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Article

Performance versus Values in Sustainability Transformation of Food Systems

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Abstract: Questions have been raised on what role the knowledge provided by sustainability science actually plays in the transition to sustainability and what role it may play in the future. In this paper we investigate different approaches to sustainability transformation of food systems by analyzing the rationale behind transformative acts—the ground that the direct agents of change act upon—and how the type of rationale is connected to the role of research and how the agents of change are involved. To do this we employ Max Weber’s distinction between instrumental rationality and value-rationality in social action. In particular, we compare two different approaches to the role of research in sustainability transformation: (1) Performance-based approaches that measure performance and set up sustainability indicator targets and benchmarks to motivate the agents in the food system to change; (2) Values-based approaches that aim at communicating and mediating sustainability values to enable coordinated and cooperative action to transform the food system. We identify their respective strengths and weaknesses based on a cross-case analysis of four cases, and propose that the two approaches, like Weber’s two types of rationality, are complementary—because they are based on complementary observer stances—and that an optimal in-between approach therefore cannot be found. However, there are options for reflexive learning by observing one perspective—and its possible blind spots—from the vantage point of the other, so we suggest that new strategies for sustainability transformation can be found based on reflexive rationality as a third and distinct type of rationality.

Keywords: complementarity; food systems; perspectives; rationality; sustainability assessment; sustainability transformation; sustainability transition; sustainability science

“Like any action, social action may be determined as: (1) *instrumentally rational* through expectations of the behavior of objects in the environment and of other human beings, and the use of these expectations as “conditions” or “means” to attain one’s own rationally pursued and calculated *ends*; (2) *value-rational* through a conscious belief in

the unconditional *intrinsic* value of some specific ethical, aesthetic, religious, or other form of behavior purely as such and independently of its effects ..." Max Weber [1] (Teil 1, I, §2, own translation of [2], emphasis in original).

1. Introduction

Food production has substantial impacts on climate change, biodiversity and environmental resources such as water, soil, and air [3], and it plays a significant role in the global threats to planetary boundaries [4,5]. Accordingly, a wealth of sustainability assessment methods has been developed by science to help food systems become more sustainable (e.g., [6–8]). However, the transition to sustainability does not necessarily start with an evaluation of sustainability, and sustainability assessment does not automatically lead to sustainability transformation [9–19]. Generally, there is a tension between research that is oriented toward description and analysis and research that is oriented toward action and development [20]. A better understanding of complex social-ecological systems in itself does not necessarily offer solutions to sustainability problems in practice [18,21]. It can be argued that there is an ongoing "sustainability revolution" in form of a broad, long-term shift in governance paradigm or regime, but the ongoing transformations are largely piecemeal, incremental and diffuse [22]. The actual course and pace is uncertain, and it is not clear how science can best contribute to the processes of transformation that are brought about by societal agents of change. Therefore, the questions of how to prompt social-ecological transitions to achieve sustainable transformational change and, specifically, how to overcome the so-called "implementation problem" (from the viewpoint of research) of how to get from sustainability assessment to sustainability transformation are coming to the fore in sustainability science (e.g., [18,19,23–33]).

While sustainability science has increased our understanding of complex problems in social-ecological systems substantially, progress on how this knowledge can lead to transition to sustainability is lacking. On this basis, Miller et al. [34] (p. 244) pose some very fundamental questions on the role of science and knowledge in facilitating sustainability outcomes: "What is the appropriate role of science in contributing to action and decision-making for sustainability? What kind of science is useful for this purpose? What knowledge, if any, is needed to make better decisions? How can sustainability science best participate in the implementation of sustainable solutions?" They suggest, inter alia, that sustainability science can strengthen its contributions to sustainability transitions by creating and pursuing desirable futures and by mapping and deliberating sustainability values, focusing on the role of values in science and decision-making for sustainability [34] (p. 243).

Knowledge and values, and the relation between knowledge and values, thus seem to be at the center stage in the question of how to "implement" sustainability assessments to achieve transformations towards sustainability in food systems and in other social-ecological systems. Sustainability assessments are complex and typically made by experts, whereas sustainability transformation involves changes in a range of practices and "learning by doing" by different actors (farmers and processors, marketers, business people, policy makers, consumers) who are primarily focused on efficient and sufficient production and distribution of food, fiber and energy. Hence, there are growing concerns in sustainability science about the lack of practical use of sustainability assessment tools in food systems and agricultural decision support tools by the intended users [35,36], and the lack of impact of farming systems modelling to improve farming systems by supporting farmer behavior change [37]. More generally, the different kinds of information systems for environmental management fail to be used and benefit policy and planning outcomes [38].

Participatory processes are increasingly suggested to be a solution to the implementation problem. In a large review of stakeholder participation for environmental management, Mark S. Reed states that: "The complex and dynamic nature of environmental problems requires flexible and transparent decision-making that embraces a diversity of knowledges and values. For this reason, stakeholder participation in environmental decision-making has been increasingly sought and embedded into national and international policy." [39] (p. 2417). Not only is participation a potential solution to the

management of complexity, but relatedly, the authors referenced above also point to better participation as a possible solution to the implementation problem. For example, they propose the need for learning from stakeholders and end users [35], including user perceptions and intentions [38], and intimate involvement of those who are needed for change to be implemented [37], in a paradigm featuring dialogue in order to construct relevance to practice [36].

However, there is a growing general acknowledgement that participation in itself is not enough to overcome the implementation problem [39,40]. “Although many benefits have been claimed for participation, disillusionment has grown amongst practitioners and stakeholders who have felt let down when these claims are not realised.” [39] (p. 2417). Even transdisciplinary research that includes in-depth participation and integration of practice knowledge does not necessarily result in change in a sustainable direction [41]. Reed concludes that “stakeholder participation needs to be underpinned by a philosophy that emphasises empowerment, equity, trust and learning.” [39] (p. 2426).

These are important elements, but we believe a deeper analysis of the role of knowledges and values in sustainability transformation can help resolve the implementation problem and the broader problem of how to best promote transformation. Focus is on the transformational “system failures” divided into the directionality failure and the reflexivity failure [42,43]. Directionality failure concerns a lack of shared vision regarding the goal and direction of the transformation process and consequent inability of distributed agents to shape systemic change. Reflexivity failure concerns the insufficient ability of the system to monitor, anticipate and involve actors in processes of self-governance, partly because of different discursive spheres and the need to deal with uncertainty.

The sustainability assessment approach may itself also increase risk of transformation failure. The development of multicriteria sustainability assessments enhances the knowledge basis for making decisions towards sustainability transformation through better tools and more appropriate tool choices (e.g., [44]). However, it has proven harder than expected to put into practice the principles of sustainability assessment [45,46]. Many sustainability attributes are not (yet) measurable and “hard” methodologies need to be complemented by “soft” methodologies which are at least able to identify critical issues and trade-offs [45]. Since any assessment tool has already assumed fundamental value judgements related to what is considered good or not good in terms of sustainability [47], the full effectiveness of such tools can only be reached by exposing and working with the value basis in relation to value communication, motivation and trust [48]. More generally, Jones et al. [49] state that values are a fundamental aspect of cognition that complements the use of other cognitive constructs such as knowledge, and that the study of values deserves a stronger place to further our understanding of the cognitive dimensions in the coupling of social and ecological systems and to improve the practical management of social-ecological systems.

On this background, there is a need to explicate the difference between working with better knowledge and stronger values in the development of research methods and tools for taking actions towards sustainability transformation. Alrøe et al. [48] call for comparisons of the strengths, weaknesses and complementarities of performance-based and values-based approaches to bringing about real transformation towards more sustainable food systems. These contraposed approaches exhibit very different grounds of action. In brief, *performance-based* approaches aim at measuring performance and setting up sustainability indicator targets and benchmarks to motivate the agents in the food system to contribute to the transformation, whereas *values-based* approaches aim at communicating and mediating sustainability values to enable coordinated and cooperative action to transform the food system.

In this paper we compare and analyze performance-based and values-based approaches to sustainability transformation of food systems by analyzing the *rationale* behind the transformation—the basis that the direct agents of change (including individuals, businesses and governmental and non-governmental organizations) are assumed to act upon—and how the type of rationale is connected with how the agents of change are involved and how research is involved in the approach [50,51]. To do this we employ Max Weber’s distinction between instrumental rationality and value-rationality

in social action [52,53] (see also [54]). The concept of rationality is often associated exclusively with instrumental rationality, but Weber's more general concept of rationality means using grounds of action that can be substantiated in an understandable and communicable way.

Contrasting performance and value oriented strategies in this way enables us to better understand their respective strengths and weaknesses in bringing about sustainability transformation, to see what might be learned from one approach to improve the other, and to suggest new strategies for sustainability transformation.

2. Framework for Analysis

2.1. Rationale or Ground of Action

We use the distinction, suggested by Weber, between instrumental rationality (sometimes translated as "means-ends rationality") and value-rationality to analyze the rationale that is employed to promote sustainability transformation in performance-based and values-based approaches:

"Social action, like all action, may be oriented in four ways. It may be: (1) instrumentally rational (*zweckrational*), that is, determined by expectations as to the behavior of objects in the environment and of other human beings; these expectations are used as "conditions" or "means" for the attainment of the actor's own rationally pursued and calculated ends; (2) value-rational (*wertrational*), that is, determined by a conscious belief in the value for its own sake of some ethical, aesthetic, religious, or other form of behavior, independently of its prospects of success; (3) affectual (especially emotional), that is, determined by the actor's specific affects and feeling states; (4) traditional, that is, determined by ingrained habituation." [52] (p. 25).

Social action is action which is meaningfully oriented toward the behavior of other persons, and both strictly traditional behavior and purely affectual behavior lie on the borderline of what can justifiably be called meaningfully oriented action [52,55]. Though based in individual actors, affectual action can be a crucial component of social action, especially in times of upheaval, and traditional, or habitual, action is undoubtedly a very important part of everyday social action in form of traditions and institutionalizations. However, neither can be communicated as rationales for action. We therefore focus on the distinction between instrumental rationality and value-rationality as two different forms of rational grounds of action.

Value-rational action is distinguished from the affectual type by its explicit formulation of the values governing the action and the consistent intentional and purposeful orientation of the action to these values [52,56]. Since value is what is pursued through action, it is a cause or ground of action, but it is also the end of action, the good that is sought [57]. However, the meaning of the action does not lie in the achievement of end results, but in the intrinsic value of the action, irrespective of the likelihood of success or of costs that might occur [58]. By contrast, instrumentally rational action is based on knowledge (expectations) of the consequences of the action (e.g., expected benefits and costs). The means, the end, and the secondary consequences are all rationally considered, taken into account, and weighed. Ends, goals, and aims are always values-based, but what characterizes instrumental action is that actions are grounded in the knowledge-based expectations of how to reach those ends and not in those values in themselves (see also [53]).

More generally, Weber pointed out that different departments of life such as mystical contemplation, economic life, technique, scientific research, military training, law, and administration may be rationalized in terms of very different ultimate values and ends, and: "what is rational from one point of view may well be irrational from another" [59] (p. 26). In particular, the value-rational must appear completely irrational from the viewpoint of instrumental rationality (cf., [52,53]), but: "A thing is never irrational in itself, but only from a particular rational point of view." [59] (p. 194).

This perspectival view of rationality was radicalized further by Niklas Luhmann, who pointed out that in general rationales do not exist outside the perspectives of social systems: "Modern society's

principle of differentiation makes the question of rationality more urgent—and at the same time insoluble. . . . The concept of rationality merely formulates the most demanding perspective on a system's self-reflection. It does not signify a norm, a value, or an idea that confronts real systems. (That would presuppose someone who says that it is rational to be guided by this.) It merely indicates the keystone of the logic of self-referential systems." [60] (p. 477).

2.2. Ideal-Types

In practice, the two modes of orientation of action, instrumental rationality and value-rationality, are often intertwined. Weber notes that this classification formulates in conceptually pure form certain sociologically important types to which actual action is more or less closely approximated or which constitute its elements. For example, the ends (goals) of instrumental actions may well be determined in a value-rational manner, so that the action is instrumentally rational only in respect to the choice of means. However, Weber's clear conceptual distinction of different and equally compelling grounds of action is important to avoid a one-sided view of rationales, where acting on the basis of values may seem plainly irrational from an instrumental rationality, or the opposite.

The types of rationality are thus proposed as "ideal-types", a notion conceived by Weber as a methodological tool to help understand and analyze social reality:

" . . . we can make the characteristic features of [the relationship between empirical data and an abstract construct] pragmatically clear and understandable by reference to an ideal-type. This procedure can be indispensable for heuristic as well as expository purposes. The ideal typical concept will help to develop our skill in interpretation in research: it is no 'hypothesis' but it offers guidance to the construction of hypotheses. It is not a description of reality but it aims to give unambiguous means of expression to such a description. . . . An ideal type is formed by the one-sided accentuation of one or more points of view and by the synthesis of a great many diffuse, discrete, more or less present and occasionally absent concrete individual phenomena, which are arranged according to those one-sidedly emphasized viewpoints into a unified thought construct. In its conceptual purity, this mental construct cannot be found empirically anywhere in reality. It is a utopia." [61] (p. 90).

The use of the undifferentiated collective concepts of everyday speech is always a cloak for confusion of thought and action, Weber writes, whereas, when carefully applied, ideal-typical concepts are particularly useful in research and exposition: "Only through ideal-typical concept-construction do the viewpoints with which we are concerned in individual cases become explicit. Their peculiar character is brought out by the confrontation of empirical reality with the ideal-type" [61] (p. 110).

The two kinds of approaches to the role of research in sustainability transformation that we contrapose here, performance-based and values-based, can themselves be seen as ideal-types. We use Weber's well-known and more fundamental ideal-types of rationality to compare performance-based and values-based approaches in regard to a number of exemplary cases. Performance-based approaches to sustainability transformation follow a surge of performance-based measures to improve performance in business management [62,63], as well as in organizational and public management [64,65]. As an ideal-type, the performance-based approach is based on the institutionalization of an instrumental reason for action in form of selected performance measures and indicators [66], i.e., sustainability assessment tools and frameworks like multicriteria assessments (MCA) and key performance indicators (KPI). Performance-based approaches aim at enhancing the abilities of practitioners to achieve sustainable outcomes, in part by rewarding those activities through their verification and social or economic marketability. The values-based approach, as ideal-type, is based on a set of institutionalized values, i.e., a set of agreed upon values that directs the decisions and actions of daily practices and development initiatives. Many individual, community and organizational

approaches to sustainability transformation are values-based in this sense; for example, organic farming and food systems directed by overall values and ethical principles.

2.3. Cross-Case Analysis

The analysis of rationale is carried out in a cross-case analysis of four cases. The cases are specific projects or initiatives that represent different research approaches to the transformation of food systems toward more sustainable practices and structures. Some cases are directed by researchers, others not. One or more from the author group has been involved in all the cases, and for all but one, in a leading role.

Cross-case analysis is a research method that allows researchers to compare cases from different settings, communities, or groups to understand relationships among the cases, refine and develop concepts, and build or test theory [67]. Some features of cross-case analysis are: cases represent rich examples of experiences; cases are comparable in relation to certain patterns of similarities and differences; comparisons among cases can construct and yield meaningful linkages, analogies, inferences, and conditional generalizations; and the analysis provides possibilities for learning from one case to another.

The cases analyzed in this article can be seen as representatives of the two ideal-typical approaches to the role of research in sustainability transformation, performance-based and values-based approaches. They have been selected as what Flyvbjerg [54] calls extreme cases. This does not mean that they are all at the very extreme ends of the instrumental rationality—value-rationality spectrum. As Weber [52] (p. 26) notes: “It would be very unusual to find concrete cases of action, especially of social action, which were oriented only in one or another of these ways.” But it means that there are no cases which represent “the middle of the spectrum”, not only because we do not know of such approaches, but because we expect that more can be learned from cases that are closer to one of the two ideal-types [68]. We follow up on this methodological choice in the discussion.

2.4. Analysis of Stakeholder Involvement

We analyze the stakeholder involvement in approaches to sustainability transformation by asking who are involved (including researchers and experts), when or where in the process, and why and how they are involved. This analysis can provide a picture of the rationales at work in the different approaches that is not only directly based on the self-descriptions made by the projects or initiatives in the cases, but also indirectly on how they involve stakeholders, knowledges and values.

We differentiate stakeholders by their role in the approach, and we have identified five such stakeholder roles:

- *Sponsors*, who fund or otherwise support the specific project or initiative.
- *Developers*, who work to research and develop the project or initiative.
- *Beneficiaries*, for whom the project or initiative has been created, and who will directly benefit from it.
- *Agents of change*, on whom the transformation of the system *directly* relies, and who are expected to change their practices as a result of the project or initiative.
- *Indirectly involved stakeholders*, who are not engaged directly in the project or initiative, but who are either susceptible to be affected (positively or negatively) by it, or who indirectly affects it.

The “direct agents of change” here is not to be confused with the usual, broader concept of “change agents” (e.g., [69]), the actions of which will often not directly lead to sustainability transformation, but depend on their influence on other, direct, agents of change. The distinction is important here, because the focus is on the potential of different approaches to actually lead to sustainability transformation, and here the direct agents of change are essential in initiating and enacting change. Our focus on the direct agents of change cuts across the different actor typologies found in relation

to sustainability transformation, since these typologies include types of actors that have weak or no agency [70].

The “indirectly involved stakeholders” is a very varied category. It includes public authorities that may indirectly affect approaches to sustainability transformation in form of incentives and regulations. It also includes stakeholders who are known to be affected, and who can therefore be included in the assessment of impacts, as well as stakeholders that are unobserved or unknown by the approach in question. Sustainability is a “holistic” semantic that, so to speak, wishes to take the whole into consideration, and therefore all affected stakeholders are in principle included. We will not consider indirectly involved stakeholders in the analysis because they by definition do not participate in the actual decision-making, changes in practice, or other acts towards transformation, and therefore they are not relevant to the analysis of rationales. However, we will take up the question of steering by governments and the distinction between known and unknown impacts in the discussion.

We identify the way in which the agents of changes are involved in the project through Biggs’ [71] framework of four participation modes as generalized by Probst and Haggmann [72] and Barreteau et al. [73]:

- Contractual (stakeholders are “contracted” to provide input)
- Consultative (the “owner” gathers information by consultation)
- Collaborative (with exchange of knowledge on an equal footing)
- Collegiate (with a shared ownership of the process)

An important note here is that whereas the usual focus is on stakeholder involvement in research (as in Biggs’ framework, in line with instrumental rationality), the “involvement” here is in some cases the other way round, with stakeholders being the main agents in sustainability transformation, and research being involved in this in some ways and to some degrees.

3. Cases

The four cases described here are different approaches to how research can help instigate sustainability transformation. They have been chosen as prospective representatives of the two ideal-type research approaches to sustainability transformation, performance-based and values-based, as indicated in parenthesis in the headline for each case.

3.1. *The Sustainability Consortium—TSC (Performance-Based)*

The Sustainability Consortium is a global nonprofit organization working at the intersection of science and business to transform the consumer goods industry to deliver more sustainable products [74]. Their work is organized around measuring the sustainability profiles of particular product categories, of which “Food, Beverage & Agriculture” is a predominant example. TSC aims to create credible, scalable tools, strategies and services that are based in science, informed by stakeholders and focused on impact across the entire lifecycle of products, including environmental, social and economic imperatives. More than 100 members (including manufacturers, retailers, NGOs, civil society and corporations), with over US\$100 billion in sales, work collaboratively on innovation for a new generation of products and supply networks. The business motive for commercial members is making a profit and building economic resilience from sustainability.

TSC is continuously building a global indicator database based on an online platform where TSC members can compare key performance indicators, metrics and targets to construct Life Cycle Assessments and Category Sustainability Profiles that identify the focus areas and performance measures for a particular product. The latter contain up to 15 Key Performance Indicators (KPIs), each with several response options, though many of the KPIs are generated by binary scores of best practice which are secondarily aggregated at a whole product level from many upstream and downstream strands of the supply chain [75]. Sustainability “hotspots” and “opportunities for improvement” are automatically identified and a summary of results is available instantly.

Transforming values for improved sustainability outcomes is not an overt target of TSC's work, but the member's priorities of key performance indicators inform the sustainability programs of other members. There is a strong focus on learning for sustainability and an underlying premise that sustainability credentials in form of a high KPI score will provide a business advantage in markets compared to competing products with weaker KPIs or without any scoring device. For example, a metric called an "Improvement Opportunity Rating" is calculated for a given product that, in part, reflects the users' performance compared to that of competing manufacturers and suppliers in the supply chain and markets. Producers and manufacturers can use the tool to prioritize the 4–5 most important KPIs to discuss with suppliers or policy makers to neutralize competition and maintain market share and price premiums.

TSC is an important cross-scale bridging organization that constructs sustainability metrics of dispersed actors in global production, manufacturing and supply chains. It is a particularly far reaching example of a burgeoning number of market accreditation tools that prescribe measures of codified sustainable practices for agriculture and forestry. Some market accreditation schemes have become embedded and drive the shape of established sustainability assessment practice. It has considerable potential strength from reaching large businesses in global production and manufacturing chains, from its voluntary and collaborative approach, and by being nurtured within a strong business practice and focus.

3.2. New Zealand Sustainability Dashboard—NZSD (Performance-Based)

The New Zealand Sustainability Dashboard project (2012–18) aims at developing sustainability assessment tools for food producers and industries, and at setting sustainability indicator targets that motivate the transformation of farming systems for sustainability and resilience [76]. The project has developed a structured framework based on international literature that has identified the four pillars of sustainability—environmental integrity, social well-being, economic resilience and good governance. The overarching goals and goal per pillar have been developed in alignment with Government strategies, cultural values and international sustainability assessment systems, especially the FAO SAFA program.

Within each pillar a hierarchy of five levels has been created. The first describes the goal for the pillar, which is broken into the outcomes if that goal is achieved. Each outcome is further divided into objectives. The achievement or movement towards the objectives will be shown by indicators for which measurements can be collected by each end-user of the Dashboard. Performance measures are developed for each industry in consultation with stakeholders, and these are ideally measured against 'reference values' such as targets, critical thresholds, minimum farming standards and best practices [77].

As an example, the project is reviewing and refining assessment metrics for the Sustainable Wine New Zealand program. The focus has been on the development of assessment metrics where:

- The metrics align with sustainability goals, outcomes and objectives.
- The information can be easily captured and the measure calculated.
- Measures and indicators align with national or international norms.
- There is a reference for objective performance indicators. However, other indicators that for example measure the use of specific practices or the presence of plans are used where information to derive performance indicators is not easily available.

In the example of energy use in winery:

- All energy used is monitored, recorded and tracked for the production sites.
- Performance is assessed and reported against tuned operation sized benchmarking results and can be incorporated into a process of continual improvement aided by links to immediately relevant learning resources.

In the example of vineyard water use:

- Water use efficiency indicators are calculated for the property including seasonal irrigation efficiency (seasonal water applied/seasonal evapotranspiration—seasonal rainfall, plus accounting for soil type) and water use efficiency (area/volume product/water applied).

3.3. *HealthyGrowth—HG (Values-Based)*

The HealthyGrowth project (2013–2016) aimed to identify alternative food chains that are able to grow in volume without losing the value basis that they started from, in order to learn (1) how the growth of values-based food chains can help the transformation into more sustainable food systems; (2) to what extent such values-based food chains can function as a sound foundation for the integrity of organics and consumer trust; and (3) to what extent they constitute a substantial potential for development and growth of organic markets.

The project was organized as a multi-perspectival project including five disciplinary perspectives. It included 19 case studies of values-based food chains conducted by 10 research teams in 10 different European countries [78]. Based on the outcome of the five disciplinary analyses, some of the key factors for successful values-based food chains have been identified through a multi-perspectival process of communication involving the perspectives of the different teams.

What characterizes the success of these cases of values-based food chains is that value communication (or moral communication) along the chain is crucial. Values are not seen as objects that can merely be transported along the chain, but as something that has to be communicated between the agents of the chain and re-actualized by each link in the chain to be kept alive [79]. Values cannot be reduced to economic value, the market actors in the chain have to be able to enter into a discussion of both price and value. This is in contrast to “added value” approaches where all values are transformed into economic values. Value communication starts in the primary production, but any one of the main agents of a value chain is able to mediate the values—or stop the value communication and turn it into a merely economic communication. Assessments and other sources of knowledge can enter into the development of the chains, but it is the chains themselves that organize the use of existing knowledge and assessment tools on the basis of their values.

The observed cases of values-based food chains are organized as forms of partnership cooperation between the different agents; partnerships that support the hybrid communication between values and economics, and which establish mutual dependencies which facilitate long-term cooperation and mutual development. Involvement in these values-based food chains enhances the farmers’ possibility to develop more sustainable farming systems, because the very fact that the chain is able to mediate values makes it possible for farmers to work with the development of their production on the basis of values.

3.4. *MultiTrust Platform—MTP (Values-Based)*

The MultiTrust project (2011–2014) investigated methods to make and communicate overall assessments of the effects of organic food systems on society and nature to help organic actors develop the organic food systems in line with their ethical principles [80]. Organic agriculture is seen as a self-organizing system based on a shared meaning. This is expressed in the principles of organic agriculture, which are the result of a large and global process to formulate basic ethical principles for organic agriculture [81,82]. Since these principles in many ways harbor values that are different from mainstream ideas about sustainability, it was clear that the development of assessment methods would have to take this into account and be very specific about the value basis. However, the results of a multi-stakeholder workshop on how overall assessments may benefit the development of organic food led to a more radical solution: stakeholders concluded that: (1) assessments should be driven by user needs; (2) assessments must be used in chains; and (3) assessments should focus on tangible initiatives [83].

This led to the proposal of a cooperative communicational platform for developing more sustainable food chains [83–85]. The proposed tool works by exposing and communicating the value-laden criteria (e.g., animals living a natural life, environmental health, closing nutrient cycles) used by different actors in the food chain (producers, processors, retailers, consumers, etc.) for selecting goods and taking new development initiatives (e.g., providing above standards outdoor facilities for slaughter pigs, reducing the use of antibiotics, building a biogas plant). Communicating about values (in form of criteria) and concrete initiatives enables the actors in the chain to understand in what direction other actors are moving, and why, and coordinate their own decisions and actions accordingly. For instance, producer criteria and initiatives may influence consumer choices, and the criteria and buying strategies of consumers may influence strategic producer decisions.

The tool is based on the idea that assessments must be used in chains. Sustainability transformation of food systems is a complex undertaking that requires mediation of values and synchronization of actions. If any link, be that production, processing, sale or consumption, lags behind, the transformation is stopped in its tracks. The food chain determines what is needed in form of assessments to assist sustainability transformation, and the proposed tool can help doing this by enabling mediation of values and determination of the criteria needed for a relevant and consistent assessment.

4. Results from the Cross-Case Analysis

There are clear differences in rationale between the cases. The rationales are related to different views on how food system changes come about and what the role of stakeholders, knowledge and values are in food system transformations. The findings are summarized in Table 1 and the main aspects are elaborated below.

Table 1. Involvement of stakeholders, knowledges and values in the cases.

	The Sustainability Consortium (TSC)	New Zealand Sustainability Dashboard (NZSD)	HealthyGrowth (HG)	MultiTrust Platform (MTP)
Main tools for change (indicating the involvement of knowledges and values as grounds for action)	Life cycle assessments, key performance indicators, benchmarking	Sustainability assessments, key performance indicators, benchmarking, learning sheets, reference values	Describing innovative and successful cases of values-based food chains, identifying key success factors	Cooperative communicational platform, exposing value-laden criteria for decision-making
View of sustainability	A product feature based on knowledge	A farming system state based on knowledge	Ongoing decision-making based on mediation of values	Ongoing decision-making based on communication of values
Main rationale	Instrumental rationality	Instrumental rationality	Value-rationality	Value-rationality
Stated goal for transformation (indicating the goal for involvement of stakeholders)	Transform the consumer goods industry to deliver more sustainable products	Motivate the transformation of farming systems for sustainability and resilience	Identify alternative food chains that are able to grow in volume without losing their value basis	Help organic actors develop the organic food systems in line with their ethical principles
Sponsors	TSC members, e.g., Unilever, BASF and other multinational consumer-goods producers and traders	Several NZ food industries, NZ government, several universities	European Union and eleven member states	<i>Initial phase:</i> The Danish Ministry of Food, <i>Later phase:</i> The organic food system

Table 1. Cont.

	The Sustainability Consortium (TSC)	New Zealand Sustainability Dashboard (NZSD)	HealthyGrowth (HG)	MultiTrust Platform (MTP)
Developers	TSC members' staff, associated researchers, experts from companies	Consultants, NZSD researchers, industry representatives, and in some cases farmers	HG researchers, food chain agents develop their own food chain	MTP researchers, food system agents (agents drive ongoing development of the platform)
Immediate beneficiaries	Same as sponsors	Participating industries and their farmers	Existing and new alternative food chains	Organic actors and organic food systems
Agents of change	TSC members, the members' suppliers (consumer-goods producers)	Farmers, food industries	Food chain agents (producers, retailers, consumers, etc.)	Food system agents (producers, retailers, consumers, etc.)
Mode of participation (for the agents of change)	<i>Members:</i> collegiate <i>Suppliers:</i> contractual (they must comply with the new rules of the game)	<i>Industry:</i> collaborative <i>Farmers:</i> contractual, consultative, or collaborative	Collegiate (the food chains have ownership of their own transformation processes)	Collaborative to collegiate (the food system will have ownership of the operative platform)
The surmised aims of involvement of stakeholders (beside the stated goal of sustainability transformation)	<i>Members:</i> develop a new market segment and gain a competitive advantage <i>Suppliers:</i> gain access to the new market, competitive advantage	<i>Industry:</i> inter-grower competition, alignment with grower values <i>Farmers:</i> comparative benchmarking, competitive advantage	Mutual learning and inspiration, exchange of experiences on partnership organization and mediation of values in the food chain, influence the course of the development	Exposing and discussing values in form of criteria, coordinating and synchronizing decisions in the food system, influence the course of the development

4.1. View of Food System and Change

The Sustainability Consortium sees the food system as a global market system, focusing on the consumer goods industry (i.e., large businesses in global chains), and operates to enable competition between products based on their sustainability credentials. This has the dual purpose of enabling companies to compete on and profit from making more sustainable products and in this way encouraging the development of more sustainable food systems. Sustainability is seen as a feature that products have to a larger or lesser degree.

The NZ Sustainability Dashboard mainly sees the food system as a production system, focusing on localized (i.e., New Zealand) farmers and industries, and operates to assist and motivate the transformation to sustainable farming systems. The dual purpose is to promote sustainable transformation of the farming systems through scoring and benchmarking and enable them to compete better on a global market increasingly concerned with sustainability. Sustainability is seen as a state that farming systems can move toward.

HealthyGrowth sees the food system as self-organizing food chains, focusing on alternative, values-based and presumably more sustainable food chains, and operates to identify ways for alternative food chains to compete and grow in the food market and thereby make the food system more sustainable. The purpose is to investigate what enables such chains to grow in volume without losing their integrity and consumer trust. Sustainability is seen as an ongoing process that has to be continuously discussed and mediated in the food chain.

MultiTrust sees the food system as a self-organizing system, focusing on organic food systems based on shared values and ethical principles, and operates to develop tools that help actors in the system communicate on the criteria they use for making decisions and taking initiatives to develop

their practice. The purpose is to investigate how overall assessments may be used to help transform food systems to the better by exposing and communicating their value basis. Sustainability is seen as a continuing process of development based on communication of values.

The approaches differ in their perspectives on what food systems are and how they may be brought to change, as well as in the means they deploy to foster the emergence and adoption of sustainable practices. This diversity of conceptions and methods suggests that these approaches draw on a variety of rationales or grounds for action.

4.2. Involvement of Stakeholders

The Sustainability Consortium involves main market players and product suppliers in a common framework of sustainability accreditation. The involvement of the TSC members in developing the assessment framework indicates that they consider sustainability an important marketing factor. Members fund the initiative and are the beneficiaries of the tools that are being developed. In the development team, there are member representatives (often chairing the working groups), experts from companies, and associated researchers involved in the construction and prioritization of measures and indicators, and effectively elaborating new sustainability standards for market accreditation. Decision-making is, however, limited to the members. The suppliers are direct agents of change, and they must comply with the new requirements to gain access to the growing market segment for sustainable products. They are not part of the development team, nor involved in testing or giving feedback on the approach. The involvement of the suppliers can thus be described as contractual.

The NZ Sustainability Dashboard project involves partners from the primary industry in developing the sustainability assessment framework and in setting targets to be achieved. NZSD is funded by the New Zealand government and several industries and universities. The beneficiaries are the participating industries and individual farmers in those industries. Farmers are direct agents of change, and they are expected to feed data to the sustainability assessment tool and adjust their farming performance in accordance with their benchmarking and performance relative to reference values. In most cases the developers are consultants (who chair the working groups), researchers from the associated universities, and industry partners. Farmers are consulted about their expectations for the tool and to test tool prototypes by way of stakeholder workshops, surveys and interviews. In the kiwifruit industry farmers are included in the development to help define the goal and structure of the tool, following a collaborative mode of participation. In other industries, such as New Zealand Wine, the participation of farmers is more institutionalized and channeled through industry governance and management. In this case the industry is a direct agent of change in the same way that government regulation is a direct agent of change in so far as the institutional rules and regulations can be enforced.

HealthyGrowth works to support the agents of the food chains in organizing their own chains and the value communication in the chain. HG is an EU ERA-net project funded by ten member states, with the alternative organic food chains as main beneficiaries. HG researchers are the main developers of the project as such, but the initiation and development of the alternative food chains is solely in the hands of the food chain agents (including producers, retailers, consumers, etc.) who are also, by default, the direct agents of change. The question of involvement is thus reversed in this case and researchers can be seen as to some degree involved in the sustainability transformation process. The project makes a point of distinguishing between disciplinary perspectives “owned” by the experts in the respective research fields, and a multi-perspectival research process that includes both research and stakeholder perspectives on an equal footing. The main mode of participation is collegiate in the sense that the food chains have ownership of their own transformation processes and every link in the chain is treated by the other as an equal partner.

The MultiTrust platform is conceived as tool that integrates into the organic food systems to support the agents’ own communication about the value-based criteria that are employed, or in demand, for development toward better and more sustainable organic food systems. The MultiTrust project as such is funded by the Danish Ministry of Food, whereas the proposed communicational

platform is to be funded and run by the organic food system itself, with the various food system agents (from producers to consumers) as main beneficiaries and the direct agents of change. In the start-up phase the involvement of stakeholders was collaborative, with the MT researchers taking responsibility for initial development. However, the plan is for the organic food system to take over further development and ongoing running of the platform, changing this into a fully collegiate participation mode.

4.3. The Role of Knowledge and Values

The Sustainability Consortium is focused on measures of impacts across the entire lifecycle of the products based on scientific knowledge. Quantification is a key element, such as the generation of indicators from binary scores of best practices, which allows for subsequent calculation of metrics that compare performance between competitors. TSC's global database entails a harmonization for comparability that allows for performance hotspot analysis and benchmarking. However, it also channelizes what is measured and how, which carries risks of unintended effects of losing local tuning and diversity and dumbing down other measurements and things that are hard to measure. There is no explicit, system-wide value-rational process that can guide the overall sustainability of decisions and initiatives by the direct agents of change. The approach is thus fundamentally performance based, building primarily on instrumental rationality.

The NZ Sustainability Dashboard project focuses on developing assessment metrics that can be easily captured and calculated and where there is a reference for objective performance indicators. The approach is primarily performance based in that it monitors performance assessments in relation to sustainability goals and aspires to set up benchmarks and targets to be achieved. The setting of overall sustainability goals for each industry builds on value-rationality, but the main focus and operation of the approach is based on instrumental rationality.

The HealthyGrowth project aims to help existing and new values-based food chains grow by facilitating mutual learning and inspiration through identification of significant success factors and narration of cases, with key chain agents as important communicators. The coherence and growth of the food chains depends on the successful communication about and mediation of these values across the chain. The chains are thus fundamentally based on value-rationality with instrumental rationality as a subordinate ground for action.

The MultiTrust project focuses on how overall assessments can help make food systems, especially organic food systems, more sustainable, looking at the role of knowledge, values and communication in such assessments. The main tool for change is an online cooperative, communicational platform that works by exposing and communicating the value-laden criteria that the food chain agents employ when they make decisions on buying or selling or taking new development initiatives. This allows for coordination of values-based decisions in the system and for comparison of stated criteria and tangible initiatives with the organic values and ethical principles. The approach is thus clearly based on value-rationality, bringing in assessments and instrumental rationality only where this makes sense to the food chain agents on the basis of their criteria.

4.4. The Road to Sustainability Transformation

The stated purpose of all the approaches is to promote more sustainable food systems, that is, sustainability transformation. However, they harbor different rationales for how transformation is brought about.

The TSC and NZSD approaches assume that assessment is sufficient to lead to transformation and that the underlying values are agreed by the agents of change. Their focus is therefore on measuring performance through assessments. This is based on instrumental rationality. Even though the TSC and NZSD approaches are shaped around sustainability goals, which are evidently values-based, they are operating and set up according to an instrumental rationality where results of performance assessments are intended to drive the transformation. The mechanisms envisioned to lead from

assessments to transformation include benchmarking between producers, target setting by industries or market players, and individual or guided learning processes.

On the other hand, the HG and MTP approaches assume that reinforcement and nurturing of the values is the most important, even sufficient in itself to drive transformation. They have comparatively little interest in measurement to show that stated values are coupled with practices that produce the outcomes sanctioned by the agreed sustainability values.

In TSC sustainability accreditation is expected to secure and increase profit. However, the degree to which this leads to actual sustainability transformation depends on how crucial to overall sustainability the specific implemented measures are, and whether the actions taken by the companies to meet the targets have other effects that counteract sustainability transformation. Moreover, companies outside the Consortium will only be influenced by the TSC framework to the degree that they share the assumption that sustainability is an important market factor, and decide to enter into the TSC framework or establish competing sustainability frameworks.

For NZSD the same considerations as for TSC apply in terms of whether the performance measures in themselves can guide sustainability transformation, albeit with the addition of practitioner-driven indicator selection processes and benchmarking. Moreover, since it works with entire industries, the NZSD project has the potential for NZ wide coverage. In the case of NZ Wine, NZSD works with 94% of the NZ vineyard area and inclusion and participation in the sustainable transformation of most of the NZ wine production can thus be ensured. However, whether this will ultimately lead to actual sustainability transformation depends on the chosen performance measures and targets and how appropriate the actions taken to meet these performance measures and targets are in regard to overall sustainability.

In HG the focus is on processes of what is assumed to be transformations to more sustainable food systems, in form of growth of food chains that are intentionally and explicitly oriented toward specific values. Decisions and initiatives made as a result of the project will directly lead to sustainability transformation in so far as the value basis is consistent with the values of sustainability. However, this transformation will only apply to the chains involved, and a broader increase in sustainability will depend on the growth of these chains or the emergence of new values-based chains aiming at sustainability transformation.

In MTP the focus is on communicative processes that are presumed to lead towards a more sustainable food system by way of decisions and initiatives by the agents in the food chain, because they are based on the fundamental values and ethical principles of organic agriculture. In so far as the proposed tool is generally adapted, this will directly lead to sustainability transformation, on the conditions that the food agents are sincere in their use of the tool (and trust each other to be sincere) and that the criteria are consistent with the values of sustainability.

5. Discussion

Looking beyond the specific cases, what can be learned from these differences between performance-based and values-based approaches to sustainability transformation? Specifically, how are the questions of why and how stakeholders should be involved related to the main rationale of the approach, and how can the identified strengths and weaknesses of the two very different, ideal-typical approaches be used to further develop actual approaches to sustainability transformation? To address these questions in full, we first summarize key strengths and weaknesses of performance-based and values-based approaches in Table 2 as a basis for the discussion of these ideal-typical approaches to sustainability transformation.

Table 2. Strengths and weaknesses of approaches to sustainability transformation.

	Performance-Based Approaches	Values-Based Approaches
Strengths	<p>Continuous adjustment of actions to improve performance and achieve targets.</p> <p>Delineates consequences of alternative practices, which gives clear directions for choosing.</p> <p>Allows for a firm risk assessment.</p> <p>Measures the gap between current and desired states, which allows for scaling of investments.</p> <p>Clear basis for accreditation and marketing.</p> <p>Benchmarking can motivate individual responsibility.</p> <p>Credibility of the process (in an instrumentally rational sense).</p> <p>Sets sustainability as a definite target to be reached.</p>	<p>Continuous coordination of values between stakeholders.</p> <p>All agents of change are involved in deciding where to head.</p> <p>Allows for a broad recruitment of agents based on shared values.</p> <p>Enforces a social contract about common purpose.</p> <p>Brings the value basis of tools into focus and discussion.</p> <p>The shared value basis gives resilience to guide actions in a future and uncertain world.</p> <p>Ownership of the process, which furthers increased motivation and legitimacy of the process.</p> <p>Sets sustainability as an ethical goal to be pursued.</p>
Weaknesses	<p>Steers by what is possible (and easy) to measure.</p> <p>Neglects the unknown consequences.</p> <p>The means become the targets, and the targets may not lead to the overall goal of sustainability.</p> <p>Quantification and indexation hides contextual information.</p> <p>Petrifies value discussions and the value basis of tools.</p> <p>Neglects agents of change as individual decision-makers.</p> <p>Agents of change do not get ownership of the values.</p>	<p>Difficult to ascertain which actions fit the values.</p> <p>Difficult to choose between alternatives.</p> <p>Complex to communicate benefits in the market.</p> <p>Difficult to involve agents that do not share the value basis.</p> <p>Uncertainty on the actual consequences of values-based actions.</p> <p>Requires trust that the values are put into action.</p> <p>Lacks credibility (in an instrumentally rational sense).</p>

5.1. Stakeholder Roles and Rationales

The rationale for acting towards sustainability transformation is closely connected to the rationale for involving the agents of change in the transformation (cf. [86]). Performance-based approaches, on one hand, tend to involve agents of change in an instrumental way to improve results. That is, food chain agents, such as suppliers in TSC and farmers in NZSD, can be compelled by market incitements or organizational means to pursue certain targets that are deemed to be instrumental in bringing about sustainability transformation. This can be very efficient in terms of the ratio of involvement, and it leaves the agents free as to how they are going to meet the targets. However, an important complication is that there is a variety of knowledges and experiences in social-ecological systems [87], and different ways of reasoning among stakeholders such as the different “production logics” found in organic farming [88]. The downside to instrumental involvement is that the actions taken to most efficiently meet the targets may turn out to not actually contribute to sustainability, or even have negative effects, because the agents act instrumentally with the targets as the goal and not based on an orientation toward the overall goal of sustainability. It also risks alienating the agents of change who operate in local conditions dependent on time, place, ecology and culture, leading to a loss of ownership and motivation toward overall sustainability transformation. This is a well-known problem in regulation of agriculture, where there often is a discrepancy between expected and actual outcome of regulation due to differences in values and way of reasoning between the regulatory system

and the farming systems [89], thus limiting the capacity of public authorities to act as direct agents of change.

Values-based approaches, on the other hand, tend to involve agents of change by way of an invitation to share values and set the course of development; in HG the focus is the self-organizing processes of food chains, in MTP it is a tool for exposing and communicating value-based criteria. The food chain agents in HG and MTP can enter into establishing alternative food chains or into developing the organic food system if they to some degree agree with the value basis, or at least are able to act on this basis. This can be a major barrier to a large ratio of involvement due to the observed heterogeneity in values among, e.g., farmers [90]. The upside is that all the actually involved food chain agents act on a common value basis, or on a shared pool of values that are continuously discussed, and that their actions are thereby continuously re-oriented toward the overall goal of sustainability.

In terms of learning *how* to move towards more sustainable practices, performance-based approaches channel our attention to how the agents can seek an agreed state that gives effect to assumed values. Values-based approaches do not put the 'how' to test, but presuppose we know what to do, assuming we agree on the values and how to balance their various nuances. The difference is not that performance-based approaches work towards a goal and values-based do not. Having values as a ground of action does not preclude having a goal; often the value basis can have the form of a vision of a desired future. However, the difference is that a values-based approach does not expect that this future can be brought about by calculating how to get there based on available knowledge, whereas a performance-based approach does not expect that values-based actions will bring about this future.

There are different ways in which the weaknesses of each approach can be handled. One option is to employ a different rationale for involvement than the general rationale for transformation, i.e., values-based involvement in performance-based approaches and instrumental involvement in values-based approaches, but this is not unproblematic.

In performance-based approaches there is not a general consensus about what should go into the assessment framework due to the importance of context specificity, plurality and flexibility [91]. Therefore, efforts may be made to establish a shared value basis in a specific performance-based approach, for example by involving representatives for the agents of change in the development of the performance-based tools through stakeholder workshops etc., based on the idea that we have to transform values, as well as farming practices and technologies, if resilient and sustainable food, fiber and energy systems are to emerge. However, this can be of little avail if it does not acknowledge the existence of different values and perspectives and the need to open up for handling such differences as a basis for development of tools.

In values-based approaches, a seemingly obvious option is to incorporate market mechanisms, or other institutionalized incentives, to induce performance-based efficiency into the values-based system. However, this can turn out to be counter-productive, because it interferes with the mediation of values that the system depends on, or because the values are transformed or restrained by having performance based approaches operating alongside or as part of a learning and transformation feedback loop. For instance, the HealthyGrowth project shows that establishing long term partnerships rather than relying on standard short term market contracts promotes the chances for success of values-based food chains [79].

The bottom line is that the two approaches offer very different conditions for involvement of stakeholders due to the different rationalities employed.

5.2. *The Role of Motivation: Making the Agent Act*

Societal goals for sustainable development risk falling short of expectations because of what has been called "cockpit-ism" [92]: the illusion that top-down steering by governments alone can address global sustainability problems. This is an illusion because it disregards the problem of how to mobilize agents of change. Motivation is an important means to bridge the divide between

sustainability assessment and sustainability transformation, and also to understand the difference between the values-based and the performance-based approaches. Where Weber's two types of rationality, instrumental rationality and value-rationality, are concerned with the communicable grounds for social action, motivation is related to the individual, affective or emotional grounds for action, which are outside the social sphere of rationality. Following John Maynard Keynes' distinction between the rational motive for acting (the ground of action) and the psychological motive for acting (the cause of action) [93], we distinguish between three aspects of acting towards sustainability: (1) what the rationale for acting is; (2) what actually makes the agent act; and (3) which acts actually lead to sustainability transformation.

The distinction between value-rationality and instrumental rationality reviewed throughout the present paper informs the first aspect. To inform the second, we need to distinguish between intrinsic and extrinsic motivation as the basis for the intention to act (see also [94,95]). Intrinsic motivation is when the agent acts out of own interest and inherent satisfaction; it is the prototype of autonomous or self-determined behavior, which does not need encouraging, nudging or whipping from outside. Extrinsic motivation is when the agent acts on something instrumental to a value that is held by the agent. It ranges from acting on incentives from outside to situations where the extrinsic motivation has been more or less internalized [96]. Intrinsic motivation is integrally connected to the needs for competence and autonomy, and feelings of competence, autonomy and relatedness are all crucial factors for the process of internalization. Accordingly, rewards, deadlines, imposed goals, competition, evaluation, and negative feedback have all been shown to decrease intrinsic motivation, presumably because they were experienced as controls [94]. Conversely, positive performance feedback is expected to enhance it.

The distinction between instrumental and non-instrumental thus plays a basic role in the motivation for acting (2 above) as well as in the rationale for acting (1 above). Being based on instrumental rationality, performance-based approaches risk reducing (non-instrumental) intrinsic motivation towards the broader sustainability values and goals, and therefore may fall short on sustainability issues that are not part of the performance structure. Hence, performance-based approaches have to have a clear strategy for working with motivation to ensure that the scheduled goals are reached. Individuals that are intrinsically motivated towards an activity will improve not only their performance, but also their endurance and determination to succeed in the long term. Multiple factors must be met to nurture intrinsic motivation: participation, a sense of accomplishment, an enjoyment in taking part, and an understanding of the inherent benefits of the activity all help. Even if individuals have knowledge of the need to enhance performance, and hold to sustainable values, they still might not increase their performance if the factors that are required to motivate them to do so are not in place.

Deliberation of which acts will eventually lead to sustainability transformation (3 above) must be rooted within one or the other form of rationality (but never both). Performance-based approaches focus on a number of selected aspects of sustainability, whereas the values-based approaches focus on actions that are believed to promote overall sustainability. Actions may have both direct and indirect transformative potential, i.e., change may result directly from the action itself or indirectly by influencing the actions of other agents. For example, one successful act that triggers transformation may inspire other agents to act. This is a form of extrinsic motivation that gets internalized to build intrinsic motivation. Such growth processes based on inspiration and internalization seem crucial to values-based approaches. Growth of transformation might also be based on social cognitive processes leading to the formation of a social unit or "collective" that perceives and acts as one [97], or based on social contracts in which the immediate needs and opportunities of individuals are trumped by the groups longer term interests. This transgresses the model of agents as individual selves that motivational processes are based on.

The importance of intrinsic motivation underpins the arguments made in this paper that there is a more direct engagement with sustainability transformation in values-based approaches than in

performance-based approaches. In other words, the issue of intrinsic motivation as a limiting force seems especially connected to performance-based approaches. However, performance assessment can offer other forms of motivation by enabling agents to see how to approach an agreed valued state. A particular form of this is the “improvement escalator”—a type of lumbering, slow and impassive performance incentivization process based on monitoring performance and then benchmarking, empowered by performance anxiety or competition [77].

5.3. *The Case of Organic Agriculture: A Tension between Rationales*

Organic agriculture is an instructive case to illustrate the tension between performance-based and values-based approaches because it embraces aspects of both. Many conflicts within organic agriculture, such as the questions of transport from areas with better production conditions versus zero-miles consumption, the use of irrigation versus preserving water resources, and leaching of nutrients versus animal welfare in outdoor pig production, can be seen as debates around which practices perform best within an instrumental rationale. Similarly, there are tensions between production forms due to “epistemic barriers”, the fact that not all aspects of sustainability are equally readily revealed [98]. However, there are also tensions reflecting more fundamental divergences between performance-based and values-based approaches.

On the one hand, organic agriculture can in itself be considered a values-based approach to sustainability transformation since it builds on an explicit and broadly accepted set of values in form of the Principles of organic agriculture [81,82]. On the other hand, organic agriculture is undergoing a rapid development to improve the production based on research and development that often relies on performance-based methods. A marked tension between the two approaches is expressed, for example, in the distinction between input-replacement organic agriculture and agroecology-based organic agriculture. The first makes the partial, utilitarian changes that are needed to comply with the organic rules in an otherwise conventional system, whereas the latter demands fundamental structural changes and new modes of practice compared to a conventional system. A similar tension is expressed in Paul Thompson’s distinction between resource sufficiency and functional integrity as two quite distinct approaches to agricultural sustainability [99–101].

This two-sided character of organic agriculture is documented in the “conventionalization” debate [102,103], which was spurred by the observation that in some cases the practices of organic farms comply with the regulations, but not with the principles of organic agriculture. The elaborate organic certification system allows the organic food system to function without reference to the organic value basis. This enables development in terms of efficiency improvement, growth in scale, mechanization, use of new technologies, and specialization and differentiation of production systems that in many ways resembles the development of conventional agriculture. Conventionalized organic agriculture takes the rules as given conditions, and measures performance mainly in terms of economic returns. A performance-based approach could move this form of organic agriculture closer to the founding values, if the performance measures reflect those values and not just the present regulations. A value-based approach could challenge the values embedded in the regulations and the very idea that the organic regulations and economic drivers are sufficient to guide the transformation to more sustainable food systems. It may even challenge the values that have been determined in the Principles of organic agriculture.

Many organic actors are aware of this tension and work to remedy the downside of the market accreditation system and the risks in incorporating performance assessments at the expense of guidance from the organic values. This motivated the values-based approaches in the HG and MTP projects which focused on tools and practices that can support value communication along the food chain. The communication of values, and of the (value-based) criteria that are used for taking decisions on daily practices and development initiatives, is crucial to establish shared values and build long-term partnerships between the involved businesses and organizations. Conversely, the concern whether

organic standards are sufficient to ensure that the organic agricultural practices are sustainable has led to calls for a broadened and deepened performance-based assessment of organics [104].

5.4. Complementarity of Rationalities

Instrumental rationality and value-rationality cannot be fused into one combined rationality that preserves the strengths of both. “As ideal types, the two [types of rational social action] are utterly opposed. One type asks: ‘What are the demands of my values, and how can I conduct myself consistently with them?’ The other type is uninterested in consistency with values, but rather asks: ‘What is the most efficient route from A to B?’” Although these two rationalities are usually combined in actual life, Weber held that there is no rationality that mediates between the two; hence, ethical decision making is always fraught with risk and ambiguity.” [105] (p. 419).

In fact, the two rationalities are complementary. You cannot at the same time base your actions on intentions and consequences. To act instrumentally excludes that you at the same time act based on values, you have to disregard values as partial and biased to be able to rely solely on the instrumental calculations. Conversely, to act fully value-rationally, you have to disregard instrumental calculations of consequences as partial and biased. This is a form of observer stance complementarity [106], where value-rationality is based on an involved observer stance, focusing on clarifying the internal world and forming intentions in form of values and ethical principles as a ground for action, and instrumental rationality is based on a detached observer stance, focusing on describing the external world and producing expectations in form of general knowledge as a ground for action.

The same form of complementarity, we propose, can be found between the derived concepts of values-based and performance-based approaches to sustainability transformation. The quantification, indexation, and metricization inherent in the construction of performance measures that is essential to performance-based approaches, comes at the cost of hiding the context and value basis and obstructing the mediation and communication of values that is essential to values-based approaches (cf. [107]). Conversely, the open and continued debate of fundamental values and the grounding of actions directly in values work against the determination of value-basis and grounding of actions in finely crafted metrics. This has also consequences for issues such as motivation, as discussed above, where the involved observer stance of values-based approaches support the intrinsic motivation that has been found to be important to actually instigating changes and sticking to goals, such as sustainability transformation, better than the detached observer stance of performance-based approaches. The consequence of this complementarity hypothesis is that we would seek in vain for in-between approaches that offer the strengths of both. Efforts to combine the two should take this fundamental complementarity into account and seek ways not to merge, but to transcend the two approaches.

5.5. Dynamics of Rationales

If, as we argue, values-based and performance-based approaches cannot be merged, we might ask whether and how they can interact with each other in some form of dynamics of rationales. This can be either in diachronic (evolutionary or historical) processes such as the structuralization and institutionalization of rationales or in synchronic (contemporary) processes such as the cooperation and conflict between different rationales. Weber himself described historical processes where value-rationality became transformed into instrumental rationality through institutionalization. Notably, he argued in *The protestant ethic* how religious sentiments in form of the protestant work ethic reanimated and changed social institutions to form the basis for capitalism [59,108]. Systems may be designed in the service of particular values, but once established, they carry on instrumentally in ways that leave practitioners with no other choice, so it no longer becomes an exercise of values. “Today the spirit of religious asceticism—whether finally, who knows?—has escaped from the cage. But victorious capitalism, since it rests on mechanical foundations, needs its support no longer.” [59] (pp. 181–182).

Along the same line, we described above how the value basis of organic agriculture has historically been institutionalized in form of international standards and regulations, and argued that this was accompanied by a shift from value-rationality to instrumental rationality. A similar institutionalization of value-rationality, but into assessment tools instead of standards (see [47]), seems to be a prerequisite for any performance-based approach to sustainability transformation. The cost is that the value basis becomes tacit and hidden. The implication of this is that assessments can be designed in the pursuit of values, but once they are adopted and have economic and practical benefits, action can become so logical and calculative that it is almost impossible to make values-based decisions outside of that utilitarian sphere and to even see them as valued-laden activities.

This again underpins the complementarity between values-based and performance-based approaches in synchronic processes, since it is not possible to, at the same time, determine and stabilize values as a basis for performance assessments and having an open discussion on what values to base decisions on. This complementarity is made clear by the elaboration of the two approaches as ideal-types. More generally, the meeting of different rationalities can lead to conflicts (e.g., [105]), especially if there is not enough awareness of the rationalities at work and their importance in relation to the involvement of stakeholders, knowledges and values.

When, for example, researchers develop a specific sustainability assessment tool, the chosen tool is necessarily embedded with a particular worldview and particular values in form of assumptions on what is important to measure and methods for how to measure it [47]. Sometimes there is a deliberate and elaborate value-rational process of determining the values that form the basis for the tool and, thus, the instrumental rationality of using the tool to measure and improve food system structures and practices. However, in the process of institutionalization of such sustainability assessment tools, where the tools are standardized and disseminated as monitoring tools or performance measures, the embedded value basis no longer functions as a ground of action. The value-rational decisions are excluded by the tool's instrumentally rational function.

Moreover, we may envisage a dialectical process of shifts between instrumental and value-rationality. For example, once there is a sense of value-rational agreement, there is an effort to align instrumental rationality to support it, and then as the value-rationality disappears it creates space for diverse values to oppose this instrumental rationality, and it swings the other way.

Following this idea, there may be options for more dynamic, staged approaches that repeatedly shift between relying on value-rationality and instrumental rationality as linked alternating phases in a reflexive learning process of motivating and orienting change in the behavior of farming and food systems. However, such approaches would require new tools and procedures that are able to handle values and knowledges explicitly and on an equal footing and in relation to multiple scientific and stakeholder perspectives; tools that can observe one perspective from the vantage point of the other, and thereby be better able to find possible blind spots in the perspective in focus [60,109,110]. So far, we have not seen such explicitly staged, multi-perspectival approaches to sustainability transformation.

5.6. Toward a Reflexive Rationality

We find a distinction that is similar to Weber's distinction between instrumental rationality and value-rationality in the traditional distinction between consequentialist and non-consequentialist ethics (e.g., [111]). In consequentialist ethics, such as utilitarianism, the morally right thing to do is the thing that will have the best consequences, whereas non-consequentialist ethics is a diverse group of approaches in ethics, such as deontological or duty ethics and virtue ethics, which have in common that they focus on the morally right actions regardless of the possible consequences of those actions. Weber made his distinction in relation to "social action", whereas the distinction between consequentialist and non-consequentialist ethics is made in relation to "moral action". We will not here explore the connection between social and moral action in detail, but only make a brief argument for the relevance of work on moral action to substantiate our proposal of a third type of rationality.

In regard to Weber's [52] characterization of instrumental and value-rationality as meaningfully oriented (social) action that is based on an understandable and communicable rationale, moral action is a subset of this where the rationale has a compelling character grounded in the valuation of certain values above others, such as the intrinsic value of persons and living beings. Sustainability is (also) an ethical or normative concept [101,112], e.g., based on a systemic extension of moral considerability to the ecological communities that we are part of [113], and social action towards sustainability therefore corresponds to moral action. Hence the work on moral grounds of action has direct implications for our discussion of rationales for sustainability transformation.

In ethics, different grounds of action can be seen as a potential expansion of the sphere of moral action, from a (non-consequentialist) focus on the *character* and *intentions* of the moral agent to a (consequentialist) concern for the *known consequences* and impacts of those actions, and further on to a concern for the *unknown consequences* and the limits of observation and knowledge. "Including unknown consequences diminishes the moral importance of the known consequences, and therefore increases the importance of intentions and principles of moral acting, but it also provides a new basis for critical reflection on the intentions and principles of acting" [113] (p. 73). The inclusion of unknown consequences as a moral ground of action is the source of relatively (compared to the thousands of years of ethical history) new ethical concepts such as the precautionary principle, ecological justice, and sustainability understood as functional integrity.

In the context of the present paper, this suggests that there is yet another form of rationale, which transcends the two types of rationality suggested by Weber. As ideal-types, value-rationality disregards general knowledge as a ground for action, and instrumental rationality disregards the limits of science-based knowledge, and it is this very disregarding that gives these two types their force as rationales. The new, third form of rationale, which we call *reflexive rationality*, will take into account both the available scientific knowledge and the limits of knowledge, giving new weight to values in regard to instrumental rationality and new weight to knowledge in regard to value-rationality. However, it is not just a combination of the two; it is not possible to get reflexive rationality by simply combining the two, because reflexive rationality requires a rethinking of the boundaries of both instrumental rationality and value-rationality. Such rethinking needs to take into account the role of scientific and stakeholder perspectives, as well as differences in rationales and values, in addressing "wicked problems", such as sustainability, where there are different interests and different perspectives involved that frame the problem differently [114]. Reflexive rationality therefore requires observation of a second order [60,109,115] and polyocular, or multi-perspectival, communication [116], and this is only possible by recognizing the restrictions internal to value-rationality as well as instrumental rationality.

An example of reflexive rationality in action is found in the precautionary principle (e.g., [117]), which has played an important role in European environmental and food legislation for decades [118], but which is also highly contested in relation to risk assessment in for instance international trade agreements [119,120]. In the widespread praxis of risk assessment, we may speak of "instrumentally rational precaution". This is based on the available scientific knowledge and ignores ignorance regarding the causal consequences of the decision and the values and preferences of those who might be affected. Although the precautionary principle must also be science-based and calls for further research in form of society's capacity for early detection of dangers, this principle entails a different approach to ignorance that can be called "reflexive precaution". This involves reflections on the limits of knowledge and control, and deliberate strategies for handling ignorance and uncertainty (cf. [121]). The precautionary principle requires that preventive action must be taken in front of irreversible changes with unforeseeable consequences, in advance of conclusive scientific evidence of the danger (e.g., [118]). Thereby the principle shifts power from science-based knowledge to basic ethical principles on responsibility towards the natural basis of life and future generations.

5.7. Beyond Performance versus Values

Above, we proposed a new and third type of rationality, reflexive rationality, based on rethinking the boundaries of instrumental rationality and value-rationality. An overview of the characteristics of the three types of rationality is given in Table 3. As noted, we see reflexive rationality acted out in form of the precautionary principle. There is, however, a much larger potential, and need, for reflexive rationality in relation to the growing complexity of social-ecological systems and the wicked problems facing modern society, which calls for embracing diversity and ambiguity [122] and for handling values and uncertainties (e.g., [123,124]).

Table 3. Three types of rationality.

	Value-Rationality	Instrumental Rationality	Reflexive Rationality
Action	Grounded in explicitly formulated values	Grounded in knowledge-based expectations of the consequences of the action	Grounded in both knowledge, the limits of knowledge, and values
Process	Consistent intentional and purposeful orientation of the action to these values	Means and ends are rationally considered, taken into account, and weighed	Deliberate strategies for handling ignorance and uncertainty
Meaning	The meaning of the action lies in the intrinsic value of the action	The meaning of the action lies in the achievement of end results	The meaning of the action lies in the wise use of knowledge
Blind spots	Disregards science-based knowledge as a ground for action	Disregards the limits of science-based knowledge	Disregards that a second order perspective is still a perspective
Tools	Processes of value formulation and communication	Performance measures and targets	Second order observation and polyocular communication
Examples	Practices based on the ethical principles of organic agriculture	Decisions based on performance measures, e.g., risk assessment	Decisions based on the precautionary principle

Reflexive rationality can help underpin new strategies for sustainability transformation, but the tools to bring reflexive rationality into action are sorely lacking. Assessment in itself is not enough; participation in itself is not enough; intention in itself is not enough. We need tools better able to handle the variety of values, knowledges and stakeholders needed for sustainability transformation and to take into account the various limits of rationality: (1) Tools that can explicitly handle knowledge gaps, limits of knowledge, perspectives as basis of knowledge, and values as basis for assessments; which are robust towards the dominance of the measurable and the failure of good intentions; and which underpin the role of acting early in form of effortless action (*wu wei*) [125], and acting cautiously in form of precautionary action; (2) Tools that take into account key social mechanisms such as trust, in accordance with Luhmann who developed the understanding of trust as a reduction of social complexity [126,127], and power, in accordance with Flyvbjerg who developed the classic concept of *phronesis* (i.e., prudence or practical wisdom) to handle issues of values and power [54,128]. “*Phronesis* is most important because it is that activity by which instrumental rationality is balanced by value-rationality, and because such balancing is crucial to the sustained happiness of the citizens in any society, according to Aristotle.” [54] (p. 4); And (3) tools that can take into account the reality of social systems and their role in relation to sustainability, and the need for coordination and synchronization of social systems with different time bindings and time horizons to enable sustainability transformation [115,129].

Performance-based approaches are dominant today with regard to the role of science in sustainability transformation as well as other societal goals. The reasons are obvious, drawing on the might of science and the strength of instrumental rationality. The mistake is to think of the performance as the end in itself. Values-based approaches are thriving outside the limelight, showing an entirely different, agent-based and value-driven approach to sustainability transformation; a successful, but still quite restricted approach. It would be a mistake, however, to fathom the values-based approach as an alternative that can relieve performance-based approaches of their duty. The way forward is to build on the strengths of these two ideal-typical approaches and seek to avoid their weaknesses. Not by finding the happy medium; this will have the strength of neither, because bringing in the perspective of performance destroys values as ground of action and bringing in the perspective of values destroys performance as ground of action. However, by employing these two approaches as elements in a reflexive approach that acknowledges their potential and limits, and which establishes a third, yet to be fully determined, ground of action that incorporates the limits of both good intentions and known consequences; a ground of action similar to the rationale found in the precautionary principle.

In a reflexive approach, performance assessment is just one step, and it will be worthless without agreeing on and rewarding values that promote sustainability. Equally, having sustainable values in place is worthless if we do not know where we are now, why, where we want to get to, and how we can best get there. One way to conceive this reflexive approach is as an ongoing feedback dialogue between all players in a society under a constantly changing set of pressures, a polyocular communication that can handle different perspectives, rationales and values, and which leads to increased opportunity for values transformation and practice transformation to co-evolve. One of the subtle imprisoning effects of mensuration is the way it implies that a crisp goal state can be predetermined, yet resilience thinking says it will always be a changing set of targets or at least a blurry target. We do not expect the same definition of values and little requirement to measure players' "orientations" towards sustainability in the same crisp terms. Hence values tend to be left out of the conversation in some blind assumption that the numbers alone will guide us to increased human and environmental wellbeing.

Both performance-based and values-based approaches are invaluable, but both have their weaknesses and we cannot do both at the same time. When one approach takes the lead, we need to use the perspective of the other to see where the first goes astray, and find complementary ways forward. Based on reflexive rationality, performance measures and indicators have the potential to support communicative action through reasoned justification, bringing to open and conscious reflection the criteria and grounds for action, and thus avoiding the enhancement of an instrumental rationalization and the dominance of an instrumental, or purposive, means–end rationality [52,66]. Correspondingly, discussions and decisions on foundational values have the potential to place available performance measures in a wider and more comprehensive context.

6. Conclusions

There are two very different ideal-typical approaches to the role of research in sustainability transformation. Some of their respective strengths are that performance-based approaches excel in delineating consequences of alternative practices and continuously adjusting actions to improve performance and achieve targets, whereas values-based approaches excel in their continuous coordination of values between all the agents of change as a resilient guide to actions in an uncertain world. Some of their weaknesses are that performance-based approaches neglect unknown consequences and steer by what is easy to measure, while values-based approaches require trust that the values are put into action and suffer from uncertainty about the actual consequences of values-based actions.

Performance-based approaches rely on instrumental rationality where actions are grounded in knowledge-based expectations of how to reach the chosen ends, whereas values-based approaches rely on value-rationality where actions are based directly on values in themselves. Both approaches are equally focused on bringing about a more sustainable future. The difference is that a values-based

approach does not expect that this future can be brought about by calculating how to get there based on available scientific knowledge, whereas a performance-based approach does not expect that values-based actions will bring about the desired future.

While instrumental rationality has been dominant and decisive for the development of modern civilization, mensuration has an uneven, structuring effect over and above the strengths and weaknesses of leading off the conversation on values versus performance. Performance-based approaches are well-known and widespread, values-based less prominent. However, contrasting the two as equally valid approaches to sustainability transformation is crucial to understand why both may fail, and to see how to progress. The lessons learned from contra-posing the two are, however, rather intricate.

The two approaches offer very different conditions for involvement of stakeholders due to the different rationalities employed. Performance-based approaches typically work toward general tools that are tested scientifically and which refer to international norms. Due to their instrumental nature and the dominant position of instrumental rationality they can have very strong institutionalized incentives for participating, which ensures that targets are met. This serves to substantiate the general validity and coverage of the tools, but it also risks alienating the agents of change who operate in local conditions dependent on time, place, ecology and culture, leading to a loss of ownership and motivation toward overall sustainability transformation. Values-based approaches typically involve agents of change in a shared value communication which promotes ownership and motivation for working toward overall sustainability transformation, and which is flexible towards different and variable conditions. However, they may have difficulties in achieving a wide coverage due to the heterogeneity of values among stakeholders.

We see no option for finding an optimal, in-between approach that offers the best of both ideal-types, because they are complementary in the sense that they rely on mutually exclusive grounds of action; you cannot at the same time act based on intentions and consequences. The quantification, indexation, and metricization inherent in the construction of performance measures comes at the cost of hiding the context and value basis and obstructing the mediation and communication of values. Conversely, the open and continued debate of fundamental values and the grounding of actions directly in values work against the fixation of values and grounding of actions in finely crafted and elaborated metrics.

Efforts to combine the performance-based and values-based approaches must take this fundamental complementarity into account and seek ways not to merge, but to transcend them. For instance, there are options for reflexive learning between the two types of approaches by observing one perspective from the vantage point of the other, and thereby be better able to find possible blind spots in the perspective in focus. For essentially values-based approaches, such as farming and food systems based on the ethical principles of organic agriculture, the results indicate that great care should be taken when employing performance measures to improve the system. The measures and connected targets will necessarily be focused only at certain aspects of the system. The specific directions gained from these performance measures should be balanced by other perspectives and the wider concerns inherent in the value basis to take into consideration the unmeasured and unmeasurable effects. If performance based approaches are to transform food systems, it will not be enough to just discuss and determine their value basis in the development stage. It would be even worse to deploy a predefined performance-based tool without reflecting on the values embedded in the selection and design of performance measures. Instead, the underlying values must continue to play a role to balance and supplement the powerful but narrow performance measures and to help the agents of change keep the overall goal of their joint endeavor front and center of their plans, actions and communication.

We now urge adoption of a third type of approach to sustainability transformation based on reflexive rationality as a third and distinct type of rationality. Reflexive rationality grounds social action in the available empirical and experiential knowledge, takes the contextual and perspectival basis of knowledge into account, and relies on values and ethics where knowledge ends.

The reflexive rationality approach proposed here transcends the existing approaches to sustainability transformation. So far, it has only been enacted in limited and restricted forms such as the precautionary principle. We expect that innovative and adequate tools will be needed before it can fully facilitate sustainability transformations. This calls for decision makers, researchers and agents of change to expand their usual modes of reasoning. Successful sustainability transformations will require a greater consideration of the basis and limits of knowledge, special focus on motivation and communication for change, and especially a critical reflection on values and performance assessment as complementary strategies to build a sustainable future.

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References and Notes

1. Weber, M. *Wirtschaft und Gesellschaft. Grundriss der Verstehenden Soziologie*; Mohr Siebeck: Tübingen, Germany, 1922. (In German)
2. “Wie jedes Handeln kann auch das soziale Handeln bestimmt sein 1. *zweckrational*: durch Erwartungen des Verhaltens von Gegenständen der Außenwelt und von anderen Menschen und unter Benutzung dieser Erwartungen als »Bedingungen« oder als »Mittel« für rational, als Erfolg, erstrebte und abgewogene eigne Zwecke,—2. *wertrational*: durch bewußten Glauben an den—ethischen, ästhetischen, religiösen oder wie immer sonst zu deutenden—unbedingten *Eigenwert* eines bestimmten Sichverhaltens rein als solchen und unabhängig vom Erfolg . . . ”
3. Foley, J.A.; Ramankutty, N.; Brauman, K.A.; Cassidy, E.S.; Gerber, J.S.; Johnston, M.; Mueller, N.D.; O’Connell, C.; Ray, D.K.; West, P.C.; et al. Solutions for a cultivated planet. *Nature* **2011**, *478*, 337–342. [[CrossRef](#)] [[PubMed](#)]
4. Rockström, J.; Steffen, W.; Noone, K.; Persson, Å.; Chapin, F.S.; Lambin, E.; Lenton, T.M.; Scheffer, M.; Folke, C.; Schellnhuber, H.J.; et al. Planetary boundaries: Exploring the safe operating space for humanity. *Ecol. Soc.* **2009**, *14*, 32. [[CrossRef](#)]
5. Steffen, W.; Richardson, K.; Rockström, J.; Cornell, S.E.; Fetzer, I.; Bennett, E.M.; Biggs, R.; Carpenter, S.R.; de Vries, W.; de Wit, C.A.; et al. Planetary boundaries: Guiding human development on a changing planet. *Science* **2015**, *347*, 1259855. [[CrossRef](#)] [[PubMed](#)]
6. Ness, B.; Urbel-Piirsalu, E.; Anderberg, S.; Olsson, L. Categorising tools for sustainability assessment. *Ecol. Econ.* **2007**, *60*, 498–508. [[CrossRef](#)]
7. Van Passel, S.; Meul, M. Multilevel and multi-user sustainability assessment of farming systems. *Environ. Impact Assess. Rev.* **2012**, *32*, 170–180. [[CrossRef](#)]
8. Schader, C.; Grenz, J.; Meier, M.S.; Stolze, M. Scope and precision of sustainability assessment approaches to food systems. *Ecol. Soc.* **2014**, *19*, 42. [[CrossRef](#)]

9. Often, “sustainability transformation” is used interchangeably with the more frequently used term “sustainability transition”, and both focus on transformative change at the systems level. The terms are, however, connected to different research networks and research agendas [10]. The notion of transition is used in a closely knit network strongly linked to the Dutch sustainable policy context whereas transformation has a larger scope and a broader basis [11]. Transition has a focus on major, radical transformations or discontinuous shifts to new socio-technical systems with new technologies and new social groups, whereas transformation refers to adaptive changes in the trajectories of existing systems, related to changes in what guides innovative action [12] (p. 228). In relation to socio-ecological systems such as food systems, the fundamental connection to ecological systems together with precautionary considerations speak for adaptive and gradual changes (though there may be elements of radical innovations and transitions), and therefore we mainly use the term sustainability transformation in this paper (in line with, e.g., [13–16]).
10. Elzen, B.; Geels, F.W.; Green, K. *System Innovation and the Transition to Sustainability: Theory, Evidence and Policy*; Edward Elgar Publishing: Cheltenham, UK, 2004.
11. Chappin, E.J.L.; Ligtoet, A. Transition and transformation: A bibliometric analysis of two scientific networks researching socio-technical change. *Renew. Sustain. Energy Rev.* **2014**, *30*, 715–723. [[CrossRef](#)]
12. Geels, F.W.; Kemp, R. Transitions, transformations and reproduction : Dynamics in socio-technical systems. In *Flexibility and Stability in the Innovating Economy*; McKelvey, M., Holmén, M., Eds.; Oxford University Press: Oxford, UK, 2006; pp. 227–256.
13. Abson, D.J.; Fischer, J.; Leventon, J.; Newig, J.; Schomerus, T.; Vilsmaier, U.; von Wehrden, H.; Abernethy, P.; Ives, C.D.; Jager, N.W.; et al. Leverage points for sustainability transformation. *Ambio* **2016**, *46*, 30–39. [[CrossRef](#)] [[PubMed](#)]
14. Kim, S. Interdisciplinary approaches and methods for sustainable transformation and innovation. *Sustainability* **2015**, *7*, 3977–3983. [[CrossRef](#)]
15. Moore, J. Ecological footprints and lifestyle archetypes: Exploring dimensions of consumption and the transformation needed to achieve urban sustainability. *Sustainability* **2015**, *7*, 4747–4763. [[CrossRef](#)]
16. Ziervogel, G.; Cowen, A.; Ziniades, J. Moving from adaptive to transformative capacity: Building foundations for inclusive, thriving, and regenerative urban settlements. *Sustainability* **2016**, *8*, 955. [[CrossRef](#)]
17. Smith, A.; Stirling, A. The politics of social-ecological resilience and sustainable socio-technical transitions. *Ecol. Soc.* **2010**, *15*, 11. [[CrossRef](#)]
18. Wiek, A.; Ness, B.; Schweizer-Ries, P.; Brand, F.S.; Farioli, F. From complex systems analysis to transformational change: A comparative appraisal of sustainability science projects. *Sustain. Sci.* **2012**, *7*, 5–24. [[CrossRef](#)]
19. Folke, C.; Carpenter, S.R.; Walker, B.; Scheffer, M.; Chapin, T.; Rockström, J. Resilience thinking: Integrating resilience, adaptability and transformability. *Ecol. Soc.* **2010**, *15*, 20. [[CrossRef](#)]
20. Alrøe, H.F.; Kristensen, E.S. Towards a systemic research methodology in agriculture rethinking the role of values in science. *Agric. Hum. Values* **2002**, *19*, 3–23. [[CrossRef](#)]
21. Wittmayer, J.M.; Schöpke, N. Action, research and participation: Roles of researchers in sustainability transitions. *Sustain. Sci.* **2014**, *9*, 483–496. [[CrossRef](#)]
22. Burns, T.R. The sustainability revolution: A societal paradigm shift. *Sustainability* **2012**, *4*, 1118–1134. [[CrossRef](#)]
23. Fischer-Kowalski, M.; Rotmans, J. Conceptualizing, observing, and influencing social-ecological transitions. *Ecol. Soc.* **2009**, *14*, 3. [[CrossRef](#)]
24. Veldkamp, A.; Van Altvorst, A.C.; Eweg, R.; Jacobsen, E.; Van Kleef, A.; Van Latesteijn, H.; Mager, S.; Mommaas, H.; Smeets, P.J.A.M.; Spaans, L.; et al. Triggering transitions towards sustainable development of the Dutch agricultural sector: TransForum’s approach. *Agron. Sustain. Dev.* **2009**, *29*, 87–96. [[CrossRef](#)]
25. Darnhofer, I.; Fairweather, J.; Moller, H. Assessing a farm’s sustainability: Insights from resilience thinking. *Int. J. Agric. Sustain.* **2010**, *8*, 186–198. [[CrossRef](#)]
26. Leach, M.; Rockström, J.; Raskin, P.; Scoones, I.; Stirling, A.C.; Smith, A.; Thompson, J.; Millstone, E.; Ely, A.; Arond, E.; et al. Transforming innovation for sustainability. *Ecol. Soc.* **2012**, *17*, 11. [[CrossRef](#)]
27. Wilson, S.; Pearson, L.J.; Kashima, Y.; Lusher, D.; Pearson, C. Separating adaptive maintenance (resilience) and transformative capacity of social-ecological systems. *Ecol. Soc.* **2013**, *18*, 22. [[CrossRef](#)]
28. Olsson, P.; Galaz, V.; Boonstra, W.J. Sustainability transformations: A resilience perspective. *Ecol. Soc.* **2014**, *19*, 1. [[CrossRef](#)]

29. Hinrichs, C.C. Transitions to sustainability: A change in thinking about food systems change? *Agric. Hum. Values* **2014**, *31*, 143–155. [[CrossRef](#)]
30. Heras, M.; Tàbara, J.D. Let's play transformations! Performative methods for sustainability. *Sustain. Sci.* **2014**, *9*, 379–398. [[CrossRef](#)]
31. Duru, M.; Therond, O.; Fares, M.H. Designing agroecological transitions; A review. *Agron. Sustain. Dev.* **2015**, *35*, 1237–1257. [[CrossRef](#)]
32. McAlpine, C.A.; Seabrook, L.M.; Ryan, J.G.; Feeney, B.J.; Ripple, W.J.; Ehrlich, A.H.; Ehrlich, P.R. Transformational change: Creating a safe operating space for humanity. *Ecol. Soc.* **2015**, *20*, 56. [[CrossRef](#)]
33. Hayden, A.; Wilson, J. Is it what you measure that really matters? The struggle to move beyond GDP in Canada. *Sustainability* **2016**, *8*, 623.
34. Miller, T.R.; Wiek, A.; Sarewitz, D.; Robinson, J.; Olsson, L.; Kriebel, D.; Loorbach, D. The future of sustainability science: A solutions-oriented research agenda. *Sustain. Sci.* **2014**, *9*, 239–246. [[CrossRef](#)]
35. Triste, L.; Marchand, F.; Debryne, L.; Meul, M.; Lauwers, L. Reflection on the development process of a sustainability assessment tool: Learning from a Flemish case. *Ecol. Soc.* **2014**, *19*, 47. [[CrossRef](#)]
36. Cerf, M.; Jeuffroy, M.-H.; Prost, L.; Meynard, J.-M. Participatory design of agricultural decision support tools: Taking account of the use situations. *Agron. Sustain. Dev.* **2012**, *32*, 899–910. [[CrossRef](#)]
37. Woodward, S.J.R.; Romera, A.J.; Beskow, W.B.; Lovatt, S.J. Better simulation modelling to support farming systems innovation: Review and synthesis. *N. Z. J. Agric. Res.* **2008**, *51*, 235–252. [[CrossRef](#)]
38. Díez, E.; McIntosh, B.S. A review of the factors which influence the use and usefulness of information systems. *Environ. Model. Softw.* **2009**, *24*, 588–602. [[CrossRef](#)]
39. Reed, M.S. Stakeholder participation for environmental management: A literature review. *Biol. Conserv.* **2008**, *141*, 2417–2431. [[CrossRef](#)]
40. Wesselink, A.; Hoppe, R. If post-normal science is the solution, what is the problem?: The politics of activist environmental science. *Sci. Technol. Hum. Values* **2011**, *36*, 389–412. [[CrossRef](#)]
41. Polk, M. Achieving the promise of transdisciplinarity: A critical exploration of the relationship between transdisciplinary research and societal problem solving. *Sustain. Sci.* **2014**, *9*, 439–451. [[CrossRef](#)]
42. The notion of “system failure” comes from from the perspective of innovation systems in sustainability transition studies [43]. The notion assumes the existence of an ideal market or system, in comparison with which deficits or failures can be identified. This terminology can be questioned, but the identified failures do point out important problems for sustainability transformation.
43. Weber, K.M.; Rohrer, H. Legitimizing research, technology and innovation policies for transformative change: Combining insights from innovation systems and multi-level perspective in a comprehensive ‘failures’ framework. *Res. Policy* **2012**, *41*, 1037–1047. [[CrossRef](#)]
44. Gasparatos, A.; Scolobig, A. Choosing the most appropriate sustainability assessment tool. *Ecol. Econ.* **2012**, *80*, 1–7. [[CrossRef](#)]
45. Brunori, G.; Galli, F.; Barjolle, D.; van Broekhuizen, R.; Colombo, L.; Giampietro, M.; Kirwan, J.; Lang, T.; Mathijs, E.; Maye, D.; et al. Are local food chains more sustainable than global food chains? Considerations for assessment. *Sustainability* **2016**, *8*, 449. [[CrossRef](#)]
46. Brunori, G.; Galli, F. Sustainability of local and global food chains: Introduction to the special issue. *Sustainability* **2016**, *8*, 765. [[CrossRef](#)]
47. Gasparatos, A. Embedded value systems in sustainability assessment tools and their implications. *J. Environ. Manag.* **2010**, *91*, 1613–1622. [[CrossRef](#)] [[PubMed](#)]
48. Alrøe, H.F.; Møller, H.; Laessøe, J.; Noe, E. Opportunities and challenges for multicriteria assessment of food system sustainability. *Ecol. Soc.* **2016**, *21*, 38. [[CrossRef](#)]
49. Jones, N.A.; Shaw, S.; Ross, H.; Witt, K.; Pinner, B. The study of human values in understanding and managing social-ecological systems. *Ecol. Soc.* **2016**, *21*, 15. [[CrossRef](#)]

50. In the present paper we want to bring attention to the role that the type of rationale (the ground or reason for acting) plays in sustainability transformation. Many other important factors to sustainability transformation have been identified in the growing sustainability transition literature, such as technological innovations, social and cultural issues, economics, policy and power (see, e.g., [51], and the other papers in the special issue introduced in this editorial). Other important issues for sustainability transformation have been identified in the sustainability assessment literature, such as value communication, trust and motivation (see, e.g., [48], and the other papers in the special feature introduced in this editorial). It is not possible to address all these issues in the present paper, but we do discuss the relation between some of these issues and the type of rationale in the Discussion section.
51. Markard, J.; Raven, R.; Truffer, B. Sustainability transitions: An emerging field of research and its prospects. *Res. Policy* **2012**, *41*, 955–967. [\[CrossRef\]](#)
52. Weber, M. *Economy and Society. An Outline of Interpretive Sociology*; University of California Press: Berkely, CA, USA, 1978.
53. Weiss, J. Max Weber's distinction between means-end rationality and value-rationality—rationale, scope, difficulties. In *Social Action*; Seebass, G., Tuomela, R., Eds.; D. Reidel: Dordrecht, The Netherlands, 1985; pp. 207–223.
54. Flyvbjerg, B. *Making Social Science Matter: Why Social Inquiry Fails and How It Can Succeed Again*; Cambridge University Press: Cambridge, UK, 2001.
55. Beckermann, A. Value-rationality and the distinction between goal-oriented and value-oriented behavior in Weber. In *Social Action*; Seebass, G., Tuomela, R., Eds.; D. Reidel: Dordrecht, The Netherlands, 1985; pp. 225–233.
56. Kroneberg, C. Wertrationalität und das Modell der Frame-Selektion. *Kölner Zeitschrift für Soziologie und Sozialpsychologie* **2007**, *59*, 215–239. (In German) [\[CrossRef\]](#)
57. McDonald, H.G. Creative actualization: A pluralist theory of value. *Contemp. Pragmat.* **2006**, *3*, 117–150. [\[CrossRef\]](#)
58. Von Scheve, C. Societal origins of values and evaluative feelings. In *Handbook of Value*; Brosch, T., Sander, D., Eds.; Oxford University Press: Oxford, UK, 2016; pp. 175–195.
59. Weber, M. *The Protestant Ethic and the Spirit of Capitalism*; Scribner: New York, NY, USA, 1958.
60. Luhmann, N. *Social Systems*; Stanford University Press: Stanford, CA, USA, 1995.
61. Weber, M. "Objectivity" in social science and social policy. In *Max Weber on the Methodology of the Social Sciences*; Shils, E.A., Finch, H.A., Eds.; The Free Press: Glencoe, IL, USA, 1949; pp. 49–112.
62. Neely, A. The performance measurement revolution: Why now and what next? *Int. J. Oper. Prod. Manag.* **1999**, *19*, 205–228. [\[CrossRef\]](#)
63. Neely, A.; Richards, H.; Mills, J.; Platts, K.; Bourne, M. Designing performance measures: A structured approach. *Int. J. Oper. Prod. Manag.* **1997**, *17*, 1131–1152. [\[CrossRef\]](#)
64. Behn, R.D. Why measure performance? Different purposes require different measures. *Public Adm. Rev.* **2003**, *63*, 586–606. [\[CrossRef\]](#)
65. Nicholson-Crotty, S.; Theobald, N.A.; Nicholson-Crotty, J. Disparate measures: Public managers and performance-measurement strategies. *Public Adm. Rev.* **2006**, *66*, 101–113. [\[CrossRef\]](#)
66. Townley, B.; Cooper, D.J.; Oakes, L. Performance measures and the rationalization of organizations. *Org. Stud.* **2003**, *24*, 1045–1071. [\[CrossRef\]](#)
67. Khan, S.; Vanwynsberghe, R. Cultivating the under-mined: Cross-case analysis as knowledge mobilization. *For. Qual. Sozialforschung/For. Qual. Soc. Res.* **2008**, *9*, 1–18.
68. That is, we are not familiar with any approaches to the role of research in sustainability transformation that fall in between the performance-based and values-based. Many approaches build on performance-based and values-based elements in some mixture, though not always explicitly and deliberately. Usually the recognized emphasis is on one of them and we expect that the approaches that show a clear emphasis on either a performance-based strategy or a values-based strategy are most fruitful for the analysis made here.
69. Stephens, J.C.; Hernandez, M.E.; Román, M.; Graham, A.C.; Scholz, R.W. Higher education as a change agent for sustainability in different cultures and contexts. *Int. J. Sustain. High. Educ.* **2008**, *9*, 317–338. [\[CrossRef\]](#)
70. Fischer, L.-B.; Newig, J. Importance of actors and agency in sustainability transitions: A systematic exploration of the literature. *Sustainability* **2016**, *8*, 476. [\[CrossRef\]](#)

71. Biggs, S.D. *Resource-Poor Farmer Participation in Research: A Synthesis of Experiences from National Agricultural Research Systems*; International Service for National Agricultural Research: The Hague, The Netherlands, 1989.
72. Probst, K.; Hagmann, J. *Understanding Participatory Research in the Context of Natural Resource Management—Paradigms, Approaches and Typologies*; AgREN Network Paper 130; Overseas Development Institute: London, UK, 2003.
73. Barreteau, O.; Bots, P.W.G.; Daniell, K.A. A framework for clarifying “participation” in participatory research to prevent its rejection for the wrong reasons. *Ecol. Soc.* **2010**, *15*, 1. [[CrossRef](#)]
74. The Sustainability Consortium. Available online: <http://www.sustainabilityconsortium.org> (accessed on 21 February 2017).
75. Still, H.; Gentle, H.; Lu, Y.; Wallis, J.; Whitehead, J.; Moller, H. *Are We There Yet? Use of Reference Values for Assessing and Encouraging Sustainable Agriculture*; Center for Sustainability, University of Otago: Dunedin, New Zealand, unpublished.
76. The New Zealand Sustainability Dashboard Project. Available online: <http://www.nzdashboard.org.nz> (accessed on 21 February 2017).
77. Whitehead, J.; Lu, Y.; Still, H.; Wallis, J.; Gentle, H.; Moller, H. Target setting and burden sharing in sustainability assessment beyond the farm level. In *12th European International Farming Systems Symposium, 12–15 July 2016, Workshop 2.4*; Harper Adams University: Newport, UK, 2016.
78. The HealthyGrowth Project: From Niche to Volume with Integrity and Trust. Available online: <http://healthygrowth.eu> (accessed on 21 February 2017).
79. Noe, E.; Laursen, K.; Kjeldsen, C. *Mediation of Values from Production to Consumption—A Relational Analysis of Values Based Organic Food Chains*; HealthyGrowth Task 5 Report; The HealthyGrowth Project, Aarhus University: Tjele, Denmark, 2016. Available online: http://projects.au.dk/fileadmin/projects/healthygrowth/Task_Reports/TASK_5_REPORT.pdf (accessed on 21 February 2017).
80. Alrøe, H.F.; Noe, E. How can we know if organics becomes better? A perspectivist view on multicriteria assessment. In *Building Organic Bridges*; Rahmann, G., Aksoy, U., Eds.; Johann Heinrich von Thünen-Institut: Braunschweig, Germany, 2014; pp. 191–194.
81. Lutikholt, L.W.M. Principles of organic agriculture as formulated by the International Federation of Organic Agriculture Movements. *NJAS Wagening. J. Life Sci.* **2007**, *54*, 347–360. [[CrossRef](#)]
82. IFOAM. *Principles of Organic Agriculture*; International Federation of Organic Agriculture Movements: Bonn, Germany, 2005.
83. Alrøe, H.F.; Noe, E. A prototype tool for multicriteria assessments to develop organic food chains. In *Building Organic Bridges*; Rahmann, G., Aksoy, U., Eds.; Johann Heinrich von Thünen-Institut: Braunschweig, Germany, 2014; pp. 195–198.
84. An Animated Presentation of the MultiTrust Platform Tool. Available online: https://youtu.be/UF15_4knPUA (accessed on 21 February 2017).
85. Kastberg, P. Promoting communication, participation, and learning with regard to organic food products: A communication theoretical approach. *Ecol. Soc.* **2015**, *20*, 3. [[CrossRef](#)]
86. Wesselink, A.; Paavola, J.; Fritsch, O.; Renn, O. Rationales for public participation in environmental policy and governance: Practitioners’ perspectives. *Environ. Plann. A* **2011**, *43*, 2688–2704. [[CrossRef](#)]
87. Benessia, A.; Funtowicz, S.; Bradshaw, G.; Ferri, F.; Ráez-Luna, E.F.; Medina, C.P. Hybridizing sustainability: Towards a new praxis for the present human predicament. *Sustain. Sci.* **2012**, *7*, 75–89. [[CrossRef](#)]
88. Noe, E.; Alrøe, H.F.; Thorsøe, M.H.; Olesen, J.E.; Sørensen, P.; Melander, B.; Fog, E. Knowledge asymmetries between research and practice: A social systems approach to implementation barriers in organic arable farming. *Sociol. Rural.* **2015**, *55*, 460–482. [[CrossRef](#)]
89. Noe, E.B.; Alrøe, H.F. Regulation of agroecosystems: A social systems analysis of agroecology and law. In *Law and Agroecology: A Transdisciplinary Dialogue*; Montedure, M., Buengiorno, P., Benedetto, S.D., Isoni, A., Eds.; Springer: Berlin, Germany, 2015; pp. 31–45.
90. Darnhofer, I.; Schneeberger, W.; Freyer, B. Converting or not converting to organic farming in Austria: Farmer types and their rationale. *Agric. Hum. Values* **2005**, *22*, 39–52. [[CrossRef](#)]

91. De Olde, E.M.; Moller, H.; Marchand, F.; McDowell, R.W.; MacLeod, C.J.; Sautier, M.; Halloy, S.; Barber, A.; Benge, J.; Bockstaller, C.; et al. When experts disagree: The need to rethink indicator selection for assessing sustainability of agriculture. *Environ. Dev. Sustain.* **2016**. (First Online). Available online: <http://dx.doi.org/10.1007/s10668-016-9803-x> (accessed on 21 February 2017). [[CrossRef](#)]
92. Hajer, M.; Nilsson, M.; Raworth, K.; Bakker, P.; Berkhout, F.; de Boer, Y.; Rockström, J.; Ludwig, K.; Kok, M. Beyond cockpit-ism: Four insights to enhance the transformative potential of the sustainable development goals. *Sustainability* **2015**, *7*, 1651–1660. [[CrossRef](#)]
93. Carabelli, A. Keynes on probability, uncertainty and tragic choices. *Cahiers d'économie Politique/Pap. Polit. Econ.* **1998**, *30*, 187–226. [[CrossRef](#)]
94. Ryan, R.M.; Deci, E.L. Overview of self-determination theory: An organismic-dialectical perspective. In *Handbook of Self-Determination Research*; Deci, E.L., Ryan, R.M., Eds.; University of Rochester Press: Rochester, NY, USA, 2002; pp. 3–33.
95. Deci, E.L.; Ryan, R.M. *Intrinsic Motivation and Self-Determination in Human Behavior*; Plenum Publishing Co.: New York, NY, USA, 1985.
96. Richard M. Ryan and Edward L. Deci distinguish between three types of motivation, *amotivation*, *extrinsic motivation* and *intrinsic motivation*, connected to six types of regulation on the self-determination continuum [94]. Amotivation is the state of lacking the intention to act, corresponding to *non-regulated* behavior. Extrinsic motivation ranges from the least autonomous, acting on the basis of *external regulation* such as reward and punishment, over *introjection* where an external regulation has been internalized, but not accepted as one's own (like self-censoring), and *identification* where the external goal or regulation has been internalized, but is still separated from one's other beliefs and values, to the full *integration* of external regulation in congruence with the personally endorsed values, goals, and needs. The latter is close to intrinsic motivation, but the acts are still instrumental to a separable value deeper integrated with the self. At the fully self-determined end of the continuum is intrinsic motivation, corresponding to *intrinsic regulation*.
97. Marsh, K.L.; Richardson, M.J.; Baron, R.M.; Schmidt, R.C. Contrasting approaches to perceiving and acting with others. *Ecol. Psychol.* **2006**, *18*, 1–38. [[CrossRef](#)]
98. Carolan, M.S. Do you see what I see? Examining the epistemic barriers to sustainable agriculture. *Rural Sociol.* **2006**, *71*, 232–260.
99. One type of approach conceptualizes sustainability as a problem of *resource sufficiency*. This is an “accounting” approach that presumes the ability to measure and calculate the proper balance between present resource use and future needs on the basis of the available knowledge of the consumption of resources. The other type of approach conceptualizes sustainability in terms of the *functional integrity* of a self-regenerating system. On this view, a practice that creates a threat to the system's capacity for reproducing itself over time is said to be unsustainable, taking risks and limits of knowledge into account. The two types differ in which questions they take to be most fundamental, and each of them will tend to subsume the other as less fundamental.
100. Thompson, P.B. Agricultural sustainability: What it is and what it is not. *Int. J. Agric. Sustain.* **2007**, *5*, 5–16.
101. Thompson, P.B. Sustainability as a norm. *Soc. Philos. Technol.* **1996**, *2*, 75–93.
102. Guthman, J. The trouble with 'organic lite' in California: A rejoinder to the 'conventionalisation' debate. *Sociol. Rural.* **2004**, *44*, 301–316. [[CrossRef](#)]
103. Darnhofer, I.; Lindenthal, T.; Bartel-Kratochvil, R.; Zollitsch, W. Conventionalisation of organic farming practices: From structural criteria towards an assessment based on organic principles. A review. *Agron. Sustain. Dev.* **2010**, *30*, 67–81. [[CrossRef](#)]
104. Merfield, C.; Moller, H.; Manhire, J.; Rosin, C.; Norton, S.; Carey, P.; Hunt, L.; Reid, J.; Fairweather, J.; Benge, J.; et al. Are organic standards sufficient to ensure sustainable agriculture? Lessons from New Zealand's ARGOS and Sustainability Dashboard projects. *Sustain. Agric. Res.* **2015**, *4*, 158. [[CrossRef](#)]
105. Starr, B.E. The structure of Max Weber's ethic of responsibility. *J. Relig. Ethics* **1999**, *27*, 407–434. [[CrossRef](#)]
106. Alrøe, H.F.; Noe, E. Sustainability assessment and complementarity. *Ecol. Soc.* **2016**, *21*, 30. [[CrossRef](#)]
107. Kelly, A.; Burrows, R. Measuring the value of sociology—Some notes on performative metricisation in the contemporary academy. In *Measure and Value*; Adkins, L., Lury, C., Eds.; Wiley-Blackwell: Oxford, UK, 2012; pp. 130–150.
108. Nee, V.; Swedberg, R. *On Capitalism*; Stanford University Press: Stanford, CA, USA, 2007.
109. Luhmann, N.; Behnke, K. The modernity of science. *New Germ. Crit.* **1994**, *61*, 9–23. [[CrossRef](#)]

110. Burisch, R.; Wohlgemuth, V. Blind spots of dynamic capabilities: A systems theoretic perspective. *J. Innov. Knowl.* **2016**, *1*, 109–116. [[CrossRef](#)]
111. Thiroux, J.P.; Krasemann, K.W. *Ethics: Theory and Practice*, 11th ed.; Pearson: Upper Saddle River, NJ, USA, 2015.
112. Stumpf, K.; Baumgärtner, S.; Becker, C.; Sievers-Glotzbach, S. The justice dimension of sustainability: A systematic and general conceptual framework. *Sustainability* **2015**, *7*, 7438–7472. [[CrossRef](#)]
113. Alrøe, H.F.; Kristensen, E.S. Toward a systemic ethic: In search of an ethical basis for sustainability and precaution. *Environ. Ethics* **2003**, *25*, 59–78. [[CrossRef](#)]
114. Rittel, H.W.; Webber, M.M. Dilemmas in a general theory of planning. *Policy Sci.* **1973**, *4*, 155–169. [[CrossRef](#)]
115. Luhmann, N. *Ecological Communication*; Polity Press: Cambridge, MA, USA, 1989.
116. Alrøe, H.F.; Noe, E. Second-order science of interdisciplinary research: A polyocular framework for wicked problems. *Constr. Found.* **2014**, *10*, 65–76.
117. Krayer von Krauss, M.; van Asselt, M.B.A.; Henze, M.; Ravetz, J.; Beck, M.B. Uncertainty and precaution in environmental management. *Water Sci. Technol.* **2005**, *52*, 1–9. [[PubMed](#)]
118. O’Riordan, T.; Cameron, J. *Interpreting the Precautionary Principle*; Earthscan: London, UK, 1994.
119. Harremoës, P.; Gee, D.; MacGarvin, M.; Stirling, A.; Keys, J.; Wynne, B.; Vaz, S.G. *The Precautionary Principle in the 20th Century. Late Lessons from Early Warnings*; Earthscan Publications Ltd.: London, UK, 2002.
120. Cooney, R. *The Precautionary Principle in Biodiversity Conservation and Natural Resource Management*; IUCN: Gland, Switzerland; Cambridge, UK, 2004.
121. Ravetz, J.R. Usable knowledge, usable ignorance: Incomplete science with policy implications. *Sci. Commun.* **1987**, *9*, 87–116. [[CrossRef](#)]
122. Fleming, A.; Howden, S.M. Ambiguity: A new way of thinking about responses to climate change. *Sci. Total Environ.* **2016**, *571*, 1271–1274. [[CrossRef](#)] [[PubMed](#)]
123. Sluijs, J.V.D. Uncertainty as a monster in the science–policy interface: Four coping strategies. *Water Sci. Technol.* **2005**, *52*, 87–92.
124. Funtowicz, S.; Ravetz, J. Values and uncertainties. In *Handbook of Transdisciplinary Research*; Hirsch Hadorn, G., Hoffmann-Riem, H., Susette, B.-K., Grossenbacher-Mansuy, W., Joye, D., Pohl, C., Wiesmann, U., Zemp, E., Eds.; Springer: Dordrecht, The Netherlands, 2008; pp. 361–368.
125. Allen, B. *Vanishing into Things. Knowledge in Chinese Tradition*; Harvard University Press: Cambridge, MA, USA, 2015.
126. Luhmann, N. Familiarity, confidence, trust: Problems and alternatives. In *Trust: Making and Breaking Cooperative Relations*; Gambetta, D., Ed.; Department of Sociology, University of Oxford: Oxford, UK, 2000; pp. 94–107.
127. Lewis, J.D.; Weigert, A. Trust as a social reality. *Soc. Forces* **1985**, *63*, 967–985. [[CrossRef](#)]
128. Flyvbjerg, B.; Landman, T.; Schram, S. *Real Social Science: Applied Phronesis*; Cambridge University Press: Cambridge, UK, 2012.
129. Noe, E.; Alrøe, H.F. Sustainable agriculture issues explained by differentiation and structural coupling using social systems analysis. *Agron. Sustain. Dev.* **2015**, *35*, 133–144. [[CrossRef](#)]

