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Integrated scenarios of sustainable food production and consumption in Germany

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Making food production and consumption more sustainable is a highly complex venture, requiring varied policy instruments. While finding an integrated and coherent approach is difficult, the use of strategic foresight might help to fill the gap. This article presents the results of an extensive scenario-building process in which we searched for sustainable solutions regarding food production and consumption in various possible future contexts in Germany. First, so-called context scenarios were formulated to describe different developments beyond the control of the relevant players, but that might have a significant impact on food production and consumption. Second, strategic food scenarios were developed to examine a wide range of sustainable solutions. Finally, the context and strategic food scenarios were merged and assessed to provide policy makers with a helpful "reality check" on different strategy options and guidance in prioritization. We explain the underlying methodology and, after a brief discussion of the main advantages and limitations of our approach, we draw some conclusions for sustainable food-consumption policy, highlighting the important role of society.

KEYWORDS: food consumption, sustainability, strategy, public policy

Introduction

Making food production and consumption more sustainable is a highly complex venture. On a global scale, with 800 million people starving, food security is the key issue (Knickel, 2002; Wiegmann et al. 2005; Reisch et al. 2010; EEA, 2011; UNCSD, 2011). In Germany, where food is more abundant than ever before, and the variety is immense while prices are low, food security is not the problem. At the same time, consumers evince increasing unease about the ecological integrity of food. Pesticides in drinking water and wine, hormones and antibiotics in meat, salmonellae and nicotine in eggs, and preservatives and additives in food head the list of consumer concerns (Umweltbundesamt, 1998; 2010; Kessner, 2007; Du, 2012). It is the entire food-supply chain—from the field to the processor to the retailer to consumption to waste treatment and disposal—that creates huge environmental pressures and is far from being effectively addressed (Umweltbundesamt, 2002; Collins & Fairchild 2007; Virtanen et al. 2011). Wiegmann et al. (2005) show, for example, that in 2004 the stages and operations pertaining to food accounted for 16% of German greenhouse-gas (GHG) emissions, the same share as for mobility.

Food production and consumption have also been linked with negative health effects. Currently, no one can rule out a direct or indirect correlation

between the increase in nutrition-related diseases (especially allergies and cardiovascular diseases) and pollutant residues in food, artificial food additives, and the high degree to which food is processed today (Kearney, 2010; Weiss, 2011; Zessner et al. 2011; Hermanussen et al. 2012; Lindeberg, 2012). Therefore, comprehensive action toward sustainable food production and consumption requires an understanding of the entire food-supply chain—and not only of agricultural structures and practices, but of trade and transportation systems (including global equity), the retailing and marketing of products, and finally, the complexities that motivate consumer demand, and the ways in which food is treated, processed, and disposed. In other words, in addition to the ecological, social, and economic aspects of food production and consumption, public health is an important part of enhancing the sustainability of the food sector (see Reisch et al. 2010).

As complex as the topic of sustainable food production and consumption is, just as varied are the available policy instruments to steer the food system toward more sustainable outcomes. Instruments typically applied are information-based, market-based, and regulatory (Lorek et al. 2008). Nevertheless, despite growing interest in sustainable food policies on the part of policy makers, an integrated and coherent approach has thus far been difficult to find. Many of the instruments are designed one-dimensionally for

specific policy domains and do not recognize environmental and health tradeoffs (Reisch et al. 2011). Additionally, measures might lose their effectiveness or be postponed, when unexpected developments such as the collapse of global trade or weather catastrophes due to the onset of climate change shift political priorities (WEF, 2012). Strategic foresight can help to address this problem by providing an integrated vision of what a sustainable food system could look like in the future when shaped by different measures (Reisch et al. 2011).

This article presents the results of an extensive scenario-building process in which we searched for integrated solutions for sustainable food production and consumption in various possible future contexts. We refer to “integrated” here as the act of considering the entire food-supply chain in the scenario process and providing an overview of the full range of relevant technical and social innovations and ideas as well as stakeholder effects. As a first step in this project, we generated so-called context scenarios to describe possible developments beyond the control of the relevant players, but which might have a significant impact on food production and consumption. Second, we developed strategic food scenarios, which are scenarios that are shaped by the different players. The aim of the strategic food scenarios is to examine a wide range of sustainable solutions for food production and consumption. Sustainable solutions are those that move current patterns of food production and consumption toward being environmental friendly, healthy, accessible to all (also in a global perspective) and embedded in a stable economic system.

Obviously, not all possible options for sustainable food production and consumption would equally meet all criteria in the same way. This enables the representation of all potential sustainable solutions without a preselected and normative judgment about the optimal intervention, which can vary from player to player. And, finally, we evaluated the viability of “strategic food scenarios” under different context scenarios. As a result, we provide policy makers with an assessment regarding both the realization and robustness of each option. Reviewing strategic options against context scenarios has two objectives: to identify the robustness of each option (can a strategy option be realized in a particular context scenario?) and to evaluate its strategic significance (how important is a strategic option in a particular context scenario?). Hence, this method provides policy makers with a valuable “reality check” and supports them in prioritizing strategy options (van der Heijden 2003; Rhydderch & Alexander, 2009).

Methodology

Project Design

Various authors divide studies of the future into three scenario categories: explorative (what can happen in the future?), predictive (what will happen?) and normative (how can a specific target be reached?) (Amara, 1981; Dreborg, 2004; Börjeson et al. 2006). This national case study applied the scenario-management approach developed by Fink & Siebe (2011), which is a type of exploratory scenario category that holds promise as a tool for policy development.

We selected the exploratory scenario option because our aim was to find out *how* the external environment around “sustainable food production and consumption” (the “context”) *might* develop in the future. The same exploratory approach was applied to investigate possible alternative solutions that move toward sustainable food production and consumption. Börjeson et al. (2006) use the terms “external scenarios” and “strategy scenarios” for these two types of exploratory undertakings, which, in our project, correspond with notions of “context scenarios” and “strategic food scenarios.” We therefore divided the project into three phases: the development of context scenarios, the design of strategic food scenarios, and the implementation of an evaluation phase in which the strategic food scenarios were reviewed against the context scenarios.

Volkery et al. (2008) state that integrating multiple perspectives and different types of expertise in scenario processes helps to create well-founded, provocative scenarios that represent a wide range of possible futures. On the basis of this observation, the work in all three phases was done in a participatory way during a series of workshops. For both scenario types (context scenarios and strategic food scenarios), we assembled groups of experts who represented a broad range of expertise and viewpoints. The aim here was to increase the legitimacy of the scenario studies by extending the sources of information and knowledge and creating an environment conducive to organizational learning and change.

The context scenarios in the first instance were developed during two 1½-day workshops. Approximately thirty participants from politics, science, non-governmental organizations, and business attended. The strategic food scenarios were then separately elaborated during two additional 1½-day workshops involving approximately twenty experts. Participants were chosen with expertise in agriculture, food processing, and retailing, as well as backgrounds in environmental, social, and health issues. Care was taken to include a balanced mix of innovative and alternative lifestyle representatives of civil society in addi-

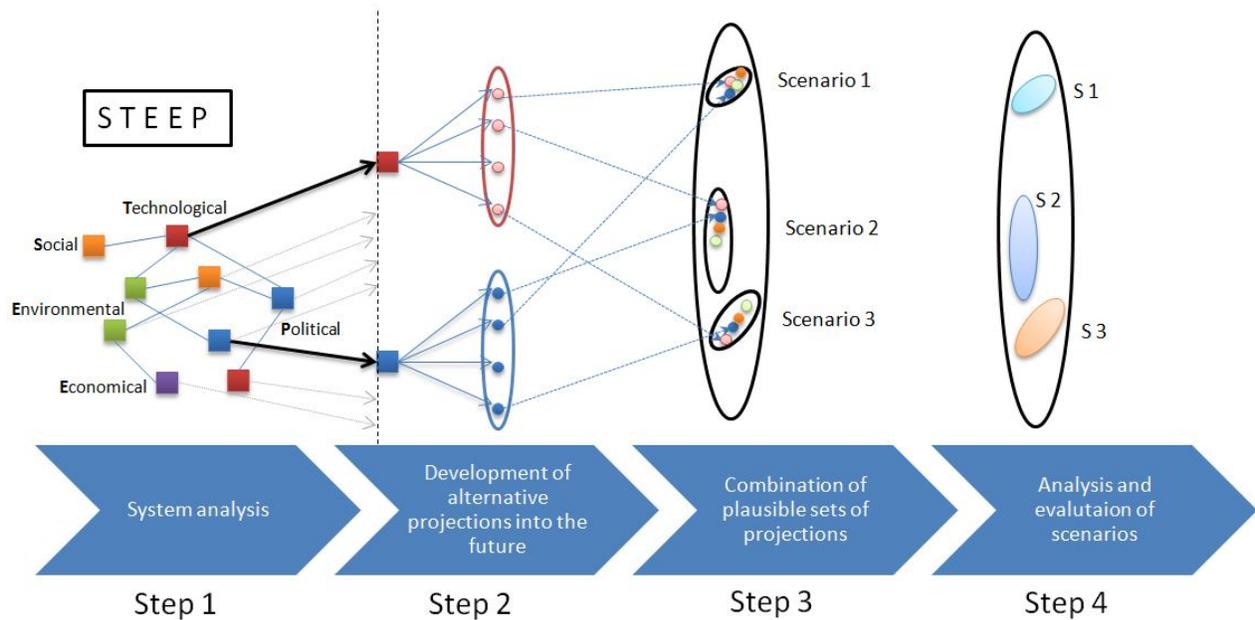


Figure 1 General scenario process in four steps (adapted from Fink & Siebe, 2011).

tion to experts from business, academia, and politics. For the third stage, all of the participants from both previous scenario phases were invited to jointly discuss the implications of the merged scenarios.

Scenario Building

Many attempts to classify and streamline scenario-building methodologies can be found in the literature and there are several comprehensive overviews by Alcamo (2001), Börjeson et al. (2006), and Kosow & Gassner (2008). This article does not attempt to categorize the different approaches or discuss their merits or limitations. Instead, we focus on highlighting some general principles of scenario building and outline the methodology that we applied, the STEEP process, as we explain in Figure 1. This is based on the four-step approach described in Fink & Siebe (2011).

Step 1: System Analysis

All scenario projects must begin by scoping the scenario field, which means defining what exactly the subject of the scenario process is and where the boundaries of the system lie. After that, all aspects that have a certain influence on the scenario field—called influencing factors—are collected in a brainstorming phase. To achieve sufficiently broad consideration of all relevant aspects, the scenario field is systematically structured into different search spheres. The search process typically handles spheres on different system levels—global, national, and sub-

ject specific—and refers to different content-related spheres in society, technology, ecology, economy, and policy (STEEP) (e.g., Maack, 2001). The various influencing factors are selected partly by desktop research and partly through a participatory process in a multidisciplinary workshop. Using all of the influencing factors that are identified for developing scenarios, however, would be too complex and dilute the scenario story. Therefore, for this project, the aim was to select close to twenty influencing factors that were deemed to have the highest impact on the subject. To select these major influencing factors, called key factors, we employed a cross-impact matrix (CIM) in which all influencing factors were checked against each other with regard to causal relation (on a scale between 0 and 3). In a simple algorithm, we classified active (row-wise sum), passive (column-wise sum), and interconnected (active sum and passive sum combined) (Figure 2). Between 15 and 22 of the active and interconnected factors were chosen to be key factors after discussions in a workshop (Gausemeier et al. 1998; Godet, 2000; Villacorta et al. 2011).

Step 2: Development of Future Options

For each of the key factors, possible developments into the future—so-called future options based on the uncertainty of the factors—were identified, using a procedure analogous to that in Ogilvy & Schwartz (2004). First, relevant aspects for each key factor were collected and discussed in a participatory

	Factor A	Factor B	Factor C	Factor D	Etc...	Active sum
Factor A	---	0	1	2	...	3
Factor B	0	---	3	1	...	4
Factor C	1	1	---	3	...	5
Factor D	2	3	2	---	...	7
... etc	---	
Passive sum	3	3	5	6		

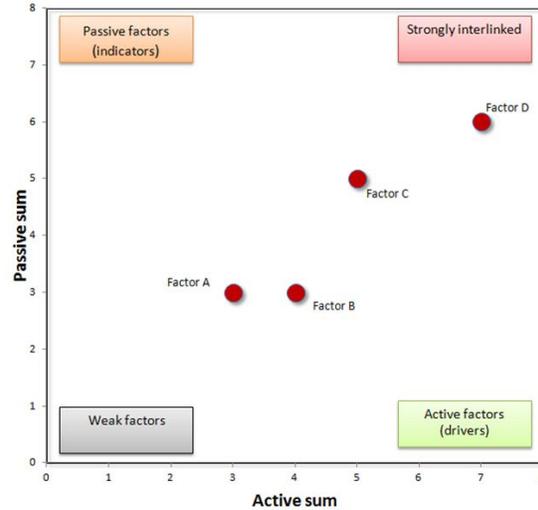


Figure 2 Example of a simple cross-impact matrix and the corresponding graphical representation. The matrix is read from left to right: Factor A has no impact on Factor B, a small impact on Factor C and a relatively strong impact on Factor D. This kind of assessment is done for all factors considered. The result is shown on the right-hand side. The location of each factor depends on its active and passive sum (x-value/y-value) (Fink & Siebe, 2011).

process with the aim of identifying the two most important ones. For both aspects, two different possible future developments were jointly defined; for example, “The importance of self-sufficiency could be either high or low in society and the share of individual contribution to the food supply could also be high or low.” The crossing of two aspects with two developments at each end resulted in a portfolio with four different fields (see Figure 3).

Each field is given an illustrative name and is called a future option. In cases where participants wanted to have a fifth future option in the portfolio, this was discussed and added. In the rare case that one of the portfolio fields was not plausible at all, only three future options were chosen. Finally, for each of the key factors, between three and five future options were available. Importantly, at that stage, the key factors were discussed individually and not in combination with other factors as occurs in scenario planning described by Ogilvy & Schwartz (2004). This procedure ensures that more imaginable or thinkable future options will be identified in a creative process (Fink & Siebe, 2011).

Step 3: Scenario Development

To build credible and coherent scenarios, a consistency analysis was applied: optional future states of each key factor were checked pairwise with all other optional future states, applying a scale from -2 (these two developments cannot occur at the same time), -1 (can occur, but do not really make sense), 0 (mutual coexistence), +1 (makes sense), to +2 (mutual support, synergy). All scenario-workshop par-

ticipants carried out this pairwise check for consistency. Ideally, this judgment should be made by consensus after deliberations within the group. Such discussions are often very time consuming, so that, alternatively, participants filled in a consistency matrix at home and deviations were discussed afterward among members of the group.

Having 22 key factors with four options each

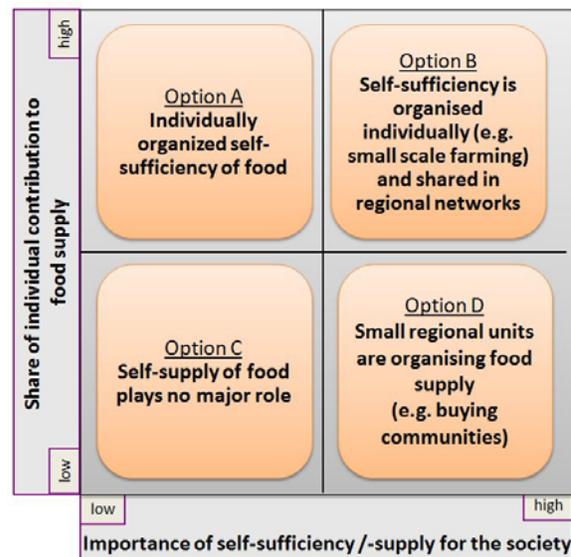


Figure 3 Example of a portfolio of future options. “Importance of self-sufficiency in society” can be either low or high. The same applies to the share of individual contribution to food supply. Four combinations are built and described.

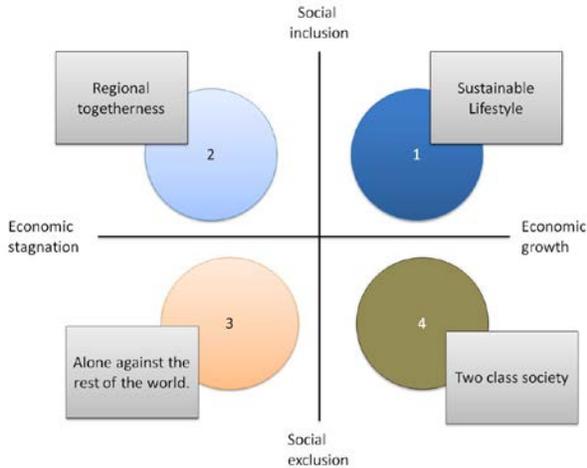


Figure 4 A simplified multidimensional scaling of context scenarios. The four scenarios are organized in a cross along the dimensions “social inclusion/exclusion” and “economic stagnation/growth.”

would mean over one trillion possible scenarios (4^{22} combinations). A scenario is typically built on the basis of one option for each key factor and the aim is to identify those scenarios that are widely consistent. A software tool helps to identify all consistent combinations of options.¹ Combinations classified as inconsistent (-2) are not further considered in the calculations, which substantially reduces the number of plausible scenarios, though a few thousand possible scenarios still remain. Some of them will only differ in one or two factors, while others will differ greatly. It is then possible to group these remaining scenarios in clusters according to their similarity (expressed as distances), which can be visualized by multidimensional scaling. With the help of this kind of automatic visualization, scenario clusters can be identified. The idea is to select the clusters most removed from each other so as to open up the scenario space as wide as possible. Every cluster (along with its characteristics) represents one scenario.

Step 4: Analysis, Mapping, and Interpretation of Scenarios

In the fourth step, the scenarios were supplemented with descriptions. To ensure that we analyzed each scenario in more detail, we first asked the following questions: What are the main characteristics of the scenario? How does the scenario differ from the others? Who are the winners and losers? In a second step, the workshop participants evaluated all scenarios and we posited the following questions: Which of the scenarios were the “most similar to today”? Which of the scenarios are the ones we would like to

¹ Scenario Manager™ developed and maintained by ScMI AG.

see? Which scenario do we expect to actually happen?

The Resulting Scenarios

Context Scenarios

Context scenarios explore possible external settings in which sustainable food production and consumption must take place and that players and performers of sustainability policy cannot influence directly. A set of 22 key factors was chosen in a workshop (see Appendix A). For each of these elements, participants identified up to five options and checked for consistency. After calculation of all possible combinations, four consistent clusters of all plausible scenarios were finally selected and graphically represented. In Figure 4, we have grouped these four clusters in a cross, spanned by the dimensions “social inclusion/exclusion” and “economic stagnation/growth” to reduce the complexity of the project results.

Very short descriptions based on the plausible and coherent option bundles of each cluster follow. The workshop participants considered all of these scenarios to be possible options for future developments through 2040. It is important to note that these kinds of scenarios are not meant to be a prognosis (Fink & Siebe, 2011).

Scenario 1: Sustainable Lifestyle

Health and sustainability are the predominant values in society. The economy is prospering and social cohesion is high, developments made possible by a culture of openness and responsibility. Materialistic values are no longer in the foreground. People are predominantly oriented around LOHAS (Lifestyles of Health and Sustainability) and consume with a notable sense of responsibility (the concept of LOHAS was developed by Ray & Anderson, 2001). These values are reflected in global network policies: there is intensive international cooperation. Climate change is occurring, but the national consequences are manageable.²

Scenario 2: Regional Togetherness

People in Germany take responsibility for themselves. Groups and communities organize their lives on their own in a crisis-like environment. Globally, people are poor and face environmental threats. Economic growth as a goal has become irrelevant. People

² It must be acknowledged that this scenario is not really sustainable from a global perspective as climate change would have severe consequences globally and also the LOHAS strategy is disputable in terms of its effectiveness. The participants named the scenario.

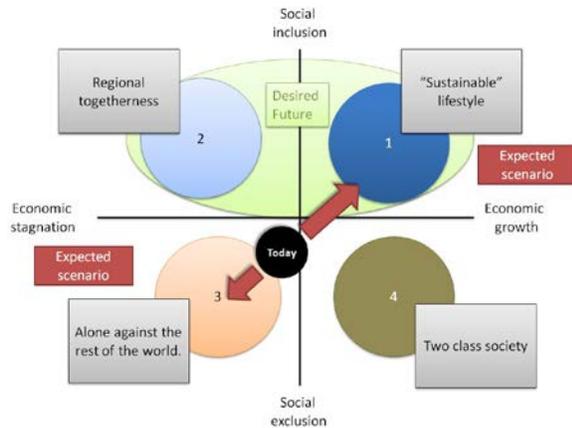


Figure 5 Visualization of context scenarios. “Today” is seen to be similar to Scenario 3. Two scenarios are expected: a positive future with economic growth and more social cohesion and a more negative future with even greater social exclusion and a stagnant economy.

act locally and regionally while materialistic values are of minor interest. Technological innovations operate in the background and environmental protection is mainly driven by sufficiency and partly by consistency strategies (for a definition of “sufficiency” and “consistency strategies,” see e.g., Huber (2000)). Efficiency plays a minor role in this scenario.

Scenario 3: Alone Against the World

All circumstances point to a serious crisis: environmental degradation is progressing and international cohesion is weak. This leads to a national and individual reorientation with a quest for maximum profit. The state takes care of its people at a very low level, adopting a dominant and authoritarian role. Profit maximization endangers global society. In such a setting, sustainability plays a minor role. People are acting as individuals in a setting of low social cohesion warding off a dominant state.

Scenario 4: Two-class Society

A materialistic and economic orientation dominates society. Solidarity plays no role—productivity and efficiency are the guiding principles. Society is divided into poor and affluent classes. The economy is widely based on manufacturing finished goods (second sector) and exports. Both the primary sector (production of raw material and basic foods) and the tertiary sector (service industry) play a minor role in Germany. Global policy is oriented toward access to necessary resources. The whole setting is dominated by strong economic and political forces. Environmental protection is not important at all.

Evaluation of the Context Scenarios

All workshop participants assessed which of the scenarios were the “most similar to today, which they would like to see, and which they expected to witness. The result is visualized in Figure 5. In the view of the participants, conditions in Germany today—in the light of the financial crisis—are most similar to Scenario 3 (Alone Against the World). Pessimists expected that we would dive deeper into this scenario, while optimists expected Germany to move toward a healthy and sustainable lifestyle (Scenario 1). Interestingly, none of the participants expected to see regional togetherness or a two-class society (Scenarios 2 and 4). The desired future, though, is mainly shown in Scenarios 1 (Sustainable Lifestyles) and Scenario 2 (Regional Togetherness)—so it stands in contrast to the current situation in terms of social cohesion. However, all of these scenarios were considered plausible futures in which sustainable food production and consumption “must” take place.

Strategic Food Scenarios

To build strategic food scenarios for sustainable food production and consumption, eighteen key factors (see Appendix B) were identified in a workshop with eighteen participants from universities, business, agriculture, nongovernmental organizations, and the state environmental agency. These participants had expertise in public health, food production and retailing, urban farming, permaculture, food waste, slow food, consumer advice, sociology, and ecology.

As was the case for the context scenarios, for each of these key factors, the participants worked out possible—but only sustainable—future developments. Each of the alternatives is thought to be more sustainable than the situation today, but of course the degree can differ from option to option. The results were also clustered and graphically represented after multidimensional scaling (Figure 6). Seven clusters of strategic food scenarios representing possible alternatives for future sustainable food production and consumption were chosen.

To better understand the differences, the seven strategic food scenarios are grouped as ranging from global orientation to local focus (vertical axes). We can also distinguish who the central players are in designing sustainability: in the upper half of the illustration, it is the customer who demands more sustainable food production, trading, and consumption (who is actively aware about health and sustainable food options). In the lower part of the illustration, the drivers of sustainable development are either the economy (agriculture, the food industry, and the retailers) or public authorities. In the following sec-

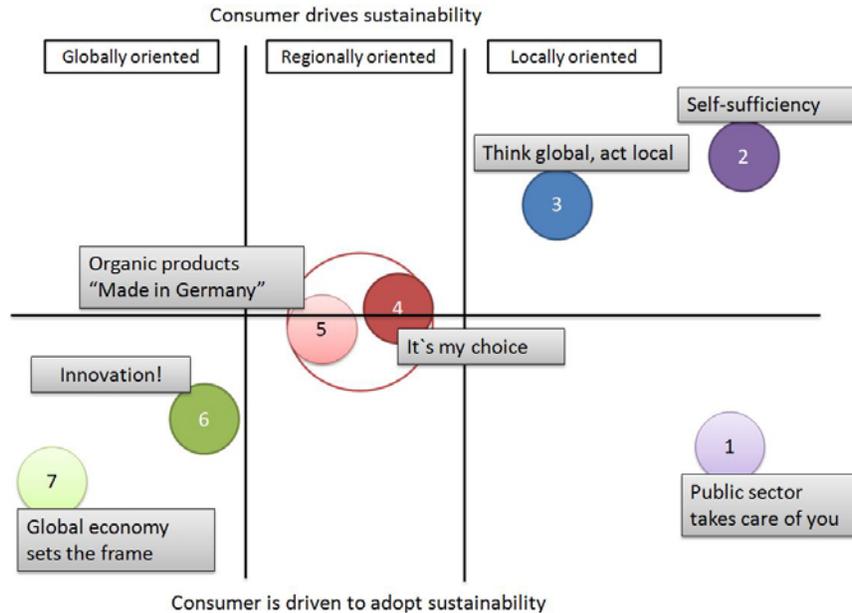


Figure 6 Multidimensional scaling of sustainable food scenarios. This representation has been slightly modified and simplified from the original output to make it more illustrative.

tions, we describe the seven strategic food scenarios in more detail.

Scenario 1: Public Sector Takes Care of You

A clear division of labor and responsibility is established in this scenario. Hardly anyone prepares food or eats at home. Public cafeterias, bistros, and cafes are widely available and public authorities ensure that food production is healthy and efficient with respect to the use of resources. Where possible, regional and seasonal food is prepared in a sustainable way (e.g., closed resource cycles, socially friendly). Agricultural production is mainly organic, and diets include only small proportions of meat. Trade plays a minor role and only takes place between regions, not internationally. Smaller-scaled agriculture is therefore established, supervised, and managed by public authorities. Indeed, the main driver for sustainability is the *public authority*.

Scenario 2: Self-sufficiency or Back to the Roots—Only on a Higher Level

The food industry is marginalized. Food production and preparation is in the hands of the consumer. Agricultural production is organized in small units, even in houses and/or urban gardens, and depends on intensive social communication and networking. However, basic products like cereals are still produced on a larger scale outside of metropolitan areas. The entire production of food and agricultural goods

is oriented toward regional and local consumption rather than global trade. The main driver for sustainability is the *autonomous and self-sufficient society*. Efficiency is not the dominant principle, but instead development is guided by sufficiency and ecological principles. Slower turnover and the closure of resource cycles reduce environmental pressures.

Scenario 3: Think Global, Act Local

The food industry has been required to adapt. The consumer is competent and aware, and demands healthy and sustainable (e.g., fair, regional, organic) products. Preparing meals at home is an important part of daily life; therefore, regional production and markets experience a renaissance. People accept regionally available food, while convenience and prepared food is less in demand than today. Agriculture has a regional focus, with innovations accepted and applied insofar as they support organic farming. Transboundary import/export, especially over long distances, does not take place on any major scale. The main driver for sustainability is the orientation and knowledge of *consumers*, whose informed purchasing decisions create regional markets.

Scenarios 4/5: Organic Products Made in Germany and It's My Choice

The food industry, distributors, and consumers share responsibility for sustainability in these two scenarios. Consumers are conscious about nutrition

and food quality and are highly ecologically sensitive. For this reason, higher prices are widely accepted. Self-sufficiency plays no role in food production—mainly because there is no time and no need for it. Food producers must comply with sustainability standards to succeed in the market. Organic fast food and organic convenience food are the choice in “Organic Products Made in Germany,” while in “It’s My Choice” people take time to cook and eat at home, which is the main difference between these two scenarios. Agriculture is innovative in both cases and organic farming is standard practice, even on a large scale. Technology and renewable energy help make organic food available all year round, with imports limited to the necessary minimum. The main drivers for sustainability are both the demand for and the supply of sustainable products. *Economy and society* are the main players.

Scenario 6: Innovations

The food industry implements radical innovations in food production and distribution so that energy consumption and GHG emissions are low. Public health and animal welfare issues are no longer concerns. Consumers are trustful of controls and of the self-commitment of the food-production chain. They enjoy inexpensive convenience food and having meals with family and friends is an important part of everyday life. Elements of self-sufficiency do not play a role in this scenario. Agriculture is very efficient in terms of energy consumption and operates with a high level of productivity. The main driver for sustainability is efficiency due to (technological) in-

novations and the main player is industry in general.

Scenario 7: Global Economy Sets the Framework

The food industry is booming. Consumers prefer convenience food and one of the main criteria is price. Products are imported from wherever they are inexpensive. Due to this particular priority, all kinds of food are available all year round. Time and cost are the key issues for both producers and consumers. Labeling and state control ensure that health and sustainability standards are fully met. Agricultural production in other countries is far more efficient than in Germany, so German farmers focus on energy and fiber crops and food is mainly imported. In economic terms, this is the most beneficial division of labor. The main driver for sustainability is efficiency due to the highly effective division of labor and optimization supported by incentivizing policies and strong economic interests.

Evaluation of the Scenarios by the Scenario Development Group

All of the participants in the scenario workshops were again asked to evaluate the scenarios’ probability, desirability, and similarity to today’s situation. Resemblance to contemporary conditions does not imply that the current system is already sustainable, but it illuminates which strategic food scenario already exists in rudimentary form. This evaluation was visualized on a map of the future (Figure 7).

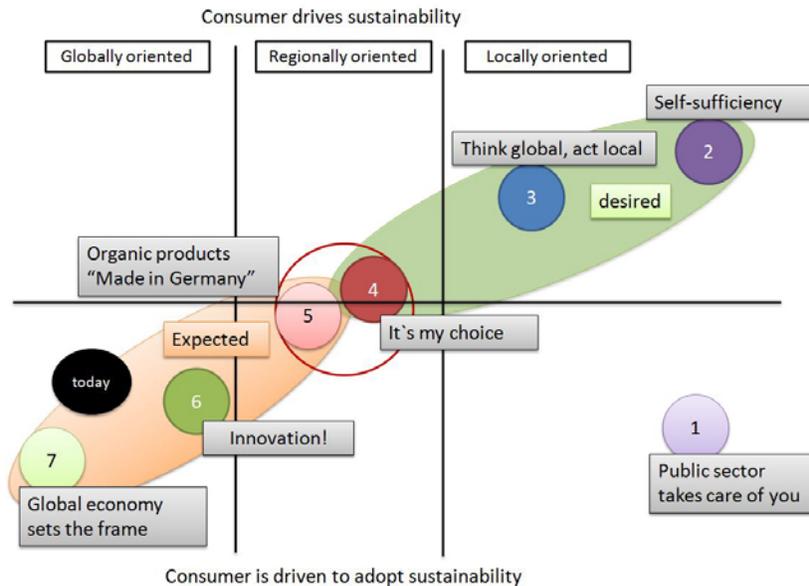


Figure 7 Mapping of “similar to today,” “expected” (orange area), and “desired” (green area) strategic food scenarios. The circled numbers show the strategic food scenarios described above.

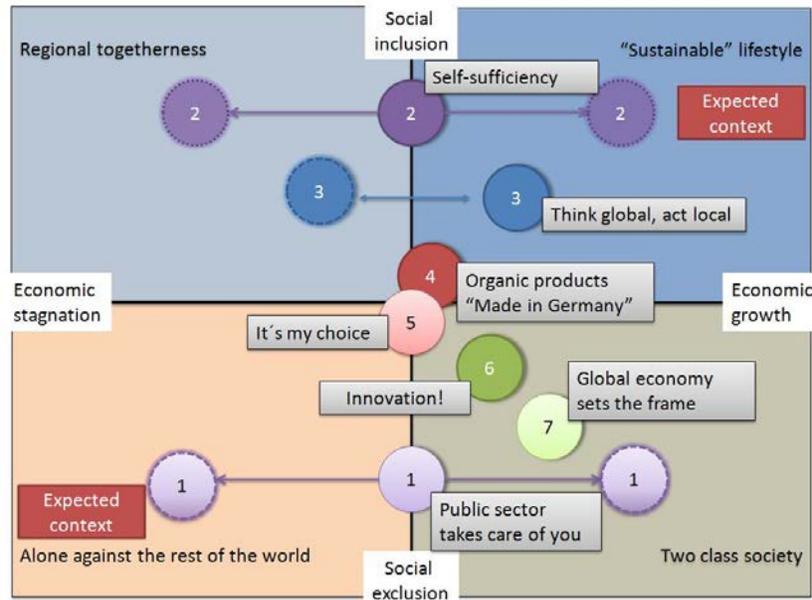


Figure 8 Merged context scenario crossed with strategic food scenarios along the dimensions “economic growth/stagnation” and “social inclusion/exclusion.”

The expected future and the current situation nearly align while the desired future is rather distant. The experts who were part of the consultation envision a current orientation toward a global economy and little consumer autonomy. They do not expect this to change, but they would like consumers to be more empowered and to desire a stronger regional and local orientation.

Sustainable Solutions in Different Contexts

After the expert participants developed context scenarios and strategic food scenarios, the two were reviewed against each other. The objective of this exercise was to learn how the strategic food scenarios might work in each context scenario. In practical terms, this meant first looking at the portfolio of the four context scenarios along their dimensions “social inclusion/exclusion” and “economic growth/stagnation” (see Figure 4).

As shown in Figure 8, we then allocated, in a discursive process, the strategic food scenarios into this portfolio. “Social exclusion” plays a major role in Scenarios 1, 5, 6, and 7 while “Social inclusion” is prominent in Scenarios 2, 3, and 4.

The allocation of strategic food scenarios to economic development (steady state vs. growth) opens up room for more discussion and insight. “Economic development” is not an explicit factor in the strategic food scenarios. Trade, retailing, source of resources, and innovations, however, are implicitly connected to the economic system. In that light, some

of the strategic food scenarios “require” economic growth while others might also work under conditions of crisis, though the interpretation is different. In the following two subsections, we discuss how a given strategic food scenario could be interpreted in a particular economic setting. We also reflect on which players will be the main drivers for sustainability.

Solutions in a Context of Economic Stagnation/Recession

Strategic Food Scenarios 4 (It’s My Choice), 5 (Organic Products Made in Germany), 6 (Innovation), and 7 (Global Economy Sets the Framework) require a high level of economic activity and consumption. A sustainable food strategy mainly based on trade, innovation, and technology would not be a realistic option under uncertain economic conditions. Scenario 6 might fit when innovation is used as an engine for triggering economic development (by increasing debt, most probably).

Scenario 1 (Public Sector Takes Care of You) could be a solution that fits exactly to the negative conditions described in Context Scenario 3 (Social Inclusion/Economic Crisis). The public sector is the last anchor for civil society and national industry. This solution tries to maintain the structures needed in the food sector to guarantee the population a basic food supply. When the economy is down and people become destitute, the state takes care of them as a social measure, using what we know today as soup kitchens and food pantries. Environmental relief

comes mainly from the low production and consumption volumes. People have little interest in sustainability values, although the footprint of poorer people is significantly smaller (Borgstedt et al. 2011). It would be very expensive, though, if the public sector “took care.” This scenario does not therefore seem to be very stable because it means a vicious circle of debt both for the people *and* the state. Social order would be endangered and the reactions of the state could be authoritarian or the state could even collapse leading to anarchistic conditions. Both alternatives have a high potential for violence and are the basic ideas of sustainability. In light of the financial crisis, one can get a small sense of this scenario by looking at countries like Greece, where such conditions are already manifest.

If, in an extreme variant, the public sector is not able to guarantee social welfare anymore (due to a lack of public money, dissolving institutional structures, or the like), no other option seems available—except for people to start to work together and help themselves as described in Scenario 2 (Self-sufficiency). This scenario, however, would require a different context of social inclusion and economic stagnation. We would be moving from Context 3 (Alone Against the Rest of the World) and Context 4 (Two-class Society) to Context 2 (Regionally Together). Here, civil society takes a leading role, people are forming small groups and in general social cohesion is high. This is a natural process of human adaptive capabilities and will to survive as experienced, for example, after the Second World War when there was hardly any formal economic activity and people had to develop their capacity for self-sufficiency.

While this is an extreme example, it does map out a pathway. When the economy becomes unstable or is stagnant, people start fending for themselves, including producing their own food, a process that can create conditions for social solidarity, mechanisms of simple exchange trade, and closer cooperation. Such effects can often be seen in regions where industries break down completely. People start taking matters into their own hands by building gardens, forming communities, and reorienting themselves to regional and local markets, as has been visible in Detroit in recent years (see also Conner et al. 2008; Dubuisson-Quellier & Lamine, 2008; Hemphill & Leskowitz, 2012).

Solutions in a Context of Economic Growth

Strategic Food Scenarios 4 (It’s My Choice) and 5 (Organic Products Made in Germany) certainly require a positive economic setting, because industry and trade are very “active,” balanced by the power of the consumer. Economic growth is not explicitly

needed, but then again economic stagnation or recession would make these scenarios impossible. Additionally, society is neither divided nor community-based.

Strategic Food Scenarios 6 (Innovation) and 7 (Global Economy Sets the Framework) have a strong focus on economic growth and global expansion. Interestingly, the German government seems to favor this strategy, most notably in the report *National Research Strategy Bioeconomy 2030* that has the aim of securing the global food supply (Federal Ministry of Education and Research, 2011). Additionally, workshop participants rated this scenario as being “similar to today” (see Figure 5). This setting requires stable global political conditions and no trade barriers or comparable obstacles. Comparable circumstances are described in Chambers et al. (2007), Brunner (2009), and Belz & Schmidt-Riediger (2010).

We already described Strategic Food Scenario 2 (Self-sufficiency) in a context of economic stagnation. But it can also be thought to take place in *favorable* economic conditions, under which this scenario reflects the free will to “do it yourself” and to “take care of yourself.” Evidence of such a development can be found in, for example, Hemphill & Leskowitz (2012) who interviewed ten “do it yourself activists.” Recent work by Van Timmeren et al. (2004), Hirsch et al. (2010), and Aiken (2012) supports this idea of developments toward self-sufficiency. In the long run, we will see how the food industry reacts. It is likely that such a huge sector will conduct very strong campaigns against self-sufficiency because of the potential loss of market share. In the best case—from the point of view of sustainability—a strong demand for sustainable products might stimulate a change of production methods and product portfolio. Currently, there is no clear picture or vision of how society might function if the majority of people tried to be independent of an efficient division of labor. The question remains if such a scenario could ever be mainstreamed.

Strategic Food Scenario 3 (Think Global, Act Local), described as a regional option, is based on strong communities. Therefore, we consider it to be relatively stable and resilient. We do not see in this case neoliberal economic growth or economic recession in extreme forms. This strategic food scenario will “work” in different economic settings and will stabilize society with a regional or local focus.

Discussion/Conclusions

The use of scenarios should be advantageous to stakeholders for two reasons: they open the mind (of a group) to possible future developments and enable thinking about topics in all their complexity in a sys-

tematic fashion. In the scenario-management approach, these two benefits are achieved as follows: options are built out of all key factors with no limitation or condition in mind, and consistencies are checked between two factors at once pairwise, which reduces complexity for the stakeholder (see also Halford et al. 2005). Computer software helps to develop scenarios with maximum consistency and plausibility. An expert panel analyzes the interdependencies of the factors and crystallizes them into a concise scenario story. Lively and, to a certain extent, controversial discussions in the workshop situations prepare the ground for creative solutions and outcomes.

Of course, the scenario-management approach also has some limitations. One lies in the need for software to help formulate the scenarios consistently. Moreover, filling in the relevant matrices is a very time-consuming and demanding process. The overall time commitment of scenario management is greater than in scenario planning or other normative methods, because one needs to fill in, calculate, evaluate, and interpret the consistencies. One major drawback is common to all scenario methodologies: the scenarios always belong to the group that worked them out. The quality of any scenario process is thus determined by the preparation of the content, the selection of participants, and the transparency and reproducibility of the outcomes (Maack, 2001).

Differentiation between context scenarios and strategic food scenarios enables parts of the work to be reused. In our project, the context scenarios will also be applied to different strategic scenarios in other topic areas, such as sustainable housing or sustainable leisure activities. In the future, additional themes might be evaluated and assessed against these contexts, which will give a rather consistent picture and will enable the context scenarios to serve as a more generic tool.

This process of differentiation also helps to identify and classify strategies as either relatively robust or focused. By definition, robust strategies are less sensitive to uncertainty about the future, while focused strategies might be more effective reaching the underlying goals but are sensitive to changes in the future. For risk-averse policy makers, robust strategies can be expected to perform reasonably well, at least compared to the alternatives, even if society and policy are confronted with surprises or catastrophes. Robust strategies may also offer a more solid basis for consensus on political action among stakeholders with different views of the future, because such strategies can provide reasonable outcomes no matter whose view proves correct (Rhydderch & Alexander, 2009). A conclusion of this study is that current political strategy is exclusively dependent on economic prosperity and that there is

no robust strategy which performs well in all context scenarios. We discovered, however, that more solidarity and empowerment of consumers are the most robust elements in the strategic food scenarios, which might lead to more sustainability under both favorable and unfavorable economic conditions.

In recent work, Reisch et al. (2011) stated that a coherent framework bringing together policy instruments (e.g., information-based, market-based, regulatory, self-commitment) and environmental, economic, and societal contexts is still lacking. Our approach might contribute to filling exactly this gap. Scenarios exploring the relevant context and merging these with strategic options has proven to be a useful instrument supporting the development and evaluation of political strategies, especially in the highly complex field of sustainability.

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Appendix A: List of Key Factors–Context Scenarios

	Social	Technological	Environmental	Economic	Political
National	<ul style="list-style-type: none"> • Social values and environmental awareness • Patterns of private consumption • Organization of daily life • Urban frameworks • Wellbeing/welfare • Social cohesion • Education • Social innovation 	<ul style="list-style-type: none"> • Dynamics of innovation 		<ul style="list-style-type: none"> • Structure of national economy • Target systems in business and economy 	<ul style="list-style-type: none"> • Public budget • Structure of the political system
Global	<ul style="list-style-type: none"> • Global values and religion 		<ul style="list-style-type: none"> • Global availability of resources • Climate change • Global state of the environment • International environmental protection 	<ul style="list-style-type: none"> • Globalization and trade • Global finance and capital markets • Global wealth 	<ul style="list-style-type: none"> • Global governance

Appendix B: List of Key Factors–Food Scenarios

Social	Technological	Economic	Political
<ul style="list-style-type: none"> • Willingness to pay for food • Food-preparation practices in households • Buying patterns • Cultural importance/settings of food • Awareness and responsibility about food • Degree of out-of-home consumption • Knowledge and competencies of consumers • Lifestyle habits with regard to nutrition • Knowledge and competencies of consumers 	<ul style="list-style-type: none"> • Degree of technological innovations in food industry • Degree of innovation in agriculture 	<ul style="list-style-type: none"> • Production of food industry • Sources of food (regional) • Degree of out-of-home consumption • Market share and position of national agricultural production • Food retailing 	<ul style="list-style-type: none"> • Role of consumer-protection policy • Use and supply of resources