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RIE

**TASK FORCE ON SUSTAINABLE
AGRICULTURE AND INNOVATION**

**BEYOND THE APPLE
OF DISCORD: EXISTING
NARRATIVES AND
WAYS FORWARD**

This report is the work of the Task Force on Sustainable Agriculture and Innovation established by Re-Imagine Europa as part of its programme on Narratives, Climate and the Future.

The Task Force consists of more than 70 experts from a wide range of backgrounds and disciplines covering NGOs, academia, CSOs and industry.

Additional information about the Task Force, its ethos and composition, is available [here](#).

N.B. All outputs from the Task Force have been produced by the team at RIE and our knowledge partners. While we have done our utmost to reflect the valuable input provided by the experts and stakeholder representatives who kindly gave up their time, this report should not be taken to represent the position of any individual member of the Steering or Expert Committees nor any organisation with which they may be affiliated.

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EXECUTIVE SUMMARY

Europe needs more sustainable food systems to cope with dramatic changes to our natural environment, economic instability, and rapid societal transformation. The issue is extremely complex, involving many dimensions and multiple objectives such as feeding a growing global population, ensuring food safety, mitigating climate change and environmental degradation, guaranteeing the development of rural areas, promoting economic growth, and equalizing the chances of different farming models. To address all these challenges, to find the best solutions, and above all to bring Europeans together in support of these solutions we need a new ecosystem for the debate that recognizes not only the multidimensionality of the issues at hand, but also the complexity and intensity of the corresponding public discourse.

To better understand public knowledge and perceptions of these issues, we took a closer look at how different stories, symbols, images, and metaphors are used to inform the debate on the future of European agriculture. We have adopted a narrative approach because it provides the tools to examine the structures hidden behind individual arguments. Vast scientific literature in various fields suggests that individual facts are usually communicated through a few basic narrative schemas - although the number of stories is large, they usually follow a small number of narrative schemas. These ready-made stories describe typical sequences of events, but also provide a handy repertoire of images. Narrative schemas describe prototypical sequences of events, providing templates for how the world works. For example, many stories describe how good deeds are rewarded; bad behaviours are punished, while hard work, inventiveness, and risk-taking will result in success. As individuals rarely rely on fact-checking, narrative plausibility, i.e., compatibility with previously adopted narratives, is a primary factor in whether new information and ideas are accepted or rejected. Strongly defined communities are built around these kinds of stories, which often leads to polarised debate.

Precaution-focused

Unpredicted consequences

New technologies are dangerous because scientists tend to overestimate their ability to understand and control reality.

Violating the rules of Nature

Toying with natural boundaries that divide species and natural speed of evolution results in creating various forms of monstrosity.

Greed destroys the traditional way of life

New technologies destroy traditional farming societies and limit freedom of choice, by shifting food production to large corporations.

We've heard these promises before

New solutions in agriculture (like new genome editing technologies) are yet another version of old solutions (like GMOs) and more technology is never a solution to problems caused by technology.

Innovation-focused

Progress

Every new technology is another chapter in the history of progress that elevates us further from the hardships of living in natural conditions.

We need to face a crisis

We need new technologies to face unprecedented challenges.

The suspicions have been addressed and tested

Doubts are an important part of the innovation process and should be resolved based on evidence and scientific methods.

We have more precise technologies than ever

"New" technologies are not "completely new", but improved versions of traditional technologies. For ages humans have used various technologies to modify plants. The main difference is that today we can act faster and more precisely.

Our research has shown that this is the case in the debate on the future of European agriculture. The discussion has been organized by a handful of narratives that may be divided into two main groups: some take **precaution** as their starting point, while others focus more on **innovation**. By comparing the typical sequences of events, vocabulary and images used, it was possible to identify four narratives within each of these groups.

Our analysis, as well as the discussions with the Expert Committee, confirmed that the existing narratives are highly polarized. At the same time, we recognized that **many basic values are shared by the different sides of the debate**, although the view of the best solutions may vary between the groups.

Our goal was not to take sides by trying to evaluate existing narratives nor to advocate a new “neutral” narrative, but rather **to discover a set of common values and procedural rules that may serve as a starting point for a new, more polyphonic ecosystem for dialogue** that would enable us to build an optimal portfolio of solutions.

In order to tap into the values that bind Europeans together, **we need to overcome the apparent opposition between precaution and innovation, as well as other simplistic dualisms that polarize the current debate**. For example, innovation and organic farming are not mutually exclusive and there are technologies that bring us closer to nature by enriching biodiversity or reducing land use. **We need to hear the voice of all stakeholders**, especially farmers and consumers. **We need to adopt a systemic approach** that is based on an understanding that both the ecosystem and society are complex systems composed of many interdependent elements. When evaluating planned change, **a comprehensive nuanced assessment of the effects on the system is needed** with respect to many criteria, rather than a single criterion for evaluation.

Diversity, democracy and freedom of choice, key European values, could guide us in the process of negotiating different approaches. Diverse stakeholders will need to work together in order to build a wide portfolio of solutions that would match the complexity of problems. We need an inclusive approach that takes into account the arguments of policymakers and scientists, but also gives a fair platform to farmers and consumers. In this process the European institutions could adopt the role of an honest broker that openly presents various possibilities and facilitates the debate, rather than forcing a single solution.

This report consists of a brief introduction presenting the main motivations for undertaking the research (**chapter 1**), a theoretical chapter (**chapter 2**) illustrating the specificity of the narrative approach, an analytical section presenting in detail the research methodology and the structure of the 8 dominant narratives (**chapter 3**), and a concluding chapter containing concrete recommendations for building an ecosystem of debate, reducing polarisation between narratives, and enabling a consensual approach and evidence-based search for solutions (**chapter 4**).

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1. INTRODUCTION

The alarming acceleration of changes to our natural environment, economic instability, and rapid societal transformation present a formidable set of interlinked challenges for our food systems. The European Commission has recognized this through the role carved out for the Farm to Fork Strategy under the wider objectives of the European Green Deal.

The gravity and complexity of the challenges in the agricultural sector are matched by the breadth and intensity of the corresponding debate. We must find solutions that are not only effective, but also acceptable to groups with different knowledge, perspectives, and preferences. The best possible solutions will be of little use if society rejects them, however ingenious or technologically impressive they may be. This is why, using the tools of narrative analysis, we have mapped the ongoing debate and the possibilities to move the complex discussion on sustainable agriculture and innovation toward a less polarized, more evidence-based, and value-driven model¹.

As social psychology research shows, narratives are a key resource for dealing with the complexity of the world and the dynamics of change. We tell stories to understand reality, to keep up with it, and most importantly to communicate with others and convey our values. In the face of complex challenges and uncertainties, various groups build their own narratives which present different perspectives and reflect different preferences². These narratives then provide frameworks for policy development and regulatory decisions³. It is important to highlight that narratives, as they are understood in the social sciences, are in no way opposed to facts. On the contrary, they are an essential vehicle for communicating facts and explaining reality, but also for building community. For this reason, building a consensus around evidence-based solutions and drafting a new framework for a European vision of sustainable agriculture and innovation requires understanding existing narratives that reflect the views and concerns of different groups within society.

It is very difficult to anticipate all of the potential ecological, economic, and societal consequences of new solutions. This equation has many factors which may compete with or negate each other, often resulting in difficult trade-offs between priorities. Finding a solution to a question as complex as the future of sustainable agriculture and innovation requires an open and inclusive debate, but current narratives tend to oversimplify the issues. Different interests and perspectives represented by various stakeholders often result in a clash of highly polarized positions.

Under these circumstances, a robust ecosystem for constructive dialogue and decision-making may prove to be more consequential than any individual choice we make. In this regard, the EU's decision-making bodies could serve as an honest broker of diverse points of views in a process moving toward a shared vision, rather than as arbiters that have to choose one perspective over another. Embodying this approach is exceedingly difficult in a narrative ecosystem that is highly polarized and does not allow for compromise, such as the political and public discourse on many aspects of sustainable agriculture as can be seen in the debate around genome editing explored in this report. Due to the complexity of highly contentious regulatory issues, it is essential to enable a space for evidence-based, nuanced decision-making, but also quick adaptation and correction. Furthermore, this space must convey the values, voices, and interests of different stakeholders, based on the European values of democracy, diversity, and equality.

In our research, we examined the narratives through which new technologies in agriculture are described today, with a particular focus on new genome editing technologies, the first technology up for deliberation by the Task Force. Polarising divisions concerning agricultural biotechnology, grounded in the contentious GMO debates of the 1980's and 1990's, have had a substantial impact on how all kinds of new technologies in the agri-food sector are perceived. Therefore, narratives related to this specific kind of technology, by serving as a case study, have a strong potential to point us towards broader conclusions and insights relevant even to innovations that are wholly distinct in a technological sense.

Based on our analysis of press and social media sources, we extracted core values and main lines of argumentation without making judgments about their validity or veracity. By analysing the narratives, we were able to take a closer

¹ The role of narratives, metaphors and framings has been highlighted in the recent Opinion on Ethics of Genome Editing published by the European Group on Ethics in Science and New Technologies (March 2021). Also the recent JCR report "Farmers of the Future" mentions that "Future policies could consider acknowledging and recognising the various values, narratives and framings that relate to agriculture, with the aim to use them ethically, to build transparency around their subjective nature, but also to be ready to re-frame communications to facilitate discussions and to increase comprehension of policy problems." (Bock, A.K., Krzysztofowicz, M., Rudkin, J. and Winthagen, V. (2020), Farmers of the Future. EN, Publications Office of the European Union, p. 4.)

² Beckert, J., & Bronk, R. (2018). An introduction to uncertain futures. In J. Beckert & R. Bronk (Eds.), *Uncertain futures: Imaginaries, narratives, and calculation in the economy*. Oxford: Oxford University Press.

³ Codin, B. (2009). The making of science, technology and innovation policy: conceptual frameworks as narratives, 1945-2005.

look at the issues that unite and divide different actors in the debate, as well as at the interests and fears they articulate. We were also able to see which metaphors, images, and scenarios shaped social perceptions of new technologies. Our analysis covered the full spectrum of attitudes toward new technologies. We applied the same tools to describe precaution-oriented narratives sceptical of genome editing and emphasising the importance of regulation, as to more enthusiastic, innovation-oriented narratives. Such an approach allowed our analysis to become a starting point for a map of the public discourse that will hopefully enable a shift from partisan, identity-oriented arguments towards a more open, value- and challenge-oriented debate. This preparatory research formed the basis of Re-Imagine Europa's initial engagement with experts and stakeholders as well as the Expert Committee's discussions about its vision for a European model of sustainable agriculture during its meeting in February of 2021.

In the following sections, we will give an overview of the theory behind this narratives-based approach, outline the methodology of our preliminary research, and describe each of the narratives identified. The final section, "Where do we go from here?", will then summarize the key conclusions of the Expert Committee meeting.

2. WHAT ARE NARRATIVES?

2.1. A USER MANUAL FOR REALITY

We are essentially narrative creatures. Telling stories is the most human thing we do. They shape our perception of social roles, civic duties, and the dangers that threaten us. Narratives provide a natural vehicle for the transmission of information within societies. Certain stories come to mind readily, certain words have negative or positive connotations, certain values are associated in the imagination with one image or another. In the everyday experience, incoming information is organised into stories according to a process known as narrative embedding. Shared narratives unite people and provide a platform for societies to undertake common actions. The purpose of our work on narratives for this Task Force was precisely to avoid rowing against the current in the ongoing debate about the future of European agriculture.

For example, by drawing our attention to suffering and the struggle for survival, news coverage from different parts of the world expands the boundaries of our solidarity and empathy. By doing so, narratives unify us in the biggest imaginable community – humanity itself. The narrative aspect of modern humanitarianism is difficult to overstate, as evidenced by vast research on the identifiable victim effect. There would be no answer to global challenges without these global narratives. But narratives can also divide us. Not sharing common narratives is one of the basic factors of exclusion and delimiting borders between nations, ethnic groups, religions, or social classes. “Us” and “them” are very much narrative structures.

As Ulrich Beck puts it, we live in a “society of global risk” (Weltrisikogesellschaft), shaped not only by catastrophic events on an unprecedented scale, but also by a constant anticipation of a new catastrophe. Unsurprisingly, we attempt to contain the mind-boggling complexity of the modern world by bringing it down to our human scale and grounding it in everyday experience. Scientists test hypotheses in their laboratories. Politicians and businesspeople make plans for a term of office or accounting cycle. And the public focuses on their neighbourhood, shopping basket or Facebook timeline, limiting the reach of solidarity to a continent, nation, local community, or family unit.

We have a limited ability to receive, process, remember, and communicate information that has not been packaged into meaningful structures, structures that narratives happen to provide. Narratives, as mental tools for understanding and prediction, tell individuals what is likely to happen and how others are likely to behave. By describing sequences of events, actions, and their consequences, they provide the basis for causal reasoning⁵. Individuals know how to behave because they are enacting their role according to narratives. Narratives thus lead to actions, and narratives shared in a group are a platform for group actions⁶. In the realm of regulation, narratives can be described as conceptual frameworks for policymaking.

⁴ Beck, U. (2009). *World at Risk*. Cambridge: Polity Press, Beck, U. (2015). *Emancipatory catastrophism: What does it mean to climate change and risk society?*. *Current sociology*, 63(1), 75-88.

⁵ Richardson, L. (1990). *Narrative and sociology*. *Journal of contemporary ethnography*, 19(1), 116-135.

⁶ Mayer, F. W. (2014). *Narrative politics: Stories and collective action*. Oxford University Press, USA.

2.2. THREE DIMENSIONS OF NARRATIVES

Any analysis must consider three main dimensions of narratives: (1) structures, (2) codes, and (3) communities.

1. Structure	1. Code	1. Community
What is the main value? How does it change in time? Are the things getting better or worse?	Who is the protagonist and who is the enemy? What is the typical vocabulary? What images are used to illustrate the story?	Who do we share the story with? Where and when is the story communicated? Which media disseminate it?
Examples: "It's always about money." "The ugly duckling" scenario." Things used to be better when we were kids."	Examples: A knight, a princess, a great innovator.	Examples: "This is a scientific point of view." "Our political party will always stand for..."

Fig. 2.1. The three dimensions of narratives

STRUCTURES. By organizing facts, agents, and events in sequences, narratives provide and explain causal links by specifying what follows what and why it happens. For example, in many stories an ethical framework whereby good deeds are rewarded, and bad acts are punished provides narrative cohesion.

A narrative may be defined as a complex (created of smaller units) systematic (following a more general pattern) representation that contains a change of state⁷. It means that in every narrative some value changes in time. This value can be wealth ("from rags to riches"), independence (Polish history as presented in most textbooks) or infant mortality (the history of medical progress).

Each narrative may be understood not only through its particular features, but also as a part of a more general "worldview" or "master narrative" that strongly influences narrative plausibility and determines the chance that a given narrative will be accepted or rejected. Political and philosophical master narratives are often organized around a "general" change of the world. In this respect, several main structures can be distinguished, around which more detailed stories on specific issues, such as economic development or the degradation of nature, are then built. For example, the narrative of progress is built around the claim that things get better over time, while in the narrative of degradation, a once beautiful world gets increasingly worse⁸. The most basic patterns of change in time are presented below:

⁷ Schmid W. (2010) *Narratology An Introduction*, De Gruyter. Prince Gerald (1982), *Narratology: The Form and Functioning of Narrative*, Mouton Publishers.

⁸ Zerubavel, E. (2012). *Time maps: Collective memory and the social shape of the past*. University of Chicago Press.

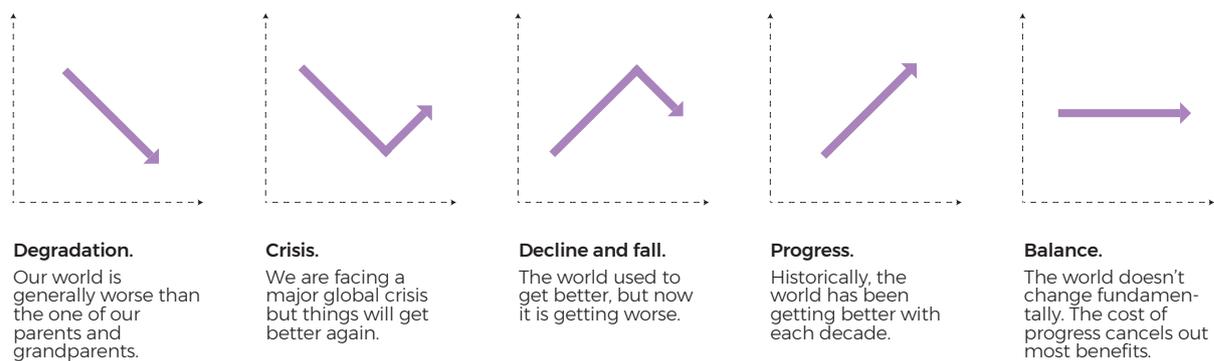


Fig. 2.2. The main metanarrative structures

Because of these features, narratives supplement facts with meaning, forming a crucial vehicle for transmitting any information. Researchers and science communicators sometimes ignore this, focusing solely on facts and data. This leads to a “narrative deficiency” of science communication in many areas⁹.

CODES. Narratives are transmitted through codes that are, at least to some degree, predetermined and contained in what Umberto Eco called “encyclopaedias” of model readers¹⁰. Stories use archetypes and symbols; pictures and movies use images and colours. Since all these features are strongly conventionalized, transmission of a narrative requires a synchronization of codes between the sender and receiver.

If the author of a message uses a different “encyclopaedia” to that of the recipient, there is a risk of misunderstanding because individual symbols may mean completely different things in the sender’s intention and in the recipient’s perception. Unfortunately, this is a common occurrence in science communication, where individual technical terms, neutral in the intention of the sender, can, for example, be strongly associated with fear on the part of the recipient. On the other hand, language that refers to values, community well-being, or moral obligations may be perceived as “empty” by scientists focused on solving technical problems.

Narrative cohesion often serves as the criterion for truth. If a narrative is internally consistent, and it agrees with previously adopted narratives, individuals tend to decide it is true, because it describes things as they usually are. If it contradicts previously adopted narratives it is often rejected, because “things like that do not happen”.

Narratives may be communicated as full stories, for example in fairy tales, novels, and movies. They are important elements of popular culture. For example, our attitude towards the climate crisis is shaped not only by scientific reports and political speeches but also by Hollywood blockbusters like “Mad Max: Fury Road” that provide audiences with a general image of a post-apocalyptic world.

COMMUNITIES. Narratives are the basic structures enabling the social transmission of information. Whenever we tell stories, we convey not only facts, but also their meaning, emotional value, and “familiarity” or “strangeness”. Even when we communicate through photographs, diagrams, or simple slogans, narratives implicitly and unconsciously fill in the blanks, enabling us to make sense of what we see or hear. This makes narratives crucial in situations of social conflict, in the communication of science, and in any consensus-seeking policy debate.

Because of the aforementioned features, narratives have a very strong potential to bring communities together, but also to create “filter bubbles” and reinforce negative stereotypes. They also structure groups by providing implicit hierarchies of visibility and credibility. For example, many anti-vaccine narratives provide a very engaging, emotionally saturated image of a world fully controlled by “Big Pharma” and corrupt governments. Sharing these narratives creates a very strong bond in a community of people who position themselves as outsiders – rebels standing against a powerful empire.

⁹Olson, R. (2021). Houston, we have a narrative. University of Chicago Press.

¹⁰Eco, U. (1984). The role of the reader: Explorations in the semiotics of texts. Indiana University Press.

Narrative communities are social groups bound by shared narrative scenarios and codes. People share narratives with others in the groups and other social structures they belong to. By adding our own personal stories and those heard from others we provide examples and elaborate on the themes of a group narrative, creating a common pool of stories. Narrative communities become important elements of identity, as identity is constructed in narratives shared with one's own group.

This leads to narratives being a key factor in creating social polarization and reinforcing existing tensions in society. At the same time, these very features make narratives a very good area to start working towards a more dialogic approach towards polarizing issues.

2.3. HOW TO WORK WITH NARRATIVES

Narrative schema	When confronted with a new narrative, audiences compare it to other well known stories through narrative schema (consisting of structures and codes).
Narrative plausibility	Facts and events that match popular narratives are perceived as more probable.
Changing narratives	Changing a narrative requires rethinking its structure, code and community roots. Simple negations (debunking) or fact checking of single facts may unintentionally reinforce a false belief.
Shadow narratives	Many narratives exist in public debate only in an implicit form or are transmitted by unofficial sources and through direct communication.

Fig. 2.3. Guiding principles for working with narratives

NARRATIVE SCHEMA. There is an enormous and ever-growing number of stories, as new stories are created all the time. Many of them, however, are similar to each other, instantiating the same general narrative schema (meta-narratives). The number of narrative schemas is low. They describe prototypical sequences of events, providing templates for how the world works. For example, many stories describe how good deeds are rewarded; bad behaviours are punished; hard work, inventiveness, and taking risks will result in success, etc. Several basic narrative schemas have been identified¹¹. As an example, one of the most popular schemas of redemption is found in many fairy tales, books, and movies, also becoming a frequent schema of narratives about the self. In the redemption narrative, an "initial negative state is "redeemed" or salvaged by the good that follows it"¹².

Narrative schemas provide a common base for values and cultural norms¹³. Personal narratives are developed following the templates provided by narrative schemas. A new narrative is much more likely to be adopted if it follows one of the narrative schemas, rather than contradicting the established rules.

¹¹ For examples of self-narratives see McAdams, D. P., & McLean, K. C. (2013). Narrative identity. *Current directions in psychological science*, 22(3), 233-238.

¹² McAdams, D. P. (2006). The redemptive self: Generativity and the stories Americans live by. *Research in human development*, 3(2-3), 81-100.

¹³ Gergen, K. J. (1973). Social psychology as history. *Journal of personality and social psychology*, 26(2), 309.

NARRATIVE PLAUSIBILITY. As individuals rarely rely on fact-checking, narrative plausibility is a primary factor in whether new information and ideas are accepted or rejected. Individuals check if a narrative conveying new information fits already adopted narrative schemas. Items that fit the narrative schema are adopted because they are just another example of "how things are", whereas information that does not fit the narrative is rejected because "things like that do not happen". For example, in their deliberation and verdicts, juries make decisions based on the plausibility of the narratives presented by the prosecution and the defence, rather than considering each piece of evidence¹⁴.

CHANGING NARRATIVES. Whether someone who receives information relies on narratives or engages in fact-checking; information-seeking; fact-searching; also depends on their mindset. Two main motives may underlie seeking information, referred to as two modes of social influence¹⁵. Informational influence, which underlies searching for facts, is motivated by the need to know. Normative influence is motivated by the need to belong and be liked. It results in looking for opinions of one's own group. Individuals in normative influence mode are unlikely to be persuaded by facts because facts are irrelevant to their information seeking and processing goal.

Debunking fake news that fits a deeply adopted narrative may have the paradoxical effect of strengthening belief in the news item¹⁶. Usually, a defensive approach does not work¹⁷. The party negating a narrative activates it and strengthens the associated mindset.

Repeating a narrative while negating it also results in it being spread more broadly. The more effective approach, according to George Lakoff, is to reframe the issue by using one's own narrative, organized around one's own values. In order to enable a clear discussion free from pre-existing stereotypes and sentiments it is very important to start with a positive message. Narrative structures convey not only facts, but also values, and should be carefully structured to reflect them.

SHADOW NARRATIVES. Some narratives exist in the public space, through magazines, books, movies, or TV. They are often created by experts and professional story tellers such as writers, journalists, film directors, and communication specialists. An important role is played by shadow narratives, narratives shared in coffee shops and pubs, and especially today on social media. Shadow narratives often shape the views of individuals and decide their reaction to the official narratives. Official and shadow narratives interact with and influence each other, as narratives presented in traditional media are discussed in private settings and on social media.

A very small proportion of stories presented in the traditional media attract the attention of the public. Therefore, traditional media try to tap into themes that are topical, or viral on social media. To understand the flow of information in societies, we need to pay attention to stories present in both traditional and social media formats, as well as to their interaction. In order to enable an open, evidence-based, and value-driven debate, we need to build a connection between the official and shadow narratives.

¹⁴Pennington, N., & Hastie, R. (1992). Explaining the evidence: Tests of the Story Model for juror decision making. *Journal of personality and social psychology*, 62(2), 189.

¹⁵Deutch, M., & Gerard, H. B. (1955). A study of normative and informational social influence upon judgment. *Journal of Abnormal and Social Psychology*, 51(3), 629-36.

¹⁶Sunstein, C. R. (2018). # Republic: Divided democracy in the age of social media. Princeton University Press.

¹⁷Lakoff G. (2014) *The ALL NEW Don't Think of an Elephant!: Know Your Values and Frame the Debate*. Chelsea Green Publishing.

3. ANALYSIS OF EXISTING NARRATIVES

3.1. METHODOLOGY

In our research we were interested in narratives shaping the collective perception of the relationship between sustainable agriculture and innovation. Given the ardent ongoing debate on the regulation of new genome editing technologies and their relationship with GMOs, we decided to look more thoroughly into the narratives shaping this polarized discussion, in many respects emblematic for the broader debate on the future of our food systems.

Using a mixture of qualitative and quantitative (machine-assisted) methods we extracted and identified dominant structures, visual and verbal codes, and lines of tension organizing the public debate.

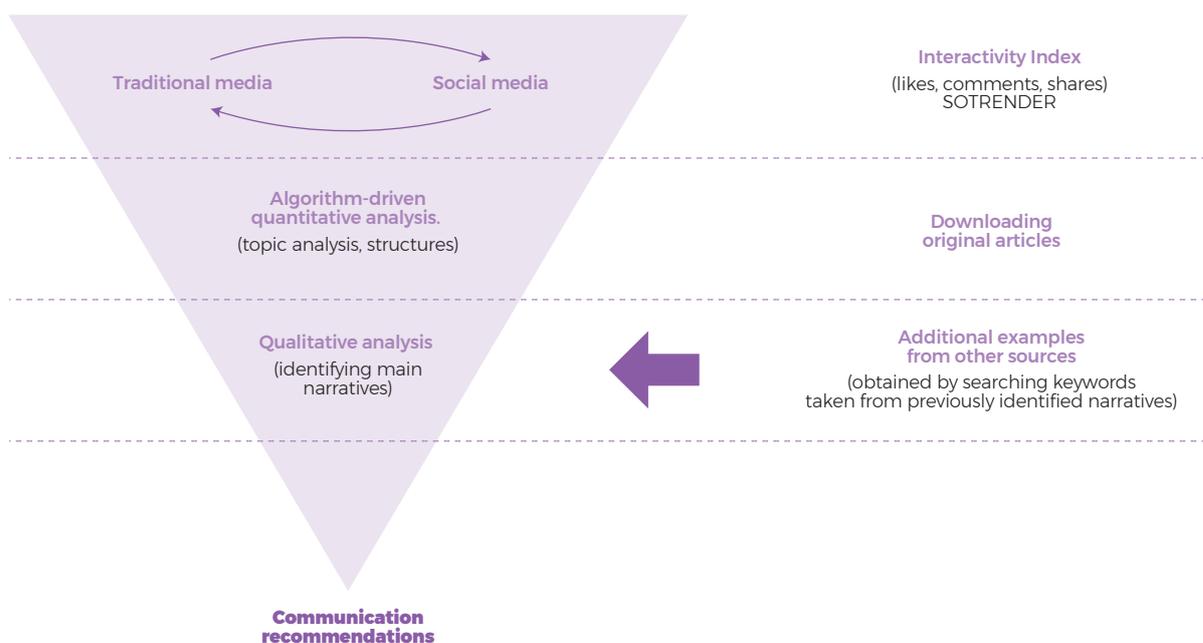


Fig. 3.1. A diagram presenting the process of analysis

We started with a corpus of 340 558 articles from 10 very different sources (timeframe: 01/01/2017 – 25/10/2020). The corpus was then narrowed down using keywords related to agriculture and genome editing. We took into account not only the content published in the media (newspapers and portals), but also its reach. For every article we analysed its impact on social media. Using an Interactivity Index, we identified the texts that attracted the most attention and readers' reactions.

In addition, we studied a separate large corpus of posts from social media focusing exclusively on genome editing and GMOs. We examined posts both from "precaution-focused" outlets, stressing the potential dangers of genome editing technologies as well as posts from "innovation-focused" outlets, highlighting the need for change and potential risks associated with not adapting new technologies.

In the first stage, both corpora were quantitatively analysed using algorithms based, among others, on entity analysis and Latent Dirichlet Allocation (LDA). We identified the most important subjects and objects of the narratives, as well as recurring thematic structures (topics) and their characteristic vocabulary. In the next step, the most representative and popular texts from each topic were coded manually and analysed qualitatively using semiotic and discourse analysis methods. As a result, we identified 8 basic narratives shaping the discourse on genome editing technologies in agriculture. (For convenience, four of these narratives were grouped as “innovation-focused” while the other four were more “precaution focused”. However our intention was not to reproduce the existing polarisation of the debate, but rather to problematize it. The existing narratives are better thought of as lying along a continuum, with more than one axis taken into account. These 8 narratives, constituting a “dictionary” of the ongoing debate, are presented in the following chapter¹.

NARRATIVE	MAIN VALUE	PREMISE	CODES AND SYMBOLS	VARIANTS AND MOTIVES
Unpredicted consequences	precaution	New technologies are dangerous because scientists tend to overestimate their ability to understand and control reality.	contamination suits	gene escape, biotechnology can endanger genetic diversity, drowning in a sea of “chemicals”...
Violating the rules of Nature	precaution	Toying with natural boundaries that divide species and natural speed of the evolution results in creating various forms of monstrosity.	monstrous mutations, syringes	monstrous hybrids, ultimate hubris, transforming humans
Greed destroys the traditional way of life	precaution	New technologies destroy traditional farming societies and limit freedom of choice, by shifting food production to large corporations.	starving people, barcodes	big business destroys traditional values, technology is a means of control, farmer suicides...
We’ve heard these promises before	precaution	New solutions in agriculture (like new genome editing technologies) are yet another version of old solutions (like GMOs) and more technology is never a solution to problems caused by technology.	DNA helix, arrogant scientists, lab coats	false promises, genome editing is oversold
Progress	innovation	Every new technology is another chapter in the history of progress that elevates us further from the hardships of living in natural conditions.	vector graphics, diagrams, holographic interfaces, smiling people, sun	the new Green Revolution, we need to overcome “manufactured controversy”
We need to face a crisis	innovation	We need new technologies to face unprecedented challenges.	forking path, diagrams, boardgames, or/either	prevent climate catastrophe, adapt to climate change, feed 10 bln people
The suspicions have been addressed and tested	innovation	Doubts are an important part of the innovation process and should be resolved based on evidence and the scientific method.	there are no distinctive codes for this narrative	we are listening, trillions of meals have been safely consumed
We have more precise technologies than ever before	innovation	“New” technologies are really not so new. For ages humans have used various technologies to modify plants. The main difference is that today we can act faster and more precisely.	infographics with DNA helix, pictures of “domesticated” plants and animals	we should not use the term “GMO” anymore, “genome editing” techniques have been there for centuries

Fig. 4.0. A table presenting dominant narratives present in the debate on genome editing in the context of general attitudes towards biotechnology in agriculture

¹For other possible typologies of narratives describing food systems see: SAPEA, Science Advice for Policy by European Academies. (2020). A sustainable food system for the European Union. Berlin: SAPEA. <https://doi.org/10.26356/sustainablefood> (pp. 56-62).

This preliminary research then formed the basis of the Task Force's engagement with the experts and stakeholders who would go on to form the Expert Committee. We also used the identified narratives and additional insights from this process to design the first meeting of the Expert Committee, which consisted of two days of interactive discussions in February of 2021. Participants also completed an informal survey to establish general attitudes toward the topic and potential areas of agreement and disagreement prior to the meeting. The goal of this meeting was to use the preliminary research conducted by Re-Imagine Europa as the basis for a wide-ranging, values-based debate about the role of innovative technologies within Europe's model of sustainable agriculture, fully utilising and combining the varied expertise and experiences of the Expert Committee members while avoiding the trap of common binary arguments. In turn, these discussions informed the conclusions of this report as well as the accompanying 'White Paper on the Regulation of Genome Editing in Agriculture'.

The aim of our analysis was to map the narratives dominating the current debate on the future of agriculture. It is these narratives that, through their structures, codes and community building, influence farmers' attitudes and consumer decisions, and shape expectations towards legislators.

NARRATIVE 1.

UNPREDICTED CONSEQUENCES (THE DANGER ESCAPES)

Type: precaution-focused

Outline of the narrative:

1. Scientists have good intentions, but they create a dangerous situation because they overestimate their ability to understand and control reality.
2. At first the danger is latent, while the benefits are visible and easy to point out.
3. Until one day, due to lack of control, the danger escapes.
4. The artificial element interferes with the natural environment in an unpredicted, dramatic, or even catastrophic way.

A key premise of this narrative is its emphasis on the complexity of reality. It is often accompanied by images and metaphors related to the bigger picture, unforeseen influences, the "butterfly effect" or the "effect of scale." The approach of some academics as well as companies is criticized as narrow and short-sighted.

This narrative is built around the opposition of nature and culture. Nature is presented as a surrounding environment – the "default" state of reality, while culture creates its own, separate realm within the domain of nature in a form of an "enclosed garden". An existing or anticipated escape of a certain "unnatural" element provides the main storyline.

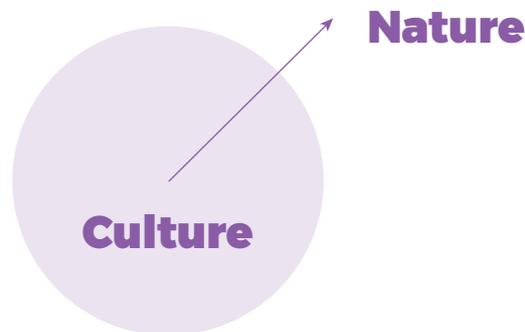


Fig. 4.1. A diagram presenting the main structure of the "Unpredicted consequences" narrative

This narrative is usually illustrated with a relatively clear set of images and visual codes built around the general notion of **contamination**. Many articles and social media posts that follow the narrative of *Unpredicted Consequences* use some of the following symbols: vast fields overshadowed by dark clouds (no sun!), symbols of rapid, uncontrolled spreading (milkweed), dead or dying insects, and anti-contamination suits.



Fig. 4.2. A collage of press clippings and web images demonstrating the imagery that typically accompanies the “Unpredicted consequences” narrative. The material is reproduced for illustrative purposes only.

Cultural mediator. Many of the analysed texts and online discussions referred directly to the film series *Jurassic Park*. “Just as the bioengineered dinosaurs in “*Jurassic Park*” soon became uncontrollable, genetically modified crops have proven harder to contain than was originally thought.” The movies epitomize the scenario of “bringing to life” something that is unnatural, which becomes the ultimate act of hubris. Despite all the security measures taken, the danger could not be contained indefinitely. Indeed, the line from the film “Your scientists were so preoccupied with whether or not they could, they didn’t stop to think if they should.” is often used as a summary of a general relationship between technology (culture) and nature.

Variants/subnarratives:

Gene escape. Many news stories focus on genetically engineered crops that “escape”, “contaminating” previously non-GM fields because of lack of control or monitoring.

Biotechnology can endanger genetic diversity. The world is a dense network of interconnections, of which scientists only see a narrow part. Their decisions have multidimensional consequences. This opposition between simple technology and complex nature leads to another argument: The use of certain technologies continues the process of the industrialization of agriculture, leading to monocultures and further reducing biodiversity.

Drowning in a sea of “chemicals”. “The world is awash in Glyphosate.” Following the logic of metonymy, the herbicide product Roundup becomes virtually synonymous with GMOs. The very fact of the abundance of this substance is presented as dangerous. The metaphor of overflowing is applied not to the disputed technology (GMOs) itself, but to the associated substance (Glyphosate).

Mass extinction of insects. Introduction of genetically engineered crops leads to increased pesticide use, which kills pollinating insects (such as bees), which are essential for the life cycle of plants, agriculture and, ultimately, humanity.

Time bomb. Innovations derived from biotechnology are dangerous because the long-term effects are always unknown. They are introduced rapidly, without due diligence in the form of a huge experiment on the whole world.

NARRATIVE 2.

VIOLATING THE RULES OF NATURE

Type: precaution-focused

Outline of the narrative:

1. Scientists create abominations because they break the laws of nature and overestimate their ability to understand and control reality.
2. The new man-made reality is a negation of goodness, beauty, and truth (reversed values).
3. This artificial creation further contaminates the new reality.

While “The Unpredicted Consequences” narrative was built around a change in time (negative consequences are delayed), this narrative is founded on the notion of **unchanging principles**. Nature and technology are fundamentally different. Science, however developed, cannot emulate the **natural order**. There are natural boundaries that divide species and the natural speed and direction of evolution. Toying with this principle results in creating various forms of **monstrosity**.

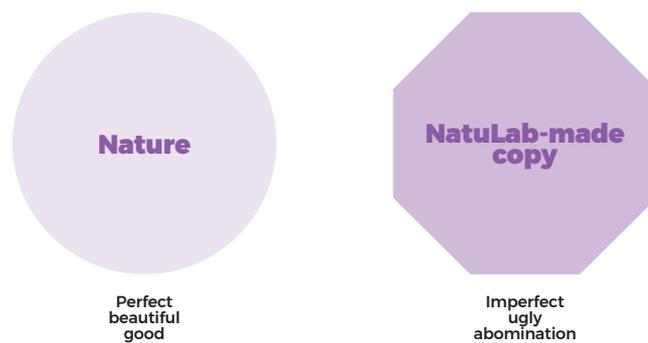


Fig. 4.3. A diagram presenting the main structure of the “Violating the Rules of Nature” narrative

This narrative is illustrated with a set of visual codes based on the notion of monstrosity (poisoned, unnatural, unexpected). Conventional symbols of nature, like apples, are either “poisoned” with omnipresent syringes or transformed into something weird (for example by changing shapes, colours, or “swapping” some features). Often it is necessary to cut the fruit to realize that it is rotten inside. All these images evoke abomination and disgust.



Fig. 4.4. A collage of press clippings and web images demonstrating the imagery that typically accompanies the "Violating the rules of Nature" narrative. The material is reproduced for illustrative purposes only

Cultural mediator. Many images and texts refer directly or indirectly to Mary Shelley's *Frankenstein* or one of its movie adaptations. Indeed, GMOs are often called "Frankenfood". This comparison introduces the idea of a "man-made monstrosity" and the notion of scientific hubris. It also links biotechnology to the semantic field of horror and science-fiction and images of mutants and alien invasion.

Variants/subnarratives:

Monstrous hybrids. An apple that looks like a frog or a tomato with the genes of an octopus evoke mythological figures of monsters that combine two different organisms. This subnarrative often focuses on breaking the natural boundaries between organisms, but it also suggests the possibility of being internally transformed after consuming a "monstrous" food.

Ultimate hubris. Creating a new form of life is the ultimate form of hubris.

Genetic engineering leads to transforming humans. Once we start down this path, we cannot stop. From plants we will move on to animals, and from animals to human beings. Undermining the "genetic identity" of species may not only blur the borders between them, but also divide one species into many – in this case leading to the creation of a new race of "superhumans", further widening of the gap between rich and poor. This is highly compatible with anti-egalitarian perceptions of biotechnology.

NARRATIVE 3.

GREED DESTROYS TRADITIONAL WAYS OF LIFE

Type: precaution-focused

Outline of the narrative:

1. For thousands and thousands of years traditional forms of agriculture have produced food and fed growing populations.
2. Traditional farming methods evolved in harmony and dialogue with nature, also providing a harmonious way of life.
3. Until one day big business introduced modern industrial standards into agriculture.
4. Destroying traditional farming communities, stealing their freedom, and creating a dense network of financial dependency that replaced traditional social networks of trust.

In this narrative nature is virtually synonymous with traditional farming and juxtaposed with industrial farming. This links the debate on genome editing (GMO, genetic engineering) to a general backlash against the industrialization and commercialization of our everyday reality, bringing in arguments from anti-globalisation discourses and general critiques of a modern, neoliberal capitalism underpinned by greed.



Fig. 4.3. A diagram presenting the main structure of the "Violating the Rules of Nature" narrative

The axes of conflict in this narrative may be illustrated by the following table:

Traditional farming

Industrialized farming

local

global

traditional

modern, industrialized

harmony with nature, cohabitation/coexistence
value-driven

exploitation of nature

bottom-up

extreme competition, money-driven

top-down

The (negative) change in time leads from the left column of this table, towards the right one. The aim (“call to action”) is to stop this transition and return to the values that preserve traditional ways of life.

Contrary to the previous narratives, this storyline is often illustrated with images of (often starving) animals and humans rather than plants. The barcode is used a symbol of commercialization and corporate ownership. Names and logos of certain biotechnology companies (often Monsanto) are also used. The figure of an ominous scarecrow is often used as another symbol of control.

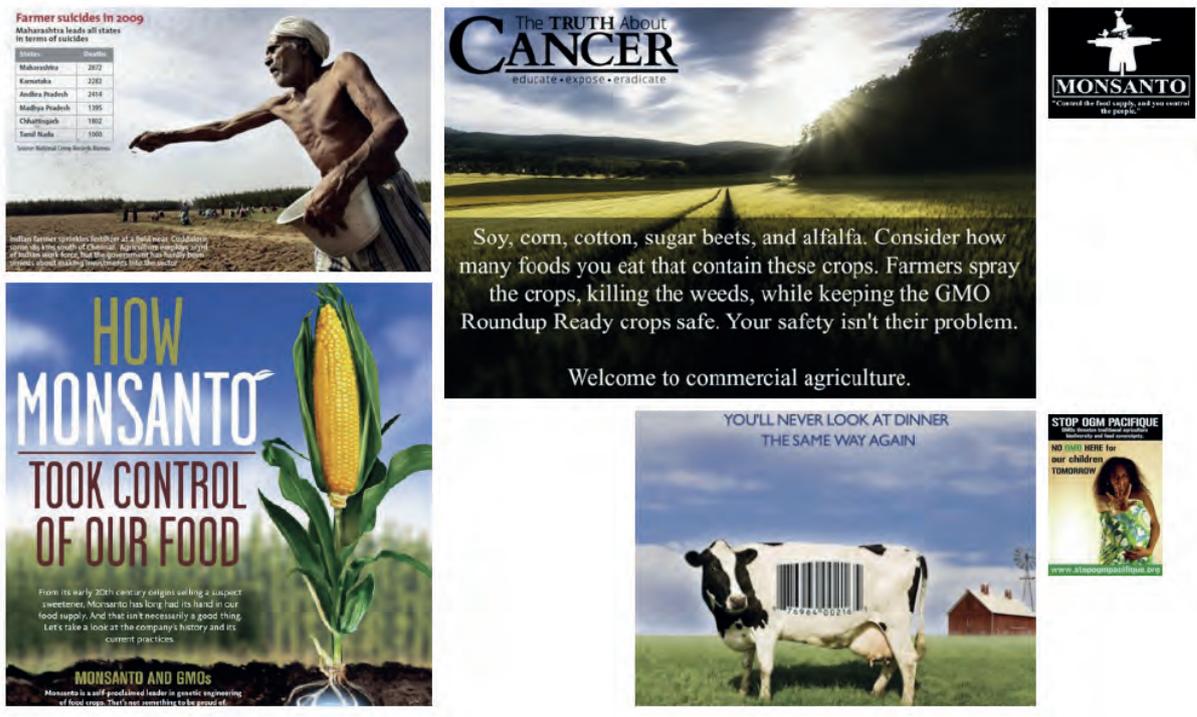


Fig. 4.6. A collage of press clippings and web images demonstrating the imagery that typically accompanies the “Greed destroys traditional ways of life” narrative. The material is reproduced for illustrative purposes only.

Versions/subnarratives:

Big business destroys traditional values. Introduction of genetically engineered crops increases competition and favours big business. It also ruins a traditional model of coexistence in rural communities.

Technology as a means of control. In this subnarrative, various technologies are presented as a “trojan horse” of big industry to infiltrate small farming, take it over and subjugate it. This introduces the issue of ownership (“no food shall be grown that we do not own”) as well as intellectual property rights.

GMOs lead to farmer suicides. Patenting seeds is presented as an ultimate form of greed that leads to hunger, desperation, and, ultimately, farmer suicides. “Seed slavery” is presented as a new form of radical dependency that leads to extreme poverty.

Biotech reinforces the corporate grip on agriculture. This subnarrative focuses on the dispersion-consolidation axis, claiming that these technologies favour the few over the many. According to this argument, genome editing creates a very high threshold to enter the market, favouring the consolidation of agriculture in the hands of large corporations, thereby ruining small producers.

Non-GM sells. There is a positive variant of this narrative, where a non-GM label is presented as part of a resistance to a powerful and evil empire of greed. It creates a powerful consumer incentive and a large market.

NARRATIVE 4.

WE'VE HEARD THESE PROMISES BEFORE

Type: precaution-focused

Outline of the narrative:

1. New genome editing technologies are yet another version of GMOs. The difference is artificial and non-intuitive.
2. Scientists/companies are trying to convince society to embrace these new technologies, blackmailing the public with visions of crises and promising new, miraculous solutions.
3. However, the same big promises were also made for GM crops and proved false.

This narrative is built on a slightly different basic opposition than the previous one. This time it focuses not on a classic nature-technology distinction, but rather on a gap between the general public and civil society on the one hand and business and scientists on the other hand. These two groups have different interests, different worldviews, and different access to information.

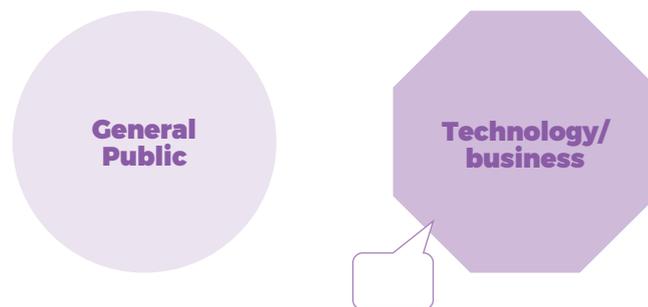


Fig. 4.7. A diagram presenting the main structure of the "We've heard these promises before" narrative

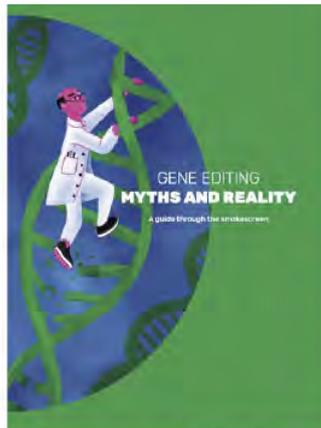
This narrative is usually illustrated by vector graphics rather than pictures. This choice is in line with its more "metadiscursive" approach – starting rather from discourse than from the problem itself. Arrogant scientists are often presented as manipulating DNA (often depicted as a ladder), just as they are manipulating arguments to convince the public. Many of these images are directly taken from positive messages presenting the possibilities of new genome editing technologies.

How GMOs can save civilization (and probably already have)

A Guest Post By Dr. Michael Eisen, Ph.D., Professor of Molecular and Cell Biology at UC Berkeley



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The Promise of CRISPR

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Biotechnology / Genetic engineering

Decoding the CRISPR-baby stories

Three books explore the He Jiankui affair and what gene editing means for the future of humanity.

by J. Benjamin Harbut

February 25, 2019



Fig. 4.8. A collage of press clippings and web images demonstrating the imagery that typically accompanies the “We’ve heard these promises before”

This narrative brings forward the key problem of overpromising and overselling. As Dario Bressanini and Beatrice Mautino point out in their book “Contro Natura”, in public debate GMO and genome editing technologies have consistently been linked to “great problems” and “ultimate solutions”. This link may have both alienated the general public by the revolutionary nature of the postulated changes and disappointed by the lack of “magic wand” solutions¹.

¹Bressanini, D., & Mautino, B. (2015). Contro natura. Rizzoli.

NARRATIVE 5.

PROGRESS

Type: innovation-focused

Outline of the narrative:

1. Under “natural conditions” life was harsh and difficult.
2. But after the scientific revolution, our quality of life has improved with every decade.
3. Innovations such as new genome editing techniques in agriculture and medicine are a part of this progress – another chapter in a long story of improving human life.

This innovation-focused narrative is strongly grounded in a general narrative of progress rooted in the Enlightenment, optimism, utopianism, and a global point of view (versus focus on local aspects). Nature and technology are clearly ranked and situated on an axis that leads from “terrible past” to “great future” [Fig. 4.9], and different access to information.

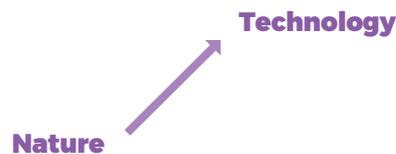


Fig. 4.9. A diagram presenting the main structure of the “Progress” narrative

This narrative is often illustrated by classical images of progress and revolution: images of victory, a shining sun, people collaborating, smiling farmers often from developing countries. Vector graphics (often in the form of diagrams and infographics) are used more often than in precaution-focused narratives. Spring green is the main colour, associated with hope and abundance. A futuristic, Augmented Reality user interface known from SF movies like “Minority Report”, “Avatar” or “Iron Man” is used to symbolize the future and technology. It is often juxtaposed with an image of scissors and/or a human hand. A soft glow surrounds objects, giving them a slightly holographic feel that may unintentionally evoke something unreal, intangible, or imaginary.



Fig. 4.10. A collage of press clippings and web images demonstrating the imagery that typically accompanies the "Progress" narrative. The material is reproduced for illustrative purposes only.

Variants/subnarratives:

The new agricultural revolution. Genome editing is presented as a direct continuation of the Green Revolution and another step on the ladder of progress. Success stories from previous revolutions (supported by rich data) are quoted as a main argument for genome editing.

We need to overcome "manufactured controversy". Current controversy surrounding genome editing is "manufactured". The opponents are accused of irrationality and fearmongering and identified with "enemies of progress".

¹Bressanini, D., & Mautino, B. (2015). Contro natura. Rizzoli.

NARRATIVE 6.

WE NEED TO FACE A CRISIS

Type: innovation-focused

Outline of the narrative:

1. We face an unprecedented crisis.
2. This is the moment of decision.
3. New technologies are a crucial weapon/tool.

Contrary to the previous narrative, this view is built around the general scenario of “challenge”, where progress is not a guaranteed, one-way street. Whatever, as humanity, we have gained in previous centuries, may be lost when we fail to adapt and face new obstacles. This reasoning is illustrated by the image of forking paths [fig. 4.11], highlighting the pivotal moment of decision. This narrative focuses very strongly on the negative effects of the non-adoption of certain solutions.

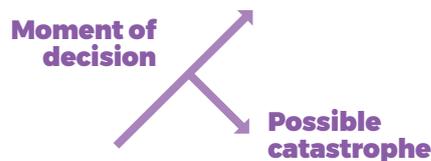


Fig. 4.11. A diagram presenting the main structure of the “We need to face a crisis” narrative

The spectrum of visual representations for this narrative is also strongly dominated by infographics and vector images with green, blue, and cyan as dominant colours. The Earth is one of the main symbols suggesting the global dimension of the challenges faced. Images representing this narrative often refer directly to the forking paths, by presenting crossroads, board-games or “either-or” scenarios depicted in the form of a split screen. Potential negative effects of neglect are often depicted the in form of scorched earth, starving people, etc.



Fig. 4.12. A collage of press clippings and web images demonstrating the imagery that typically accompanies the “We need to face a crisis” narrative. The material is reproduced for illustrative purposes only.

Cultural mediator. “Armageddon” and other Hollywood movies where catastrophe is avoidable by extreme common effort. The 1990s blockbuster starring Bruce Willis is an example of a clear narrative where humanity unites around science and strong political leaders to collectively face a looming threat. The protagonist uses technology to face the danger. However, in order to have any chance with the cosmic-scale of the problems we must first overcome local conflicts. Any class-based, cultural, or national differences are irrelevant in the face of the coming Armageddon.

Variants/subnarratives:

Prevent climate catastrophe. Genome editing technologies are presented as a crucial weapon to fight climate catastrophe by reducing the ecological footprint of agriculture. Contrary to the narratives contrasting nature and technology, here technology is presented as a way to give more space back to nature by reducing land use, carbon dioxide emissions, etc.

Adapt to climate change. If we will not be able to prevent climate change entirely, genome editing technologies might prove crucial for our survival. For example, new breeds may survive with less water in higher temperatures. These improvements will be especially important for the populations most affected by climate change.

We need to feed 10 billion people. This subnarrative refers to the crucial founding myth of the Green Revolution. In 1968 Paul R. Ehrlich published his seminal “Population Bomb”, opening a new chapter in the history of Malthusianism and making it an important part of the post-68 cultural revolution. Its main thesis was that we had already lost the battle to feed humanity because nature can feed only a very finite number of people, limited by the fertility of land. The discoveries of Norman Borlaug and other pioneers of the agrarian revolution soon changed our vision of these limits. Nowadays we are living through another rendition of this conflict. Overpopulation is again mentioned as a key problem, and the Green Revolution is said to have only postponed the inevitable by overexploiting the limited potential of the soil. The analysed subnarrative formulates an answer to this challenge.

Innovation will solve humanity’s biggest problems. This subnarrative supplements previously mentioned variants with a more case-based approach. Different stories following this pattern may focus, for example, on combating malaria or a certain pest. Stories following this subnarrative usually focus on fascinating discoveries such as the creation of genetically modified mosquitoes.

NARRATIVE 7.

THE SUSPICIONS HAVE BEEN ADDRESSED AND TESTED

Type: innovation-focused

Outline of the narrative:

1. Scientists are open to debate. Genome editing, just like any other phenomenon, will probably have positive and negative consequences.
2. We should use scientific methods to decide whether certain fears are reasonable or not and test them.

This narrative is interesting because of its metadiscursive approach. It focuses on public debate rather than directly addressing certain biological or agricultural issues. Dialogue is a central value here, with the general public and experts engaged in an open debate. Transparency and trust are key values perceived as a remedy for fear.

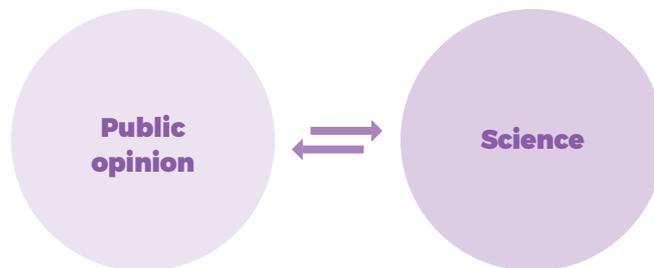


Fig. 4.13. A diagram presenting the main structure of the "The Suspicions Have Been Addressed and Tested" narrative

Our research suggests that this narrative lacks clear visual codes, resulting in the unintentional reproduction of sceptical, anti-GMO imagery, sometimes in a simply reversed form (e.g., the Frankenstein's monster is afraid of GMOs).

Variants/subnarratives:

We are listening! Genetic modification, from selective breeding to conventional GM and genome editing, has been around for a long time. Objections formulated by sceptics and concerned citizens have been addressed and tested.

Trillions of meals have been safely consumed. Genetically engineered foods have been here for a long time. Even if you are not aware of it, they have been a part of your life. None of the extreme side effects mentioned by sceptics have materialized.

NARRATIVE 8.

WE HAVE MORE PRECISE TECHNOLOGIES THAN EVER (NOTHING NEW)

Type: innovation-focused

Outline of the narrative:

1. Various forms of genetically altered plants have been around for centuries (or even millennia if we include these occurring in nature).
2. Older forms of genetic modification (e.g., selective breeding, radiation etc.) have been very imprecise.
3. Today we are using more and more precise tools that are able to solve many of our problems including those caused by older, less precise forms of genome editing (e.g., radiation or selective breeding).

This narrative is created around the image of a target, evoking the notion that new genome editing technologies are merely a more precise version of very old techniques used by humans since the beginning of farming (and also by Mother Nature herself). Genome editing, previously present in the form of selective breeding, cross-breeding, radiation-induced mutations or conventional GM is identified as a part of nature and tradition, not as something opposite.

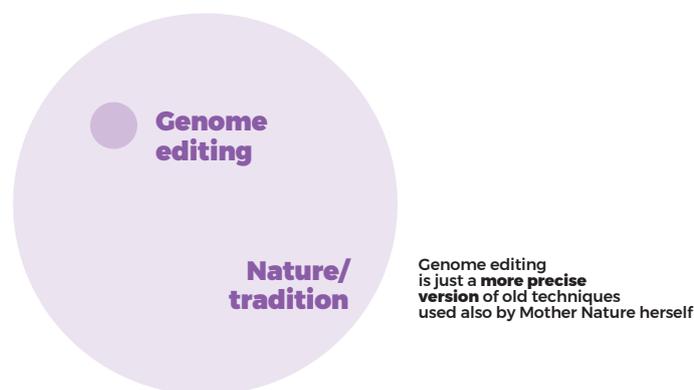


Fig. 4.14. A diagram presenting the main structure of the "We have more precise technologies than ever" narrative

This narrative is usually represented by vector graphics often in forms of diagrams and infographics. A DNA spiral is a dominant symbol, often combined with silhouettes of animals. A lot of text usually accompanies the graphics.

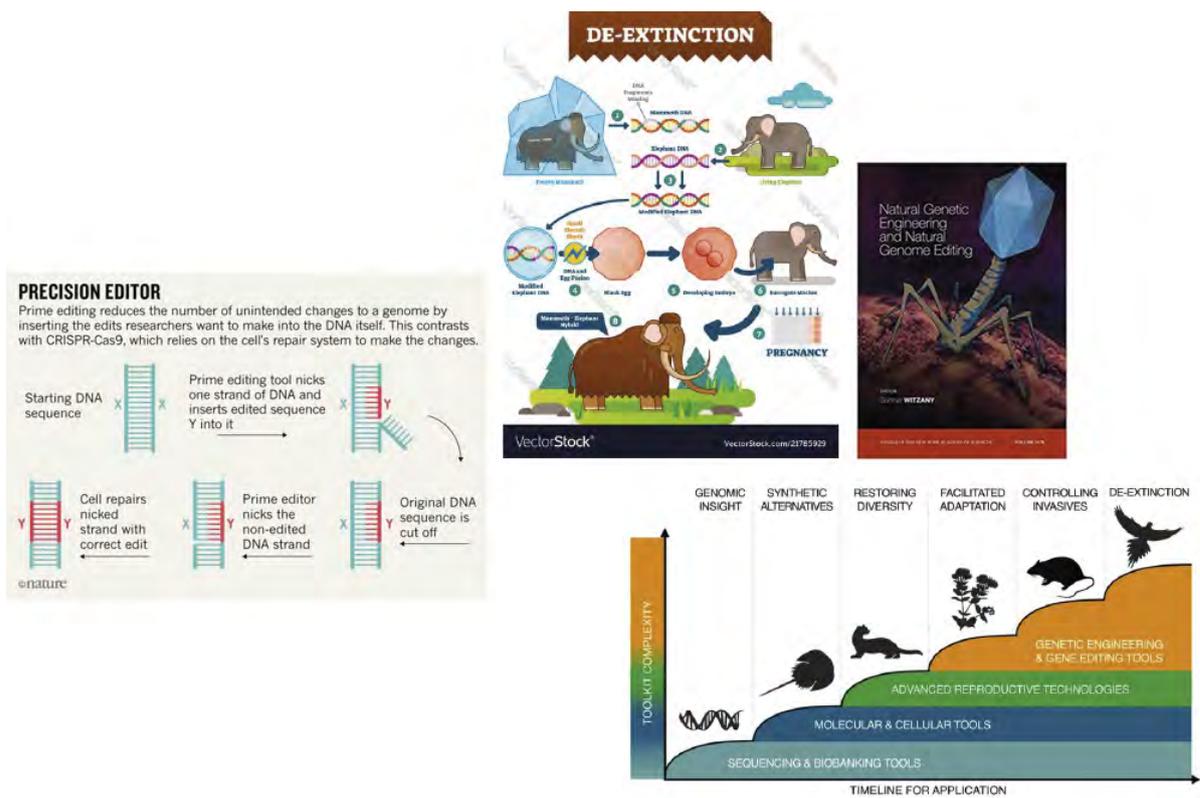


Fig. 4.15. A collage of press clippings and web images demonstrating the imagery that typically accompanies the “We have more precise technologies than ever”. The material is reproduced for illustrative purposes only.

Variants/subnarratives:

We should not use the term “GMO” anymore. This variant of the narrative focuses directly on the ongoing debate on the regulation of new genome editing technologies. It stresses the qualitative difference between new genome editing technologies and old GMOs including the transfer of genetic material from one species to another.

Primitive “genome editing” techniques have been there for centuries. This subnarrative makes genome editing technologies more familiar by “traditionalizing” them. It demonstrates that we have been editing genetic profiles of domesticated plants and animals for centuries by selective breeding, crossbreeding and many other techniques. This subnarrative cleverly uses everyday, familiar objects saturated with positive associations such as seedless fruits or popular dog breeds to question the notion of “natural” variations and “technologized” GMOs.

Gene transfer occurs in nature. This variant of the narrative goes even deeper, suggesting that various forms of “genome editing” including transgenic practices occur in nature for example when viruses transfer fragments of genetic materials from one organism to another.

Rewilding. This subnarrative aim to dismantle the one-way narrative “from nature to technology” by showing that new, precise genome editing technologies may actually enable us to reverse the negative effects of the domestication of certain plants, enriching their genetic material and bringing back genes (and diversity) that were lost in the process of selective breeding thus getting us back, closer to nature.

De-Extinction. A radical version of the aforementioned rewilding subnarrative that explores even further the possibilities of reversing human impact on nature by bringing back to life some long-extinct species.

3. ANALYSIS OF EXISTING NARRATIVES

3.2. RESULTS

1. The dominant narratives tend to frame the debate with oversimplified binary choices

Certain new technologies in agriculture are presented either as a threat that should be categorically rejected or as a simple solution to a relatively simple problem. As a result, the complexity of the debate is not well represented in the public discourse. Dominant narratives often lack the multidimensional, systemic approach needed to compare the impact of different solutions on different areas, or to consider whether a technology that is very effective in solving a certain problem may have negative consequences elsewhere.

2. There are many common values underlying different narratives and shared by different sides of the argument.

These include nature, biodiversity, and social justice. These values, instead of specific technologies or solutions, should be taken as starting point in the debate about the future of European agriculture.

3. The analysed narratives cut across many dimensions.

These dimensions include consumer health and safety, environmental protection, economic competitive and international trade, and rural development. A robust debate on European policy must consider these dimensions and the potential conflicts between them, yet individual stories often focus on one dimension, ignoring the implications for the others.

4. The analysed narratives are path dependent and aware of their own history.

They often expand on themes that have been present in the public debate since at least the 1980s, a history which is sometimes explicitly referenced. For example, narratives such as “Suspensions have been addressed and tested” or “We’ve heard these promises before” are explicitly built upon this history. This is also an example of how opposing narratives fuel each other, creating a positive feedback loop.

Innovation-focused narratives continue the progress-oriented mythology of the Green Revolution, while precaution-focused narratives are rooted in its critique. This genealogy must be taken into account in our analysis, as it often influences the positions taken by actors on particular issues. The very argument over whether new genome editing technologies should be understood as GMOs (and therefore subject to the same regulation) or are something entirely new (to be separately regulated) is also tied to this conflictual history.

5. There are important differences in the scope of the narratives.

Precaution-focused narratives account for current problems and future dangers, highlighting hidden, emergent consequences, but do not present the consequences of not doing something. As a result, they often criticize the overconfidence of scientists.

Innovation-focused narratives are embedded in a longer time span, highlighting long-term improvements, and inscribing the current debate into the history of science and progress. Innovation-focused narratives present “alternative costs” (i.e., the consequences of not adopting certain technologies). However, they usually do not elaborate on the potential risks associated with new technologies.

6. The narrative cohesion of precaution-focused narratives is stronger.

To put it simply, they offer more coherent and convincing stories, better inscribed in the network of existing cultural codes. Precaution-focused narratives are also much more tangible – visual and sensual, using a broader range of suggestive images and pop culture references, and making better use of the identifiable victim effect. They often tell the story of specific human dramas, using names, faces, and places.

Innovation-focused narratives are much more abstract, referring to data and long-term general trends rather than individual stories and biographies. This is also reflected by the use of charts, diagrams, and vector images.

7. As the labels we have adopted suggest, the precautionary principle plays a very different role in the two types of narratives.

Innovation-focused narratives often acknowledge the need for better safety procedures or more fitting regulations, as policy should adapt to the advancement of technology. Meanwhile, precaution-focused narratives put forward that

no safety procedures will ever suffice because we cannot predict everything – “however high the floodwall, one day a bigger wave will come”.

This is a pivotal difference in approach, resulting in a vast adaptation of the precautionary principle in the sceptical discourse. This difference may also be linked to the more vertical and focused character of the scientific worldview (divided into specialized domains, capable of in-depth analysis of researched phenomena) in contrast with more horizontal approach of vernacular discourse. This difference suggests that in order to build a bridge between the two sets of narratives we should encourage a systemic approach that allows us to link both forms of complexity.

8. Culture and tradition are often highlighted by precaution-focused narratives and widely ignored by innovation-focused narratives.

Many precaution-focused narratives introduce the important topic of local culture and tradition. The popularity of these narratives clearly demonstrates how important local farming communities, cultural diversity, and traditions are for the ongoing debate on the future of European agriculture.

Our analysis clearly suggests that in order to work together on a better future for European food and agricultural systems we need to move from asking polarizing, binary questions (e.g., Do we want genome editing technologies? (YES / NO) towards a more open, multidirectional, and systemic debate on values, challenges, and solutions.

These findings guide our approach as presented in the next chapter.

4. WHERE DO WE GO FROM HERE?

The current debate on the future of European food and agriculture is strongly influenced by decades of debates about GMOs and the costs and benefits of the agricultural revolution. As a result, it is highly polarized and shaped by the notion that nature and innovation are opposing concepts.

On the other hand, a detailed analysis of dominant narratives demonstrated a deep pool of shared values and common goals. In line with overarching policy frameworks such as the European Green Deal, the Farm to Fork Strategy, and the Biodiversity Strategy for 2030, we may enrich the ongoing debate by emphasising the systemic nature of the challenges we face and tracing the links between different goals and concerns. With health and safety, environment and climate change, rural development, global economic competitiveness, and more on the table there are many more axes and dimensions to the debate than the simple “pro” or “con” angle. There is a place for non-partisan reasoning and problem-focused debate and there is a need to recognise the existing trade-offs between and within health, environmental and socio-economic objectives. It must, however, be built on dialogue, trust, and the rejection of mutual stereotypes.

It is worth noting that extreme narratives on both sides support each other in a positive feedback loop. Overpromising, innovation-focused narratives of linear progress antagonise large groups of society by overlooking serious concerns that crystallise around values such as safety, nature, or tradition. Science has the tools to establish facts and cause-effect relationships, but values and preferences fall outside the scope of scientific verification. At the same time, precaution-focused narratives concentrate solely on dangers, for example, of modifying the genome, and never ask what the negative consequences of not adopting a technology may be.

Each side of the debate tends to be exclusively concerned with its own goals, scenarios and set of values, often fully rejecting the arguments of the other side. This is a model example of the “all-or-nothing” approach that often characterizes highly polarized political debates, especially in the age of social media, where the source of information and “tribal” identification with the author supersedes the actual content of the message.

Genome editing has become a symbol in this highly polarized debate. An oversimplified view of the issue foments division and has reduced any possible space for dialogue. As a result, this debate has long been reduced to a binary YES/NO question on whether to allow genome editing or ban it.

4.1. POLYPHONY IN POLICYMAKING

Addressing all of the challenges present in our food systems requires an enormous cognitive, legislative, and practical effort. The EU must refine and consolidate its vision of European agriculture, to enable a model of sustainable agriculture based on shared values that satisfies the needs and preferences of its citizens. To achieve this, it will first be necessary to answer several core questions, such as:

- What do we mean by sustainable agriculture?
- What values do we want to protect?
- What norms do we want to empower?
- What are the main challenges facing us?
- What improvements are we looking for? And how do we want to achieve them?
- What is the role of innovation and technology in the achievement of these goals?

The Farm to Fork Strategy as well as recent publications such as “A sustainable food system for the European Union” by SAPEA or a widely discussed report by Chatham House provide an important overarching framework for this debate, but a lot remains to be done. Also, the 2018 statement by the Group of Chief Scientific Advisors regarding products derived from genome editing and the GMO Directive addresses the complexity of the debate by highlighting the importance of the European Green Deal and Farm to Fork Strategy, putting sustainability at the heart of the

decision-making process and stressing that “NGT products have the potential to contribute to sustainable agri-food systems, at the same time NGT applications in the agricultural sector should not undermine other aspects of sustainable food production, e.g. as regards organic agriculture” .

Coexistence of narratives. To enable dialogue, and constructively search for shared solutions we need both a new framework that allows different narratives to coexist, as well as new narratives that reflect the current reality. Narratives that integrate, rather than divide. We should not be looking for only one “true” narrative. A European model of sustainable agriculture should emerge from a dialogue between many narratives, rather than an attempt to impose a single narrative. Each narrative may potentially highlight different aspects of the problem and bring new elements to a nuanced solution. Each narrative would also reflect the perspective and preferences of a specific group of stakeholders, expressing their respective visions, values, and preferred solutions. However, respecting European values should be common to all of them. We need to empower stakeholders, especially farmers and consumers and ask, how can we make equitable decisions, given the inevitable diversity of interests and values that exist among European citizens.

Recognizing the need for diversity and dialogue, this report does not attempt to offer a concrete new narrative but rather to offer some observations and suggestions that may become starting points for new narratives. This dialogue between narratives will hopefully converge on a shared vision for a values-based European model of sustainable agriculture that tackles our common challenges in line with the preferences of all European citizens. We discovered that many groups which may be in conflict with each other on specific topics otherwise share many common values, beliefs, and concerns. For example:

- everyone views nature as a complex system with multiple mutual interdependencies
- an overwhelming majority believes that the reliable supply of safe, nutritious, and affordable food is paramount
- virtually all groups agree on the principle of minimizing anthropogenic climate change and environmental degradation

¹SAPEA, Science Advice for Policy by European Academies. (2020). A sustainable food system for the European Union. Berlin: SAPEA. <https://doi.org/10.26356/sustainablefood>. Food system impacts on biodiversity loss (2020) <https://www.chathamhouse.org/2021/02/food-system-impacts-biodiversity-loss>.

²Statement by the Group of Chief Scientific Advisors A Scientific Perspective on the Regulatory Status of Products Derived from Gene Editing and the Implications for the GMO Directive (2018)

4.2. THE NEED FOR DIALOGUE AND A NUANCED APPROACH

Dialogue and engagement. Dialogue is critical if we are to face the most pressing challenges in Europe and other regions of the world. The need for such a dialogue and consensus building was expressed by many experts during the Task Force Expert Committee meeting. Many of these challenges are directly related to agriculture; some are environmental, especially climate change, environmental degradation, and loss of biodiversity, others are of a more economic and social nature, for example access to sufficient food, economic instability, and the decline of rural areas.

Complexity. The task of defining a European model of sustainable agriculture, and the role of innovation within it, is extremely complex. There are many different angles, such as climate, environment and biodiversity, consumer protection and health, economic competitiveness, and rural development and employment, not to mention international trade and geopolitical factors. The decisions to be made are thus multidimensional and will have various short-term and long-term consequences on both a local and global scale. As a result, any proposed solutions will likely bring more benefits for some groups than to others and may help to achieve some goals while missing or even exacerbating other problems. This complexity stands in stark contrast to the dualist, uncompromising character of the corresponding debate.

More contextual approach towards the precautionary principle. One of the foremost reasons is that the debate on the future of European agriculture has often been dominated by various interpretations of the precautionary principle¹. As it is clearly reflected in the “Unpredicted Consequences” narrative, in the case of risk, a high level of environmental protection should be secured through preventative decision-taking. In a situation of uncertainty, in both legislation and collective imagination avoiding risk is more important than looking for opportunities. Possible losses have more weight than possible gains.

The precautionary principle is a cornerstone of European regulation in many areas, a fact proudly affirmed by policy-makers and stakeholders on a frequent basis. However, recent controversies over Europe’s approach to vaccinations against COVID-19 are an interesting example of old debates about the primacy of this principle being stirred up once more, with the “innovation principle”² presented in direct conflict with it.³ Indeed, related concepts are reflected in the opinion of the European Group on Ethics in Science and New Technologies (EGE) on gene editing technologies. The document recognizes that the advent of these technologies has opened new dimensions of genome modifications. It also recommends “societal deliberation of global scope”⁴ and transcending the “safe enough” criterion. That is to say, as some risk is always present in any decision, we should always consider the risks, costs, and benefits in the widest sense. Any resulting regulatory decision should be contextual in that it should also be dependent on the situation.

The debate should be nuanced, and take many aspects into consideration, rather than be a simple “yes” or “no”.

Building a wide portfolio of solutions. In recent years significant opportunities have emerged due to innovation in agriculture, both through the development of highly technological solutions as well as advances in agroecological and organic approaches. The Expert Committee Meeting linked such innovations to the challenges faced by Europe and highlighted the complexity of the debate. There was a general agreement that to address all these challenges different approaches and technologies must be combined and that a single “silver bullet” approach does not exist. Indeed, enabling a diversity of approaches is an added value.

Polarisation. However, our analysis demonstrates that there are two broad visions of how we should proceed. The first one proposes that we need to come back to traditional farming methods. According to this perspective, many of the problems we face are caused or exacerbated by humans and our technologies, therefore we need to minimize the use of technological solutions and return to older farming methods. The other view assumes that faced with rapid change

¹Tait, J. (2001) “More Faust than Frankenstein: the European debate about the precautionary principle and risk regulation for genetically modified crops.” *Journal of risk research* 4.2: 175-189.

²https://ec.europa.eu/info/sites/info/files/research_and_innovation/knowledge_publications_tools_and_data/documents/ec_rtd_factsheet-innovation-principle_2019.pdf

³<https://www.politico.eu/article/revange-of-the-precautionary-principle/>; <https://www.newstatesman.com/world/europe/2021/03/europe-misapplying-precautionary-principle-astrazeneca-vaccine>

⁴<https://op.europa.eu/en/web/eu-law-and-publications/publication-detail/-/publication/6d9879f7-8c55-11eb-b85c-01aa75ed71a1>

we need to move quickly if we are to safeguard what we hold dear. For example, for some advocates of more technological solutions, the pace of climate change is too fast for processes of natural evolution to keep up, therefore solutions such as “assisted evolution” via genome editing techniques are necessary.

Embracing diversity. In contrast to these two diverging visions, which often seem extremely difficult to reconcile, an integrated vision would explicitly state that a combination of different methods and a diversified approach will deliver the most effective and inclusive solutions. A comparative analysis of dominant narratives suggests that a simplistic vision of the relationship between nature and technology fuels polarisation. However, when we look deeper into the narratives to find the values that are important to different stakeholders and the challenges they see for the future of food systems, there is broad consensus about our attitudes towards nature and the desired role of technology. If we manage to build a decision-making ecosystem in Europe based on dialogue and respect for diversity, it is not unlikely that new narratives will emerge from the debate, with some kind of synthesis between nature and technology at their core. Precaution-focused narratives will bring a perspective of humility, sustainability and putting values before profits. Innovation-focused narratives will bring a problem-solving orientation and a research-based approach to nature, which can also be understood as a form of respect.

4.3. THE SYSTEMIC APPROACH

Practically all parties to the debate agree that a systemic approach to food and agricultural policy is essential. The systemic approach has several aspects.

First of all, both our societies and ecosystems are complex systems in the sense that they are composed of many interdependent elements that influence each other. A change to one element is dependent on and has consequences for other elements. Indeed, the European Group on Ethics in Science and New Technologies observed in their opinion on genome editing that any change in agriculture should be considered and planned from a systems perspective.

When evaluating a planned change, a comprehensive assessment of the effects on the overall system is needed, rather than a single criterion for evaluation. For example, when evaluating a proposed solution, its impact on different elements of natural and social systems should be considered, rather than using a single criterion of economic growth or production efficiency. Only the overall balance of costs, risks, and benefits in different areas allows us to justly compare different solutions. For example, solutions that require more human labour, may be more costly (which is a key factor for food availability and security), but they provide employment. The cost of food production in small family farms may be higher than in industrial-scale farms, but the former may also attract tourism, generating additional revenue in a multifunctional manner while also serving to preserve and enrich the social and cultural life of rural areas.

In practice the systemic approach implies:

1. balancing global and local (taking into account local impact, but also global scale)
2. potential improvements can be made both within individual elements and through their connections to other elements (improving the efficacy of the system)
3. applying various scales and Key Performance Indicators (not only economic)
4. disclosing hidden externalized costs

4.4. DEVELOPMENT OF RURAL AREAS

The divide between urban centres and rural communities is one of the biggest chasms in contemporary Europe. In the years ahead, the importance of this divide may continue to grow leading to new waves of social discontent, protest, and Euroscepticism. Our research on narratives has clearly indicated the importance of the social and cultural dimension in the collective perception of new technologies in agriculture. Various dynamics and tensions between “small” or “traditional” farms and “industrialized” or “modern” farming have been at the heart of many dominant narratives. In most of the existing narratives, technology is perceived as an element of the industrialization of rural landscapes – something that contradicts the “traditional way of life”, destroys social bonds, and results in the decline of rural communities. Any dialogue on new technologies will be impossible without moving past this oversimplifying dichotomy and considering how new technologies may in fact enrich rural life.

Farmers as stakeholders. Farmers are one of the primary stakeholders in the debate on agricultural policy. And yet, despite the notable engagement of farmers and their representatives at EU level, their perspective is often underrepresented or marginalized. Decades of consistent migration from villages to cities have led to the decline of rural communities, where villages become depopulated, and the trans-generational transmission of values is interrupted. That said, recently there have been some tentative green shoots in terms of the reinvigoration of rural communities. Notably, the COVID-19 pandemic has accelerated certain trends related to frustrations with city life and the acceptance of teleworking. This has stimulated debates in several EU countries and is already feeding into policy proposals in countries such as Ireland.

Jobs and opportunities. Labour conditions in the food supply chain present a separate set of challenges. A precarious and underpaid workforce, often largely comprised of migrants with or without legal status, is endemic in the agricultural sector of many European regions. The ongoing process of mechanization leads to increased unemployment and, along with other factors, drives migration to cities, contributing to rural depopulation. At the same time, new opportunities that arise, for example through the development of agritourism or the expansion of remote work, may open up new possibilities for migration to the countryside².

Diversity of European agriculture. European agriculture is as rich and diverse as our geography and history, with traditional family farms and more industrialized farming landscapes, experimental intensive agricultures (e.g., hydroponics, vertical farming) and different forms of organic agriculture³. Many citizens and politicians believe that Europe has an agrarian vision at its core, even if this vision is no longer reflected by the structure of the economy and labour market. As the consequences for diverse rural communities are thus an important consideration in any agricultural policy, the voice of farmers should serve as an important input into the debate about the European agricultural model. Moreover, the value of small and/or family farms should be evaluated more broadly than simply from an economic perspective.

Rural culture also represents an important element of European culture. Farming is a way of life and expression of many European values, while villages are an important component of society. Beyond their position at the centre of our food systems, villages provide a social and economic environment for their inhabitants, preserving local culture and enhancing cultural diversity throughout Europe.

Farmers and innovations. Farmers have traditionally been open to innovation, consistently adopting new crops, new varieties with better quality or yield characteristics, and they are now adopting digital technologies that allow better control of their farms. Several measures could significantly increase the chances for sustainable adoption of technologies by small and family farms. Family farming should not only be sustainable economically, but also from social and cultural perspectives. Family farms may be oriented towards organic farming, using traditional techniques. But it is also the case that innovation, including biotechnology and digital technologies, can increase family farms' productivity, competitiveness, and ability to adapt to climate and environmental factors.

¹See for example: <https://www.ft.com/content/445790e4-86bc-4697-be0d-5372044cd52b>

²See: Dwyer, J. C., Micha, E., Kubinakova, K., Van Bunnan, P., Schuh, B., Maucorps, A., & Mantino, F. (2019). Evaluation of the impact of the CAP on generational renewal, local development and jobs in rural areas.

³For different “farmer profiles” see: Bock, A.K., Krzysztofowicz, M., Rudkin, J. and Winthagen, V. (2020). Farmers of the Future. EN, Publications Office of the European Union.

Several factors can make the adoption of new technologies by farmers difficult. With innovation there is always a certain risk, usually financial, which falls on the shoulders of farmers. Minimizing this risk or spreading it to different actors of the innovation process would smoothen the adoption of innovative technologies. In addition, a way to change course should a given practice or technology be found not to provide the intended benefits should be clearly articulated. Approached from this angle, it is also conceivable that technology can help small farms make efficiency gains and attain economic viability, thereby equalizing their chances with those of their large-scale or 'industrialised' counterparts.

4.5. BEYOND AN OVERSIMPLIFIED DICHOTOMY OF NATURE AND TECHNOLOGY

Our analysis suggests that the perceived dichotomy pitting nature against technology is even stronger than the one dividing traditional rural life and innovation. Innovation-focused narratives often present technology as a way of "overcoming the limits of nature" while precaution-focused narratives describe certain techniques as "violating the laws of nature". Agriculture could be the best example on how this dichotomy makes little sense. Crops cultivated in any farm are the result of centuries of innovation, sometimes they are newly created or profoundly transformed species and in many cases their origin is found thousands of kilometres away. However, they have successfully been adopted by farmers and they are often considered as traditional at present.

Both visions are surprisingly far from the image now dominant in European society - the one that presents us, humans, as merely another part of an incredibly complex natural system. In order to create a new ecosystem for problem-oriented dialogue it is extremely important to acknowledge this "orthogonality" of nature and technology and to look for the ways that innovation may work in harmony with nature, not against it.

4.6. DIVERSITY AND FREEDOM OF CHOICE

During our Expert Committee meeting, several voices argued in favour of access to new technologies as an aspect of competitiveness for smaller farms. Whether referred to as a "third way" or more generally as a matter of freedom of choice in how to conduct farming practices at more modest scales, there is a concerted desire to avoid the dichotomy increasingly presented to small farmers of either going organic or adopting more technological solutions to remain viable.

Most of the experts agreed that to address current challenges, different methods and solutions need to be combined rather than to hope for a "silver bullet" approach that will magically solve all problems. Some approaches, which may reflect different values, may work better in certain locations or regions. It is also the case that we may not fully know just how effective different solutions will be, so allowing and even encouraging adjustments to see which solutions work well under certain conditions represents a less prescriptive, and therefore more inclusive approach.

In other words, we need to encourage many solutions rather than impose one. We need to make sure that no solution will monopolize the market and exclude other options. Small family farms, for example, may be based on traditional methods but also may adopt the approach of intensive farming, with the use of different technologies. Pesticide free farming may be achieved by a combination of traditional approaches but also using seeds produced by assisted evolution techniques. In this view, an effective policy should be based on empowering rather than imposing.

Innovation-focused narratives remind us that we need to empower scientists and legislators, farmers, and consumers to actively seek out new solutions. To face rapidly changing conditions, in which existing methods and technologies

are not sufficient, we need to innovate. There are many forms of innovation. Innovation may concern technologies such as genome editing, but it may also take the form of more systemic innovation, for example through circular economy approaches where a substance that is considered a waste product in one process can prove valuable in another. Different innovations may be combined in the search for effective solutions. In this perspective it could be argued that farmers should be allowed to choose between crops and varieties that fit their needs.

At the same time, to protect the environment, our cultural diversity, and the interests of various social groups, we also need clear and reliable safety measures. Precaution-focused narratives remind us that we need a European platform that listens to diverse groups and policies that empower them to effectively protect their interests.

5. CONCLUSION. TOWARDS THE FUTURE OF EUROPEAN AGRICULTURE

The challenges we face today are unprecedented. Their complexity, their geographic scale, and the associated societal tensions are beyond anything we have faced before. And yet, in our perception of solutions in the field of agri-food innovation, as Europeans we too often remain trapped in a highly polarized debate defined by choices made in the 1990s. As we engage in a crucial discussion about the future of our food systems, we still tend to describe the world in simplistic terms drawn from the past. Instead of truly innovating, we tend to look around for ready-made solutions.

To effectively face these systemic challenges, European innovators, legislators, and opinion leaders must consider not only the discoveries of researchers in fields such as biotechnology, not only the technological and market limitations, but also the social complexity of intersecting or conflicting interests and values. At the same time, our reaction to these new developments cannot be one of radical rejection that does not take into account the potential uses of new technologies and that negates the majority position of the scientific community.

We need a new culture of debate. One founded on mutual understanding and respect for the values that guide various participants. We need to address our fears and uncertainties honestly, carefully consider the balance of risks and benefits, and be ready to learn something new and admit when mistakes have been made.

Europe needs its own, bold vision of the future of sustainable agriculture, its own solutions, built around widely shared goals such as sustainability, safety, and transparency, but also firmly grounded in European values of human dignity, freedom, and equality. We need transparent and understandable rules that achieve the delicate balance of protecting Europeans both from rash decisions as well as the consequences of slackness and inaction, but we must also take responsibility for the fate of the rest of the world. We need regulations that keep pace with changing technology, ensuring that universal values are preserved.

