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THERE IS NO SINGLE CHALLENGE, NOR SINGLE SOLUTION, FOR FOOD SYSTEMS TRANSFORMATIONS: MAKING PLURALITY VISIBLE

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1. THE NEED FOR TRANSFORMATION OF FOOD SYSTEMS

There is consensus that the current global food system is not meeting the needs of people and the planet. Indeed, evidence shows that globally, food systems are the cause of many problems, including social (e.g. loss of local knowledge, loss of farmers, lack of generational shift, growing inequalities, unfair labour conditions), environmental (e.g. climate change, land use change and degradation, water shortages and contamination, biodiversity loss), and health-related (e.g. obesity, non-communicable diseases, hunger and nutrient deficiency, food contamination) (IPCC, 2019). In this context, hunger (800 million people), nutrient deficiency (two billion people) and obesity (two billion people) together with climate change are referred to as "syndemic" because their interaction is already the main cause of ill health and premature death in all regions of the world (Swinburn et al., 2019). Impacts of food systems relate not only to outcomes that we can measure, but also to cultural values, emotions or embodied experiences associated with food, its production, transformation and consumption. Despite being incommensurable, these are also critically important to consider when outlining potential interventions in food systems.

There is a growing call (and agreement) to transform food systems towards sustainable, just and healthy systems, understanding that transformation is about fundamental, system-wide changes, beyond piecemeal interventions (see Box 1 for the new FACCE-JPI approach to food systems). But, what does transformation look like? Is there a consensus about what we want to transform in food systems, who will do it and how?

The objective of this policy brief is to call for fairer, more inclusive and eventually, more effective decisions on food systems transformations. For doing so, it focuses on decision-making under uncertainty, highlighting

complexity and framings as two components of this: On one hand complexity requires us to avoid oversimplification of messages (see the livestock section) and on the other, framing calls for the integration of a plurality of values and worldviews (see the governance section). Thus, in the context of the UNFSS objective of transforming food systems, this brief aims to raise awareness of decision makers about the need of developing and using knowledge and tools that i) tackle the complexity of food systems as complex social-ecological systems, and ii) recognise the existence of different framing and values in a context of uncertainty. We also reflect on the role of science in this process. While our focus is global, we focus on Europe to exemplify our arguments. Yet, transformation cannot happen in one world region independently from the others. A global movement requires first adopters to start the process.

2. ACHIEVING SUSTAINABLE AND JUST TRANSFORMATION IS CHALLENGING: COMPLEXITY AND NARRATIVES

It is often said that there is no silver bullet solution for food system sustainability and yet we continuously strive to find the headline-making intervention that will "have the greatest impact at scale" (Pereira *et al.*, 2020) or the famous "low hanging fruits". So many problems in our food systems have stemmed from singular interventions that have not taken broader system interactions into account. The Green Revolution, for example, succeeded in increasing yields of certain key crops, but it has resulted in a simplification of our food systems being dominated by monocultures of rice, wheat, and maize; an over-reliance on agricultural inputs to the detriment of the environment and simultaneously financially excluding most farmers (Patel, 2007; Pingali, 2012). Moreover, food systems are affected by influences from adjacent ecological and social systems, such as the functioning of the financial

system or social security arrangements. Thus, there is also growing consensus that addressing food-related challenges requires a systems approach. A systems approach allows us to understand the variety of activities and outcomes as part of a complex social-ecological system; an intricate network of actors and institutions influenced by both socioeconomic (e.g. demographic, economic) and ecological (e.g. climate change) drivers of change, subject to complex regulatory and governance regimes. We cannot be allowed to make the same error of mistaking a particular intervention for a 'one-size-fits-all' approach. Making all this visible is critical to a systemic approach to food system transformation that takes into account diverse contexts, values and needs. But, acknowledging this complexity doesn't mean that solutions cannot be found, on the contrary.

The European Scientific Advisory Mechanism (SAM, 2019) defined a sustainable food system (for the EU) as one that:

“provides and promotes safe, nutritious and healthy food of low environmental impact for all current and future EU citizens in a manner that itself also protects and restores the natural environment and its ecosystem services, is robust and resilient, economically dynamic, just and fair, and socially acceptable and inclusive. It does so without compromising the availability of nutritious and healthy food for people living outside the EU, nor impairing their natural environment”.

How to achieve this goal becomes the critical question. A plurality of views exists, which differ in terms of pathways and strategies towards achieving this common goal. In this context, different actors mean different things by “food systems transformation”. Dealing with this diversity of meanings, views and ultimately narratives, is a challenge that needs to be

recognised in and of itself. It requires first to understand and to agree on what it is that we want to transform and what may need to stay the same. How do we enable such transformations at the systems level, whilst taking local contexts and experiences into account? We also need to consider whether all actors in the food system have the same capacity, power and agency to engage and lead transformation, whether there are winners and losers, and who those are. We need to find ways to compensate for the social and environmental impacts of food system processes and to avoid the current agri-food debt of the international food system, and particularly of the European food system (Oteros-Rozas et al., 2019). This task requires opening a deliberate transformation process towards the common goal of building a plurality of sustainable, just and healthy food systems.

In order to reconcile perspectives in the unified goal of food system transformation, we first need to acknowledge the existence of different narratives. The SAPEA report described five common narratives about food systems: *Food as a commodity, Food as a human right, Food as a common good, Food as identity and culture and Food as humans' closest link to nature*. To add to the complexity, we need to recognise that different contexts, different spatial scales, different sectors, actors and capacities for action in the form of agency and power exist. So, it is not only a plurality of visions, but also a plurality of realities where often the most dominant narratives and most powerful actors usually succeed at the expense of more contextual responses. It is then clear that to succeed in its primary goal of launching *“bold new actions to transform the way the world produces and consumes food, delivering progress on all 17 Sustainable Development Goals”* the UNFSS needs to consider the diversity of frames and narratives of food¹. In

¹ See also the opinion piece by special rapporteurs of the human right to food: <http://www.ipsnews.net/2021/03/un-food-systems-summit-not-respond-urgency-reform/>

particular, giving voice to those perspectives that are often the most marginalized.

3. FRAGMENTED ANALYSES CAN LEAD TO MISUNDERSTANDINGS: THE CASE OF LIVESTOCK.

The trend towards the fragmentation of research and the simplification of messages to explain a complex reality can lead us to misunderstandings, contradictions and ultimately, taking the wrong decisions or witnessing the failure of the decisions taken. In the current context, one clear example of a complex reality coming from research that is creating many misunderstandings is the case of livestock. Increased population, rising incomes, the industrialisation of livestock production and urbanisation have resulted in a growth in the consumption of animal source foods at the global level. For example, the global demand for meat has more than doubled since the 80's (FAOSTAT, 2021). This last trend has mostly affected low- and middle-income countries rather than high-income countries, which experienced this increase in demand in previous decades: Demand for meat in Europe only increased by 3% over the same period and is now on a decreasing trend in Western Europe.

In the past 2 decades, there has been an increased recognition and understanding of the impact of the livestock sector on the environment, including on climate (e.g. Mbow et al., 2019), water (e.g. Mekonnen & Hoekstra, 2012) and biodiversity. At the same time, animal-source foods have been described by the World Health Organization as the best source of high-quality nutrient-rich food for children aged 6–23 months (Adesogan et al., 2020) and a new study by the Global Alliance for Improved Nutrition has shown that animal products are the most affordable and efficient foods to close

the nutrition gaps in children (Beal et al., 2021). However, the correlations between the consumption of red and processed meat and some non-communicable diseases in Western diets is often dominating the debate.

Recent years have also seen a significant shift in how the media, especially in Western Europe and North America, are presenting a simplified message about livestock², often advertising the potential benefits of no-meat diets (Leroy et al., 2020). In this context, the message both consumers and policy-makers get is: *“To save the planet we need to stop eating meat”*. But the reality is much more complex globally, but also in the EU, as livestock cannot be seen only as a commodity. Consumption of meat varies from 4kg per year and per person to over 100kg in the world³. In Europe there is a diversity of livestock systems, which include large scale monogastric (pigs or chicken), mixed crop-livestock systems, extensive grazing ruminant systems, backyard poultry and pigs, among others. 58% of European farms hold animals and livestock farms employ around 4 million people (salaried and non-salaried), 80% of whom reside in the more recent EU member-states (Peyraud & MacLeod, 2020). This diversity of production systems also means a diversity of contributions to food and nutrition security, to livelihoods but also a diversity of links with the environment, which include both positive and negative impacts and require various and diverse solutions (Rivera-Ferre et al., 2016).

Comprehensive analyses, integrating the multiple contributions of animal production into the equation, are necessary. Studies show large differences in environmental effects between livestock species (e.g. cattle, pig, chicken, sheep) and feed (concentrate, grass, by-products). Due to the food competition between livestock and humans, for example with soy and grain, there is particularly great potential in the utilisation of

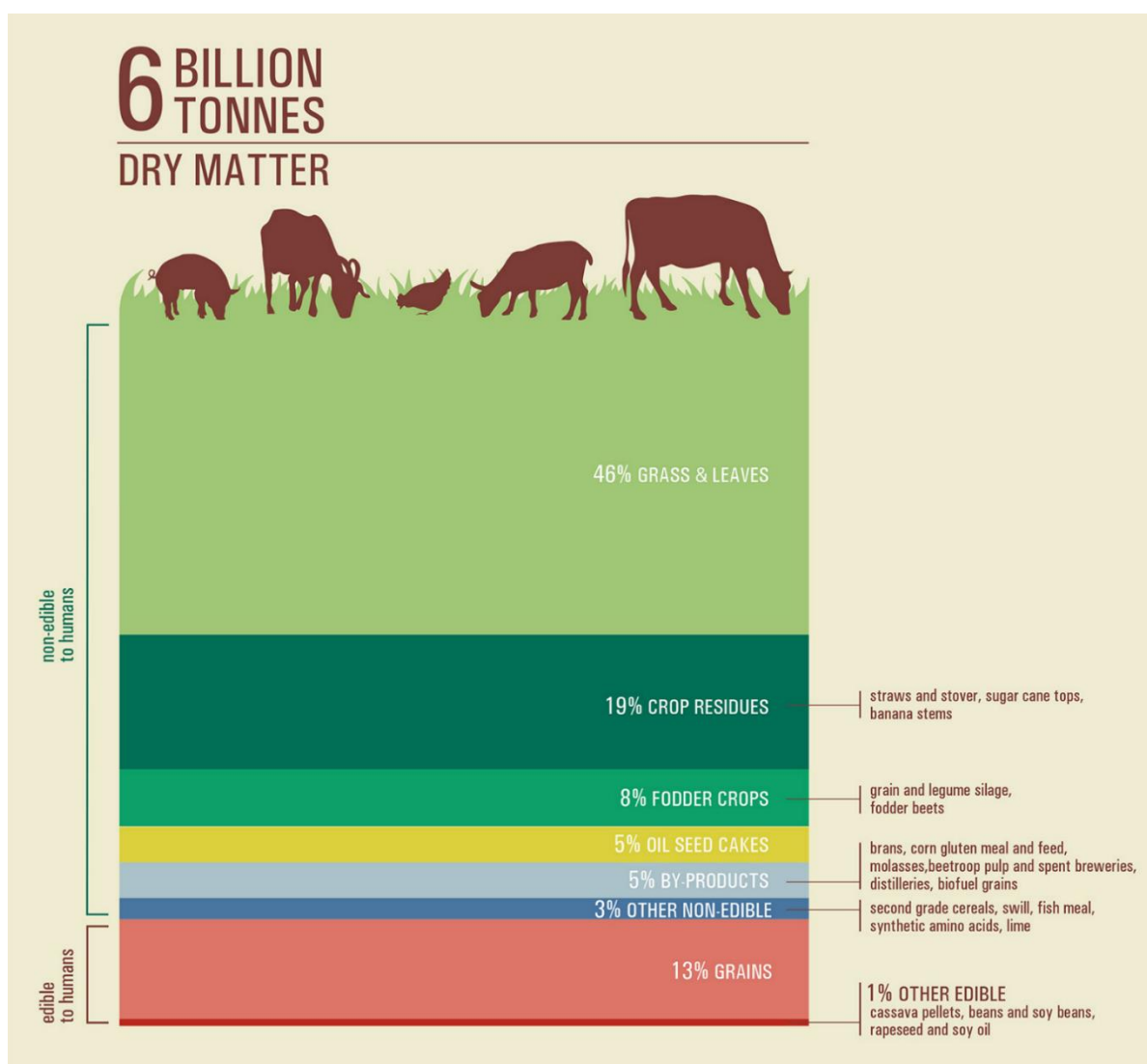
² It is worth noting that simplified messages also affect other food sub-sectors, such as the fisheries sector, but we focus here on the livestock example.

³ In carcass weight equivalent, which includes bones

grass, by-products from the agro-food industry and food waste (van Hal et al., 2019). A higher proportion of grass in the feed ration could also improve carbon storage and sequestration in soils (Knudsen et al., 2019). This could also significantly limit the need for feed imports and thus the externalisation of environmental pollution, even in the case of the extensification of agricultural production, due to local sustainability criteria (Westhoek et al., 2014).

In the case of ruminants, whilst it is true that they are responsible for GHG emissions, they also consume large amounts of biomass that are not edible by humans (including grass or agrifood waste), a large part of this biomass being produced on land that cannot be cropped (Mottet et al., 2017). When reported to nutrient density, GHG emissions of various types of food appear quite different and animal source foods

have a high ratio of nutrient density per kg of CO₂ equivalent. In addition, GHG emissions from livestock consist of methane for about 50% at global level, which is a short life climate pollutant whose actual climate warming potential varies when expressed in CO₂ equivalents over 100 years or with other metrics (Allen et al., 2018). We should not forget that ruminants also play a fundamental role in maintaining grasslands and pastures, reducing the frequency and severity of wildfires in the context of climate change and enhancing biodiversity. Livestock return nutrients to the soil through their organic waste, but they also shape traditional landscapes and cultures, and deliver a large diversity of products, including 230 protected geographical origin cheeses in the EU. Looking after their wellbeing forms part of the identity of many shepherds, cattle ranchers



The global livestock feed intake (adapted from Mottet et al., 2017)

etc. All this is particularly true in pastoralist systems which have been shown to provide “Nature Contributions to People” (Dean et al., 2021) and are often the only type of possible food system in the local ecosystems, especially in mountainous and arid environments.

These examples show that the required transformation in the livestock sector needs to consider the complex reality rather than responding to simple and linear messages. Multicriteria analysis and tools need to become the norm, rather than single criteria such as GHG emissions (Mottet et al., 2020). Decision makers also need to rely on a science that is constantly evolving and producing new evidence that may contradict the previous one. As stated by MacLeod and Peyraud (2020) in their recent report on livestock in Europe for the European Commission, a reduction of animal production will not necessarily lead to more sustainable agrifood systems and decision makers need to think twice before forming an opinion on the sector. Diets with more fruits and vegetables and less animal products do not necessarily have a lower carbon footprint than a diet balancing plant and animal source foods. While overconsumption of all types of food, including meat, is detrimental to human health, to the environment and to animal welfare, we should emphasise ‘more of the better’ rather than ‘less or none’. More sustainable food systems must continue to rely on livestock, as well as on crops, forests, fisheries and aquaculture.

4. THE ROLE OF SCIENCE AND SCIENTISTS IN TRANSFORMATIONS

So, in this context of complexity and diversity of values and narratives, where there is however a predominant tendency of simplification, what role can science and research play? Scientists have a variety of crucial roles to play, all of them important. The literature categorises their role into two transformation-focus research strings:

transformation research and transformative research (WBGU 2011).

Transformation research is mainly focused on retrospectively observing and describing causes for transformation; as well as on understanding the role of power, technology, societies, etc., in food system transformation. Indeed, there is still a lot of important work that needs to be done in bringing evidence of the impacts of current food systems trajectories for both the health of the planet, but also of its people. This is true of both the biophysical implications of the food system (Springmann et al., 2016; Gordon et al., 2017; Willett et al., 2019), and the socio-economic, political and power structures that embed inequities in who gets access to healthy food and whose labour goes into making it (Lang and Heasman, 2004; Friedmann, 2005; Dixon, 2009; McMichael, 2009; Nestle, 2012). Science has another role to play in foresight exercises and experimenting with alternatives and interventions that could help see us overcome some of these damaging trajectories- everything from insect protein (van Huis, 2016), and alternative production systems and farmer livelihoods (Stringer et al., 2020), to food waste reduction (Parfitt et al., 2010) and reconfiguring social relations and power dynamics around foodways and food environments (Pietrykowski, 2004; Lara et al., 2019; Pereira et al., 2019). Here, researchers are external to the transformation process itself as non-participating observers, as inventors or as technicians.

Transformative research is focused on transdisciplinarity, where scholars become actors of change with non-academic partners, initiating, facilitating or even supporting change through transdisciplinary research into food systems transformations. Such research can facilitate spaces to envision alternative pathways for sustainable futures, that show the different values and framings, whilst at the same time ensuring ‘safe enough spaces’ for seemingly contradictory evidence to be unpacked, the trade-offs noted and then decisions made on what interventions to enable

(Pereira *et al.*, 2020). For example, a long-standing debate between land-sparing versus land-sharing advocates has raged in the agricultural land use and biodiversity sectors (Fischer *et al.*, 2014; Loconto *et al.*, 2020). Both sides have good, reliable evidence to back up their claims, and so the question becomes not of fact versus fiction, but of weighing up different values in different contexts and deciding what is the most appropriate. These kinds of decisions cannot be helped with the production of more 'evidence', rather they require spaces where conflicts and tensions can be held in constructive dialogue (Drimie *et al.*, 2018). As well as making visible the plurality of alternative pathways towards more sustainable food systems, it is also important to ensure that more marginalised voices are also heard and that their opinions are able to enter the debate too. Actively working to include marginalized voices is vital to addressing current global inequities and ensuring that pathway diversity truly represents all possible alternatives- not just the conventional 'highways', but also the less recognised 'footpaths' that tend to be overlooked as they are the solution space offered by the most vulnerable (Leach *et al.*, 2010). Some researchers therefore also have a role to play as 'transformative space makers' (Marshall, Dolley and Priya, 2018), such as through instigating futures visioning processes with a diverse set of local stakeholders (Sellberg *et al.*, 2020) or by initiating Transformation labs (T-labs) where alternative food system actors can come together to forge a shared agenda on how they would like to see the food system transformed (Pereira, Drimie, *et al.*, 2020). Here, researchers are part of the transformation process and participate as agents of change.

4.1. Facing food systems challenges in the EU: changes in research

In 2019, in the European Union around 6.7% of the population could not afford a high-quality meal every two days (Eurostat 2021). This problem will worsen due to the pandemic-induced economic downturn. In 2017, more than half of European adults were overweight (Eurostat 2020). It is estimated that one in five deaths in the EU in 2017 was due to an unhealthy diet (particularly cardiovascular and cancer diseases, EU Science Hub 2020). Climate change will reinforce this burden of malnutrition. For instance, in the Mediterranean agriculture is expected to reduce its productivity 17% due to climate change⁴. At the same time, the European agricultural sector (EU-27) was responsible for 10.1 % of EU greenhouse gas direct emissions in 2018⁵ (excluding land use and land use change) and it is still in surplus of nitrogen and phosphorus, despite significant progress in nutrient use efficiency (Maguire *et al.*, 2017). From a social sciences perspective, one major problem faced by EU agriculture refers to the continuous decline of farms: 4.2 million farms were discontinued between 2005 and 2016, the vast majority of which (about 85 %) were small farms of a size under 5 ha (Eurostat, 2018). Furthermore, most of the farmers are older than 55 years old, which poses a serious challenge of generational change. These numbers are just but a few of the agri-food related challenges of EU food systems.

This situation reinforces the need to introduce a systems' approach to tackle the challenges. For this reason, European research programs and structures are updating their agendas to incorporate complexity in agri-food research. In the case of FACCE-JPI, four core themes (CT) are introduced. CT1 works to reduce the contribution of European agriculture to climate change and design carbon neutral agricultural and food systems. CT2 to build resilient systems capable of coping with the changes that will arise while ensuring food availability and agriculture viability. Also, in the

⁴ <https://www.medecc.org/first-mediterranean-assessment-report-mar1/>

⁵ <https://ec.europa.eu/eurostat/databrowser/bookmark/28f1df9b-0a3a-4892-8603-6955b3a31300?lang=en>

context of the nutrition transition and food insecurity in Europe, with increasing obesity and associated non-communicable diseases, nutrition-sensitive agriculture (CT3) is proposed as a strategy to be explored. To address all these challenges at once a systemic approach is introduced in order to identify the most effective strategies that will tackle all of them, analysing the synergies and trade-offs (CT4) that may arise from the combined and integrated options. In the same vein, agroecology as a systemic approach to tackle agri-food challenges is now under debate within different research structures, such as Standing Committee on Agricultural Research (SCAR)⁶, and new research infrastructures are under debate, such as agroecology living labs⁷. In the new Horizon Europe program, agroecology has also strong presence.

Furthermore, the state of the art suggests that building climate-neutral and resilient food systems which are nutritious for all will require transforming European food systems. This brings us to understand how to deal with transformation, transformation of what and by whom. Here, social sciences research provides useful insights, for instance, in identifying and making visible the narratives as well as the actors of change. The SAPEA report (SAPEA, 2020), identified five different narratives, each resulting in different transformation pathways. Jackson et al. (2021) showed how the different narratives, as landed in the EU's Farm to Fork (F2F) strategy, may result in different policy responses and how the F2F strategy had indeed failed to include alternative narratives to *Food as a commodity*, which presumably, will reduce the transformation potential of such policy. Even within agroecology, proposed as one solution to the agri-food related problems, different narratives exist (Rivera-Ferre, 2018, Giraldo and Rosset, 2017), each making emphasis on the different dimensions of

agroecology. Addressing transformation requires also identifying agents of change, which include governmental actors at different scale (from local to global), farmers, processing and retailing chains and networks, educators, citizen-consumers, NGOs, civil society and grassroots movements (SAPEA, 2020). Putting all these pieces together also requires changing the governance structure.

5. GOVERNING FOOD SYSTEM TRANSFORMATIONS

Fostering food system transformations may be conditional on the ability and willingness to change current governance regimes. Current modes of food policy-making across the globe tend to be characterised by high degrees of fragmentation, regulatory capture by vested interests, predominant support for the status quo, and the marginalisation of civil society movements, NGOs and innovative businesses pushing for food system reform. To overcome these challenges, future food system governance arrangements will have to strengthen boundary-spanning, adaptive, participatory and transformative capacities (Termeer et al. 2018).

Boundary-spanning capacities allow for mitigating incoherencies resulting from fragmented governance efforts by creating connectivity between policy domains and governance levels. The latter will require a strengthening of multi-level arrangements, particularly at transnational and local levels. Whereas optimal policy coherence may not always be opportune (OECD 2021), major steps can be made by addressing the clearest incoherencies, e.g., between the EU's Common Agricultural Policy and Green Deal objectives in the case of Europe.

Adaptive governance involves the ability to respond flexibly to the inherent uncertainty and volatility that exist within the food system. The

⁶ <https://scar-europe.org/index.php/agroecology>

⁷ See the Coordination and Support Actions All-Ready (<https://cordis.europa.eu/project/id/101000478>) and AE4EU (<https://cordis.europa.eu/project/id/101000478>)

2008-2010 global food price crises and current COVID-19 pandemic have shown that such responsive capacities are insufficiently developed, or may negatively affect the world's most vulnerable populations.

Participatory governance is key for bringing the views and experiences of the millions of actors - from farmers and fishermen to retailers and citizens on whom a food system transformation ultimately relies- into political decision-making. Recent food democracy initiatives, such as local food policy councils, citizens' tribunals and national deliberative summits show promising results, but generally remain ad hoc and fragmented. There is a need for more systemic ways of organising food democracy, connecting participatory innovations with formal decision-making in representative institutions. Building transformative capacities is essential to overcome path dependencies and for creating the conditions that foster structural change. This capacity largely relies on the presence of leadership, as well as a broader enabling environment providing the resources and political will to overcome lock-ins.

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