

Research Article

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Chefs as change-makers from the kitchen: indigenous knowledge and traditional food as sustainability innovations

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Non-technical abstract

Projections of a burgeoning population coupled with global environmental change offer an increasingly dire picture of the state of the world's food security in the not-too-distant future. But how can we transform the current food system to become more sustainable, more equitable and more just? We identify kitchens as sites of transformative innovation in the food system where cooks and chefs can leverage traditional food knowledge about local food species to create delicious and nutritious dishes. Achieving a sustainable food system is a grand challenge, one where cooks in particular are stepping forward as innovators to find solutions.

Technical abstract

How can we transform the current food system to become more sustainable, equitable and just? Enhancing agrobiodiversity has been proposed as a mechanism for shifting the current food system onto a more sustainable pathway, but there are barriers to the innovations that will enable systemic uptake of diverse plant species in the formal food system. We argue that there is a need to expand on the potential of traditional food knowledge as innovation by focusing on what happens in the kitchen. We identify kitchens as sites of transformative innovation in the food system, requiring as much consideration as the conventional areas of agricultural production, food pricing and calories. Using case studies from South Africa and Mexico, we demonstrate that there is a case to be made for combining the innovative creativity of cooks and the biodiversity of underutilized species to create a food culture that enforces eating as an ethical act. We propose that an alternative model of global food system transformation must recognize that trust and connectedness are key values that need to be scaled. Achieving a sustainable global food system is a grand challenge, one where chefs and cooks are stepping forward as innovators to find solutions.

Social media summary

Chefs as change-makers for a sustainable food system: leveraging indigenous knowledge and traditional food as innovation.

1. Introduction

“What we call culture takes place where tradition and innovation intersect.”

– Massimo Montanari (2006, p. 7)

The global food system is a major driver of global environmental change. Food production has driven massive transformations of terrestrial and marine ecosystems. Approximately 40% of all productive land has already been converted into agricultural areas (Foley *et al.*, 2011), global fish catches peaked in the mid-1990s and have since declined (Worm & Branch, 2012) and a rapidly expanding aquaculture sector is occupying more terrestrial, coastal and offshore space

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(Lester *et al.*, 2018). Meanwhile, food consumption habits are changing. Humans consume more calories than before, and diets consist increasingly of very resource-intensive animal products (Nonhebel & Kastner, 2011; Thornton, 2010; Willett *et al.*, 2019). Estimates that extrapolate current consumptive patterns into the future suggest that food production could roughly double by 2050 to meet increasing demand.

While the current food system has led to substantial gains in human well-being and economic development for parts of humanity, the benefits remain highly skewed across, among and within countries. For example, agriculture now produces more than enough calories to meet basic dietary needs worldwide, but one out of eight people do not have access to sufficient food (FAO *et al.*, 2017). The number of undernourished people in least-developed countries has not declined, and food-price volatility persists and is a consistent threat to the citizens of these countries (Tomlinson, 2013).

The business-as-usual scenario is clearly no longer viable, but what are the means by which we can transform the current food system to become more sustainable, equitable and just? On the production side, there has been a recent and significant push towards sustainable intensification of agriculture (Garnett *et al.*, 2013). This includes a range of strategies that focus on increasing food production from existing farmland (by optimizing crop production per unit area) in ways that place less pressure on the environment. Examples include using improved irrigation techniques, climate-smart agriculture or other forms of technology-based innovations, although these have all been seriously questioned in the literature (Grafton *et al.*, 2018; Loos *et al.*, 2014; Pereira *et al.*, 2018b).

On the demand side, solutions have mainly focused on shifting dietary patterns to less meat-intensive diets in order to reduce pressure on natural resources (Willett *et al.*, 2019). For example, we could potentially provide enough calories to meet the basic needs of an additional four billion people if the current crop production used for animal feed and other non-food uses (including biofuels) were targeted for direct consumption (Foley *et al.*, 2011). Other systematic reviews have shown that greenhouse gas emissions, land conversion and water use can be reduced by up to 50–80% by adopting plant-based diets, which also are beneficial for health outcomes (Aleksandrowicz *et al.*, 2016; Springmann *et al.*, 2018).

However, these solutions focus on the biophysical and tend to leave out some of the no less important reasons as to why we eat, including food as relationship to others, food as cultural identity and food as a connection to landscape (Coles, 2013; Fischler, 1988; Jackson, 2010). Belasco (2008) outlines future ‘fixes’ for the food system: one is technological, the other anthropological. What we set to outline in this paper is that we need a messy combination of both to transform the global food system. It will require changes aligned to the principles of biosphere stewardship (Folke *et al.*, 2016) that take into account the social and bio-cultural needs at the local level, but that also ensure that these needs operate in synergy with the life-supporting environment. A central principle of stewardship is that transformations towards sustainability require continuous learning and knowledge generation across knowledge systems about social–ecological systems and their dynamics (Chapin *et al.*, 2010). We argue that a good starting point to achieve this messy balance is by recognizing the innovative potential of diverse local and indigenous knowledge systems. We hypothesize that, by scaling deep, these knowledge systems have the potential to effect local-level changes that have positive emergent outcomes for the whole food system.

This paper starts with the innovations that occur in the kitchen – the realm of chefs and cooks who are tasked with farm-to-fork conversion. We provide examples from South Africa and Mexico that show how innovations in the kitchen are reconnecting people to landscapes and providing them with healthier food options, using data collected from open-ended interviews with chefs as well as secondary literature sources. Using these examples as a starting point, we propose an alternative pathway for food system transformation that does not emphasize scaling up, but identifies trust and connectedness as key values that need to be emphasized – a form of scaling ‘deep’ (see Moore *et al.*, 2015). We conclude that the indigenous and local knowledges that can be found in our kitchens as well as on our farms lie at the core of this transformative potential, and these innovations need to be supported as both technological and anthropological solutions to the world’s food crisis.

2. Kitchens as sites of innovation

We expand on Montanari’s idea that tradition and innovation intersect through cooking by exploring the notion of chefs as innovators and change-makers in the food system. To understand the innovative potential of chefs, it can be useful to consider the three-level framework of ‘deliciousness’ described by Evans *et al.* (2015) at the Nordic Food Lab: (1) the perceptual, or sensory, level; (2) the functional level, referring to nutrition and safety; and (3) the creation level, where the ideas, philosophies and ethics underpinning food are located. The pursuit of what Evans *et al.* (2015, p. 3) term “irresistible” deliciousness – achieved through the synergy of excellence at all three levels – pushes chefs to “discover and rediscover unique sources of deliciousness,” often by engaging with neglected and underutilized food materials and by exploring diverse culinary knowledge from around the world. This motivation, and particularly the third level of deliciousness where ideas and ethics are situated, holds potential for productive engagement with food system transformation efforts.

Chefs and cooks can help showcase how important diversity is in creating a more sustainable and equitable food system by incorporating underutilized and traditional species in their cooking (Bioversity International, 2017; IPES-Food, 2016). There is a contentious divide between the idea of a ‘cook’ and a ‘chef’, with the former being generally less highly regarded than the latter, who is understood to operate in the realm of ‘gastronomy’ or “the science of the kitchen and the art of eating well” (see Artusi, 2003). However, this is a false dichotomy, as highlighted by Haider and van Ouderhoven (2018, p. 1), who propose that food “as a daily art” in agricultural communities “incorporates ideas of health, spirituality, community, technology, and trade, and connects the most marginalized with the most powerful.” Here, the power of food as a connector is recognized where those that wield the knowledge over how to make it delicious (ranging from a grandmother-as-cook to a Michelin-starred chef) have a transformative power. In this paper, in order to try to break down the stereotypes so prominent in gastronomy, we refer to cooks and chefs interchangeably because what really matters in our argument are their skills and knowledge about food. By making innovative use of the diversity of tastes, sights and colours around them, some chefs are trying to bring back a sense of place and heritage to the food they prepare in their kitchens. Faced with underutilized species, chefs become ‘gastronomic explorers’ and ‘virgin’ tasters, as the new flavours and textures that biodiversity brings to the palate can enable hitherto unthought-of creations

(Pereira *et al.*, 2014). Increasing the use of neglected species contributes to agrobiodiversity, while promoting and preserving traditional knowledge and can prevent further erosion of biocultural diversity (Guerrero *et al.*, 2019). Furthermore, traditional local food is an important means for improving health, especially in poor contexts (Borsari, 2011; Milburn, 2004).

3. Traditional ecological knowledge as innovation

Innovations in the kitchen are tightly linked to traditional ecological knowledge (TEK) of the food system that provides the products with which chefs experiment (Guerrero Lara *et al.*, 2019). The demand for traditionally grown produce can help to preserve agrobiodiversity and cultural landscapes and thus has synergies with the environment (Johns *et al.*, 2013; Téllez-Muñoz & Zografos-Johnsson, 2014). Despite the potential benefits of traditional farming practices, TEK is often misconceived as an antiquated, inefficient and obsolete body of knowledge, overlooking its dynamic and evolving nature (Cannarella & Piccioni, 2011; Mgbeoji, 2010; Nugraha, 2005).

The undervaluation of traditional practices is reflected by the fact that they have been largely replaced by modernized agricultural practices (Gómez-Baggethun *et al.*, 2010; Pereira *et al.*, 2018b). This can have impacts on gastronomy and health, as the products people cook with now are often less nutritious, less culturally relevant and less tasty (Allen *et al.*, 2014; Dernini, 2011; Littaye, 2016). This global food system is sometimes characterized as producing “food from nowhere,” rather than “food from somewhere” (Coles, 2013, p. 258; McMichael, 2009, p. 147). Chefs have started to create TEK-inspired innovations of local cuisines (inspired by ‘cooks’) that seek to harness the synergies between sustainability, health and taste by choosing ingredients that are delicious and help to maintain cultural landscapes and preserve biological diversity (Barber, 2014; Müller *et al.*, 2016). The Plant-Forward Global 50 initiative has collected 50 examples of chefs introducing “heirloom and indigenous varieties of produce, grains, and other plant-based foods” to their creations (EAT Forum & Culinary Institute of America, 2018). Such ‘farm-to-fork’ restaurants are efforts to reconnect people to farming and the landscape, which has become increasingly important in a world of a commodified food system where producers and consumers are disconnected (Gordon *et al.*, 2017). Their work is one way to break stereotypes and build trust, allowing stigmatized species and crops to become popular among civil society and fostering appreciation for the diversity of grains and flavours, which is essential for the uptake of neglected or ‘orphan’ species (Pereira, 2017).

Ways for innovation and tradition to meet in the kitchen are countless; the only restriction is the creativity of cooks (inspiring the third level of deliciousness). Novel ingredients that are compatible with local cuisine but less harmful for the environment can be explored. Chef Ángel León from Aponiente, Spain, for example, is experimenting with phytoplankton (a group of species with a very high reproduction rate) and discarded fish in order to achieve traditional flavours with more sustainable ingredients (Guerrero *et al.*, 2019). The Nordic Food Lab experiments widely with underutilized ingredients using a mix of traditional processing and modern technique: the Lab’s ‘koji-chovies’, for example, are made from herring – a plentiful and relatively underutilized Nordic fish – preserved in the style of anchovies with the aid of koji fermentation (Evans *et al.*, 2015).

Together, traditional practices both in the kitchen and in the field are building multiple types of diversity: indigenous farming practices are essential to safeguard agrobiodiversity (Johns *et al.*, 2013; Nazarea, 2006) and to enable dietary diversity (Fischer *et al.*, 2017; Pereira, 2017), contributing to human and planetary health (Allen *et al.*, 2014). Education that hybridizes technical with traditional knowledge in order to maintain agrobiodiversity is becoming increasingly recognized (Johns *et al.*, 2013; Pereira *et al.*, 2018b), emphasizing the need for both the technical and the anthropological interventions proposed by Belasco (2008). Another aspect is knowledge diversity, which goes beyond traditional farming practices and includes local culinary knowledge among different societal actors. If such knowledge is present and culinary innovations fit the culinary culture and habits, they are likely to spread (Guerrero *et al.*, 2019). Their absence, however, can present a barrier to innovation (Guerrero *et al.*, 2019).

Despite the potential of culinary innovations based on TEK to foster diversity, reconnect people to the landscape and rebuild trust, the effect on the communities holding the knowledge is uncertain. Depending on whether innovations are supported by ethical institutions or not, they can either be a means to empower or to capitalize on local communities (Cannarella & Piccioni, 2011; Hellin & Higman, 2005; Pereira, 2017). TEK does not easily fit into the intellectual property rights system that protects other types of innovations, making communities holding the knowledge more susceptible to exploitation, which is why interventions have to be carried out in a careful manner (Johns *et al.*, 2013; Mgbeoji, 2010; Téllez-Muñoz & Zografos-Johnsson, 2014). The drive to celebrate place and geographies by food practitioners responding to the placeless foodscape of the modern industrial food system can also lead to the production of complex commodity lore, purposefully obscuring the less palatable realities of provenance while highlighting – or marketing – the more palatable aspects (Coles, 2013). Special attention must be paid to various intersecting power relations that often characterize rural food (knowledge) systems, such as inequalities arising from colonial, urban–rural and gendered power structures (Howard, 2003; Pereira, 2017).

4. Programme on Ecosystem Change and Society case studies

Boxes 1 and 2 offer examples based on ongoing Programme on Ecosystem Change and Society (PECS) research into alternative food systems in South Africa and Mexico (see Figure 1). In both cases, there are aspirations to transmit and transform TEK for sustainability, but there are also concerns in the supply chains – both practical and ethical – that are acknowledged. The analysis and discussion that follow will draw on the work described in Boxes 1 and 2 and situate it in the context of innovation as described by Moore *et al.* (2015), where impact can happen not just from scaling up (getting bigger) or scaling out (replicating), but also by scaling deep (changing relationships, worldviews, etc.).

5. Bigger may not always be better: scaling innovation in the food system

A key insight that has emerged from the work interrogating the innovative potential of chefs in the food system refers to scale, especially when what one is attempting to scale is a connection to landscape or culture through an innovation that focuses attention on the deliciousness of food. Confronting the challenges of

Box 1. South Africa.

South Africa's food system is in particular crisis, characterized by increasing food insecurity for the poor, consolidation of power and profit within the food value chain, nutrition transition and an agrarian system of scarce arable land and water in which a small number of mainly white commercial farmers are privileged over black smallholder farmers (Drimie & Pereira, 2016). The landscapes of South Africa are highly biodiverse, however, and home to many underutilized indigenous foods that could contribute to agrobiodiversity, dietary diversity and cultural connectivity (Mbhenyane, 2017).

Recent research on indigenous foods is contributing to a better understanding of the role that these foods can play in creating a more just and ecologically sound food system, but modernization continues to erode indigenous foodways in South Africa (Mbhenyane, 2017; Shonhai, 2016). Rapid urbanization, supermarket saturation and the ongoing nutrition transition are supplanting traditional patterns of food consumption with a Western diet that is high in sugars, fats and animal proteins, leaving the poor to shoulder the triple burden of malnutrition (May, 2017). Global food system staples like wheat and rice have become aspirational, while indigenous foods are perceived negatively (Bharucha & Pretty, 2010; Mbhenyane, 2017; Pereira, 2017). In the Western Cape, where Khoikhoi and San first peoples relied on the diverse landscape for sustenance and medicine (Philander, 2010), negative perceptions, uncertainty that a market for indigenous foods exists and lack of knowledge were recently documented as primary challenges for small farmers attempting to re-engage with indigenous foods (de Bruin, 2018). The lack of scientific knowledge on the nutrition and safety of these indigenous foods (Evan's second, functional level of deliciousness) has also been highlighted as a barrier to use and uptake.

But an interest in underutilized indigenous foods is also burgeoning in the Western Cape, South Africa's gastronomic hub and a global biodiversity hotspot, rooted in the growth of high-end cuisine in Cape Town and the surrounding winelands. In this regional economy, eco-gastronomy – defined as an approach to food production focused on the stewardship of ecosystems and social justice that uses food to reconnect people to each other and the biosphere – is beginning to “provide seeds for social–ecological transformation in the food system” (Markey, 2017). In this context, a small but growing number of civil society organizations seek to link restaurants with shorter, more ethical food value chains focused on building resilient and sustainable livelihoods among marginalized farmers and fishers. Some of these initiatives are working specifically to revive knowledge around the access, use and heritage of underutilized and indigenous foods to encourage an ecologically sound and equitable food economy. Chefs are positioned as critical partners in these initiatives – their role being to constitute a reliable market for farmers and fishers, as well as to utilize their position to shift perceptions and consumption habits around underutilized indigenous foods.

Kobus van der Merwe, owner and chef at the small restaurant Wolfgat (recently recognized as restaurant of the year by the World Restaurant Awards in February 2019) is pioneering place-specific cuisine drawing on the indigenous foods of the Western Cape with motivations that deeply consider the social histories and ecological aspects of food systems (Lindow, 2017). Another chef in Cape Town described how the “naturally evolved food culture” present in the Western Cape, which he connects to lengthy stewing as a primary method, “needs to be dragged into a more modern, wholesome direction.” He felt food culture was perhaps stunted due to how people have been displaced from the land and that “filling that huge gap by bringing food culture into the present could be a compelling story ... but I don't know if that means we lose the cultural element of [the food], or whether that means we're sustaining it because cultural stuff evolves.” This echoes concerns of whether this place-specific cuisine can have an impact outside of the wealthy – often foreign – patrons of high-end restaurants in the Western Cape. However, the potential is clearly there, with another chef noting that the use of neglected and underutilized species had “taken off quite a bit sooner than I thought,” and “basically most of the top ten [restaurants in South Africa] have samphire, dune spinach and *soutslaai* (indigenous fynbos edibles) on their menus.” The consequences, however, of less rigorously considered motivations for engaging with indigenous foods can be antithetical to the intended revival, especially in the threatened and fragile microbiomes of the Cape Floristic Region. In 2016, a Cape Town chef who described van der Merwe as a “hero” collected and discarded kilograms of plant material from a fragile section of coast without any knowledge of indigenous plants. This story illustrates the potential of uninformed engagement by chefs to damage ecosystems.

Power-awareness and ethical approaches to indigenous knowledge are critical wherever underutilized and indigenous foods are valorised and commercialized (Pereira, 2017). Navigating these dynamics is particularly challenging in the highly unequal society of the Western Cape, where colonialism decimated Khoikhoi and San populations and where apartheid subsequently engineered the rejection of indigenous identity and heritage among coloured descendants of the Khoikhoi and San (Philander, 2010). For one small-scale farmer working to incorporate indigenous foods into the Cape Town food system, the way some Cape Town restaurants are beginning to market indigenous foods feels “like the new way of colonizing those foods, just as they try to uprise.” This illustrates the potential of uninformed engagement by chefs that ends up reinforcing unequal power dynamics and a new type of colonization of local knowledges and landscapes. The ecological implications of overexploitation by people ignorant of the fragility of protected ecosystems could also end up having the opposite effect of the original intention to create more sustainable food value chains. The edible insect movement – similarly characterized as holding potential for ecological stewardship, biocultural diversity and food security – is an example of a failure to attain these big-picture impacts, instead reproducing power relations in global food systems as much as challenging them, with little benefit accruing to “those who it claims to empower” (Evans, 2014; Müller *et al.*, 2016).

global food systems is often framed as requiring innovations that can either be scaled up (get bigger) or sometimes be scaled out (be replicated) (Moore *et al.*, 2015; Pereira *et al.*, 2018a). This has led to a fixation on quantifying ‘impact’: numbers of school meals allocated, counts of calories consumed, amounts of yield

gained, etc. However, this quantitative focus means that the pathway to achieving increased impact automatically means an increase in the numbers: more children fed in school (even if they are fed unhealthy food), 2000 calories per person per day (even if this means eating refined maize meal for every meal),

Box 2. Mexico.

Mexico is one of the most bioculturally diverse countries in the world, where complex and rich ecosystems provide a wide array of traditional ingredients with relevant social–ecological importance. The indigenous population of Mexico is divided into 62 different ethnic groups with 68 linguistic groups and 364 different dialects (DOF, 2010). Within each indigenous group, there are social and cultural traits that permeate the intricate local food systems that are premised upon centuries of oral traditions and indigenous knowledge. UNESCO has listed traditional Mexican cuisine as an Intangible Cultural Heritage of Humanity since 2010, highlighting the complex food chain that it implies, from planting and harvesting to cooking and eating. Native ingredients are just one element of a complex food system that includes a wide array of traditional skills, ritual practices, ancient agricultural knowledge and community customs and participation. Traditional cuisine often relies on the conservation of ecosystems for the sustainable supply of traditional ingredients.

This rich food system dramatically contrasts the inequalities faced by indigenous groups. Over 10% of the Mexican population is considered indigenous (nearly 11 million people). Although mostly concentrated in rural and peri-urban areas, the largest cities in Mexico concentrate important indigenous populations that are primarily located in marginal areas. The population suffering from poverty increased from 53.3% in 2012 to 55.3% in 2014 (CONEVAL, 2015). This increase is linked to a lack of food security, which affected 28 million people during that period, of which 2.9 million people live in mostly indigenous municipalities (CONEVAL, 2015; Cordero-Ahiman *et al.*, 2018). Besides these poverty-related problems, the Mexican food system is experiencing more extensive health problems, mostly related to overweight and obesity: 70% of the adult population are overweight, of which 32% are obese, and one in every three children is now overweight (Díaz-Domínguez *et al.*, 2016).

The contrast between vastly rich traditional food systems and the inequalities and health problems faced by indigenous groups in Mexico is stark. Mexican cuisine is highly regarded internationally, but it is clear that the Mexican food system is far from being healthy. However, a movement of chefs is starting to respond to the crisis through increased reconnection to indigenous foodways. Mexico's gastronomic legacy has been a centre for resistance and resilience and has maintained a strong focus on indigenous foods that are rich in diversity. Author and chef Ricardo Muñoz Zurita has worked for many years to explore the traditional foods and ingredients throughout the country (Muñoz Zurita, 2000). He talks about the “great gastronomic diversity of [Mexico]: there's almost every imaginable landscape here, and that gives way to different ingredients and styles of cooking” (Ulla, 2013).

One of the states of Mexico where it is possible to illustrate the importance and struggles of a traditional food system is the southern state of Oaxaca. Oaxaca is a place with a unique ethnic identity within Mexico, and this unique culture is well expressed in the highly elaborate food that it is famous for – where even the most basic of foods are labour intensive (Thrussell, 2016). Its indigenous cultures and traditions are as vast as the complexity of their traditional food system. This diversity also accounts for a great variety of traditional knowledge linked to biological resources associated with ‘ethnic’ food products with high commercial value. The markets in Oaxaca have long been studied based not only on the concentration and interchange of local products, but also on the spread of different productive agro-ecological practices (Arellanes *et al.*, 2013). At the same time, urban and rural areas of Oaxaca are facing a growing abandonment of traditional diets in favour of more commercial ones. These dietary changes are the main concern of a ‘kitchen movement’ of traditional cooks and young chefs from the eight regions of Oaxaca who have studied in schools of gastronomy around the country.

In the community of Zimatlán de Álvarez, one of the most important gastronomic festivals involves knowledge and skills being shared between national and international chefs, gastronomy students and local cooks in order to elaborate upon endemic dishes with local ingredients. As a result of these regional gastronomic festivals, young chefs from Zimatlán, like Ovidio Pérez Amaya, have become the main promoters of traditional indigenous recipes, elaborated exclusively by local families and communities, but with a special interest in the processes of production of the ingredients required. After finishing their training as professional chefs, this group of young cooks return to their communities to build kitchens based on the techniques they have known since they were children, keeping alive a wide array of cooking skills based on traditional knowledge closely linked to natural resources. As Ovidio argues: “The connection we have with food comes from the coexistence of grandparents and great grandparents who were mostly people dedicated to the fields, and who would explain what you could eat and how you could prepare it ... This is one of the main ways in which you begin to value the properties of food and to understand how to care and cultivate the ingredients.”

The inheritance of traditional knowledge and its transmission are founding elements of a local cuisine that Ovidio describes as an extensive assortment of edible leaves, flowers, fruits, animals and insects that are being eaten again after years of disregard. Some of these were already staples of the traditional diet, but current trends are reassessing their nutritional and social–ecological value. However, the current over-demand for ‘traditional’ indigenous food is becoming a challenge: facing an audience that increasingly values ‘food from somewhere’, locally produced foods are now part of a trend and lifestyle that promote exorbitant prices for these products. The reintroduction of local food products could have potential impacts on the local environment, and this process could change the roles and distribution of economic benefits within Zimatlán.

An illustration of this is the demand for grasshoppers, which are traditionally prepared in the region. On the one hand, collecting grasshoppers has become an important economic activity, seasonally employing a proportion of the local population that has to find new places to catch the insects in order to cope with growing demand. This not only modifies the ingredient's supply chain, but also alters local economic activities and ecological conservation. In some places around Zimatlán, forestland is being changed to grassland to ensure the provision of grasshoppers, contributing to local ecological crises related to land degradation. These modifications in local supply chains, related to the increasing demand for traditional ingredients, have also fostered efforts to protect the traditional indigenous recipes that cooks like Ovidio use and share in this movement of traditional chefs. Acknowledging these trade-offs and cultivating interventions that could help to achieve more equitable outcomes both socially and ecologically are ongoing challenges facing sustainable food systems.



Fig. 1. A transdisciplinary session on chefs and cooks as change-makers in the food system was held at the PECS II conference in Oaxaca City, 7–10 November 2017. Here, Chef Ovidio with his partner, Lizeth Alejandra Palomares Lizárraga, and PECS conference session co-organizer, Rafael Calderón-Contreras, are posing in front of a display of traditional Oaxacan foods and drinks that Chef Ovidio brought to share with the session participants. Zayaan Khan and Loubie Rusch from South Africa can be seen on Skype in the background. Samples of fynbos edibles prepared by Loubie were also on display, and participants were able to taste these products.

higher yields per hectare (even if this means more pesticides and no more pollinators), etc. By focusing attention on the kitchen as a site of innovation and on the landscape as gastronomic, the importance of the quantitative starts to give way to the qualitative, and a more nuanced concept of scaling impact starts to emerge. Many of the most innovative food system interventions are less concerned about economies of scale and higher returns on investment, and instead are focused on maintaining human–environment connections through their products and are concerned about ensuring equitable access to quality products by the poor (Markey, 2017).

However, while creativity and innovation are certainly the hallmarks of many contemporary chefs, they are still largely embedded in conventional value chains, even if some of them are trying to disrupt this status quo. It is important to shed light on the power dynamics of who gets to make these decisions, the driving forces behind more ethical innovation in the food system and what the systemic implications of galvanizing an ‘ethical and sustainable food culture’ based on high-quality, tasty products means in a world largely defined by unequal access. We argue that emphasizing values based on scaling principles of connectedness, trust, ecological integrity and equity is arguably more important than bigger ‘impact’ numbers if the goal is to break away from business as usual. This references Belasco’s (2008) argument that innovation for a more sustainable food system is not just technological, but also anthropological. However, focusing on the sociocultural aspects of food comes with its own set of challenges, and it has the potential to create even greater disparities in who wins and loses in the global food system.

Emphasizing values can be referred to as ‘scaling deep’. Scaling deep for long-lasting change is achievable only “when people’s hearts and minds, their values and cultural practices, and the quality of relationships they have, are transformed” (Moore *et al.*, 2015, p. 3). A clear first step in this shift towards scaling deep is the recognition of place-based knowledge (e.g., TEK) as critical for scale-appropriate innovations in the food system. By

highlighting alternative forms of knowledge as innovation (not just the scientific or technological, but also the anthropological or cultural), the emphasis on what needs to ‘get bigger’ becomes more apparent. Some of the examples of the work that chefs are doing in South Africa and Mexico showcase that what actually needs to be scaled is trust and connection. ‘Scaling deep’ can be understood as preserving tradition and enhancing knowledge, which in a sense speaks to a need for humility in this type of work (Ulla, 2013). However, maintaining this humility in the context of a need for systemic transformation is challenging, and there needs to be constant reflection on this movement as it grows in popularity through platforms such as the EAT Forum.

5.1. Trust

In the case of Oaxaca, the relationship between buyers and producers is mediated by a strong sense of trust. Chefs belonging to the Zimatlán movement are important consumers of local products, but they are also mediators in the marketing process of specific local products. The food movement relies on such mediation, where local chefs often suggest local producers increase the prices of specific products according to the availability and market demand. Local chefs have turned into actors who influence the quality of the ingredients offered in local markets, and local producers are now starting to fulfil the chefs’ requests for quality. Here, quality comprises all three levels of ‘deliciousness’ proposed by Evans *et al.* (2015). For a smallholder, it is more profitable to sell their products to a local chef concerned about quality than to a regional intermediary who focuses more on the quantity of the product. This issue has created a series of feedbacks in which local producers instruct chefs about the use of specific ingredients in an effort to increase their range of products. These relationships have important implications for the agro-ecological production systems in which these ingredients are produced. For instance, local producers now are less concerned with increasing quantities, focusing instead on ensuring the quality and availability of specific

products. Zimatlán has become a regional reference for the production of traditional ingredients, increasing awareness about the importance of organic production through sustainable agricultural and forest practices. The case of grasshoppers is interesting because the smallholders that catch them for markets are now concerned about the use of pesticides that reduce their availability, even at the height of the grasshopper season. Chefs have contributed, in this sense, to the conservation of traditional practices that protect the grasshopper while producing other ingredients essential for indigenous cuisine in a more sustainable manner. However, as mentioned above, there is also a negative feedback due to the increased demand for grasshoppers that has fuelled a change in the landscape to allow for increased grasshopper habitat at the expense of forests. This highlights that, as with all innovation, there is also a need for appropriate regulations and adaptive management responses to limit any negative repercussions, in this case spurred on by an increased demand.

In the South African context of post-colonialism and displacement, trust is critical in a different sense. Over the last few years in the burgeoning food scene in the Cape Town area, access to wild indigenous foods for chefs was mediated largely by one small business. The founder of this business, a white South African, closed operations in 2018 because he “started resenting [the business], seeing it as taking this indigenous knowledge and giving it to these white restaurants. My conscience started coming to the fore and I couldn’t do this anymore.” His trust relationships, built over many years with indigenous knowledge-holders from “generations of generally impoverished people,” helped him to recognize that “to have their knowledge sold off is criminal.” For the civil society organizations now working to revitalize the use of indigenous foods in the Western Cape, whether trust and the dynamics of appropriation can be navigated in such a highly unequal society is one of the most complex challenges ahead. Despite the clear potential pitfalls of a chef-led indigenous food revitalization in the Western Cape, it is refreshing to see that there are chefs who are humbly trying to connect to their role within this movement, as demonstrated by one Cape Town chef who noted the following:

When you’re dealing with recipes, you become a sort of custodian for your little moment of time through the generation ... A dish can exist for 200 years, and over your little moment in time, you become the person who continues the heritage ... And in that, there is a distinct heritage of chefs reinventing that dish, of working the dish over to suit the moment in that they are in ... so that it continues to have its sort of cultural standard amongst us, and continues to exist and be alive as a conceptual thing ... what I really struggle with is how to do that, in the context of what we’re talking about when we’re talking about other people’s cultural heritage. How do I custodian [sic] that ... information without taking control of it, you know, and taking ownership of it, and then turning it into some strange sort of elitist bastard version.

Creating a space within which chefs are aware of the powerful role that they can play in stimulating more sustainable and equitable food systems and how best to do this ethically, is critical if this innovative potential is to be leveraged for transformative change.

5.2. Connection

The social-ecological connections that derive from the interchange of ingredients for cooking transcend mere economic value of the products. The complex arrangements of knowledge, techniques and activities behind traditional food systems evoke

more than monetary value or the quantities of food produced. In the face of global market pressures, Oaxaqueños deliberately choose to shop at local markets rather than supermarkets for fresh ingredients because not only are these locally grown ingredients seen to be the best and the tastiest, but also their flavours connect people to place and to history (Thrussell, 2016). However, as observed in the Zimatlán case, the notion of fair trade is essential for strengthening the connectivity between local markets, producers and consumers. Before the reassessment of local traditional cuisine by trained chefs, prices were determined according to the demand from the state’s capital city. This situation created a wide array of intermediaries that took most of the economic benefits of the production of local ingredients. The effort involved in recreating and often rescuing long-lost recipes and products by local chefs and restaurants has meant that chefs play the role of those intermediaries, ensuring quality while also reconnecting people to their landscape and the biocultural heritage embodied in cuisine.

Similar shifts are happening in the Cape Town food system, where there is a movement for chefs either to forage directly themselves or to source directly from farmers that are growing indigenous edibles. Dune spinach (*Tetragonia decumbens*) is a slightly salty spinach-like fynbos plant that not only is now being grown by peri-urban farmers in Cape Town and used by chefs in the city, but also has made its way into a fruit and vegetable box scheme. However, despite being the first successfully cultivated fynbos vegetable, it has become a victim of its own success. Because it grows so abundantly, it outgrew demand, as many people would only make use of it sporadically and the knowledge regarding how to cook well with it has not yet been widely spread. The sensory ‘deliciousness’ described by Evans *et al.* (2015) can thus be embodied on the plate through the diversity of landscapes represented by different ingredients and their connections to specific places. However, these diverse tastes are not only due to the novelty of the ingredients themselves, but must also be paired with the knowledge of how to cook them, which is often associated with traditional recipes in the minds and hands of cooks. A critical component of building social-ecological connections through food is therefore acknowledging this knowledge. As Ovidio Pérez Amaya states:

There are varieties of products that have been lost due to disuse. However, in many cases it is not the case of rescuing scarce ingredients, it is the lack of knowledge of how to use them. The traditional kitchen has two complicated factors since it is designed to work with any type of product; it is easy-to-obtain food, the costs depend on the person who makes it and the quality of the product. The flavour of the greenhouse tomato is not the same as those grown in the orchards. There are recipes that do need specific products but even so, they have been modified. An example, the duranguense caldillo is originally with dried venison meat, but it can be done with beef. It changes the flavor, but ... it was made to work. The quality of the food will depend on each cook in the kitchen, the quality¹ of the ingredient and how truthful you are to the traditional way of cooking.

Scaling deep innovation in the food system requires taking into consideration that traditional knowledge and practices are as important as the quality of the ingredients for ‘deliciousness’. It emphasizes that the perceptual, functional and sensory components of delicious food have deeper roots in how we value the nature we eat and the traditional knowledge-holders that prepare these foods. This notion links the social and ecological aspects of food systems, and the extent to which these types of relations can be extrapolated to other scales is best illustrated by successful

networks that have started to build on these values, such as the Slow Food Chefs Alliance, including action manifestos like the one launched by an international group of chefs around Sustainable Development Goal 2 to eradicate hunger at the EAT Forum in 2018 (Chefs Manifesto, 2018).

6. Conclusion

This paper demonstrates that there is a case to be made for combining the innovative creativity of cooks with local knowledge and the biodiversity of underutilized species to create a food culture that enforces eating as an ethical act. With the current problems facing the global food system, it is time for creative solutions to make the food system more sustainable, while at the same time ensuring that good, healthy, culturally acceptable food is accessible to all. We propose an alternative model of global food system transformation that does not emphasize scaling up, but rather recognizes that trust and connectedness are the key values that need to be scaled through a focus on diversity. These are grand challenges, but one where chefs and cooks are stepping forward as innovators to find transformative solutions.

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Note

ⁱ Or 'deliciousness', as per Evans et al. (2015).

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