develop in Norway specifically. We developed questions to guide and motivate further discussions among food system stakeholders. The aim is also to challenge, discuss, and use the scenarios for starting a strategic dialogue for further developing new questions.

General questions for each scenario or the combination of scenarios

- How will we and our task area (all disciplines) be affected when we are moving in the direction of one of the scenarios?
- What does a high degree of change in the Norwegian food system entail?
- How clear is the need for change in the Norwegian food system?
- What is the capacity and readiness for change in society, politics, and industry?
- Can the public, residents, and business have different roles than they do today?
- How can new collaborations affect the sustainable development goals with the help of the food system?
- What can we do to influence development and change?
- Who will do worse and who will do better in the scenarios?
- Which scenario feels most threatening (a nightmare), and why?
- How can the stories be further developed?

A very effective way of encouraging a good discussion is to ask yourself or a group of colleagues or stakeholders the question “What if ...?” linked to a certain problem, trend, threat, or opportunity. We recommend using these powerful two words when you engage with the FPF scenarios and want to facilitate a fruitful discussion or strategic process.

Examples of specific questions for individual drivers or trends in a scenario

- *What if ...* companies exclude the meat eaters in their staff (end partner environment) by announcing that they will serve only vegan food in their canteen?
- *What if ...* governments raise taxes on animal products and drastically reduce taxes on plant-based products?

- *What if ...* by 2040 most meals currently cooked at home are instead ordered online and delivered from either restaurants or central kitchens? (According to UBS - the Union Bank of Switzerland - online business models have disrupted many sectors, from retail to taxi industries, and are now doing the same thing to supermarkets and restaurants.)
- *What if ...* time-starved and convenience-seeking consumers turn to delivery services and eventually replace the need for home cooking?
- *What if ...* the agriculture of the future takes place on a molecular level in test tubes and bioreactors?

What if ... you build your own questions for each scenario and challenge yourself and your organization to think about the future while it is still possible to influence and build it?

“Scenarios will be useful when used. The scenarios should be the beginning of a strategic dialogue, not the end of one. They tell the story about possible futures. And yes, we like to provoke thinking about the future and still be in the position to make change happen!”

– Katja-Maria Prexl and Antje Gonera

9. National and International FPF Project Cooperation Partners

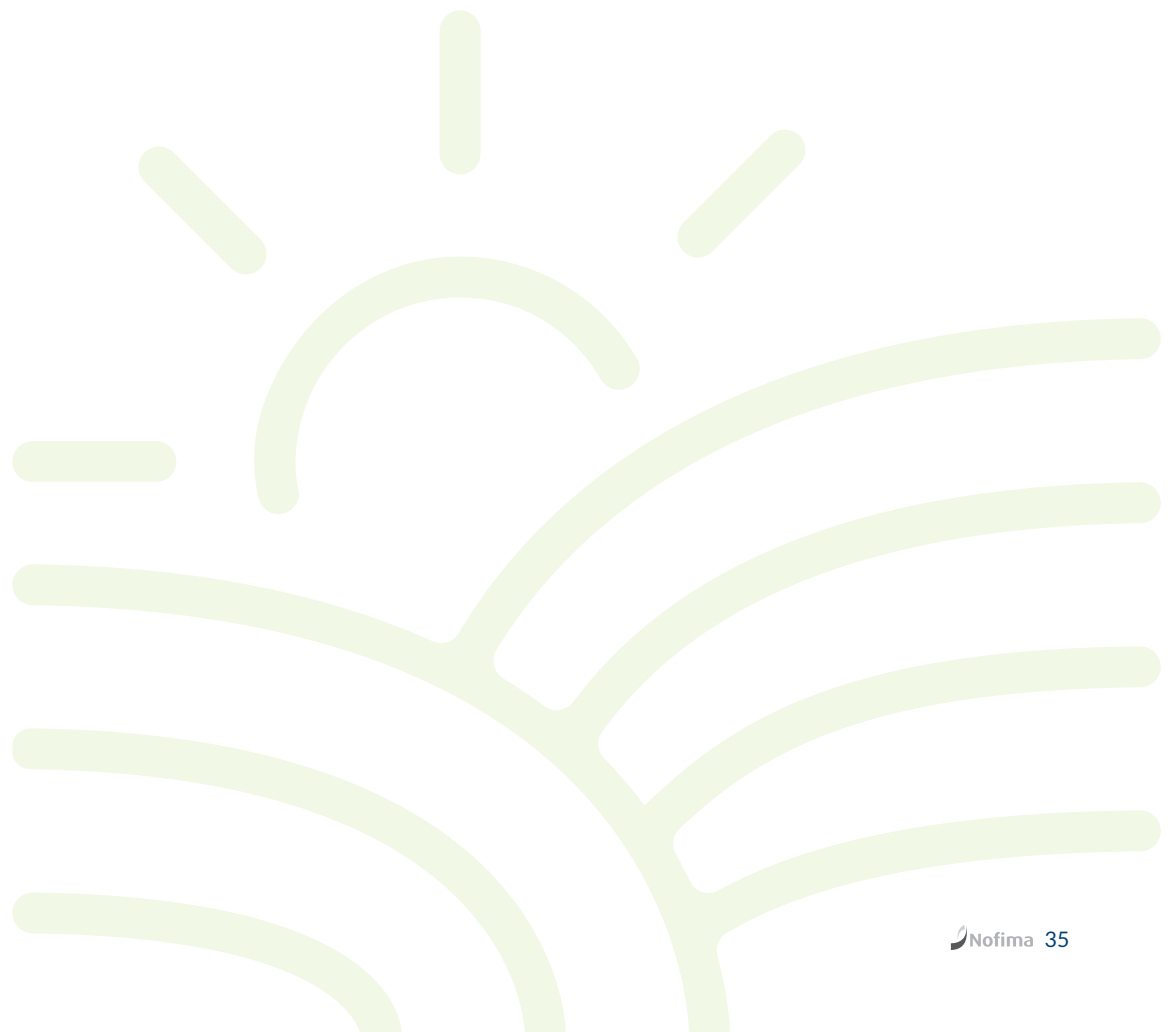
The FoodProFuture project is an international trans-disciplinary research project. Participating research institutions are NOFIMA, NMBU, NIBIO, Østfoldforskning, OsloMet (SIFO), NTNU, Luke and VTT (Finland), RISE (Sweden), UB Bourgogne (France), and UFT (Bulgaria). Participating industry partners are

Orkla, Bama, Felleskjøpet, AM Nutrition, Halogen, Hoff, Gartnerhallen, Mills, Skala, Lantmannen, Borregaard, AgriAnalyse, Norsk Landbruksrådgiving, and Norsk Matraps AS. Project duration is May 2017 to April 2021.

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11. APPENDIX

Appendix 1

Example of how to make people think of the future: Development of Newspaper-Headlines for 2040+

There are a lot of ways to start thinking about possible future states. You can imagine it, prototype it, visualize or write about it, but as it is quite difficult to think about the future, a useful starting point to “bridge the gap” is to create fictional Headlines of the Future. This helps project members play with hypothetical language that describes a possible future. It seems to be a good tool to help build future food visions. In order to create

involvement and engagement with something we assume to be risky and not 100% predictable (e.g., Liedtka, 2015; Slovic, Finucane, Petere, & MacGregor, 2004), we asked FPF colleagues: When you imagine reading a newspaper in 2040 what do you think the headlines about food, plant-based food, plant-based protein, food consumption and culture, trends or cooking would look like in Norway? In the following we show some examples of the feedback we have received after sending out our online question during 2018 and 2019:

Table 1: Selection of Future Food Newspaper-Headlines for 2040+

Newspaper-Headlines for 2040+
Many meat eaters feel stigmatized: ‘Why can’t they just leave me alone with my steak?’ says Kåre (57)
GROW YOUR STEAK IN ONE DAY! - With the new efficient method for stem-cell culture you may now grow your own Friday-steak in the kitchen from the day before.
New finding: Could plant-based proteins explain the explosion of cancer cases in Europe?
Orklas SmartFood sold out in days - food with your personal optimal nutritional profile.
Last livestock farm to close in Europe as lab meat continues to soar.
Somalia ran out of grasshopper bars, producer struggling to keep up with demand.
Norway’s largest vertical greenhouse for chickpeas launches in Northern Norway.
The environmental change was at the tip of our fork, at last, plants are becoming the basis of the western diet.
Meat eaters, the new smokers in a time of vegetarian rule
Norway secures “bean deal” with Brazil and the Congo. Following the sharp increase in consumption of Norwegian-produced beans, peas and oats, the production hit the roof in 2031, unable to produce more. Pulses are so popular in the rest of Europe, too, so little can be bought there. But the Norwegian Government signed a deal today with the Congo and Brazil, guaranteeing to buy at least 20 000 tonnes of legumes in each country for a guaranteed high price the next 20 years, while promising to secure rainforest on the equivalent of the growing area.
Try foods from the 20th century. NB! May contain animal proteins.
A small contingent of farmers from the mountainous regions in Mid-Norway has applied for dispensation to take up animal production. The farmers argue that the need for controlling vegetation requires use of animals. They further state that the meat from these animals can be used for food to vulnerable consumer groups with special requirements.

Appendix 2

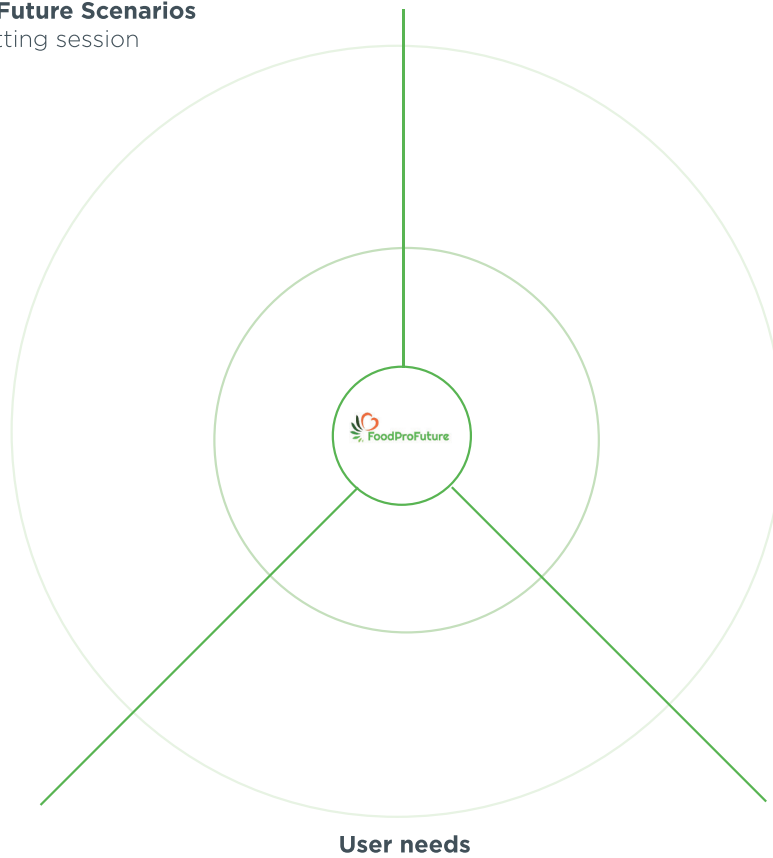
Trend Mapping - Bulls eye trend spotting: What issues and trends cause change in our societies and markets?

WP5 Workshop // Future Scenarios

Bulls eye trend spotting session

Macro trends

- Political
- Economic
- Social
- Technological



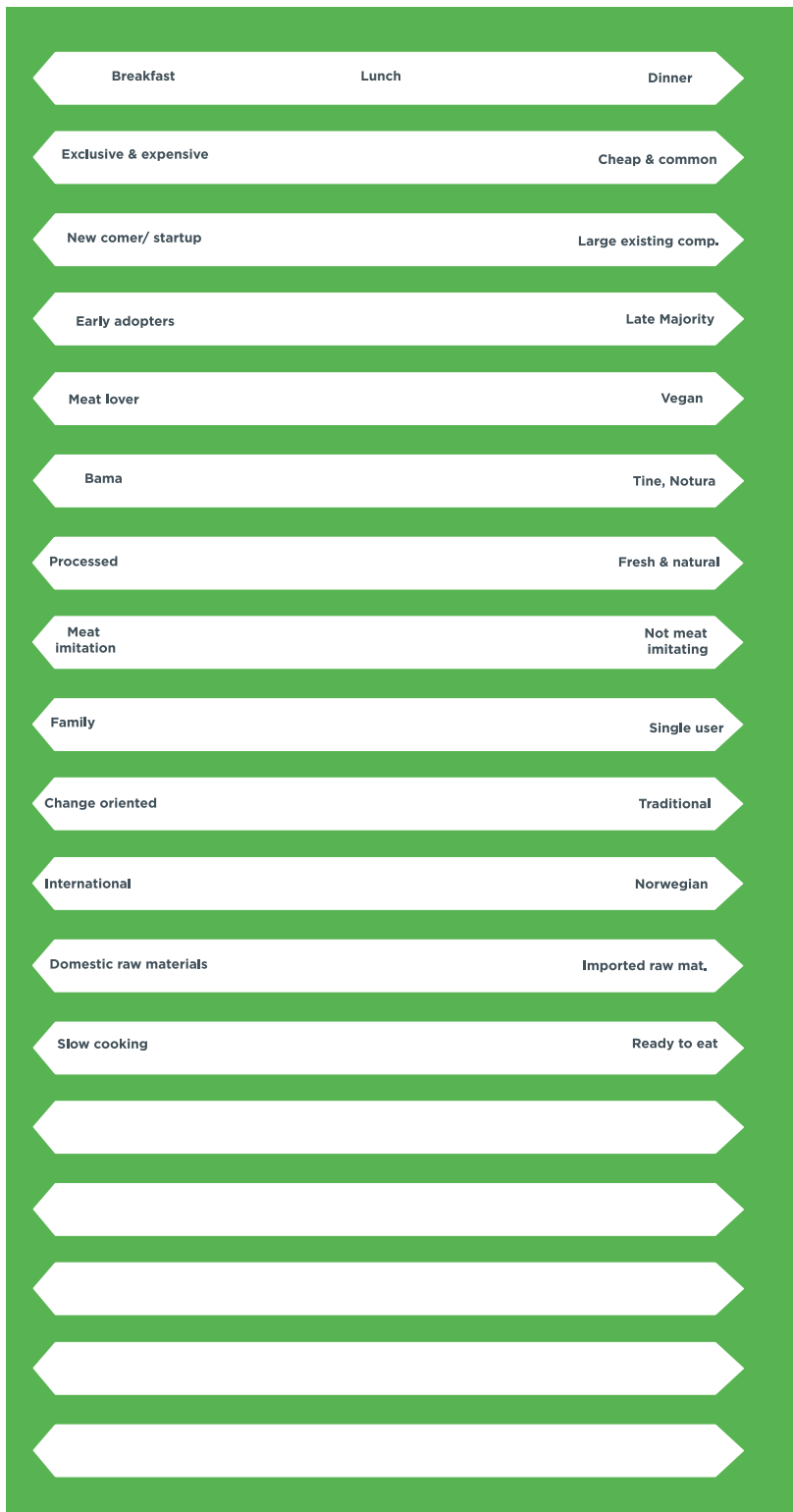
Micro trends

- Norwegian plant based food production
- (Local) markets
- Distribution dynamics
- FoodProFuture project resources

Source: FoodProFuture & Halogen

Appendix 3

Some examples of axis of possibilities to construct the scenario-matrix: What contradictions would be relevant to illustrate to facilitate a good discussion about viable Norwegian food products that may lead to a desirable shift towards more plant-based diets, in year 2040+?

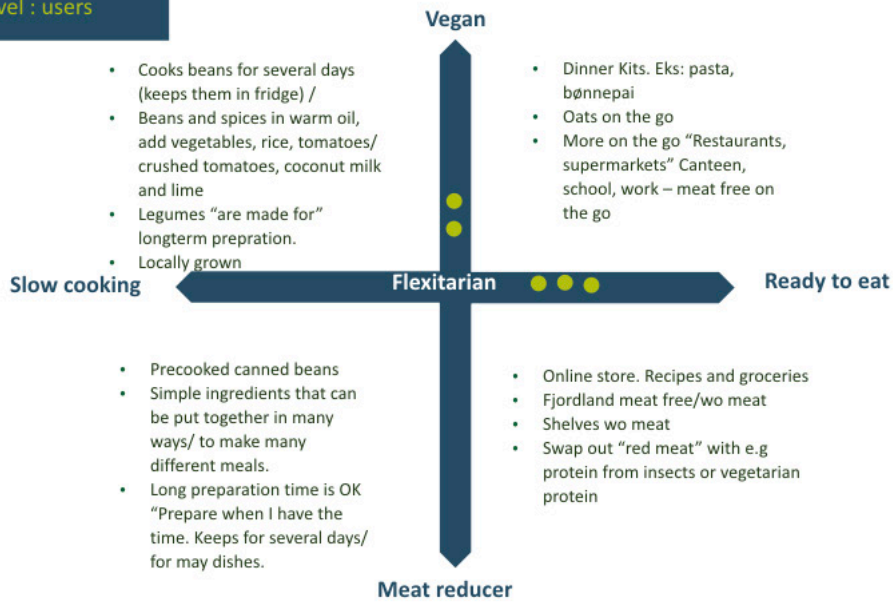


Appendix 4

Output from the FPF Scenario Workshop

Axis of possibilities

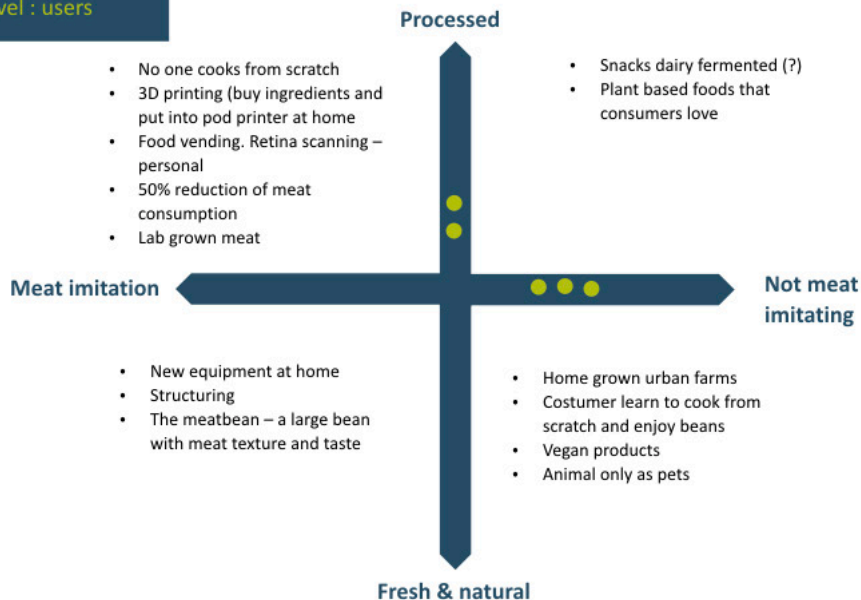
Group 1 // Level : users



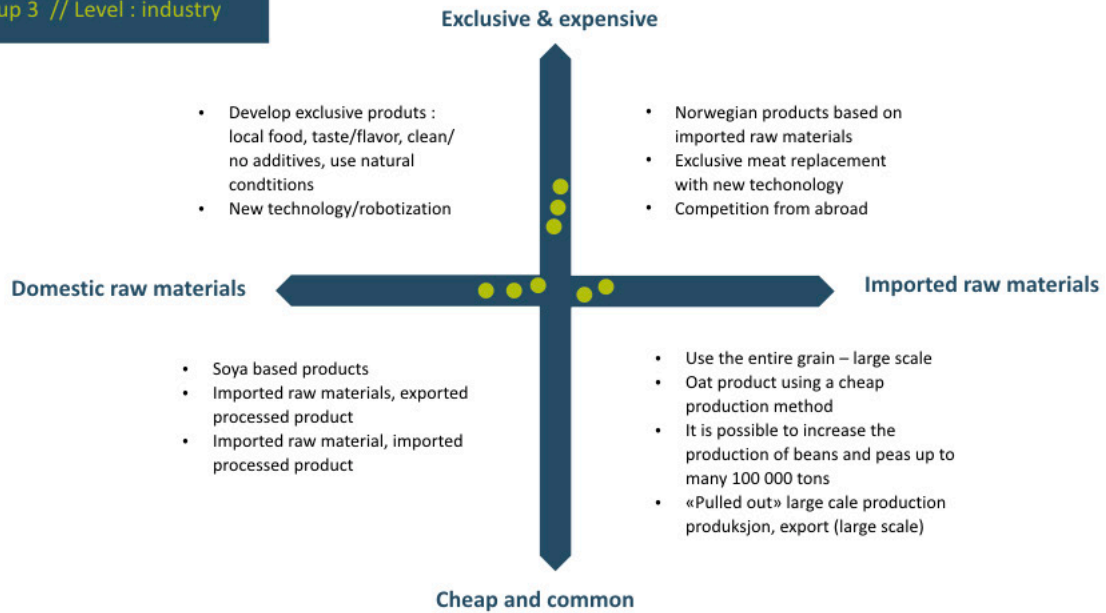
Increased need for individually adjustable meals, new/different combinations of nutrients and good flavors

Axis of possibilities

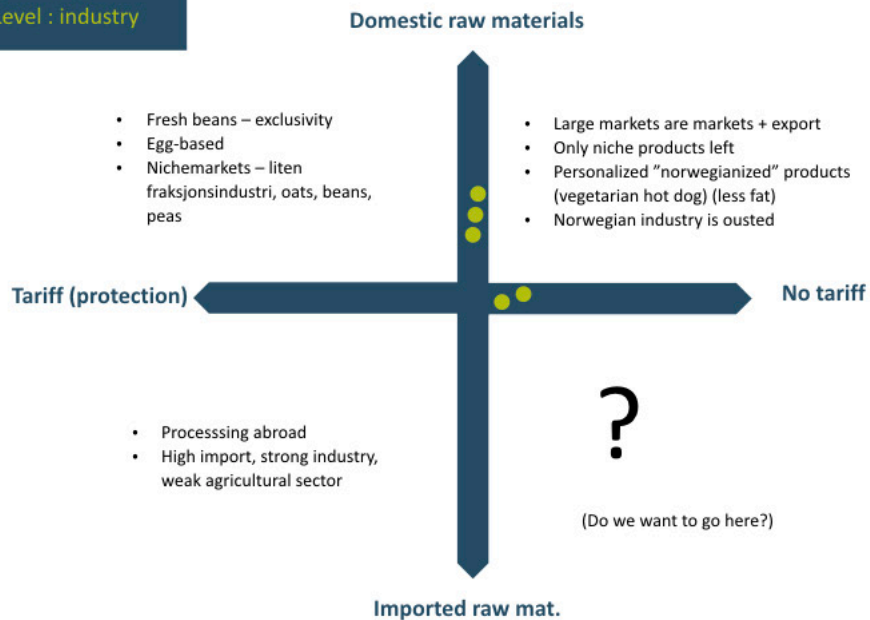
Group 2 // Level : users



Axis of possibilities
Group 3 // Level : industry



Axis of possibilities
Group 4 // Level : industry



Appendix 5

Scenario-Card Example for further development

Senario cards

Describe the scenario:



User. Describe how the scenario provides opportunities and/or constraints for end users



Industry / production / market.

Describe how the scenario provides opportunities and/or constraints



Farmers / cultivation.

Describe how the scenario provides opportunities and/or constraints



Appendix 6

FPF-Scenario Films



Link to the FPF-Scenario Films:

<https://foodprofuture.no/future-food-senarios/>

Source: FoodProFuture

Foto and drawing credits:

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Halogen

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Nofima is a business-oriented research institute working in research and development for aquaculture, fisheries and food industry in Norway.

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