FOOD SYSTEM TRANSFORMATION : FOCUS ON TASTE, REMOVE OBSTACLES AND EMPOWER BREEDING PLACES

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Abstract

The global food system is dysfunctional. The Food and Agricultural Organization (FAO) of the United Nations (UN) is concerned from the agricultural side. There is more regression than progression in reaching the targets that were set to realize the Sustainable Development Goals (SDGs). The World Health Organization (WHO) of the UN has serious concerns about the relation between what people eat and the increase in lifestyle related diseases. At least twelve of the seventeen SDGs are highly relevant to the food system. The first part of the paper follows the food system from farm to table to give an impression of the problems. The conclusion of the first part is that the global food system should be transformed fundamentally. Despite the worldwide concerns and visible manifestations of the problems, the transformation of food systems has not happened. One of the reasons is complexity. The food system is extremely interrelated and has many non-linear cause and effect relations. There are no simple 'one-size-fits-all' solutions. The second part of this paper identifies aspects that may accelerate the transformation: (i) put taste back on the agenda, (ii) remove obstacles, (iii) empower breeding places of change. Taste and nutrients have not been among the criteria that shaped the current system. Reintroducing taste has an impact on many elements of the food system. Changing food habits is challenging. The better alternatives must at least be as Convenient, Affordable and Tasty (the C.A.T. formula) as the foods people are asked to give up. Five obstacles have been identified that obstruct food systems transformation. Firstly, there are hidden costs that deceivingly give the impression that the food system is efficiently delivering cheap foods. Secondly, the less desirable foods like meat and ultra-processed foods are largely supported with subsidies. Thirdly, production of foods is based on a commercial, profit oriented, money-making system; good food is not identified as a human right. Fourthly, there are gaps in data collection and research. Research and the subsequent results are dominated, and often arguably biased, by company's interests. And fifthly, there is a low sense of urgency. The food system seems to do what is supposed to do; the general public is hardly confronted with the problems. Consequently, the dominant paradigms of 'business as usual' are supported. Or, alternatively phrased, the support of new paradigms is not strong enough. Therefore, food systems transformation can be accelerated by empowering the breeding places that have an immediate interest in a better food system. The following are recognized: kitchens, farms, companies, cities and other local governments, schools and other educational institutions, and research labs that spark innovation. The common denominator of these breeding places is people. People make the change and need to be empowered in all kinds of ways, no matter how small the initial impact might seem. Although leaders of large organizations or with a lot of followers have more impact, it is imperative that all people take 'culinary responsibility', because 'a bad system will beat a good person every time'. Food systems transformation requires conviction, perseverance and true dialogue based on mutual understanding

and respect. Let the better foods for the people and the planet be tasty. After all, who has a problem with eating something delicious?

Key words

Food Systems, transformation, SDGs, taste, farm to table, real foods

Introduction

In 2015 the United Nations (UN) formulated seventeen Sustainable Development Goals (SDGs) ("Nutrition and the Sustainable Development Goals," n.d.) to be reached by 2030 for the benefit of mankind. The Food and Agricultural Organization (FAO) of the UN released a report in 2019 on the progress the world is making on attaining the SDGs that are related to food and agriculture. The conclusion is that 'progress' is not the right word; regression would be a better description. The indicators on the majority of the SDGs related to sustainable agriculture, food security and nutrition show a negative rather than a positive trend (FAO, 2019).

Another branch of the UN, the World Health Organization (WHO), reported that dysfunctional food systems are causing a world health crisis. The WHO calls for a major review on how food is produced and distributed, and what people are eating. Malnutrition is considered to be the main cause of death and disease in the world. Malnutrition comes in many disguises. Hunger (SDG no. 2) is the most obvious; obesity and all kinds of chronic diseases are other manifestations of malnutrition (WHO, 2019). According to the WHO, SDG no. 3: good health and well-being is in jeopardy. Combatting malnutrition through a better food system should be an important consideration in preventing the leading killers on the planet, such as diabetes, heart and lung disease, and various forms of cancer (WHO, 2018).

Apparently, both the FAO and the WHO agree that the food system needs to change. Reaching the SDGs requires a change of policies, beyond climate change. The focus needs to be on the transformation of the food *system* and include the abundant non-linear, multi causal feedback loops. A detailed analysis is required to understand the problems of the current food system. How are agriculture and health connected? What are the obstructions of change and how to start the movement towards a better system? This paper addresses these questions and specifically how taste is involved. Thinking differently on the role of taste directly contributes achieving five of the SDGs, and indirectly at least four other ones.

The food system

At least twelve of the SDGs contain highly relevant indicators to nutrition (Scaling Up Nutrition, n.d.). The food system is everything that is required to get food (including beverages) to the consumer, from farm to table or whatever other instrument that people use to consume their food. This system comprises all aspects of food growing, harvesting, transporting, storing, retailing, cooking, eating, and wasting (Nestle, 2019). Ericksen (Ericksen, 2008) groups activities in the food system into four categories: producing food, processing and packaging food, distributing and retailing food and consuming food. The function, objectives and challenges are vastly different in each one of these categories; so are the factors that determine success or failure. Furthermore, the categories do not function on their own, but they are interdependent and influence each other. That makes it a system and therefore a systemic approach is needed to understand the challenges of the system.

Essentially, the mission of the food system is to provide food security. The World Food Summit organized by the FAO in 1996 defined food security as when 'all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life' (FAO). This definition implies that food security can be assessed from two perspectives. The first is *quantity*, often phrased as 'no more hunger'. However organized, the food system must produce enough to feed 10 billion people by 2050. From this productivist perspective, scientific and technological innovations are sought after to enhance agricultural output. *Quality* is the other perspective on food security. It is demand-oriented and has an emphasis on the accessibility to healthy, nutritious and tasty foods. This includes the forces that prevent people from making these choices and on the consequences of unhealthy foods (Sonnino et al., 2018). Therefore, the interpretation of food security of the WHO may well be different than the FAO. Both organizations see a dysfunctional food system but from a different perspective; the concerns of the FAO are primarily on the quantity side, whereas those of the WHO originate from the quality side. In order to get a food system that combines quantity with the desired quality, the two perspectives need to merge

As the food system is deeply connected to the SDGs, the impact of the food system on the sustainability of food production and food behavior (patterns of consumption) needs to be addressed. Sustainability is defined as 'the ability to continue a defined behavior indefinitely without harming the social and the physical environment' (Struik, 2017). Consequently, from a social perspective, sustainable diets should originate from food systems that do not generate poverty and inequality. From a natural or biological perspective, they should not destroy natural resources or negatively affect biodiversity. It is complicated to merge these quite different perspectives, with different academic traditions and methodologies. In terms of the SDGs, sustainability has a bearing upon goals like climate action, life on land, life below water, zero hunger, responsible consumption and production, and good health and well-being. Dwivedi et al. (2017) have outlined the key attributes of the ideal food system. Ideally the food system:

- delivers adequate nutrition and health;
- creates biodiversity and avoids ecological and environmental impact;
- ensures livelihood for farmers, fishermen and hunters;
- safeguards diverse landscapes, equitable access to land, water, seeds, and other inputs.

Merging all these perspectives and goals requires a well-defined policy on a global scale that outlines lower level policies on supranational, national, regional and local scales. Unfortunately, the food system is highly fragmented. Even though agriculture, nutrition, and health are closely connected, they are regarded and studied separately. The interactions between all actors and interests in the food system are complex and based on multi-causal, nonlinear relations (Fardet & Rock, 2014). Policies are often sector based and remain within 'silo's'. Structural interdependencies are hardly recognized or studied. There is a need to know more about the relation between food and other resources like energy and water, the relation between food and other areas like the environment, transportation, land use, et cetera. Policies on food and health are spread among a broad range of organizations and institutions each with their own capacities and legal limitations, responsibilities and priorities. The capacity to deal with problems holistically is extremely limited. It has also been reported that there are serious knowledge gaps and that there is a need for evidence-based sustainability metrics that give more insight in the relations between food security, nutrition, diets,

health, agricultural productivity, use of resources, and environmental costs and benefits (Sonnino et al., 2018). How the food system works, is determined by multiple economic, environmental, social, and political factors. Therefore, an inter-disciplinary approach is required, a synthesis of social and natural sciences (Ericksen, 2008).

The impact of the current food system

A closer inspection reveals the functioning of the current food system in the following three sections:

- agri- and aquaculture, the origin of food;
- processing, packaging, distributing and retailing food;
- consuming food.

1. Agri- and aquaculture, the origin of food

Except for those who forage in the wild, what people eat comes from some form of agriculture or aquaculture. Agriculture is not just about plants (agronomy, horticulture and forestry in part). Raising animals for meat, dairy or eggs is also a part of agriculture. Likewise, aquaculture is not only about farming water animals like crustaceans, finfish and mollusks, but also about plants, like seaweeds and freshwater macrophytes (FAO, 2020).

Agri- and aquaculture is done with a purpose and based on manmade decisions. It has an impact on life on earth and includes the selection of breeds and varietals to use, agricultural practices, effects on biodiversity, distribution of wealth, cultures and landscapes. Even tourism and housing are involved. Agriculture occupies more than one-third of all potentially cultivable land, uses about 70% of freshwater and is reported to be responsible for up to 30% of greenhouse gas emissions (Aleksandrowicz, Green, Joy, Smith, & Haines, 2016).

Plant growth requires three major nutrients: nitrogen, phosphorous and potassium. Farmers have generally moved from traditional sources to industrial fertilizers. Phosphorous and potassium are minerals that are extracted from finite sources in the earth crust. The production of nitrogen is almost entirely based on ammonia, which is highly energy-intensive. This implies that agriculture has become increasingly dependent on the use of fossil fuels and other finite sources and of the industries behind this way of farming. Plant science has helped to develop varietals that perform well within this particular agricultural system. Natural methods to bind nitrogen to the soil like crop rotation and the use of plants that bind nitrogen to the soil have been replaced. The negative effects on biodiversity and life beneath the soil are underestimated. The extensive use of industrial, synthetic chemicals has been linked to numerous environmental hazards like global warming and groundwater contamination (Crews & Peoples, 2004).

Synthetic fertilizer is not the only chemical that agriculture relies on, crop protection is another. Crop protection is the euphemism for chemicals used as herbicides, pesticides and fungicides. These are extensively used. Some plants have been genetically engineered to survive on the chemicals that kill all other plants. An extensive review of the safety of genetically modified crops is reported by Marek Cuhra (2015). His team found unexpectedly high levels of glyphosate residues have been found in glyphosate-tolerant plants. These residues are passed on to consumers and pose a potential health hazard. Research on the safety of these new agricultural practices is often planned, performed and reported by researchers employed by the industries that produce these chemicals. This bias is likely

to lead to incomplete reports and health hazards. (Cuhra, 2015). In livestock farming the extensive use of antibiotics threatens human health due to antibiotic-resistant bacteria (Dwivedi et al., 2017).

Biodiversity is dwindling rapidly. The problems are much more severe than perceived. It is suggested that the sixth mass extinction on the planet is taking place. The rate of population loss among various species of animals, not only those that are close to extinction, is extremely high—even in 'species of low concern' (Ceballos, et al., 2017). 95 percent of all calories consumed come from just thirty species. Just three of those, corn, rice and wheat, supply about half of the global calorie demand (Dwivedi et al., 2017). The Club of Rome reports that humans and farm animals together represent a staggering 97 percent of the body weight of all living land vertebrates on earth. This illustrates our agricultural choices, and especially the extensive consumption of meat (V. E. U. Weizsäcker & Wijkman, 2017).

Farming starchy grains like corn, wheat, soybean, rice, and sorghum is supported by government subsidies. These grains are mainly needed for the production of animal feed, food additives, oils and biofuels. This implies the consumption of ultra-processed foods and meat is indirectly sponsored. About 56 percent of all calories consumed in the US come from subsidized foods, according to the researchers (Franck, Grandi, & Eisenberg, 2013). The abundant consumption of meat has a large impact on the current food system. Industrial beef production is reported to be around ten times more damaging to the environment than any other form of livestock. It is a major user of land and water, and an important source of greenhouse gas emissions, of which especially methane gas (Carolan, 2018). Grain-fed animals, especially cows, have a poor conversion rate of feed to food which severely impacts the overall food supply. Of all the calories in the feed that cattle consume, humans receive a mere three percent through beef consumption (Cassidy, West, Gerber, & Foley, 2013). Animals are a functional part of balanced biological systems. Therefore: it is not the cow, it is the how that needs to be considered.

All in all, the present agricultural system has successfully been organized to produce food reliably and cheap, but this system has consequences. Regional character, taste and nutrients have been compromised. Modern agriculture has turned into highly simplified systems that are structurally and functionally very different from natural ecosystems. Agricultural products have largely been turned into commodities. Relying on monocultures is no longer desirable from a social, economic and ecological point of view. The modern food system uses resources inefficiently, is highly energy (fossil fuel) dependent, susceptible to pest outbreaks and vulnerable to variability of the weather. Furthermore, it is a globalized system that relies on world transports. To illustrate: the intensive meat industry in the Netherlands depends on grains grown on other continents. It can be changed by aligning agricultural systems with ecological principles but that requires time and other emphases than specialization, short-term productivity and financial profitability (Nicholls, et al 2016, Dwivedi et al, 2017).

2. Between farm and table: processing, packaging, distributing and retailing food

A fundamental shift in eating patterns occurred over the past two decades: most food is consumed out of home. Traditionally food was mostly prepared and eaten at home. Ingredients, seasons, cooking techniques and the cook were familiar. However, this has changed by making food cheap, convenient, ready to eat, and ready to heat. Meals are provided by the food-industry and by all sorts of restaurants, and food service organizations that supply train stations, airports, hospitals, nursing

homes, cafeterias of companies, events, et cetera. The food system has therefore dramatically changed. Real home cooking based on raw ingredients (as opposed to opening bags of powder and adding hot water) is disappearing from many households. The proportion of packaged and (ultra-) processed foods in the human diet has risen dramatically (Popkin, 2017). This implies that generally the consumer has become disconnected from the origin of food. This revolution in the food system has important implications for the functioning of the system. The modern packaged and ultra-processed foods are not sold at local farmers markets. The success of this system is reflected in the growth of the sales of supermarkets. Globally, the market share of foods bought in supermarkets is reported to have risen from five to ten percent around 1990 to over fifty percent around 2010 and it is still rising rapidly (Reardon, 2012).

The traditional food system with many small players that operate locally and seasonally, has gradually evolved into a system with just a few deciding players that operate globally. Procurement has globalized and food chains have become longer. When the time between harvest and consumption prolongs, typical flavor characteristics (taste and aroma) of fresh foods, including micronutrients, are likely to get lost. Furthermore, there is a chance for the development of off-flavors. The longer the time between harvest and consumption, the greater the loss. For supermarkets the 'shelf life' is an important factor. The dominance of large retail corporations in the market has had a major influence on the selection of genotypes, harvest and post-harvest decisions. Quality can be gained by harvesting at the ripeness stage (optimizing eating quality), and by using the postharvest handling procedures that will maintain the optimal flavor and nutritional quality of fruits and vegetables (Kader, 2008, Ritchie et al., 2018).

Before refrigerators entered households on a large scale at the end of the fifties of the last century, people either ate foods that were fresh and therefore seasonal or foods that were brined, smoked, dried or preserved in some other way. Fruits and vegetables have always been washed, sliced, packaged and so forth. Likewise, animals have always been divided into functional parts and given some kind of basic preparation to conserve it. Bread was baked, beer was brewed, cheese and butter were made, oil was pressed, ham was smoked, coffee beans were roasted and so forth. Throughout history, a certain level of processing has always taken place to make basis ingredients more accessible and convenient to the consumer. Many of these practices you could also do at home, but it was found to be more practical and efficient to leave it to specialists.

Gradually, regular processing evolved into more intricate types: ultra-processed foods entered the food scene. Foods become more convenient and terms like 'fast food' and 'junk food' started to get more common. In 2009 the NOVA classification put these foods in a separate category and labeled them as ultra-processed foods. It is important to distinguish regular processing from ultra-processing food. The classification is as follows:

- *group 1: unprocessed and minimally processed foods.* These are the edible parts of plants or from animals. Minimal processing includes removal of unwanted parts, simple processes like grinding and roasting and packaging.
- *group 2: processed culinary ingredients.* Examples of this group are a variety of oil and vinegar, butter, sugar, salt. Pressing, refining, milling, drying are examples of applied techniques. The key difference with the first group is that these products are rarely consumed by themselves. Products of this group are used to make foods more enjoyable, diverse and nourishing

- *group 3: processed foods.* This category originates from the combination of the first two groups, several ingredients and techniques are combined to create something new. A baked dough of milled grains, water, salt and yeast make bread. Canning, brining, preserving in oil, cheese making belong to this category.
- *group 4: ultra-processed foods.* This category is fundamentally different from the first three in that the processes are highly industrialized and involve techniques that are far beyond the traditional kitchen or simple food factory. Whole foods are first fractionated (water, fats, proteins and carbohydrates are separated), then submitted to hydrolysis, hydrogenation, and/or other modifications. From these derived substances foods are formulated (Monteiro et al., 2019).

Ultra-processed foods are not always easy to identify. Meat, cheese, pizza and pasta dishes, even milk and French fries may look much the same as the original, but the way they are made, from fractions of real foods that are highly processed, define them as group 4 (Monteiro et al., 2019). An additional problem is that these foods are often marketed as healthy, light, vegan, organic, or gluten-free. The consumer is thus fooled into buying foods that seem to be the original, but in fact the original matrix has been replaced by something else. In many cases these 'food-like substances' are poorly satiating, hyperglycemic, partly synthetic, cosmetically designed, and cheap (Fardet & Rock, 2019).

These ultra-processed foods have become an important part of the human diet. Data from the US, Canada and the UK suggest that around 62 percent and 90 percent of added sugars come from ultra-processed foods and beverages. These foods are reported to pose a significant threat to human health. As these foods are considerably less expensive than the less processed foods, they are disproportionally eaten by the lower income and lower educated classes of the population. The increased consumption of these foods is highly likely correlated to the rise in the number of chronic diseases (Gupta et al., 2019). Confirmation can be found in an international comparative study that found lower education leads to inequalities in life expectancy. Smoking, relatively high body weight and lower-income were identified as important factors that affect life expectancy (Mackenbach et al., 2019). The first reports on COVID-19 indicate that patients with lifestyle related diseases like hypertension, cardiovascular disorders, hypercholesterolemia, and diabetes suffer most (Graselli, et al., 2020).

3. Consuming food

The quality of foods that reach the fork, is influenced by everything that has happened in the previous stages of the food system, largely beyond the control of consumer. Quantity-wise there is not much to worry about. Roughly one-third of the worldwide food produced for human consumption does not even reach the consumer. Food loss and waste amounts to about 1.3 billion tons per year (FAO, 2011). From a quality perspective, there are many concerns. Cynically phrased: the consumer has been reduced to a means to generate money. The food system at large has turned into an economic model which is centered on making a profit. It is characterized by scale, technology, consolidation, centralization, commoditizing, globalization, and concentration of power. The system serves large enterprises and global markets. Although this development has several positive aspects, there are also negative effects that need to be stopped (Harvie, 2019).

Some negative effects are evident. Soils have become poor due to modern intensive agricultural methods. Yield and nutritional value are negatively correlated; widely reported as the 'dilution effect'. For example, fruits and vegetables contain, in general, not only fewer minerals like iron, magnesium and zinc, but also less protein. The quality of the soil is not the only factor to blame. The choice of high yielding varietals is another. Side-by-side studies in broccoli, wheat and maize show lower nutrient contents in cultivars that are selected for high yields (Davis, 2009).

On top of that, Zhu and colleagues reported that rising levels of carbon dioxide (CO_2) will also harm vitamin levels. A particular study focused on rice. Besides declines in protein, iron, zinc, and many spore elements, consistent declines in vitamins B1, B2, B5, and B9 were observed, across countries and varieties of rice. Consequently, climate change pose direct potential health hazards. Since rice is the primary food source for more than two billion people and supplies 25% of the world calories, this loss of quality could have severe consequences. Insufficient micronutrients, protein, vitamins, etc. can cause nutritional deficiencies directly (in cognitive development, metabolism, and the immune system) and indirectly (obesity, diabetes type 2 and other 'chronic' diseases). This decline of food quality enhances food insecurity and is at the root of costs in other systems (Zhu, et al. 2018).

Some negative effects have yet to be uncovered and may even require rethinking the way bodily functions operate. The current understanding of the metabolic system has developed through evolution. Do the newly developed ultra-processed foods interact with the brain-gut pathway in the traditional way? Ultra-processed foods are so fundamentally different compared to the foods that people always ate, that there is reason to believe that information about its nutritional content may not be accurately conveyed to the brain. Physiology could be affected in unanticipated ways that could promote overeating or metabolic dysfunction. A better understanding is critical to determine whether there are effects on satiety signaling, metabolic health, addictive properties of foods and obesity. The traditional focus on nutrients like fats and carbohydrates may be insufficient to understand the full effects of eating ultra-processed foods (Small & DiFeliceantonio, 2019).

Systematic reviews and meta-analyses of published data indicate that there are significant differences between conventionally produced organic foods. Organic crops are reported to have higher concentrations in a range of antioxidants and lower levels of the toxic metal residues like cadmium. Organic meat, milk and dairy products have higher concentrations of omega-3 fatty acids which are nutritionally desirable. A few small cohort studies also indicate positive effects of eating organic foods. However, it is currently not possible to quantify to what extent organic food consumption may affect human health (Barański et al., 2018).

The EAT Foundation presented a strategy to prevent malnutrition, reduce non-communicable disease risk, and lessen the impact of food production and consumption on climate change. This group concludes that the regular diet should be more plant-based and less meat-centric; people should eat more fresh, real foods and less ultra-processed foods (Swinburn et al., 2019; Willett et al., 2019). Health councils all over the world agree. The recent Brazilian and Canadian dietary guidelines suggest to eat 'real' foods and to avoid the ultra-processed ones. Adhering to these guidelines would implicitly also reduce the consumption of salt and sugar (Monteiro et al., 2017).

The conclusion of the analysis of the impact of the current food system is that the best diet for the planet and for humans is the same. Changing current diets to a variety of more sustainable dietary patterns could potentially lead to reductions as high as 70–80 percent of greenhouse gas emissions

and land use, and 50 percent of water use (Aleksandrowicz et al., 2016, Rose, 2019). The way to achieve that is by adopting a less meat-centric diet, and by reducing food waste (Crews & Peoples, 2004). Major problems could be solved with one solution: eat food, not too much, mostly plants (Pollan, 2008).

How to transform the food system?

Evidently, there are success stories in agriculture, but globally agriculture is in a poor state. Agriculture is a global industry that relies largely on small farms. Small farms account for a large proportion of agricultural holdings worldwide. The FAO estimates that 72 percent of the roughly 570 million farms worldwide operate on less than one hectare and an additional 12 percent on less than two hectares. More than half of the world food calories are produced by farms that average less than five hectares (FAO, 2016). Economic development based on cheap calories overlooks the economic needs of the global rural population (3 billion people), 50 percent of whom work in agriculture (Altieri et al., 2012). Most small farmers and fishermen are in a very dependent position, caught in cycles of poverty, without access to education, employment, economic and social infrastructure, and political representation. Poverty is the largest threat to producers of food globally and the largest driver of food insecurity (Gladek et al., 2017). The same sector that is partly responsible for changing climate condition, suffers supposedly most from less reliable weather conditions, bush fires and erosion. This is a barrier for young farmers to start. Agricultural households need to earn a decent income, otherwise it is hard to imagine that they will stay in agriculture or that their children will take over (Dixon, 2015).

This situation adds on to the reasons why food system transformation is high on the agenda of the United Nations and its institutions like the FAO and WHO. This paper is certainly not the only one to underscore the need for change. Tim Lang and his colleagues published a comprehensive book more than a decade ago (Lang, 2009). Large support for food system transformation can be found in the academic community. World leaders are aware of the problems and in a position to initiate the transition towards a better food system. Nonetheless, despite all this, the truth of the situation is that things got worse rather than better (FAO, 2019, WHO, 2019). It is common to conclude articles on this subject with the need for more research and suggestions. Good research is important, especially if knowledge or data gaps are identified. This article focusses on food systems transformation itself, and specifically on food choice behavior. The following aspects that may accelerate the transformation are elaborated:

- put taste back on the agenda;
- remove obstacles in food systems transformation;
- empower breeding places of change.

Put taste back on the agenda

Many aspects are mentioned in the discussion on the transition towards a healthier food system. The Society for Nutrition Education and Behavior recommends that environmental sustainability should be inherent in dietary guidance up to setting national dietary guidance (Rose, 2019). Typically, one very evident aspect is not mentioned: taste, or better deliciousness. One might wonder whether people are going to change their food choices solely because they are more sustainable. As discussed, taste has not been among the criteria that shaped modern agri- and aquaculture. Varieties and production methods were selected on yield and based on the demands of the food industry and

retail. The consequences of neglecting taste and nutrients in the current food system leads to this list:

- Our food system is largely organized to produce cheap, tasteless commodities without regional character or quality which generates hardly any added value for farmers (Dwivedi et al., 2017).
- Famers do not have a sufficient income, in a system that practically forces them to do what the big players demand, which impedes their free will (Altieri, 2011).
- These tasteless commodities are likely to contain fewer nutrients (Ritchie, 2018), and residues of all kinds of chemicals, synthetic fertilizer, glyphosate, antibiotics, that ultimately end up in our foods, soils and waters (Cuhra, 2015).
- The commoditized crops, especially corn and soy, are used mainly for the production of ultra-processed foods that are low in nutrients and are likely to be related to the rise of chronic diseases, especially in the lower income classes (Hall, et al., 2019).
- Commoditized crops are also used to feed animals which would normally graze, and to produce a variety of food additives, including high fructose corn syrup, bio fuels, and cheap seed oil that is used for deep-frying snacks (Aleksandrowicz, 2016).
- These additives (including salt, fat and sugar) are indispensable to make the ultra-processed foods extra craveable and to reinstate what was lost in farming in the first place (seasonal, local, real foods with their taste and nutrients) (Monteiro, 2017, Monteiro, 2019).
- Growing these commodities makes use of precious land, and uses fresh water, that could otherwise be used for growing a larger variety of (organic) vegetables that would promote bio-diversity, soil life and health (Dwivedi, 2017).
- The fruits and vegetables that consumers buy in supermarkets have generally not been selected on taste to start with. In many cases, they are harvested before they are ripe to increase shelf life in the supermarket. Flavor characteristics are not fully developed; consumers are likely to be disappointed (Ritchie et al., 2018).
- The profits that the industry at large makes with this system are used for seductive marketing and sponsoring academic research that turn people away from enjoying original real foods (Monteiro, 2019).

Reading the above, it should not be difficult to imagine how taste could be a part of the desired transition towards a food system that would help to realize the SDGs. It directly involves goals nos. 3 (good health and well-being); 12 (responsible consumption and production); 13 (climate action); 14 (life below water); and 15 (life on land). It could also affect nos. 1 (no more poverty); 2 (zero hunger); 4 (quality education); 8 (decent work and economic growth); and 9 (industry, innovation and infrastructure).

It is fair to assume that taste and nutrients are a key to a better food system which is essential for the vitality of the people and the planet. Taste and nutrients are closely related and represent the added value that was lost. Reinstating taste would enable farmers to earn a better income and distinguish themselves. Governments at all levels could take the role of facilitating the transition, helping farmers, inspiring education, using subsidies to make the better foods more affordable and putting taxes on the less desirable foods (Franck, et al., 2013).

Remove obstacles in food systems transformation

Some forces obstruct food systems transformation. These need to be understood, preferably be acted upon, removed or looped around. The following obstacles are discussed:

- true costs are not visible;
- cheap food is supported;
- good food is not a human right;
- gaps in data collection and research;
- low sense of urgency.

1. True costs are not visible

The food system delivers large quantities of cheap food. But cheapness comes at a price. Food is only cheap because many costs have been externalized (Carolan, 2018). When the true costs of our foods would be calculated, they would not be cheap at all. The costs of health impacts in food systems are reported by the WHO to be ballooning and amounted in 2017 to 12,85 trillion US dollars worldwide. The costs as a result of the negative effects of greenhouse gas emission, water and air pollution, loss of biodiversity et cetera, are not included in these costs (Branca et al., 2019).The Food and Land Use Coalition (FOLU) calculated that the global market value of the food system amounts to 10 trillion dollars. In another light, the current food system thus leads to a net deficit of at least 3 trillion dollars every year (FOLU, 2019). The idea that the current system is productive and efficient is false and obstructs the required transformation. The real question is therefore 'how much longer can we afford cheap food?' Investing in sustainable solutions seems more sensible.

2. Cheap food is supported

Governments support the quantity paradigm. Industrial agriculture is subsidized on a large scale (Franck et al., 2013). Meanwhile, governments develop policies to discourage the consumption of unhealthy foods. Several countries have introduced taxation on soft drinks, regulation regarding the serving portion of soft drinks and restrictions on the marketing of unhealthy foods, especially targeting young children. Although such initiatives seem promising, they are reported to have minimal effects (Chan, Kwortnik, & Wansink, 2016). Furthermore, they are aimed at the consumer and not at the system. It is difficult to explain why undesirable foods are made cheap, partly with subsidies, to subsequently 'punish' the consumer with taxes and regulations. It seems logical to reverse these policies: subsidize the consumption of healthy foods, education and research on sustainable and productive agricultural practices and to put taxes on the overuse of fertilizer and other chemicals that damage the food system at large.

3. Good food is not a human right

The global food system is largely based on capitalist principles. Food security is not a basic human right. Food has become the result of a commercial, profit oriented, money-making system. If not changed, the future of such a system demands increasing amounts of energy to produce increasing amounts of calories with decreasing amounts of labor-power. It is a race to the bottom – and now that this system produces a net negative value it is fair to say that the bottom has been reached some time ago (Moore, 2014). Its primary mission can no longer be achieved in the capitalist tradition.

The food system requires a different foundation. Is good food not very comparable to clean water, health and education, and therefore a human right? This may sound alien to those who believe in a free market that regulates itself. With the outbreak of the COVID-19 virus, countries, cities, and all functions that are not essential have been closed down to prevent the virus from spreading. Is it really strange to call for bold and drastic measures to get the food system under control? Central in the capitalist ideology is the focus on growth and GDP (Gross Domestic Product, the monetary measure of the market value of all the goods and services produced in an economy during a period of time). More than 11,000 scientists from over 150 countries support the view that a shift is needed 'from pursuing GDP growth and affluence toward sustaining ecosystems and improving well-being'. Growth is not needed to improve people's lives, the focus should therefore be on well-being (Ripple, et al. 2020). This logic is obstructed by both the hidden costs mentioned before and the accumulation of large amounts of money, power and other financial interests of the industrialist actors in the system. Understandably, they are going to defend their position and will therefore be against fundamental change. Their opposition is likely to diminish when they have something to gain from the transformation.

4. Gaps in data collection and research

Food, nutrition, health and agricultural research has been inspired by increasing yields and calories, and by 'nutritionism'. It is the paradigm that is based on a reductive understanding of the relationship between diet and health, where the lack or excess of one nutrient is suggested to cause one specific disease. Food is primarily regarded as a vehicle for delivering nutrients. It denies the other individual (pleasure, identity), social (power, status, linkages to other) and cultural meanings of food and eating. This paradigm framed the solutions, dietary advice, development of fortified foods, bio-fortified crops and food marketing. Many aspects of foods have hardly been studied. It has not only created anxiety about food but also brought forth the disruption of cultural practices and knowledge to the level that young mothers in poor urban slumps doubt whether they should give breastmilk to their babies (Dury, 2016).

The development of relevant and efficient policies for a better food system is also impeded by inaccurate and insufficient data. A significant gap is, remarkably, that there has been no study to establish the global sustainability footprint of ultra-processed foods (Popkin, 2017). Research has focused on only a few key foods, in a few countries and on a few environmental stressors. There are significant gaps in even the most wide-ranging assessments. An organization like the FAO is well placed to improve insights and data collection on underassessed foods and impacts. The use of modern technology, sensors and satellites should be prioritized. Adequate staffing and funding are needed (Halpern, 2019).

The food, health and agricultural industry fund research on a large scale. The primary purpose of companies is often to maximize profit and to secure shareholder value. This purpose is hard to align with research that potentially puts commercial interests in jeopardy. This has an effect on both the type of research that is being funded as on the publishing of the results. Conflicts of interest can undermine the credibility of research and researchers, resulting in skepticism of published research and loss of trust amongst the general public and policy makers (Cullerton, 2019).

5. Low sense of urgency

A last and important obstruction to transformation may be the low perception of the risks of the present system which leads to a lack of sense of urgency. People act immediately when they are in danger. Although the food system has many negative effects, it is not perceived as being dangerous. Superficially it even seems to work fine and as mentioned above, there are important powers that have an interest in 'business as usual'.

The low sense of urgency is reflected in politics. To illustrate: Austria has the largest share of its farmland devoted to organic agriculture of any EU member state. A large majority of the Austrian parliament voted in July 2019 to ban the national use of the weed killer glyphosate. The law was due to take effect in January 2020, but three weeks before, the chancellor said that she could not sign the bill because the European Commission was not informed in time (Murphy, 2019). Bureaucratic technicalities like these obstruct transformation and are not in line with the will of the people.

The transformation of the food system needs new paradigms. In his book 'the structure of scientific revolutions' (2012), Thomas Kuhn elucidated how these develop. First, there is 'normal science' characterized by an intellectual framework that is shared among a strong community of researchers. Within this existing paradigm, research is focused on the anomalies of the existing framework. Essentially research is oriented to understand and confirm the status quo. When unresolved anomalies start to accumulate scientists – especially coming from outside the accepted community – will start to question the paradigm. The theories that are embedded in present thinking are challenged and possibly refuted. This may lead to a revolutionary change in world-view in which the old paradigm is replaced by a newer one. This new scientific truth does not triumph by persuading its opponents, but by empowering a new generation with new theories and data which help them to think differently and make change happen.

Therefore, to accelerate food systems transformation it is paramount that people have the right perception of the costs, problems, dangers and risks of the present food system. The sense of urgency needs to rise to make clear that 'business as usual' is not a sensible option. Think differently needs to get empowered by people with new theories and business models.

Empower breeding places of change

Awareness of the obstacles in food systems transformation is important; removing them is certainly a part of the solution. However, many of the obstructions mentioned above are not easily fixed and will therefore take time. Although policies need to fundamentally change at the highest level, a bottom-up strategy might be more effective. Following Kuhn's reasoning, the best way forward is to show that other paradigms are more successful. Everything starts small, and action is needed. This section addresses how and where to change can happen without big constraints and obstacles. The world needs proofs of concept, best practices, that show that there are ways of transforming the current food system into a better one. Some places appear to be interesting breeding grounds of food systems transformation and therefore in a good position to lead the way. These are:

- kitchens;
- farms;
- companies;
- cities and other local governments;
- schools and other educational institutions;
- research labs that spark innovation.

1. Kitchens

To start at the table, what people buy and eat is an implicit vote for the food system that they sustain. The daily choices are saying 'yes' to the system behind it. Buying and eating differently will ultimately change the system. It is important to realize that consumers are happy with the foods that they currently buy: food choices are made Convenient, Affordable and Tasty (C.A.T.). Consequently, the food choices that are better for the people and the planet also need to be C.A.T. For this reason, traditional public health campaigns, focused on telling people what they should do, are unlikely to be effective in altering behavior. People are not just simply going to change their food choices because they feel that they need to take responsibility in attaining the SDGs. On the other hand, people appreciate delicious foods. Liking is a motor of food choices. Therefore, studying food behavior, deliciousness and liking is a vital part of solving the challenges in the food system. Culinarians could help in making 'real food' dishes just as – or more – desirable and craveable as the ultra-processed foods. Ultimately the consumer needs help with the preparation of tasty meals – even with much less meat (Klosse, 2019).

There are not many chefs with an academic background. This may explain why the perspective of chefs in changing food behavior is often overlooked in the academic world. The partnership of the Culinary Institute of America with the Harvard T.H. Chan School of Public Health is a welcome exception. Together they launched the Menus of Change initiative to advance better food choices and menu development. From this initiative the Menus of Change University Research Collaborative (MCURC) sprouted. It is 'a collaboration of forward-thinking scholars, food service leaders, executive chefs, and administrators for colleges and universities who are accelerating efforts to move people toward healthier, more sustainable, and delicious foods using evidence-based research, education, and innovation.' Plant-forward dining is promoted and researched as a mainstream concept for chefs and the food industry. Plant-forward is defined as: *a style of cooking and eating that emphasizes and celebrates, but is not limited to, plant-based foods—including fruits and vegetables (produce); whole grains; beans, legumes (pulses), and soy foods; nuts and seeds; plant oils; and herbs and spices—and that reflects evidence-based principles of health and sustainability* (The Culinary Institute of America, 2019).

Chefs can reconnect consumers, farmers and nature. To guide chefs in their role in reaching the SDGs the Chefs Manifesto was launched by the SDG2 Advocacy Hub. This manifesto outlines eight thematic areas that chefs are most passionate about working on:

- ingredients grown with respect for the earth and its oceans;
- protection of biodiversity and improved animal welfare;
- investment in livelihoods;
- to value natural resources and reduce waste;
- celebration of local and seasonal food;
- a focus on plant-based ingredients;
- education on food safety and healthy diets;
- nutritious food that is accessible and affordable for all ("The Chefs' Manifesto Podcast," n.d.).

The primary motive of chefs to work on these themes is that they know from training and experience that the quality of the ingredients determines for a large part the outcome. Words in the above list

like respect, protection, investment, education, accessible and affordable indicate that their interest goes beyond developing delicious dishes. Chefs are important allies in food systems transformation because they connect consumers and production from origin to the mouth (Moreau 2019).

2. Farms

The farm is an indispensable breeding place for transformation. That is where change needs to happen! The prominent question is whether there is an alternative to 'business as usual' in farming. Could there be a food system that is inclusive, sustainable, efficient, nutritious and healthy? A system that enables millions of farmers to earn a decent living and prevents enormous amounts of food that go to waste? A system with farming practices that are adequately productive and lead to a significant reduction of the emission of greenhouse gasses like CO_2 and methane and limits the emission of nitrogen (World Economic Forum, 2018).

Agroecology could be the alternative paradigm. The term agroecology refers to the application of ecological principles to agriculture. There is increasing evidence of the advantages, benefits, impacts, and multiple functions of agroecology; HLPE 2019 gives a review (Moore Lappé, 2016, HLPE, 2019, Anderson et al. 2020). The FAO introduced an analytical tool, the 10 Elements, that can help countries to operationalize agroecology. The properties of agroecological systems and approaches are identified: (1) diversity, (2) co-creation and sharing knowledge, (3) synergies, (4) efficiency, (5) recycling, (6) resilience, (7) human and social values, (8) culture and food traditions, (9) responsible governance and (10) circular and solidarity economy. These 10 Elements are meant to serve as a guide for policymakers, practitioners and stakeholders in planning, managing and evaluating agroecological transitions (FAO, 2020).

The notion that everything starts small is extra relevant regarding farms. Not only because small-sized farms dominate the system, but also because of elements that are so small that they are easily overlooked: microbiology and seeds. In natural systems the soil is full of immensely diverse microorganisms. These are critical drivers of soil functions and agricultural crop productivity. Instead of looking for the next generation of chemicals to improve productivity, it might be more effective to enhance soil vitality by looking closely at biochemical and molecular mechanisms that optimize plant-microbiome interactions and improve farm yields (Qiu et al., 2019). New agriculture is likely to require new seeds. Seeds are an important part of the food chain. Instead of being selected only for shelf life, yield and uniformity, deliciousness could be the driver of breeding. Row 7 is a collaboration between a chef, Dan Barber, a plant breeder from Cornell University, Michael Mazourek, and a seedsman, Matthew Goldfarb. Row 7 aspires to grow far beyond the founders. Food is reimagined from the ground up. The seeds are publicly available and their measure of success is not the money they earn, but the number of farmers that use them. The fork and the farm have found each other ("Row 7 Seeds -Our Story," n.d.).

3. Companies

Between fork and farm are all sorts of commercial companies that can make food systems transformations happen. Think of restaurants, foodservice companies, company catering and supermarkets. All of these could connect to farmers, facilitate shorter supply chains, reduce waste, et cetera. The bigger these companies are, the better. Their demand drives supply. Companies can outline a specific food policy with standards for procurement and types of meals to serve. It could be a means to make (or save) money. It becomes a two-edged sword when these companies inform

their customers about the company policy; how they connect to farmers and activate shorter supply chains, and – of course – by delivering delicious dishes at a profitable price. Companies take 'culinary responsibility' inspire others and become an actor in food systems transformation.

An inspiring example is the Google Food Program. The company provides free and delicious plant forward foods to its employees, all over the world. In doing so they have created a new kind of 'blue zone' where food supports a long and healthy life. One of the things that Google learnt is rather obvious: when people enjoy the virtuous aspects of foods they have no problem in changing their behavior. There are also financial benefits for the company. The food program proves to be a reason for people to choose for Google as an employer, the retention rate of personal is higher, sick leave is lower and productivity is higher. The Google example shows that good food should not be considered as a cost, but as an investment. The company shows leadership and supports and inspires change (Black, 2020).

Retail companies can take culinary responsibility as well. Supermarkets could influence food choices and food preferences by determining what is offered in the stores and by allocating how much space is made available for every product group. They often have magazines in which they could help consumers with preparing delicious, plant-forward dishes. Furthermore, they determine food prices. With their buying power they have an impact on the price farmers receive for their products, and the types of farmers they buy from. But their influence stretches further. In general, low prices in the shops stimulate the relentless search for cheapness in the system, with all the undesired results. Retail organizations have the potential to improve public health. However, only a few positive initiatives seem to be reported (Pulker et al., 2017).

4. Cities and other local governments

Over half of the world's population lives in urban areas. Local governments are in an ideal position to facilitate and encourage activities that help to achieve the SDGs. That makes cities and other local governments a part of the solution. Urban areas are confronted with all the negative effects of the global food system, like public health, social inequalities and environmental damage. Providing food security is a basic responsibility for governments. As mentioned before, this means that all people, at all times, should have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Lower governments have the right scale for food policy innovation.

An area where people have limited access to affordable and nutritious food is called a 'food desert'. Clearly local governments are responsible for preventing 'food deserts'. Unfortunately the term has been rather simplistically defined as when a substantial number of people has low access to a supermarket or large grocery store. Food deserts should not be seen as a problem that can easily be solved bylarge scale, economically efficient formal systems (Battersby, 2019). Informal, local and small scale solutions could well be more effective. Parts of local food policies could revolve around aspects such as local farms, farmer's markets, urban farming opportunities, and food sovereignty. Policies could also be developed on giving smaller retail units a chance, facilitating the use of unsold food products, educating less privileged subcommunities on the consumption of real foods, and on promoting cooking skills in general.

Initiatives have been taken. At the world expo of 2015 in Milan, a protocol was launched: the Milan Urban Food Policy Act (MUFPP). It aims to develop more sustainable urban food systems through

city-to-city collaboration. More than 160 cities across the globe have signed this protocol. In the preamble this document refers to the importance of adopting a systematic food policy approach, 'since food policies are closely related to many other urban challenges and policies, such as poverty, health, and social protection, hygiene and sanitation, land use planning, transport and commerce, energy, education and disaster preparedness. It is essential to adopt an approach that is comprehensive, interdisciplinary and inter-institutional.' This sounds good, but recent research among the member cities revealed that there are important knowledge gaps and that city representatives lack a basic understanding of the functioning of the food system. The realization of the vital role that cities could play, remains therefore large unutilized (Sonnino, et al 2018). The solution does not seem out of reach. Every city inhabits hundreds of people that have both the knowledge, creativity and ingenuity to develop local initiatives that city representatives can learn from.

5. Schools and educational institutions

To live life on earth, it helpful to have a basic understanding of how nature functions. Chefs, farmers, business leaders, city representatives, politicians, food professionals, doctors, parents, and so forth, all should have a basic understanding of the relation between food, health and sustainability. As teachers play a crucial role in human life, all sorts of schools, educational institutions and other forms of education (like distance learning) are important breeding places for food systems transformation.

Literacy levels are the test of an educational system. Globally, the overall trend is positive. Youth literacy rate increased from 83 percent to 91 percent over two decades (UNICEF, 2019). How about food literacy? The British Nutrition Foundation (BNF) reported that almost a quarter (23 percent) of five – seven year olds say that bananas, roast chicken, broccoli and wholegrain bread belong in the dairy and alternatives food group. One-sixth (16 percent) believed that bread, yoghurt, chocolate and salmon belong in the fruit and vegetables food group. Supposedly, literacy rates on the environmental side will not be much better, possibly even worse. If the literacy rate is a test of education in the world of food, health and sustainability, there is a lot of room for improvement. The BNF therefore suggests that food and nutrition education for teachers should be included in the government's obesity plan. Teachers should receive relevant training to ensure that they have an understanding of the important role they play in supporting the health and wellbeing of children ("BNF survey exposes UK students' ideas on food and healthy eating," 2019). In families of children with cancer commercial foods were considered more nutritious than homemade foods. Such harmful beliefs concerning food and health are reported to be widely prevalent. Targeted educational interventions are suggested to play a role in reducing malnutrition in these children (Srivastava, et al. 2018).

Food literacy interventions conducted in a secondary-school setting have demonstrated a positive impact on healthy food and nutritional knowledge (Bailey et al, 2019). It starts with good practices. Some countries, e.g. Japan and France have government supported school lunch programs. The state-run Japanese *kyushoku* system provides meals based on fresh ingredients to school children from kindergarten to junior high school. The meals are combined with nutritional education (Ishida, 2018). The Harmony project that started in the UK in 2018 regards nature as the world's greatest teacher. It recognizes the impact of human activity on the natural world and believes that the solutions to these problems are close at hand. A teachers' guide has been developed based on the experience of the use of the principles of harmony at the Ashley School, a primary school in the UK

("The Harmony Project," 2020). Programs that connect local farms to schools have a positive effect. Parents and teachers reported that the program increased students' willingness to try new foods and increased students' intake of fruits and vegetables. Children discussed what they learned at home with their parents, which resulted in increased fruit and vegetable intake (Barnard, 2020).

At university level, it is suggested that programs in agronomy should stimulate interaction between science and practice. Reflection, dialogue, action-oriented participation, and observation is needed to ensure that the agronomy becomes less contested (Struik, 2017). The Italian based Future Food Institute aspires to change the world through food. 'Climate shapers' are empowered at global bootcamps that are organized in collaboration with the FAO. Next to that, they host a master's program and organize inspiring training programs for schools ("Future Food Academy: Homepage," 2020). To conclude, and return to the kitchen, it is often suggested that eating real foods, is a part of the solution. It should be realized that home cooking based on real foods requires basic knowledge about ingredients, seasons, cooking methods and such. Education is needed at all levels to help people make better food choices. Culinary education is a crucial and indispensable part of this.

6. Research labs that spark innovation

Research labs complete this list of breeding places for food systems transformation. The approach of this paper uncovers where innovation and modern technology can help, from the way food is grown and produced to food consumption. Innovation is needed to fundamentally transform our relation to food and the planet. With all the technology available it is possible to reconnect to nature, and become more engaged and respectful. The Alliance of World Scientists is ready to assist the transformation to a better future. It claims that 'transformative change, with social and economic justice for all, promises far greater human well-being than does business as usual' (Ripple, 2020).

The brains of the world can energize the shift from quantity to quality. This requires a reallocation of capital for promising themes that are under-researched. To mention an example, worldwide, less than one percent of agricultural research is dedicated to the development of organic farming. It is suggested that agroecological farming could be realized on a global scale and provide food security if it would get more focus (Niggly, 2014). Interesting new agricultural practices such as advanced greenhouse horticulture, symbiotic agricultural systems (like aquaponics and vertical urban farming), development of alternative proteins, digital traceability systems, precision farming, robotics, remote sensor devices, et cetera can become a part of food system transformation (Gladek, 2017, FOLU, 2019). Considering the structure of global agriculture with many small farms it is essential to support small scale initiatives. This requires policies that aim at strengthening smallholder farms and new agricultural initiatives. This is also in line with the SDGs like poverty reduction and no more hunger (Scaling Up Nutrition (SUN) Movement, n.d.).

Reductive reasoning has led to believe that there is one solution to every problem. In food, health and education modern digital technology can be used to improve the relationship between people and the world. Advanced algorithms, artificial intelligence and machine learning can potentially increase the understanding of complex systems and empower people to make more personalized decisions. Food systems transformation will be accelerated with innovations that improve our relationship with food and therefore with personal health and general life on earth. Examples are a range of lifestyle apps that not only monitor a status but also give guidance in what and especially how to improve their situation. Likewise, in the kitchen interactive embedded systems can be

designed to facilitate people with preparing delicious dishes. The mission of The Academy for Scientific Evaluation (TASTE) is to make taste measurable with new sensory techniques. Research is conducted to develop and validate the mouthfeel model. Deep, objectified insights in taste potentially make it possible to bridge product characteristics to consumer preferences. The consumption of tasty, healthy, nourishing and sustainable food can be encouraged ("- The Academy for Scientific Taste Evaluation," n.d.).

Conclusion

From farm to table, the global food system could be something to be proud of. Granting livelihood to farmers and people that work in the system; preserving cultures and landscapes; protecting life on earth and the vitality of soil and water, while ensuring the accessibility to tasty and nutritious food in a way that can be continued indefinitely.

'A bad system will beat a good person every time'. This quote from W. Edwards Deming implies that working on changing the system is more fruitful than blaming people or the system itself (Elkington, 2018). The UN and its organizations FAO and WHO call for action. The SDGs have a deadline and should be reached in 2030 for the benefit of mankind. Therefore, this is the decade of action. Agriculture is the binding factor in seventeen SDGs, more than any other sector. The current global food system is out of balance and needs to be transformed.

This paper first addressed what is wrong in the system from farm to table. The system is extremely connected and there are many causal loops. This makes the transformation of the food system difficult to initiate. There are no quick fixes and simple solutions. Many scholars call for extra research. The biggest caveat of food systems transformation may be to think that it is all a matter of argument. The bigger question is therefore how to start the movement. Three aspects are elaborated: put taste back on the agenda, remove obstacles in food systems transformation, and empower breeding places of change.

Much of behavior is based on, mostly unconscious, habits. Changing habits is difficult and requires time, understanding and consideration of what is at stake. This decade of action is 'marked by more questions than answers and more problems than solutions' ((Bauman & Frank, 2017, p. 167). Humanity needs true dialogue. Not just between professionals or politicians and not primarily focused on convincing the other. When all human beings are recognized as valid partners in the dialogue, compassion, interaction and understanding will be more likely. This may lead to imaginative and inclusive solutions (Kociatkiewicz, 2018).

Like everything, food systems transformation starts small and requires people with conviction, perseverance and adequate support. It can and must be done by empowering chefs, farmers, thought leaders in companies, cities, lower governments, schools and research labs. Let research results be open source and let governments and governmental institutions take barriers away. Let this all lead to tasty foods that are better for the people and the planet. After all, everybody loves delicious foods.

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