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Policy mixes for more vital legume value chains: Evaluation across competing policy frames

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Abstract

Legumes receive increasing attention in sustainability transition research as they can contribute to more sustainable food systems. Previous research has established the need for policies relating to both production and consumption to tackle the marginalisation of legumes in European cropping systems and diets. In this paper, we apply the policy mix framework to food system transition and develop it further into an interpretive policy mix framework to evaluate policy mixes for more vital legume value chains. The interpretive policy mix framework facilitates a better understanding of competing policy frames in designing more consistent, coherent, and comprehensive policy mixes for transitions. The paper analyses three competing policy frames promoted by the food system actors, who are engaged in the development of legume production and consumption in Finland. A comparative analysis of the frames highlights that the policy objectives do not align well; currently, there is no shared understanding among food system actors of what kind of policy mix is needed for more vital legume value chains. The results emphasise networking as a key element in building more coherent policy mixes. The paper shows how the interpretive policy mix framework can support in this endeavour by unveiling conflict lines and possible compromises between the different policy frames.

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1. Introduction

Transition to sustainable food systems poses wicked policy problems that require an appreciation of the complexities involved (Lang, 2021). The role of legumes in the transition to more sustainable food systems is one specific case in point (Balázs et al., 2021a). In Europe the specialisation of the production systems and the reliance on an intensive use of chemical inputs in farming and on imported soy for feed have marginalised legumes in Europe's cropping systems (Magrini et al., 2016; Voisin et al., 2014; Zander et al., 2016). Despite the European Commission's (EC, 2018) attempt to increase the use of legumes within the European Union (EU), the production and consumption of legumes have remained low (Balázs et al., 2021a; Makery, 2019).

A greater inclusion of legumes in crop rotation is essential for building more sustainable food systems. Legumes can play a vital role in diversifying the cropping systems, enhancing soil quality, reducing greenhouse gas emissions from production, and increasing farmland biodiversity (Nemecek et al., 2008; Peoples, 2009). Furthermore, legumes can provide a good source of protein and other macro- and micronutrients to humans (Ferreira et al., 2020; Päivärinta et al., 2020). A greater use of legumes has been recognised essential when shifting towards more healthy and sustainable diets in the Global North (Willet et al., 2019). Many EU countries promote an increased intake of legumes as part of sustainable and healthy diets in their nutrition guidelines (e.g., Helsediktoratet, 2021; MSS, 2019; Health Council of the Netherlands, 2015). The greater use of legumes in crop rotation is supported also by several agricultural policy measures (Balázs et al., 2021b; Voisin et al., 2014). The novel plant-based products have penetrated the food markets in recent years (Lonkila and Kaljonen, 2022; Mylan et al., 2019; Tziva et al., 2020).

Despite these positive developments, the policy landscape supporting the creation of vital legume value chains has stayed fragmented (Balázs et al., 2021a, 2021b; Magrini et al., 2016). The policies guiding legume production and consumption do not align well currently. Agricultural policy measures incentivising the integration of legumes in crop rotation are not concerned with whether the legume harvest is used for feed or food. On the other hand, nutrition policies do not care if the legumes consumed are produced domestically or imported. This hampers the development of vital legume value chains. In Finland, for example, the food industry lacks domestic ingredients for their growing category of plant-based products (Lonkila and Kaljonen, 2022).

More consistent, coherent, and comprehensive policy mixes are needed to develop legume value chains as part of the transition to more sustainable food systems. Studies on governing sustainability transitions have highlighted that any transition requires policy mixes (Rogge and Reichardt, 2016; Rogge et al., 2020) that shield novel technologies and allow niches to grow (Kemp et al., 1998; Smith and Raven, 2012), but also destabilise the current regime and unsustainable practices (Kivimaa and Kern, 2016). The policy measures across the various policy fields -- or food system activities -- need to align to build a coherent policy environment for transition (Rogge and Reichardt, 2016).

In this paper we examine the policy mixes for more vital legume value chains as part of the transition to sustainable food systems. We acknowledge that designing policies that simultaneously address the production and consumption of legumes, the health and environmental benefits of legumes, and the domestic and international markets for legumes is by no means an easy task. Rather the opposite, policy mixes for vital legume value chains need to navigate between multiple policy goals and preferences of the actors across the food system. In this paper we develop the policy mix framework introduced by Rogge and Reichardt (2016) and Kivimaa and Kern (2016) further to incorporate an interpretive analysis of competing policy frames (Entman, 1993; Schön and Rein, 1994). We distinguish three policy frames promoted by food system actors, who are engaged in the development of legume production and consumption in Finland. The three policy frames differ both in their policy objectives and instrument mixes. We show how the interpretive analysis of policy frames can support the identification of conflict lines, but also key nominators between the policy goals and instruments proposed by the food system actors. In this manner, the interpretative policy mix framework can be of value when designing more comprehensive policy mixes for future.

Even though the empirical case focuses on legume value chains in Finland, the study provides valuable insights on how to design more consistent, coherent and comprehensive policy mixes for sustainability transitions. The interpretive policy mix framework developed in this paper allows for evaluating competing policy frames as part of emergent and evolving policy mixes. It thus foregrounds the politics inherent in designing policy mixes and transition governance as the contested and messy nature of the policy process becomes visible (Flanagan et al., 2011; Hajer and Wagenaar, 2003; Meadowcroft, 2009).

2. Interpretive policy mix framework

2.1 Evaluation and design of policy mixes across competing policy frames

The concept of a policy mix has its origin in innovation and economic policy analysis (Mundell, 1962). It was developed to draw attention to a myriad of policies required to support innovations. In sustainability transition studies, the policy mix framework has been developed further to evaluate the combined effect of policies across various policy domains on sustainability transition (Kern et al., 2019).

Rogge and Reichardt (2016), who have been the pioneers in developing the concept within transitions studies, define policy mix as a combination of elements, processes, and characteristics. The elements are at the core of the policy mix framework. They comprise the policy strategy, a combination of policy objectives and the principal plans for achieving them, as well as the policy instruments or instrument mix operationalising the policy strategy. The policy instruments can be distinguished into economic, regulatory, and informational measures (see also Bemelmans-Videc et al., 2003). For a transition to take place, a combination of these instruments is required. Hajer and Wagenaar (2003) underline further networking as an own measure for environmental governance. A novel set of instruments, including behavioural instruments and nudging (Thaler and Sunstein, 2008) have also gained momentum in steering consumption. Rogge and Reichardt underline that the policy processes, by which the combination of policy instruments emerge, interact, and are implemented, are critical for the functioning of the policy mix (see also Edmondson et al., 2019; Flanagan et al., 2011; Kern et al., 2019).

In this paper, our aim is to develop the understanding of policy processes further by integrating the analysis of competing policy frames to the analysis of emergent and evolving policy mixes. Howlett and Rayner (2007) have emphasised that any policy development is constrained by the previous policy choices (see also Diercks, 2019). Therefore, when searching for novel policy mixes, for example, for developing vital legume value chains, there is a need to consider not only the existing policy infrastructure, but also the differing preferences of actors in developing them. In sustainability transitions research the capacity of incumbent companies in making powerful coalitions with policy makers has been acknowledged (Geels, 2014), while niche actors often lack the resources in forming solid policy frames and related coalitions (Rosenbloom et al., 2016). Although struggles between different frames have been identified important for transition processes and contextualising innovations (ibid.), they have, to date, been less investigated as part of policy mixes for transition. The aim of this paper is to enhance the understanding of competing policy frames in the design of policy mixes for sustainability transitions.

By policy frame we mean a coherent way of understanding a policy issue (e.g., Schön and Rein, 1994; Hajer and Wagenaar, 2003). We follow Entman (1993) by seeing framing as the selection of certain aspects of reality and making them more salient to promote a particular interpretation of the policy problem, the causal reasoning behind the problem and the proposed solutions to remedy the problem. Policy frames affect the policy process as the actors can form coalitions advancing certain framing of the issue and make some instruments seem more relevant and efficient than others (Schön and Rein, 1994; Entman, 1993).

To detect and understand competing policy frames is critical when assessing the possibilities for consistent, coherent, and comprehensive policy mixes. Consistency, coherence, and comprehensivness, as Rogge and

Reichardt (2016) argue, is essential for policy mixes to guide and steer sustainability transition. In the context of evolving policy mixes, the evaluation of consistency across the competing policy frames helps to draw conclusions regarding how well the different policy objectives and proposed instruments align. Coherence describes how the different policy goals and instruments across the policy fields, such as agricultural, innovation and nutrition policy, contribute towards the same transition trajectory (see also Huttunen et al., 2014). Finally, the analysis of comprehensiveness allows to evaluate how extensive and exhaustive the goals and instruments mixes proposed by the competing policy frames are.

When analysing the comprehensiveness of a policy mix, it is not enough to focus only on creative policy instruments that shield niches for more sustainable production and consumption patterns. Attention must also be paid to policies destabilising the current dominant regime (Kivimaa and Kern, 2016; Kivimaa et al., 2021). Kivimaa and Kern (2016) suggest that destabilising measures can include the regulation and controlling of the environmental impacts of the existing regime, structural reforms, the reduction of the flow of human and financial resources to the existing regime, the replacement of dominant governance organisations or networks with new ones, and the introduction of new organisational or institutional practices. We need to remember that proposition for destabilising measures is always politically controversial. A detailed scrutiny of the competing policy frames can advance the understanding of the power struggles at play.

In this paper we use this interpretive understanding to evaluate the competing policy frames as part of the emergent and evolving policy mix (Figure 1). We see the framework as useful in elaborating the in/consistencies between the competing policy frames, thereby providing valuable knowledge for designing more consistent, coherent, and comprehensive policy mixes, which take into account the various stakeholder positions and goals in a more inclusive manner. In this manner, the interpretive understanding of policy mixes has also practical relevance for the planning of policy mixes for sustainability transition.

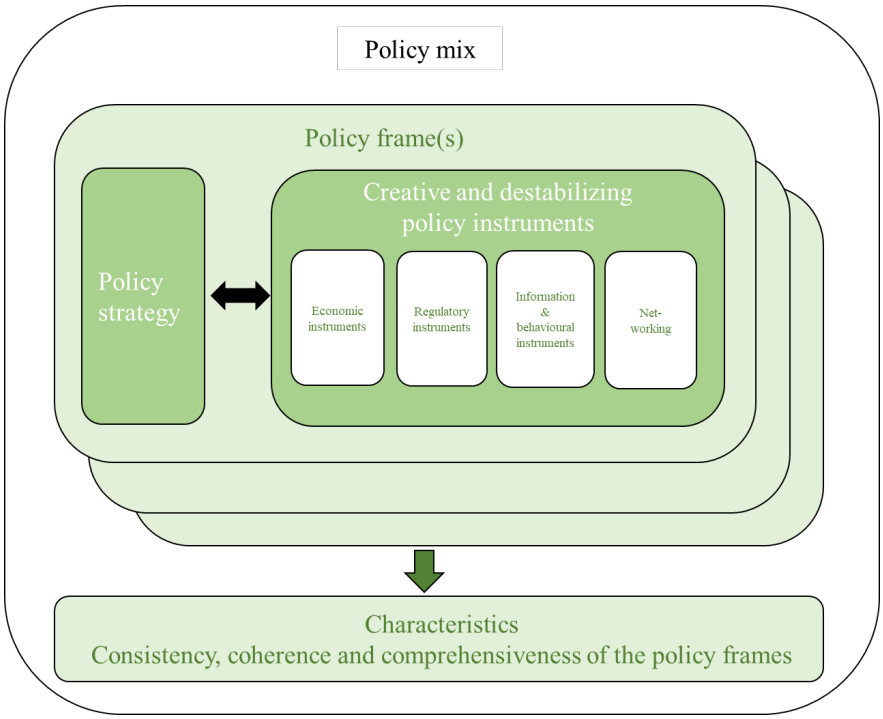

Figure 1 The interpretive policy mix framework

2.2 Policy mixes for more vital legume value chains

To date, most of the studies of policy mixes for sustainability transitions have focused on energy (e.g., Reichardt et al., 2016; Kivimaa et al., 2017) or mobility transitions (e.g., van der Vooren and Brouillat, 2015, Kivimaa and Rogge, 2020). In this study, we widen the use of the conceptual framework to food system tran-

sition. Food systems are, by definition, composed of multiple activities and goals (Ericksen, 2008; Kaljonen et al., 2020; Lang, 2021). A food system encompasses activities from inputs to agriculture and from processing, distribution and retailing to food consumption. The creation of more vital and diverse legume value chains, hence, requires investments, innovations, and actions across all these food system activities.

The complexity of the food system poses a specific challenge for policies governing the transition. In food system research, coherent food policies spanning across all food system activities and related policy domains have been argued for long (Candell and Pereira, 2017; Huan-Niemi et al., 2020; Mason and Lang, 2017). The creation of vital legume value chains clearly presents a similar challenge. Farmers, meat industry, plant-protein start-ups, consumers, and nutritionists, to name a few, may have differing goals for domestic legume value chains as well as competing preferences for policy instruments. Up until now, the policies affecting the production and consumption of legumes have been fragmented in Europe (Balázs et al., 2021b; Magrini et al., 2016). The measures targeted at consumption and production have not been coordinated. Moreover, the various lock-ins in the current food system that hamper the more vital use of legumes in European crop-rotation and in diets, have been insufficiently addressed (Magrini et al. 2016; Zander et al., 2016).

The European Commission (2018) has recognised legumes as vital part of sustainable food systems. More robust self-sufficiency in legumes would help reducing the dependency on imported soy for feed. Moreover, the targets set for the reduction of biodiversity loss and climate impacts of the food system in the new EU Farm to Fork strategy highlight the importance of legumes (EC, 2020). Currently, the most important economic instrument guiding legume production in the EU is the agricultural support system under the Common Agricultural Policy (CAP). The goals for the CAP and the levels of support are negotiated at the EU level, but the member states define the more targeted measures to fit their context according to the subsidiarity principle.

In Finland, legume farming has received support as part of the Greening Measures (crop diversification) and Ecological Focus Areas (N-fixing crops) under pillar one of the CAP.[1] Additionally, CAP's second pillar, the Rural Development Programme, encompasses support to agri-environmental schemes and organic farming, which have relevance for the legume production as well. Farmers further benefit from a protein crop premium paid via Finland's coupled support system.[2] These support mechanisms have contributed to increasing the interest of farmers in legume production. In 2020, peas and broad beans, the two most common legume varieties cultivated in Finland, were grown on 21 thousand hectares and 13.5 thousand hectares respectively, while in 2010, peas were grown on 6,1 thousand hectares and broad beans on 9,4 thousand hectares (Luke, 2021). The figures are, however, still very low in comparison to grains, such as wheat, barley, or oat.

Legume consumption is so far mainly promoted by informational policy measures. Many European countries have updated their national nutrition guidelines to include sustainability aspects (e.g., CNAUP, 2003; Health Council of the Netherlands, 2015; MMS, 2019; see also Lang, 2021). As opposed to agricultural policy, nutritional policy falls under the jurisdiction of the member states. The Finnish nutrition recommendations (NNC, 2014) follow the ones set on the Nordic level. These are being updated to incorporate sustainability aspects as well (Helsediktoratet, 2021). In Finland, the entire public food sector, including day care, schools, elderly care centres, are recommended to follow the dietary guidelines, which fosters the impact of the informational guidance (Kaljonen et al., 2018). The recommendations and regulations for public procurement can spur domestic legume production and consumption further by increasing the demand and development of domestic products and making them easily accessible for consumers (Balázs et al., 2021a; Kaljonen et al., 2018). Behavioural instruments, nudging and labelling, can play a vital role in promoting legumes in restaurants and retail as well (Kaljonen et al., 2020; Narciso and Fonte, 2021; Magrini et al., 2021).

The EC (2018) has attributed research and innovation an important role in building more self-sufficient plant

1 See for more details Food Authority (2021); MAF (2014).
2 See for more details MAF (2021a).

protein sector in Europe. The EC has funded many research projects to support the creation of vital legume value chains. In Finland, the Ministry of Agriculture and Forestry has accordingly supported the formation of the Protein and the Food and Beyond clusters to support the creation of a novel (plant) protein ecosystem in Finland (VTT, 2020a, 2020b). Such innovation support and networking have indeed been recognised as important for shielding innovations and creating new legume value chains (Bentia, 2021; Tziva et al., 2020). In Finland, however, the food industry is still lacking the domestic ingredients and processing facilities for plant protein fractions to support their growth (Lonkila and Kaljonen, 2022). Hence, better coherence between innovation and agricultural policies is clearly needed.

In what follows we examine how the actors involved in the development of legume value chains in Finland would like to see the current mix of policies to be developed further. We evaluate the goals and instruments the different actors are pushing forward and analyse what kind of policy frames they create. We use the interpretive policy mix framework to evaluate the consistency, coherence, and comprehensiveness of the policy strategy and instruments across the policy frames (Figure 2). Besides analysing the in/consistencies between the policy frames, we also evaluate the comprehensiveness of creative and destabilising policy instruments proposed. The destabilising policy instruments are currently largely missing from the policy mix. They are, however, necessary for breaking the current lock-ins in the food system functioning. Such destabilising policy instruments could include, for example, the phasing out or reduction of agricultural subsidies to livestock production, more stringent regulations on fertiliser use, taxing of high-carbon or unhealthy foods, restrictions to advertising or introduction of novel organisational structures and practices.

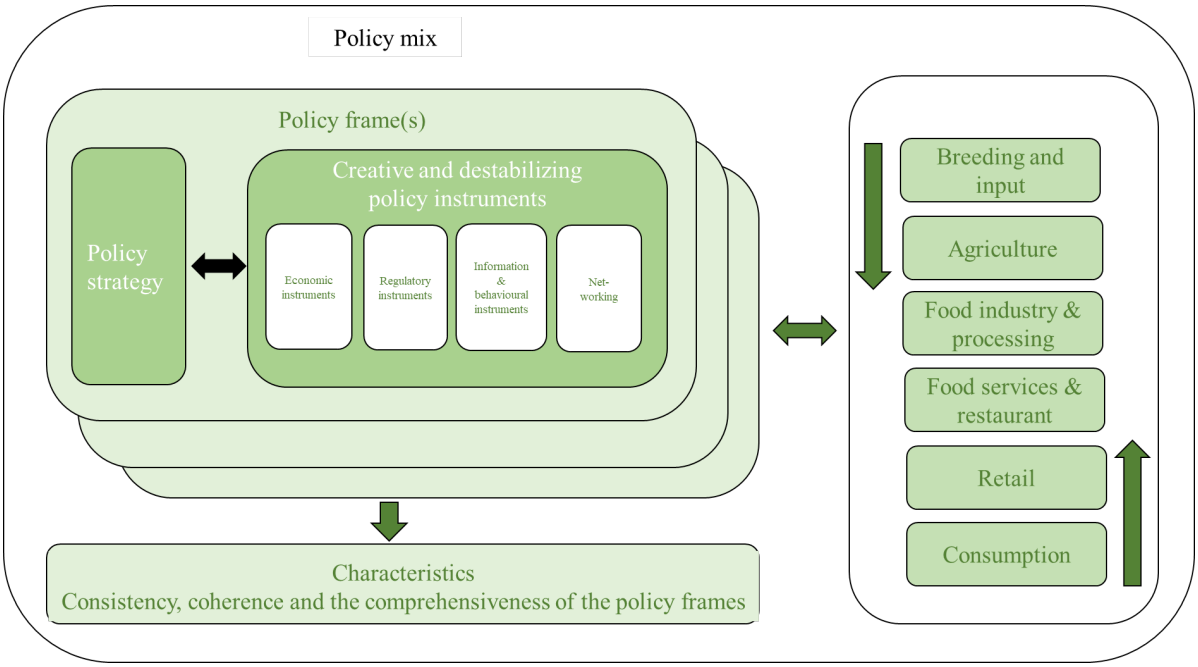

Figure 2. Interpretive policy mix framework for building more vital legume value chains in sustainable food system transition

3. Research data and methods

To identify food system actors' perceptions of how the policy mix for vital legume value chains in Finland should look like, we interviewed 26 persons from 22 different institutions involved in developing legume production and consumption in Finland (Table 1). First, we interviewed actors representing food system activities from input and breeding, agriculture, processing, retail, restaurants and food services, and consumption. We asked them to evaluate the problems hindering the development of legume value chains in Finland, and

to propose public and private policy measures to solve those problems. In the second step, we interviewed employees at the Ministry of Agriculture and Forestry, the Ministry of Environment and the Ministry of Social Affairs and Health. We asked the representatives of the different ministries to evaluate the feasibility and the comprehensiveness of the suggested measures and if there were any critical measures missing from the ones suggested by the food system actors. Besides the interviews, we organised also a workshop to deliberate policy measures to unravel the lock-ins in current legume value chains. Altogether 30 actors across the food system attended the workshop.

Table 1 Food system actors interviewed

Institutions and actors interviewed	**Food system activity**
Technical Research Centre of Finland (VTT), Protein Cluster	Research
Boreal Plant Breeding Ltd.	Breeding and input
Central Union of Agricultural Producers and Forest Owners (MTK) Luomuliitto ProAgria, advisory services The Finnish Cereal Committee (VYR)	Agriculture
HKScan A-Rehu	Processing (feed and meat)
Gold & Green Verso Pouttu Valio (plant-product line)	Processing (plant-based companies)
Leijona Catering Ylva	Restaurants and food services
S-Group	Retail
Motiva Martat World Wildlife Foundation (WWF) Nutrition Council of Finland (VRN)	Consumption
Ministry of Agriculture and Forestry Ministry of Social Affairs and Health Ministry of the Environment	Public policy, Ministries
Value for legumes workshop, 2nd Nov. 2020	Across the food system

The data from the first round of interviews was coded with the computer software NVivo and analysed with regards to the measures either demanded or taken by food system actors to strengthen the legume value chain as well as the policy objectives and reasoning behind the measures. We analysed the measures in relation to the instrument type and the food system activity the measure was targeted at. We distinguished the measures further into creative and destabilising ones. Based on this analysis, we differentiated three policy frames with distinct policy objectives and instrument mixes proposed. As policy frames they reflect distinct understanding related to the policy problem, causal interpretation about the reasoning behind the problem and proposed solutions.[3]

3 In contrast to Entmans (1993) definition of a policy frame, we did not include the interpretations related to morality into our analysis. The policy problem at hand did not evoke much discussion on this in

As a last step, we assessed the picture the three policy frames are painting together regarding consistency, coherence, and comprehensiveness. In the last step the interviews with the ministerial advisors were of crucial importance. Regarding consistency, we examined how consistent the three policy mixes were with each other. We investigated whether the different policy objectives highlighted by the three policy frames can be simultaneously achieved as well as whether the three different instrument mixes work together or contradict each other. By assessing consistency, we discovered conflict lines between the food system actors. The analysis of comprehensiveness gave us tools to assess whether the instruments proposed by the three policy frames address all the lock-ins in the legume value chain or whether there are creative or destabilising measures missing to strengthen the legume value chain. Based on this step-by-step analysis, we draw conclusions about the coherence of the policy process and how the political dimension behind the competing policy frames can be better accounted for in the design of more effective policy mix.

4. Competing policy frames for more vital legume value chains

4.1 Development of profitable and secure legume production

The first policy frame highlights the barriers hindering farmers from cultivating legumes. According to interviewed food system actors representing primary production, feed companies, breeding, and extension, the low profitability of legumes, insecure harvest, the challenging weather conditions in Finland as well as farmers' inexperience in growing legumes are all factors that disincentivise farmers from including legumes in crop rotation. Growing legumes for food is particularly challenging as the harvest quality needs to be much higher than when used for feed.

This policy frame emphasises both public and private measures for making legume production more profitable and secure for farmers (Table 2). Agricultural subsidies are attributed a prominent role in incentivising farmers to cultivate legumes as the subsidies can reduce the profitability gap between legumes and other crops. Particularly, the actors supporting this policy frame call for higher coupled support payment for farmers cultivating leguminous crops. They underline that the support for legume production should be continued under the renewed CAP and suggest that requirements of domestic feed could be integrated also into animal welfare schemes, while fertilisation levels for nitrogen should be coupled with soil quality.

Simply introducing more agricultural subsidies will, however, not be enough to make legume cultivation profitable and secure. Accordingly, actors constructing this policy frame call for more funding for plant breeding to develop legume varieties for the Finnish climate with high and reliable yields, as well as for research on cultivation methods and the use of herbicides. To tackle farmers' lack of knowledge on how to produce legumes, this frame highlights the need to accelerate knowledge exchanges between farmers. Advisory services should also play their part in exchanging knowledge on cultivation methods and on how to reach the necessary crop quality for feed and food. This policy frame further raises the need for domestic ingredient industry, which is currently missing from the Finnish legume chain. Public investments in processing facilities would help to secure a more stable demand and price for Finnish legume producers.

While public policy has an important role to play in the transition towards more secure and profitable legume production, this frame emphasises that the market prices of legumes must be set right. Many actors criticise that the market prices of Finnish legumes are bound to the market price of soya and argue that if farmers would get higher prices for legumes, more farmers would start cultivating legumes. Some of the actors underline contract farming as a solution to low market prices and actively promote collaboration between farmers and the food industry in this regard. With long-term contracts farmers and industry would have better security both in terms of price and supply.

In summary, this policy frame highlights the need for more public spending on the development of legume production conditions to increase the attractiveness and security of legume farming for both feed and food.

the interviews.

Actors constructing this frame however refrain from suggesting that support should be reduced for competing crops or livestock farming. Rather, they leave it to the markets to set the price for legumes right. The actors supporting this frame, including the Farmers Union, refrain from suggesting any policy measures guiding food, or legume, demand (see also Lehtonen et al., 2021).

Table 2 Policy frame for the development of secure and profitable legume production

	Breeding & input	**Agriculture**	**Food industry & processing**	**Food services & restaurants**	**Retail**	**Consumption**
Economic instruments	**funding for plant breeding; research on plant health & herbicides**	**funding for research on cultivation methods; research on economic value of legume cultivation; higher coupled support for legumes; using Pillar I & II for supporting legume production (green area, crop rotation, animal welfare scheme, N-level); contract farming**	investments in processing facilities	better use of public procurement rules to support domestic plant-proteins		
Regulatory instruments		**animal feed self-sufficiency target**				
Information & behavioural instruments		**advising farmers on crop quality & cultivation methods; knowledge exchange between farmers; better access to data on price development**	responsibility commitment to using domestic feed			labelling; food education
Networking	**protein cluster; collaboration between farmers and industry**					

*) The policy instruments with the most prominent support are marked in bold.

4.2 Let the markets guide legume consumption and production

The second policy frame highlights that the demand for Finnish-grown legumes is currently not met. Despite the slight increase in the production volumes, the food industry is lacking high-quality ingredients. Most of

the broad bean harvest is used for feed. Moreover, the industry processing plant-protein fractions is lacking from the value chain. This policy frame relies on markets to solve these bottlenecks in production, believing that the rising demand eventually will force the production to redirect its practices. This policy frame is put forward by the niche food industry actors, who produce plant-based alternatives to meat and dairy products, and by actors in retail.

This policy frame takes a critical stand on the agricultural subsidy system, deeming it as ineffective and distorting the markets (Table 3). The most radical actor even stated that no agricultural production should be subsidised. Actors constructing this policy frame rather promote contract farming between legume farmers and processing or food industry as well as intensified knowledge exchange and collaboration among all actors along the legume value chain as solutions to the current low level of legume production. They support the attempts to build a more stronger plant protein ecosystem in Finland with the help of Protein and the Food and Beyond clusters (VTT, 2020a, 2020b). They stress that networking amongst the actors is also required to increase their lobbying power within the Finnish food system and in food policy. They also see the establishment of the ingredient industry in Finland as the collective responsibility of actors along the legume value chain rather than that of the state.

The market-oriented nature of this policy frame is also reflected in the fact that to increase the consumption of plant-based meat and dairy alternatives, they demand public support for only marketing campaigns and consumer education. Actors constructing this frame emphasise that plant-based alternatives to meat and dairy products should be eaten because consumers want to and not because they are forced to do so. Accordingly, they do not actively suggest changes to nutritional guidelines or to public procurement rules promoting plant-based diets. With flexitarians rather than vegetarians or vegans as their main target group (Lonkila and Kaljonen, 2022), they fear that public policy instruments guiding consumers towards eating less meat could cause a negative backlash from consumers.

Since the most important reasons for consumers to switch towards eating more plant proteins are the taste and price of meat and dairy alternatives, especially the plant-protein product companies call for more innovation funding for product development. Interviewees criticise that currently innovation funding is directed only at developing ingredients and processes but not towards developing tasty and inexpensive products. This policy frame also sees a problem in the food law regarding the naming of products (Lähteenmäki-Uutela et al., 2021). Most companies interviewed agreed that they would preferless strict labelling regulation for plant-based products.

This policy frame, in summary, highlights the role of markets and of collaboration between all actors in strengthening the legume value chains. Public funding should be spent only on improving the business environment of plant-based companies to further promote the consumption of plant-based meat and dairy alternatives.

Table 3 Policy frame for market guidance on stronger legume value chains

	Breeding & input	**Agriculture**	**Food industry & processing**	**Food services & restaurants**	**Retail**	**Consumption**

Economic instruments		contract farming; phase-out of subsidies	**innovation funding; investments in processing facilities; export support**	changes in public procurement contracts to support plant-based products		support for marketing campaigns
Regulatory instruments			**change in food law regarding the name of meat alternative**			
Information & behavioural instruments		re-education programme for livestock farmers		training for cooks	positioning of products; nudging; consumer campaigns	consumer campaigns & education
Networking	**development of ecosystem; protein cluster; establishment of research consortium, better information flow between producers, industry and consumers on demand and needs**					

*) The policy instruments with the most prominent support are marked in bold.

4.3 Public guidance for sustainable diets

The third policy frame expounds the problem of too low consumption levels of legumes and too high consumption levels of animal products. This policy frame underlines that to transition towards more sustainable and healthy diets, meat and dairy products should be increasingly substituted with plant-based alternatives. Legumes, as protein-rich and nutritious crops, are presented as an important component of more sustainable

and healthy diets. Accordingly, the legumes should eventually become a normal part of Finnish diets.

This policy frame highlights the role of public policies and civic initiatives in guiding people towards more sustainable and healthy diets (Table 4). Actors constructing this frame, including two public agencies, two food service providers, and two civic organisations campaign on the benefits of plant-based diets, serving of vegetarian and vegan food at school canteens, cooperation with the food industry on developing new plant-based products and updating of the nutritional guidelines in favour of plant proteins.

Table 4 Policy frame for stronger public guidance on sustainable and healthy diets

	Breeding & input	**Agriculture**	**Food industry & processing**	**Food services & restaurants**	**Retail**	**Consumption**
Economic instruments	funding for plant breeding		innovation funding; investments in processing facilities	**school meals in the support of sustainable diets; changes in public procurement contracts and requirements to support sustainable diets**		**change in lunch voucher and Kelas meal subsidy system; reduced VAT on vegetable**s
regulatory instruments			restricting advertising of animal products			forced adoption of more sustainable consumption behaviour
Information & behavioural instruments				**training for cooks and sharing of recipes**		**updating nutritional guidelines; consumer campaigns and education**
Networking	networking for stronger policies and instrument mix across chain; cooperation in product development					

*) The policy instruments with the most prominent support are marked in bold.

This policy frame supports a myriad of policy measures to change eating behaviour towards eating more legumes both at home and in public canteens. Public procurement is promoted as the main tool to guide people towards eating more sustainably. As public canteens still serve too little legumes and plant-based food, changes in the public procurement contracts and requirements are essential. The product development could be enhanced with public funding as well. The actors pushing forward this policy frame underline that the cooks working at public canteens still lack the knowledge of how to prepare legumes and legume-based products. Hence, more training and capacity building is required to prepare nutritious and tasty plant-based foods. Lunch vouchers are recognised as yet another method of increasing legume consumption. Public and private employers can provide their employees with one lunch voucher a day as a taxable benefit or reduce it from the employees' salaries (Edenred, 2021). If the vegetarian lunch option would be cheaper for someone with a lunch voucher or if only the vegetarian menu could be purchased with a lunch voucher, more consumers might regularly eat vegetarian food. Finally, it is argued that also the Social Insurance Institution (Kela) could promote the consumption of legumes at university canteens by tightening the rules regarding meal subsidy

entitlements.

The actors presenting this policy frame, hence, tend to push forward more stringent regulatory and economic measures guiding consumption. They call for restrictions on advertising of animal products and a lower value-added tax for vegetables, for example. They call also for more active communication between the ministries on the environmental and health benefits of plant-based diets. The regulations should restrict unsustainable consumption habits as recommendations and individual responsibility for changing consumption patterns are relatively ineffective.

In summary, this policy frame calls for public guidance towards more sustainable and healthy diets. Actors constructing this policy frame highlight the slow nature of market-driven change and argue that to speed up the transformation towards more plant-based diets, public measures promoting the inclusion of legumes in human diets are needed.

5. Consistency and comprehensiveness of the policy mix for more vital legume value chains in Finland

The analysis of the policy frames reveals that there is currently no collective vision of a policy mix for more vital legume value chains in Finland. Rather, food system actors pursue different policy goals with distinctively different instrument mixes. The first identified policy frame aims at increasing domestic legume production and calls for measures developing legume cultivation to become more profitable and secure for farmers, while the third policy frame intends to change eating habits to become healthier and more sustainable and puts forward measures to increase sustainable legume consumption. These two policy frames focus on two different ends of the legume value chain and both the pursued goals and suggested instrument mixes do not align. The production-oriented policy frame shows no interest in governing consumption, whereas for the consumption-oriented policy frame, it does not matter whether legumes are sourced domestically or from abroad.

The second policy frame trusts the markets to increase both legume production and consumption in Finland and wants to improve the business environment for novel plant-based foods and companies. While this market-oriented policy frame has an interest in increasing both legume production and consumption, it rejects agricultural subsidies and other forms of public support to legume production as well as economic and regulatory guidance of consumption. The frame accepts public support solely for novel food innovations and business ecosystems to support the market growth of legume-based products. The instrument mixes put forward by both the production- and consumption-oriented policy frames are therefore partially inconsistent with the instrument mix called for by the market-oriented frame. Both the production- and consumption-oriented frames underline that achieving their goals of increased legume production and consumption depends heavily on policy support. For the production-oriented frame, agricultural subsidies are indispensable, and public funding for plant breeding and research is necessary to increase the area under legume cultivation. Food system actors behind the consumption-oriented policy frame stress that stronger economic and regulatory public policy instruments are required to shift to sustainable and healthy diets.

In sum, the three policy mixes are currently inconsistent with each other as they pursue different policy goals and promote distinctively different instrument mixes. Theoretically, it is possible to strengthen legume production, to improve the business environment for plant protein companies, and to increase legume consumption simultaneously. However, the incompetence or unwillingness to take the needs of other actor groups along the food system into consideration currently leads to a situation where the different goals do not align. The instrument mixes, which the three policy frames put forward, match poorly and in some cases are even contradictory.

Our interviews with the policy advisors to the Ministry of Social Affairs and Health (MSAH), the Ministry of Agriculture and Forestry (MAF) and the Ministry of Environment (MoE) revealed that they also propose measures with different food system activities in mind and assess the importance of public policy and markets differently. The policy measures put forward by the consumption-oriented policy frame appeal to the policy

goals and measures put forward by the MSAH. The measures put forward by the MSAH continue the long tradition of nutrition and health policy, now with a stronger emphasis on sustainability (Lang, 2021). According to this thinking, all the available public policy instruments are needed to support sustainable and healthy eating patterns and diets. In our interview the representative of the MSAH wanted to add several other instruments still to the ones put forward by the consumption-oriented policy frame. These include, for example, the integration of sustainability criteria into nutritional recommendations (Helsediktoratet, 2021), the introduction of a label that communicates both the healthiness and sustainability of a food product (EC, 2020), and restricting advertising of unhealthy food products to children (Fogelhom et al., 2021). Many of these initiatives are currently under investigation at the Ministry, while the while the taxation of unhealthy and unsustainable foods is considered politically and administratively more challenging.

The instruments proposed by the representatives of the MAF, on the other hand, focused mainly on inputs, agriculture and innovation policies. They agreed with food system actors constructing the production-oriented policy frame that better incentives for integrating legumes into crop rotations should be included in the national strategic plan of the CAP (MAF, 2021b). They, however, also highlighted the need to strengthen domestic production by creating stronger ecosystems for domestic legume-based products and stressed the ministry's continued support for the of the Protein Cluster (VTT, 2020a, 2020b). In accordance with actors constructing the market-oriented policy frame, the representatives of the MAF also argued for public innovation support and expressed their confidence in informational policies and markets to guide consumers towards eating more legumes as part of moderate shifts towards more fish and plant-based diets. These measures are emphasised also in the Ministry's Climate-friendly food programme (MAF, 2020).

In comparison with the representatives of the MSAH and MAF, the interviewed representative of the MoE took a more holistic view on building vital legume value chains in Finland. In the interview, the representative of the MoE considered all food system activities along the legume value chain and argued for policy measures emerging from various policy domains. Like representatives of the MAF, the importance of the public support for food innovations was highlighted. For the plant-based products to become a normal part of people's diets, the state should also ensure that the price of the products and the food environments are set right. In this way, the representative of the MoE supported the policy measures put forward by the consumption-oriented policy frame, but also production frame in underlining the need for extension and education so that growing legumes could become a more salient business path for farmers. Despite such a holistic approach, the policies at hand for MoE are limited and come mainly through more general climate policies (MoE, 2021). This can also partly explain the ability to perceive the issue from a wider perspective and could potentially also translate to facilitating the other sectoral ministries to broaden their perspectives.

Both the ministries' representatives and the food system actors put forward a rather substantial catalogue of creative policy measures which would improve the conditions for both legume production and consumption. Surprisingly, none of the frames, however, argued for stronger support on organic farming systems, of which the legumes are an essential part of. The food system actors as well as the representatives of the ministries were also reluctant in pushing forward any destructive policy measures (see also Tziva et al., 2020). Only the market-oriented policy frame criticised the agricultural subsidies for upholding the current regime and structures. This frame, however, challenged the subsidy system in principle, and was not able to put forward any concrete examples of measures destabilising the system. The consumption-oriented frame suggested restrictions to advertising unhealthy and unsustainable products. Furthermore, the taxing of high-carbon food was also discussed in this context, but it was deemed politically and administratively unfeasible. The creation of novel structures and institutions was supported most prominently within the market frame. Measures that would tackle the intensive use of pesticides and fertilisers and pave the way for a more low-input farming system, such as augmenting support for organic farming or the remuneration of legume ecosystem services, restrictions or taxing the use of inorganic nitrogen fertilisers or taxing of high-carbon food items, were not proposed. Neither were the low price of soya or trade regulations touched upon in the Finnish policy frames.

The emergent three policy frames illustrate how the Finnish food system actors pursue the strengthening of the legume value chain from rather narrow perspectives, considering the food system activities they are only themselves engaged in. They fail to go across the policy domains and assess the role of legumes as part of more systemic sustainability transition of the food system (see also Lonkila and Kaljonen, 2021). The benefits of the inclusion of legumes in agriculture and human diets are still considered separately.

6. Discussion and conclusions

The interpretive policy mix framework developed in this paper helps to understand the political and contested nature of policy mixes for sustainability transitions. It facilitates the understanding of why the design of consistent, comprehensive, and coherent policy mixes may be difficult when designing novel means for sustainability transition and what kinds of barriers need to be overcome to create policies for sustainability transition.

Policy analysts have established that there is no one single policy field where changes would lead to increased legume production and consumption in Europe (e.g., Balázs et al., 2021a, 2021b; Schiavo and Aubert, 2020; Topp et al., 2014). Our analysis of the different policy frames in Finland echoes this finding. To strengthen the Finnish legume value chains, changes in policy fields targeting agricultural production, nutrition and health, innovation and food markets as well as climate and environment are being pushed forward by different food system actors. The three policy frames identified anchor into different policy fields under the jurisdiction of different ministries of agriculture, health, and environment. As outlined above, the instruments put forward across the three policy frames are fragmented and, on some points, even contradictory. Food system actors tend to promote policy measures that would benefit the activities they are themselves engaged in, without considering other food system activities or the needs of other food system actors in developing legume value chains. Consequently, the suggested policy instruments do not form a consistent whole that would help creating more vital legume production and consumption simultaneously.

This fragmentation hampers the transition towards sustainable food systems. On the one hand, more powerful food system actors, namely actors relying upon the production-oriented policy frame, have more possibilities and strength to lobby policy makers than the less powerful actors, such as consumer organisations or environmental NGOs. Hence, policy changes for enhancing production conditions for plant-protein feed are likely to be more impactful than those of enhancing legumes as part of diets. This may fragment the policy landscape even further. On the other hand, food system actors engaging in the development of legume value chains are often niche actors who need to stand up to regime actors, including the meat and dairy industry. The disintegration of the food system actors involved in developing legume value chains into three different groups which pursue three different goals may weaken the actors' bargaining power within the food system. This study therefore highlights the need for networking between the different food system actors. Developing spaces for networking may also foster cooperation between actors in ways that go beyond their views on public policy measures. It is important that public administration allows for actors to come together and find common ground also in order to develop market solutions for more vital legume chains.

Spaces where food system actors can learn about each other's needs are required to overcome their vested interests and negotiate compromises. Networking is important for the food system actors along the legume value chain to find one voice. Public administration, which has a responsibility to act on the environmental and climate impacts of the current food system, needs to facilitate this exchange between food system actors involved in developing the legume value chain.

The interpretive analysis of policy mixes can help this endeavour by highlighting the points of conflict, but also the possible compromises among the different food system actors and policy fields. The analysis across the Finnish legume value chain reveals how some of the policy measures promoted in both market- and consumption-oriented policy frames could be aligned for more consistency. While companies producing plant-based meat and dairy alternatives are generally against more stringent public regulation, they are more than

willing to support policies that only indirectly lead to an increased legume consumption. Policy measures such as trainings for cooks, measures promoting the use of plant-based food products by food services, and an active communication on the environmental and health benefits of legumes would promote legume consumption more subtly and would have an impact on the demand for plant-based products. A broader compromise could even be possible between the production- and consumption-oriented policy frames. While both actor groups supporting these frames fail to recognize the needs of the other, they do not deny the need to increase legume consumption or the profitability of legume production respectively. Again, this highlights the need for networking for actors to gain knowledge of and become sensitive to the potential of other food system activities in promoting more vital legume value chains.

Finally, the analysis of competing policy frames does further highlight the challenges involved for policy makers in planning policy mixes coherently across policy fields. Policy makers need to recognise and understand the potential to develop legume value chains within different policy fields and across food system activities. The results of this study call for better collaboration between ministries in developing legume value chains and sustainable food systems. The ministries need to develop a collective understanding of how agricultural, health, environmental, and innovation policies can be aligned for stronger use of legumes in sustainable food systems. Policy makers need to become better aware of the different policy frames for more vital legume value chains and the related interests represented by the different food system actors. Instead of focusing only on stakeholders close to their own policy field, the policy officials should broaden their perspectives to accommodate the interests of other stakeholders engaged in other food system activities.

Accordingly, ministries need to commit to developing the legume value chains jointly by simultaneously improving conditions for legume production and consumption and destabilising the unsustainable production and consumption practices. To establish legumes as a central element in European cropping system and diets, the current agricultural subsidy system that maintains livestock production and high levels of meat and dairy consumption needs to be questioned. As explained above, the Finnish food system actors, however, refrained from fundamentally questioning the existing subsidy structure, partly because of political realities. Considering the marginalised position of legumes and the urgent need to reduce the environmental and climate impacts of the food system, policy planners and makers should, however, include destructive policy measures in the policy mixes. Therefore, further elaboration of what kind of destructive policy instruments are required in building effective and efficient policy mixes for strengthened legume value chains is critically needed.

Kivimaa and Rogge (2020) highlight that for transformative change to happen, support from civil servants and ministers for more permanent changes in the policy mix is crucial. This study on the policy mixes for vital legume value chains further emphasises networking as a key element in building more coherent policy mixes. The interpretive policy mix framework can support the designing of more consistent, coherent and comprehensive policy mixes by unveiling conflict lines and possible compromises between actors and highlighting weak points in current policy mixes and administrational efforts in guiding sustainability transitions. It allows for zooming in on the political process by which a policy mix is formed and facilitates a better understanding of different perceptions of the ideal policy mix. By so doing it renders visible the politics inherent in evolving policy mixes.

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US Agricultural Colleges' International Strategic Partnerships: Leadership's Critical Insights & Recommendations

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Abstract

Historically, U.S. colleges of agriculture have been leaders in generating, disseminating, and applying the latest science to address the needs of society, in educating the next generation of professionals and leaders, and in engaging in international partnerships. As these processes and goals become more global, strategic international partnerships become more critical. To understand how college leaders are approaching these critical relationships, deans of 33 leading U.S. colleges of agriculture were surveyed on key aspects of their international partnerships. The most frequently identified major goals were: 'enhancing the quality of research and scholarship'; and 'strengthening students' education'. However, more than half the deans noted four challenging issues for realizing productive partnerships: 'difference in educational quality and standards among partners'; 'incongruent expectations between the institutions'; 'language and cultural differences'; and 'different levels of institutional commitment'. Fewer than half the deans indicated that dedicated resources were allocated for the partnerships. Ten critical topics often identified by college strategic plans were seen by most of the deans as important for their college but not nearly as important for their international partnerships. Three quarters of the deans identified seven factors for future successful international partnerships, including: 'leadership at the program and college level'; and 'adequate resources, including funding, eligible faculty, facilities and space'. Several future research needs were identified: international strategic partnerships will require informed and creative college leadership and likely need to expand in scale, scope, diversity and complexity, draw successfully on the scientific knowledge worldwide, and carefully consider the wide, unique opportunities and challenges of these partnerships.

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Introduction

Historically and to date, institutions of higher education and especially their colleges of agriculture, environmental sciences, food, and community development[1] have played key roles in generating, disseminating and applying the latest scientific knowledge and technology to address global grand challenges and to educate the next generation of professionals, leaders, and engaged citizens. Around the world these colleges of agriculture, in large part through international partnerships, have helped transform rural societies, providing the foundation for productive, safe and sustainable food and natural resources systems, and successfully supporting the development of youth, families and communities. These international scientific partnerships have been an important part of U.S. research, education, and development for decades and particularly for food, agriculture, natural resources and community development (APLU, 2017; Busch & Lacy, 1983; Lacy, 2004; NSF, 2020; USAID, 2017, 2020; USDA, 2020). These partnerships take many forms, including agreements on cooperation, faculty and student exchanges and study abroad, dual degree programs, interdisciplinary joint research initiatives and centers, community and regional development activities, and networks, consortia and associations. Regardless of the specific nature of these international partnerships, they generally require formal institutional commitments, strong visionary leadership, adequate resources, clear and sound policies, open communication, and mutual benefit, reciprocity, respect and trust (AAA&S, 2020; Aaron et al., 2019; Altbach & de Wit, 2015; Deardorff & Charles, 2018; Dusdal & Powell, 2021; IIE, 2016; Ma & Montgomery, 2021; NSF, 2020; Sutton & Obst, 2011; Wohlert, 2020; Woldegivorgis et al. 2018; Zingerli, 2010).

Rebecca Keiser, Chief of Research Security, Strategy and Policy, and former leader of the U.S. National Science Foundation's Office of International Science and Engineering, noted that international collaboration ensures the U.S. science and engineering (S&E) community access to expertise, facilities, data, and research sites across the globe. Keeping the U.S. engaged with global research is critical to the health of our S&E enterprise. The National Science Foundation is committed to international cooperation in science, engineering and education research. Keiser pointed out: "We value our international partnerships around the globe and recognize that the most challenging science requires international cooperation" (NSF, 2018a, 2020).
Keiser further observed that large-scale research networks that connect U.S. researchers with partners in other countries will be key for tackling scientific grand challenges and pushing the frontiers of science in ways that are impossible for typical lab-to-lab collaborations. To meet this need, she announced an NSF program (Accelerating Research through International Network-to-Network Collaborations, or AccelNet) which aims to accelerate the process of scientific discovery and prepare the next generation of U.S. researchers for multi-team international collaborations. Among the projects to be funded are community-identified grand challenges to improve understanding of the organisms, systems and sustainability of our planet, as well as solutions to pressing problems related to the air we breathe and the food we produce (NSF, 2020). Similarly, the National Science Foundation's *Science & Engineering Indicators 2018* report (NSF, 2018b) asserted that for the U.S. to continue to act as a global economic, security, and scientific leader, its scientists and engineers must be increasingly involved in global collaborations.

A recent article in *Nature* (Crew, 2019) reported that, since 2004, the number of international scientific collaborations globally has tripled, as has the number of co-authored publications. From 2000 to 2015, the percentage of scientific publications produced by authors from two or more countries doubled, from 10.7% to 21.3%. Moreover, field-weighted citation analyses showed that the impact of these co-authored publications was considerably higher than those authored from only one country. (Ribeiro et al., 2018; Pan et al., 2012).
Many science, research and educational institutions have stressed the critical importance of international strategic partnerships and research collaborations (Chen et al., 2019; Kirstin et al., 2020; IIE, 2016). In late 2020, the American Academy of Arts & Sciences (AAA&S) published a key report entitled *America and the International Future of Science* as part of the project "Challenges for International Scientific Partnerships" (CISP)

[1] U.S. colleges of agriculture have many different names which include environmental sciences, natural resources, forestry, community development, food, health, and life sciences. In this paper college of agriculture is used to represent all variations.

(AAA&S, 2020). This report notes that international scientific collaborations have led to many groundbreaking scientific discoveries, such as the first image of a black hole, lifesaving vaccines and therapies, and new crops that help prevent famine. The CISP project's principal conclusion was that the benefits of international scientific collaborations for the United States and the world are substantial and growing, and far outweigh the risks they can present.

This project identified six key factors that are critical for the U.S. to continue and strengthen its investments and participation in international scientific collaborations. First, addressing broad societal needs and issues and advancing science and knowledge requires action beyond national boundaries. Second, it is imperative to have open, strong, and welcoming academic institutions and research organizations. Third, because of the significant decline in the U.S. portion of the world's research and development expenditures to about one-quarter of the total (Congressional Research Service, 2020), U.S. researchers should engage collaboratively with the global scientific community. Fourth, U.S. national security is increasingly dependent on scientific and technological developments occurring in other countries. Additionally, while addressing critical global challenges, like climate change, water quality, food security and poverty alleviation, scientific cooperation helps build the foundation for mutual trust. Fifth, international scientific partnerships facilitate the sharing of the increasing expense of conducting research and ensure the U.S. participation in large international projects. Finally, the U.S. should be a participant in the development of global ethical standards, norms and guidelines for science and scientific conduct within partnerships (AAA&S, 2020).

The emphasis on strategic international partnerships, particularly in the areas of food, natural resources and the environment, is reflected in *The 2030 Agenda for Sustainable Development,* adopted by all United Nations Member States in 2015. This report provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries – developed and developing – in a global partnership. Goal 17 is focused on strengthening the means of implementation and revitalization of the global partnerships for development, with an emphasis on strong, inclusive global coalitions and collaborations. Moreover, a significant number of the goals focus on global food and nutrition, insecurity, and natural resource and community sustainability, including the following: *Zero hunger; Good Health & Well Being; Clean Water & Sanitation; Affordable & Clean Energy; Sustainable Cities & Communities; Climate Action; and Life on Land.* With just under ten years left to achieve the Sustainable Development Goals, world leaders at the SDG Summit in September 2019 called for a Decade of Action and pledged to mobilize financing, enhance national implementation, and strengthen institutions to achieve the goals by the target date of 2030 (United Nations, 2020; Lacy et al., 2004; Loconto & Fouilleux, 2019).

The U.S. Agency for International Development (USAID) has also focused on the critical grand challenges related to agriculture, food, environment, and community development, and has a long and extensive history of international research and educational partnerships in these important development-related areas. A recent publication, entitled *USAID'S Legacy in Agricultural Development – 50 Years of Progress* (USAID, 2017), documents the impressive efforts and programs to innovatively develop, test, and advance best practices in agricultural and rural development. USAID has continually pioneered new approaches in agricultural science, education, economics and social organization to improve the earnings potential and standard of living of rural and urban households. The Agency has joined with many international partners to identify emerging issues and develop common solutions.

USAID has partnered with U.S. university scientists and host-country researchers to conduct research to boost crop and animal productivity, regenerate soils, manage pests, enhance nutrition, support science-based biotechnology, pioneer remote-sensing applications, and understand farming systems. In 1971, USAID and other organizations formed the Consultative Group on International Agricultural Research (CGIAR), a partnership

of international research centers. Over the years, USAID has provided more than $1.4 billion to fund the CGIAR's work, which is estimated to have lifted food production in developing countries by 7 to 8 percent. Over the last several decades, Feed the Future Innovation Labs for Collaborative Research Support Programs (CRSPs), a unique partnership between U.S. universities, developing country institutions, and USAID's other partners, have addressed issues of hunger and poverty through science and technology. Created in 1977, these long-term collaborative research programs have focused the scientific expertise of U.S. universities on improving agricultural productivity and marketing systems, and enhancing food security in both the U.S and in developing countries. Currently there are 23 interdisciplinary multi-state international programs working in Asia, Central America, and East, Southern and West Africa, nearly all of which are led by U.S. colleges of agriculture (USAID, 2020; Lacy, 1985; Rudnick et al., 2019).

Similarly, the United States Department of Agriculture's (USDA) National Institute of Food and Agriculture (NIFA) recognized the mutual benefits derived from international cooperation in agriculture and has established meaningful partnerships with other countries and organizations. These include partnerships with USAID's Partnerships for Enhanced Engagement in Research (PEER) Program, International Wheat Yield Partnership (IWYP) Program, Binational Agricultural Research and Development Fund (BARD), the Food and Agriculture Research Initiative with Ireland and Northern Ireland, and several partnerships with the National Science Foundation, The Tropical Agricultural Research and Higher Education Center (CATIE) and CGIAR. The Center for International Programs facilitates linkages between NIFA-funded programs and these partners to achieve greater global impacts (USDA, 2020; Unnevehr et al., 2003).

The Association of Public and Land-grant Universities (APLU) which includes all the U.S. colleges of agriculture, recently released a report focused on addressing global food and nutrition insecurity. This *Challenge of Change Commission* report (APLU, 2017) defines seven challenges for pursuing these global issues. It also details the steps that public research universities, their colleges of agriculture, and their partners must take to address these challenges and to meet global food needs by 2050. The challenges are to: increase yields, profitability and environmental sustainability; develop the varieties and breeds for a sustainable food system; decrease food loss and waste; create and share resources that serve all populations; ensure inclusive and equitable food systems; address dual burdens of under-nutrition and obesity; and ensure a safe and secure food supply that protects and improves public health. The report includes a strong recommendation for more strategic collaborations with our colleagues in industry, academia and government around the world (APLU, 2017; Lacy et al., 2014, 2020; Welsh et al., 2008; Glenna et al., 2007; Payumo et al., 2019).

Complementing the importance of international partnerships for research and development, is the equally important role of these partnerships for the development of the citizens, professionals, and leaders of tomorrow (Marginson & Smolentseva, 2014; Marginson, 2017). As E. Gordon Gee, President of West Virginia University, recently noted:

> *"Globalization has helped create new demands for graduates who understand our world and can compete in an international workplace. It is our job, as leaders in higher education, to connect our students to the world and the world to them…. At this fragile time in our world, it is more important than ever to give our students the skills, experience, and knowledge that will help them pursue global opportunity, understanding and, ultimately, peace." (Deardorf & Charles, 2018: xi-xii).*

With these broad global agendas in mind, strategic international research and educational partner ships and collaborations have become particularly relevant for colleges of agriculture. The previous discussion of the reports and initiatives of NSF, AAA&S, USAID, USDA, APLU, and the UN SDG strongly indicate that the challenges of food security, safety and quality, environmental sustainability and climate change, and rural development are global, requiring strategic international collaborations. U.S. colleges of agriculture have

been leaders with a long history of successful research and educational and extension collaboration, and will need to enhance and continue to build on that foundation. In addition, unlike many other university units, U.S. colleges of agriculture have committed senior administrative leadership (Associate Deans and Directors) dedicated to international collaboration.

While this review has emphasized the research, educational, and outreach benefits of international strategic partnerships, as well as the critical role of U.S. colleges of agriculture, it is equally important to acknowledge that imbalances often exist in these relationships. Most international partnerships bring together institutions with different resources and capacities. The asymmetrical power relations that may impact the partnerships are at the center of the North-South[2] theoretical debate. In the global South, due to lack of resources, financial support, and human capital, many colleges of agricultures are unable to function as a true partner. This inequality may influence the outcomes and the course of decision making, goals and programs of these strategic partnerships.

Nonetheless, within this context, describing and understanding the leaders' perceptions and opinions on the nature and goals of these partnerships, their issues and challenges, as well as successful models, are essential to future success (Deardorf & Charles, 2018; Merkx & Nolan, 2015; Heyl & Hunter, 2019). How do college leaders see their role in these international and transnational partnerships? In many instances, deans, directors and university vice-presidents play a critical role in developing and maintaining strategic research and educational collaborations. Yet, we know little about how they see their role, and specifically their perceptions that tend to shape the outcomes of their college's partnerships. This study focuses on college of agriculture leaders' perceptions of their international partnerships, to better understand and enhance those relationships.

Study Design

This study focused on those U.S. colleges of agriculture which, in numerous international rankings, are among the top colleges of this type in the world. Two research-oriented world rankings were used: the QS World Rankings of Colleges of Agriculture and Forestry, and the Shanghai Ranking of Academic Subjects. In 2020 in both rankings, U.S. colleges of agriculture constituted one third of the top 25 and the top 50. For our research, colleges were selected according to their QS rankings. The QS subject rankings are compiled using four sources. The first two of these are QS's large global surveys of academics and employers, which are used to assess institutions' international reputation in each subject. Academics are asked to list up to 10 domestic and 30 international institutions which they consider to be excellent for research in the given area. They are not able to select their own institution. Similarly, employers are asked to identify up to 10 domestic and 30 international institutions which they consider to be excellent for the recruitment of graduates, and the disciplines from which they prefer to recruit. The second two indicators assess research impact, based on research citations per paper and h-index in the relevant subject. These are sourced from Elsevier's *Scopus* database, the world's most comprehensive research citations database (Craig, 2021; QS World University Rankings-Methodology, 2021). One of the key changes over the last decade has been the increased ranking of institutions outside the U.S. and their enhanced quality and productivity. Consequently, the opportunity and value in international partnerships and collaborations with colleges of agriculture outside the U.S. continues to grow.

A cover letter on a U.S. college of agricultural and environmental sciences letterhead was sent to 40 U.S. college of agriculture deans explaining the nature of the study and asking them or an appropriate designated senior administrator,[3] to complete a 14-question Qualtrics survey. The survey was developed from an exten-

[2] The North is mostly correlated with the Western World, while the South largely corresponds with the developing countries (previously called the "Third World"). The two groups are often defined in terms of their differing levels of wealth, economic development and income inequality.

[3] Since deans were asked to respond to the survey or designate their appropriate senior administrator as the respondent, this paper

sive review of the literature on international partnerships and several interviews with university leaders. The Qualtrics survey was chosen for its ease of administration and quality of data analysis. Thirty-three surveys were completed, with an 82.5% response rate.

The participating colleges represent a diverse group of institutions (Appendix A). Sixteen are ranked among the top 50 globally in the 2020 QS World Rankings of Colleges of Agriculture and Forestry, and all the institutions are among the top 350. In addition, fourteen of the colleges are located in universities that are among the best 66 research-one North American institutions as measured by membership of the Association of American Universities. They vary considerably in size. The largest colleges have over 7000 undergraduate students, over 1000 graduate students, over 350 faculty, more than 15 departments and an annual research budget in excess of $200 million. In contrast, the smallest colleges in the surveyed group have fewer than 1500 undergraduates, around 200 graduate students and 100 faculty, 6-8 departments, and modest annual research budgets. However, despite the very different sizes of the programs, all the colleges are public institutions, provide a diverse set of majors across the sciences in plants, animals, diseases, insects, natural resources, food, nutrition, economics, and communities, acknowledge the importance of globalization in their college plans, and have some international partnership agreements.

The focus of the survey was on the nature and goals of each college's international partnerships, addressing the following eight key aspects: 1. Purposes and criteria for developing the partnerships; 2. Types of existing partnerships; 3. Substantive topics important for the mission and goals of the college and for addressing grand challenges; 4. Importance of those substantive topics for the international partnerships; 5. Ways the college promotes/encourages/rewards international partnerships; 6. Challenges or issues faced in building and maintaining the partnerships; 7. Important considerations for developing successful partnerships; and 8. Suggestions to increase and enhance successful international partnerships. For each of the key aspects of their partnerships, the dean was provided with 9 to16 possible answers. The deans utilized a 5-point Likert scale to rate each possible answer within the eight key aspects, from 1=not important/never, 2=slightly important/rarely, 3=moderately important/occasionally, 4=very important/frequently, to 5=extremely important/always. After each question, they were also asked to identify other possible answers.

After responding to the eight questions on the key aspects of the partnerships, they were asked to think about an example of a particularly successful international collaboration, why it was a success, and if it was still ongoing. The respondents were also asked if they had a particularly challenging international collaboration that did not meet expectations, and if so, what the issues were and what they would consider or suggest doing differently. Finally, these college leaders were asked if they would like a copy of the report (all responded in the affirmative).

Results

Criteria for Developing International Partnerships

A fundamental question is the stated and/or unstated goals and reasons for investing personnel and resources in developing international partnerships. The deans were provided with nine possible goals and asked to rate each one, from 1=not a goal, to 3=moderate goal and 5=major goal. They were also invited to specify any additional goals. Despite the diversity of the colleges, a strong consensus on the top two goals for developing international collaborations existed, with all but two deans rating these goals as a 4 or 5 on the scale (Table 1). About three-quarters of the deans rated as a major goal (5) '*strengthening student's education and preparation for life in a multicultural world and global economy'*, while approximately two-thirds indicated that *'enhancing the quality of research and scholarship'* was a major goal (5). About half the deans also viewed

will utilize 'dean' as the source of the data.

'encourages mutual understanding and respect among students, faculty and staff of partner institutions' as a major goal. Although intellectual property and commercial products have increasingly been viewed as goals for U.S. universities, as reflected in the proliferation of campus patent offices, this was identified as a major goal by only 4 deans (Welsh et.al. 2008, Lacy et al. 2020). Finally, only two deans identified *'achieve university/college development goals (fund raising, gifts)'* as a major goal for the international partnership (Table 1). Three deans added other purposes: *'recruit top quality grad students', 'create long term collaborations with European universities'* and *'generate international endowments for student scholarship'.*

Table 1. Criteria for Developing International Partnerships*

Criteria	Mean*	% Major goal**
Strengthen students' education	4.7	73
Enhance research	4.6	64
Encourage understanding/respect	4.4	52
Enable extension/application	4.2	46
Advance international ranking	4.2	46
Generate new revenues	3.7	30
Promote peaceful solutions	3.6	27
Intellectual property/products	2.9	12
Fund raising/development	2.8	6

*N=33, 1=not a goal, 3=moderate goal, 5=major goal

** % of deans who consider a criterion very or extremely important

Number and country partners

While every college of agriculture had some partnership agreements, they differed significantly in the number of agreements and their primary partner countries. Nearly half (46%) reported 1-25 international agreements, 24% had 26-50 agreements, and 18% had 51-100. Two colleges reported over 200 agreements.

Partner institutions were located on all six continents and in 51 countries. China, with partnerships at 30 colleges, and Brazil, with 17 partnerships, were the countries most frequently identified, followed by Australia (6), India (6), and Mexico (5). Seven countries were identified as having four agreements: Chile, Ethiopia, Kenya, Netherlands, South Africa, Tanzania, and Thailand. In total, thirteen Latin American countries and eleven African countries were identified with institutional partnerships in U.S. colleges of agriculture.

Types of Partnerships

The large number of diverse existing partnerships was the major finding in this area. Two thirds of the colleges reported seven or more different types of relationships. Every college (33) had faculty engaged in collaborative research with international colleagues. Nearly all (32) had faculty/scholar exchanges and student exchanges. Other frequently occurring types of partnerships included: faculty activities (e.g., short and online courses, visiting lectures) (30); local and national development and outreach activities (25); non-funded faculty affiliate status (23); and university/government/private/NGO partnerships (23). About half the colleges reported joint or dual degrees (17) and organized programs/centers or institutes of collaborative research (16). Despite the recent emergence of international branch campuses, only one college reported a joint branch campus overseas (universities from 37 countries had a total of 306 international branch campuses in 2021 (Cross-Border Education Research Team, 2021).

Substantive Topics and Grand Challenges

For decades, colleges of agriculture have engaged in systematic strategic planning. These plans often include mission and vision statements, such as a focus on promoting agricultural, environmental, and social sustainability through research, teaching, and public engagement to meet global challenges. More specifically, they generally identify priority themes and critical topics. In the past, the scope of these themes was often narrow.

More recently, however, they have expanded to include topics such as: sustainable agriculture and food systems; equitable and healthy communities; ecosystem viability; and the challenges of climate change.
The deans in this study were asked two questions about ten critical topics or challenges. As noted above, many of these topics and goals are among those identified by USDA, USAID, APLU and the UN's 17 SDG. Specifically, the deans were asked: how important each topic was for the college's goals (1=not important, 2= slightly important, 3=moderately important, 4= very important, 5=extremely important); and how frequently each topic or challenge was part of their college's international partnerships (1=never, 2=rarely, 3=occasionally, 4=frequently, 5=always).

As Table 2 illustrates, despite some variation, all ten surveyed topics were viewed by at least 29 of the deans as extremely or very important for their college's goals. Over 70% of the deans rated four topics as extremely important (water resources, food and fiber production, food quality and nutrition, and food safely). In addition, over 60% of the deans rated the topics of land and soil and climate change as extremely important. However, the deans were evenly split between very important and extremely important in their ratings of energy issues, community development, economic development, and genetic resources and biodiversity. Other topics volunteered by a dean as very or extremely important were: '*government policy related to agriculture and environment'*, *'curriculum globalization'*, '*sustainability of materials and natural resources'*, '*tropical agriculture and soils', 'One Health',* and *'food security'*. It was unclear if these other topics were part of their partnerships.

In contrast, despite the view that all the critical topics were quite important for the college goals, these same topics were often not nearly as important a part of the college's international collaborations. This discrepancy was most apparent for energy issues, and genetic resources and biodiversity, and to a lesser extent for climate change, community development, food safety, and economic development. However, all ten topics were seen by fewer deans as frequent or always a part of their international collaborations than the number of deans viewing the same topics as important to the college mission. This gap was moreover significantly larger between the deans' ratings of topics as extremely important for their college goals, and their reporting of the same topics as always being a feature of their collaborations. Six of the ten topics (food safely, climate change, land and soil, energy issues, community development, and genetic resources and biodiversity) were seen as always, a part of their international partnerships by fewer than 20% of the deans. Given the importance and critical nature of these topics domestically and globally, and the significant and increasing role of international research for scientific advancement, this apparent discrepancy warrants further investigation.

Table 2. Critical Topics for Colleges of Agriculture and Their Partnerships

Critical Topic	College Mission	Partnership topic
	% Very/Extremely Important*	% Frequently/ Always**
Climate change	85	60
Community development	76	56
Economic development	89	68
Energy issues	85	38
Food & fiber production	91	85
Food quality & nutrition	91	82
Food safety	91	67
Genetic resources & biodiversity	85	47
Land & soil resources	94	76
Water resources	97	82

*% of deans who identified topics as important for college mission
** % of deans who identified topics as frequently/always part of their international partnerships

Support for Success

For international partnerships to be successful, several key factors need to be considered, including institutional support, leadership**,** and access to resources. Deans were asked to report on the extent to which their university/college promoted, encouraged or rewarded international collaborations. They evaluated ten possible ways in which their college supported these partnerships, from 1=not done, to 2=planning to do, 3=occasionally done, 4=usually done, and 5=always done. Nearly half the deans reported usually or always providing seven of the ten listed means of support (Table 3).

Table 3. Ways Colleges Encourage International Partnerships*

Support	Mean	% Usually/Always**
Provide quality communication facilities	4.2	88
Support student & scholar services	4.0	79
Publicize the partnerships	4.0	73
Publish with partners	3.5	58
Provide dedicated resources	3.3	49
Organize activities with the partner	3.4	46
Include collaboration in promotion criteria	3.2	45
Join organizations on global collaboration	3.1	33
Provide awards for collaboration	3.2	39
Establish collaborative institutions	3.0	27

* N=33, 1=not done, 2=planning to do, 3=occasionally done, 4=usually done, 5=always done

** % of deans indicating the college/university usually/always provides this support or encouragement to their faculty for their international activities and partnerships

Providing high quality access to international communication facilities and enabling regular communication is clearly important for establishing, maintaining and strengthening partnerships, and was the number one means of support. Services for students and scholars, including orientation, housing, and counseling, as well as the legal and visa support, provide a necessary foundation. Increasing the visibility of the partnerships and publicizing the relationships were also identified by nearly three quarters of the deans. Three fifths of the deans also indicated that their faculty edited and published in international journals with their partners. However, when it came to providing dedicated resources for the collaborations, organizing international activities with the partners, such as forums, conferences, and joint workshops, and rewarding the partnerships by including these relationships in promotion criteria and awards, fewer than half the deans indicated they usually or always did so (Table 3). If colleges wish to strengthen their international partnerships, they may need to take a harder look at the support available/offered at both the college and university level.

Potential Issues and Challenges

Domestic partnerships with other higher education institutions; federal, state and local governmental agencies; and private corporations and industries involve a number of complex organizational and logistical issues. International partnerships expand the scope and number of potential issues and challenges. The deans were provided with twelve possible issues their institutions may have faced in building and maintaining international partnerships and were then asked to rate the importance of each issue.

Every issue was identified by at least seven of the deans as a very important or extremely important issue for building their partnerships (Table 4). Moreover, all the issues were viewed as at least moderately important by more than half the deans. Over half the deans also indicated that four of the issues were very or extremely important to the collaborations. The two issues most frequently identified as problematic were:

> *'difference in educational quality and standards among partners' and 'incongruent expectations between the institutions'. Of nearly equal concern were 'language and cultural differences' and 'different levels of institutional commitment'.*

These findings suggest that, in addition to providing adequate financial and personnel support for successful partnerships, several important unique issues and challenges should also be addressed.

Table 4. Challenges or Issues

Issues	Mean*	% Extremely/Very Important**
Different educational quality	3.7	55
Incongruent expectations	3.6	55
Language & cultural differences	3.6	52
Different levels of institutional commitment	3.5	55
Unequal resource commitments	3.3	42
Academic freedom	3.2	39
Health & safety issues	3.1	33
Legal issues (e.g. liability, intellectual prop.)	3.0	36
Shifting institutional priorities	3.0	33
Change in government policies	3.0	27
Geographical distances	2.9	33
Export compliance issues	2.6	21

* N=33, 1=not important, 3=moderately important, 5=extremely important
** % of deans identifying very/extremely important issues facing their international partnerships

Important Considerations for Future Success

The earlier reported findings on support and issues strongly suggest the need to carefully consider a number of factors or components essential for establishing, maintaining and enhancing international partnerships. Some of these factors surfaced in the discussion on ways colleges support their partnerships or the issues that threaten successful implementation of international partnerships. The deans were provided with sixteen possible considerations for successful international partnerships and asked to indicate the importance of each one for making these partnerships work well.

Table 5. Considerations for Future Successful International Partnerships

Important considerations	Mean*	% Very/Extremely Important**
Committed leaders	4.7	100
Adequate resources	4.6	97
Common willingness	4.5	88
Potential for collaboration	4.2	88
Support from senior leadership	4.1	82
Respect for culture of partners	4.0	76
Clear and sound policies	3.9	76
Concordant mission & goals	3.9	73
Existing partnerships	3.8	67
Adequate communication skills	3.7	61
Supportive govt. policies	3.6	55
Complementary strengths	3.6	55
Good political relations	3.3	39
Comparable academic quality	3.2	33
Geographical distance	2.8	15
Similar structure of higher ed.	2.7	21

* N=33, 1=not important, 2=slightly important,3=moderately important,4=very important, 5=extremely important
** % of deans who see a consideration as very or extremely important

Strong agreement existed among the deans that many of these components or factors are very or extremely important (Table 5). Of the sixteen provided, over half the deans identified twelve components as very or extremely important. Moreover, three quarters of the deans indicated that seven of the considerations were very or extremely important. Leadership at the program and college level, as well as senior university leadership, was seen as very or extremely important. Unsurprisingly, all but one dean viewed *'adequate resources, including funding, eligible faculty and students, facilities and space'* as very or extremely important. The potential for collaboration, including appropriate programs and a willingness to collaborate, were also seen as key considerations. At the same time the deans recognized that the institutions are likely embedded in different cultures, politics, and economies, and that both an understanding and respect for those differences are important (76% of the deans saw this factor as very or extremely important). Other important considerations included institutional policies and supportive government policies on issues such as visas, intellectual property and employment. Factors that were not seen as important were similarities in the organization and structure of higher education, and comparable academic quality among the partners as measured by rankings, citations and funding

Conclusions & Future Research Needs

The insights of the college deans on international partnerships and collaborations highlight the continuing critical role of these relationships for colleges of agriculture in the U.S. and globally. To conclude the survey, the deans were given three open-ended questions: (1) identify a particularly successful collaboration and describe why it was a success; (2) identify a particularly challenging collaboration and describe why it did not meet expectations; and (3) share suggestions to better engage in these partnerships in the future. Several important observations and potentially useful suggestions from the leaders' responses are summarized below.

The deans generally agreed on the need to specify the rationale and choices for international partnerships to include goals, strategies, priorities, types of collaborations, and specific topics for the partnerships. They emphasized the value of creating clear policies and procedures for the partnerships, identifying appropriate leadership, and determining the degree of institutional commitment. Important administrative considerations included standardized general agreements (MOU, AOC), active working agreements (delineated goals, activities, responsibilities, resources), performance standards and assessment criteria, and established procedures for renewal/sunset. Several deans volunteered additional observations for reasons of their success, which included:

> *'institutional commitment, support and funding', 'involvement of both students and faculty', 'long-term multi-projects with significant funding and graduate student and faculty exchanges', 'shared common goals and benefits', 'mutual respect, mutual benefit', and 'mutual trust'.*

The deans' assessments of the goals, agendas, topics, issues and challenges, and key considerations identify some important issues and guidelines for developing successful partnerships. As outlined below, some findings, proposed changes, and further research needs stand out. The most frequently identified major goals of the partnerships are

> *'enhancing the quality of research and scholarship', and 'strengthening students' education and preparation for life in a multicultural world and global economy'.*

If colleges of agriculture wish to strengthen their international partnerships, they may need to take a harder look at the support available at both the college and university level. While *'high quality access to international communication facilities'* was the number one means of support, when it came to providing dedicated resources for the collaborations, organizing international activities with the partners, and rewarding the partnership, fewer than half the deans indicated that they usually or always did so.

International partnerships involve a number of complex organizational and logistical issues. Over half the deans indicated that four issues were very or extremely important: *'difference in educational quality and standards among partners', 'incongruent expectations between the institutions', 'language and cultural differences'* and *'different levels of institutional commitment'*. Successful international partnerships require attention to a number of issues unique to them. Additional research is needed on the real or perceived organizational constraints and their relative importance for achieving productive partnerships across diverse agendas and program areas.

Ten critical topics or challenges often identified by college strategic plans were also seen by most of the deans as very or extremely important for their college. However, these same topics were often not nearly as important a part of the college's international collaborations. Six of the ten topics (food safely, climate change, land & soil, energy issues, community development, and genetic resources and biodiversity) were seen by fewer than 20% of the deans as always being a part of their international partnerships. Given the importance and critical nature of these topics domestically and globally, and the significant and increasing role of international research for scientific advancement, this apparent discrepancy warrants further investigation and analysis.

This study strongly suggests the need to consider a number of important factors for establishing, maintaining and enhancing international partnerships. Of the 16 factors surveyed, three quarters of the deans indicated that seven of the factors were very or extremely important, including leadership at the program and college level (33 deans) and adequate resources, including funding, eligible faculty and students, facilities and space (32 deans). While the deans' perceptions are crucial, additional research needs to be conducted among the scientists, educators and extension professionals to elicit their perceptions and opinions. They constitute a diverse community of scholars with different disciplinary backgrounds and cultural histories, at different stages in their careers. Here, more research on these differences and implications for successful partnerships will be important.

Most international partnerships bring together institutions with different resources, capacities, agendas, and priorities. This is particularly the case in North-South educational and research partnerships. One example is the increasingly influential Food and Land Sovereignty movements and related social movements, composed of hundreds of millions of peasants, family farmers, pastoralists, farm workers, and Indigenous peoples, mobilized to challenge the destabilizing effect of trade liberalization on small producer cultures and ecosystems across the world. These movements often influence the priorities and agendas of colleges of agriculture in the South. These colleges and the related social movements seek to champion the rights of a multiplicity of diverse farming systems and food cultures to produce local food, and to protect farmers in the global South from Northern government-subsidized large-scale industrialized, energy-intensive, capital-intensive produced foods often sold at less than the market price in their markets. Additional research needs to be conducted on the unequal levels of power, resources and human capital in these partnerships, and the impact these trends and inequality may have on the success of the partnerships. Future research should include the perceptions and insights of the international partners (Holt-Giménez 2019; McMichael, 2013).

Several scholars have been analyzing academic capitalism and the neoliberal transformation of higher education (Bok, 2003; Busch 2017; Croucher & Lacy, 2021; Giroux, 2010; Slaughter & Rhodes, 2004). Through this transformation, many universities are becoming more market-oriented and are seen as a key driver in the knowledge economy. As a consequence, higher education institutions have been encouraged to develop links with industry and business in a series of new venture partnerships, and to establish university technology transfer offices which promote patenting and licensing technologies and discoveries (Lacy et al. 2020, Olssen & Peters, 2005). More research is needed to assess how these trends and transformations may affect the types, goals, and priorities of college of agriculture international strategic partnerships.

While this study focused exclusively on colleges of agriculture and included a diverse set of institutions, there may be significant differences among the colleges of agriculture and substantial differences among the other colleges in the university. Additional study and understanding of those potential differences would enhance the success of future international partnerships.

In conclusion, international partnerships are essential for the goals and missions of colleges of agriculture. In the past, colleges of agriculture have played key roles in generating, disseminating and applying the latest scientific knowledge and technology to address critical and grand challenges and to pursue global goals, thereby providing a productive, safe and sustainable food and natural resources system and successfully supporting the development of youth, families and communities. These priorities have consistently increased in importance. The critical international strategic partnerships to address these global challenges will require informed and creative college leadership, and will likely need to expand in scale, scope, diversity, and complexity, draw successfully on the scientific knowledge and wisdom worldwide, and carefully consider the wide and unique opportunities and challenges of these partnerships.

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APPENDIX A

College of Agriculture Participating Institutions*

U California, Davis ^ (2)**
Cornell U. ^ (5)
UW-Madison ^ (8)
Michigan St. U. ^ (11)
Iowa State U. ^ (16)
Purdue U. ^ (20)
Texas A&M U. ^ (21)
Oregon St. U. (Forestry) (24)
Penn St. U. ^ (31)
U. of Florida ^ (32)
N. Carolina St. U. (38)
N. Carolina St. U. (Nat. Resources) (38)
Ohio St. U ^. (40)
U. of Minnesota ^ (43)
Kansas St. U. (46)
Colorado St. U. (49)
U. of Georgia
U. California, Riverside
U. of Arizona ^
U. of Maryland, College Park ^
U. of Missouri, Columbia ^
Virginia Tech U.
Oklahoma State U.
U. of Tennessee, Knoxville
Utah St. U.
Louisiana St. U.
Louisiana St. U.- (Coast and Environment)
U. of Arkansas
U. of Hawai'i- Mañoa
U. of Kentucky
Auburn U.
U. of Vermont
U. of Delaware

*Ordered according to the 2020 QS World University Rankings by Subject-Agriculture & Forestry.
** Numbers in parentheses represent QS rankings of college globally. Other colleges were ranked in groups of 50 from 51-350.
^ Colleges at universities that are members of the Association of American Universities

A Model Innovation: Improving Disease Management for Meeting the Challenges of Bangladesh's Aquaculture Hatchery Sector

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Abstract

Reducing disease within shrimp and prawn production is a key policy aim for Bangladesh's export aquaculture. Hatcheries that supply the farms with seed — or larvae — are potential hotspots for disease and the production of antimicrobial resistance traits. Disease pathogens and antibiotic resistant bacteria or genes can easily be transferred to farms via infected larvae. Efforts to reduce disease and transmission have focused on testing all hatchery output, improving hatchery production techniques and management practices, and generating markets for pathogen-free seed. Whilst the intrinsic value of the innovations for reducing disease and improving quality appeared evident, uptake of improvements in the hatcheries has been low. Disease remains a key production challenge, and despite some evidence of reduction in antibiotic use, antibiotics remain a necessary component of disease control. To test the viability of the new technologies and management practices we have developed a sociotechnical method of analysis, inspired by Actor Network Theory. The method utilizes interessement to analyse the role different actors/actants play in determining the destiny of the hatchery production innovations. Our approach has highlighted how the multifaceted socioeconomic and biological elements of hatchery production combine to create a weak innovation and investment environment. We therefore advocate the development of models that combine social and technical analysis for the purposes of assessing the viability of an innovation and improving the prospects of successful implementation.

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Andrea Butcher is a postdoctoral researcher in Sociology at the University of Helsinki, working with a multidisciplinary, international consortium generating knowledge on antimicrobial resistance in West Africa (AMRIWA). Prior to joining the University of Helsinki, she acted as postdoctoral researcher in Human Geography at the University of Exeter for the project Production Without Medicalisation, examining the socioeconomic conditions driving antibiotic use in shrimp and prawn farmers in Bangladesh. An anthropologist by training, Dr Butcher's expertise lies broadly in ethnography and development studies, focusing upon themes of environment, climate and development. Her work is influenced by Science and Technology Studies.

Muhammad Meezanur Rahman is aquaculture and fisheries professional with 25 years' experience in research, business, and development projects in South and Southeast Asia. In his current position as aquaculture scientist at WorldFish Bangladesh (https://www.worldfishcenter.org/), Dr Rahman leads and coordinates aquatic animal health activities, and is responsible for the implementation of USAID and DFID UK funded aquaculture development projects in the southwest and northwest of Bangladesh.

Steve Hinchliffe is a Professor of Human Geography and the Director of the Wellcome Centre for Cultures and Environments of Health at the University of Exeter. Professor Hinchliffe is an expert in public health and risk, with a focus upon livestock industries. His research draws together insights from Science and Technology Studies (particularly actor network theory) and Geography. Professor Hinchliffe is an elected Fellow of the Academy of Social Sciences and author and editor of numerous books and articles on issues ranging from risk and food, to biosecurity, human-nonhuman relations, and nature conservation.

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Introduction

Population growth and rising consumer expectations are fuelling demand for nutritious, protein-rich food from terrestrial and aqueous systems. This demand coincides with numerous production challenges, including unstable climates, ecological degradation, land constraints, economic uncertainty, and disease evolution. The threat of emerging, re-emerging and endemic diseases, as well as the potential risks posed by antimicrobial resistance (AMR), are particularly acute across the livestock-farming sector (FAO, 2018; Hinchliffe et al., 2016; Lowe, 2010). With an estimated 70% to 80% of antimicrobials used to treat and prevent infections in livestock production and aquaculture (Van Boeckel et al., 2015; Zhang et al., 2015), these sectors are being targeted for innovation in disease control and biosecurity to reduce the disease burden and prevent unnecessary antibiotic use. This includes aquaculture, the fastest growing food-producing sector globally in the wake of exhausted sea stocks and a collapsing capture industry (FAO, 2016: 149). More than 50% of the fish and shellfish consumed globally is derived from aquaculture, and almost 90% of global production is located in South and Southeast Asia (ibid.: 23). Alongside nutritional gains, aquaculture provides income and livelihood opportunities for rural populations and generates foreign currency reserves for emerging economies (ibid.). However, the emergence and evolution of production diseases in intensive farming systems has had devastating consequences across Asia, particularly for shrimp production (Stentiford et al., 2017), potentially increasing the dependence on antimicrobials to secure production (Cabello, 2006; Henriksson et al., 2017; Thornber et al., 2019). As a result, innovation in aquaculture is now directed towards increasing production, whilst simultaneously improving management practices and reducing the disease burden (Joffre et al., 2017).

In this paper, we focus on aquaculture production in Bangladesh and industry attempts to innovate in response to disease threats. Bangladesh is one of the most densely populated countries in the world, with 1,260 people per km^2 in 2018. In recent decades, rural development and food production in Bangladesh have shifted from rice to broiler poultry and aquaculture (finfish and shellfish) production (Belton et al., 2012; Hensler, 2013; *The Economist*, 2018). The latter now surpasses capture fisheries in terms of production volumes and supply of dietary protein (Belton et al., 2011; Stentiford et al., 2017). In 2016-17, Bangladesh exported 40,000 mt of high-value shrimp and prawn, generating US$450M in export earnings (DoF, 2017). In 2013-14, these figures were closer to 48,000 mt and US$550M (ibid.), indicating a decline in production and a reduction in global market prices.

The results and analysis presented in this paper form part of a wider project examining antibiotic use in Bangladesh's export-oriented shrimp sector, and to a lesser extent the prawn sector. Bangladeshi farmers currently cultivate native Black Tiger Shrimp (*Penaeus monodon*, B. *bagda*), and Giant Freshwater Prawn (*Macrobrachium rosenbergii*, B. *golda*), which are primarily exported to the European Union, the USA and Japan. Whilst a few of the farms operating in the coastal regions of the southwest are semi-intensive, approximately 90% of shrimp and prawn farms are small in scale and operate traditional or improved extensive production systems. They face several challenges, including those relating to disease (Akber et al., 2017; Paul and Vogl, 2011). The paper's focus of analysis is industry attempts to reduce disease burden and any associated reliance on antimicrobials by introducing biosecurity and seed quality innovations in the numerous hatcheries and nurseries that supply those farms with seed. Hatcheries are an under-studied area in aquaculture research which instead looks primarily at small-scale or 'traditional' farming systems and opportunities for organic production (Akber et al., 2017; Belton et al., 2012; Hensler, 2013; Paul and Vogl 2012). However, hatchery-reared seed are carriages for disease transmission onto farms, where antibiotic use in Bangladesh's export aquaculture facilities is concentrated. A key policy aim in Bangladesh has therefore been to improve hatchery management practices and seed quality, and in so doing to prevent disease outbreaks on farms, thereby increasing yields for farmers. Policy is implemented with the support of externally funded, locally delivered technical programmes.

This paper examines the outcomes of one such programme, Agriculture for Income and Nutrition (AIN), a

USAID-funded programme designed to improve seed quality by introducing new biosecurity technologies and genetically improved breeds, and establishing Best Management Practices (BMP) geared towards seed testing in Bangladesh's shrimp and prawn hatcheries. Despite the apparent productivity and commercial benefits for businesses of adopting these new innovations, uptake has remained low. In 2017, we conducted a study of shrimp and prawn hatcheries to assess the reasons why this is so, the results of which we report here. The study included a survey of hatchery facilities and their operations, supplemented by qualitative interviews with managers and technicians, and analysis of evidence presented in programme reports and scientific articles addressing matters for hatchery operations in Bangladesh. Our analysis of this material demonstrated how the commercial viability of the innovations was undermined by practices and interests of actors/actants and commercial players in the wider ecology of shrimp and prawn production in Bangladesh. To understand the influence that these various actors/actants have on the hatchery industry, we developed a sociotechnical method of analysis based on *interessement*, a concept deployed in Actor Network Theory (ANT) for ascertaining the roles of different actors/actants in the formation of an actor-network or sociotechnical assemblage. Our approach, developed from Akrich et al.'s 2002 analysis of innovation as a sociotechnical process, draws attention to the diverse social and material interactions, supply chain actor practices, and industry actors' risk perceptions that determine the outcomes of the technical innovations and investment in BMP compliance in Bangladesh's food production ecology.

The article proceeds as follows: the next section lays the foundation of our *interessement* method of sociotechnical analysis by reviewing social science and industry critiques of technical interventions in food production and disease management. We then lay out our methodology before sketching the history of Bangladesh's hatchery sector and the challenges encountered that led to the AIN programme. We then present the results of our sociotechnical analysis of the programme's innovations, which demonstrate how their commercial viability was undermined by unsupportive market dynamics and biological impediments. Finally, we discuss the value of combining a technical analysis of innovation with *interessement* for identifying matters to be considered and resolved in the wider ecology production practices, in this case shrimp and prawn production practices.

Towards A Sociotechnical Analysis

The high disease burden in livestock and aquaculture sectors has boosted the research and design of technical innovations to improve farm biosecurity, delivered through programmes aimed at improving compliance with best practices. For decades, ethnographic studies examining the social relations of food production systems have drawn critical attention to the unintended outcomes and failures of agricultural and food production interventions that foreground scientific and technical transfers without considering social and institutional contexts (Ferguson, 1994; Lewis, 1997; Mosse, 2001; Scoones and Thomson, 1994). Broadly taking aim at the normative model of implementing 'technical solutions' to solve socially determined problems, they focused their critique on the consequences of poor appreciation of the social or cultural dynamics and complex local conditions at the planning stage of development interventions, detailing how multifaceted social and material contingencies influenced the way technologies were received and applied.

Researchers in the social sciences and humanities have offered similar critiques in the field of global health (e.g. Biehl and Petryna 2013; Farmer et al., 2013), seeking out complementary models for understanding the social complexity of pathogenicity that go beyond contagion or contamination approaches. Leach and Scoones (2013) draw attention to the dangers of relying on a single model that may be unable to fully capture outbreak dynamics and alternative, policy-relevant management perspectives. They call instead for an approach to disease modelling that combines sociological and ecological as well as mathematical and epidemiological perspectives. Such a relational or configurational disease model (Leach et al., 2010; Rosenberg, 1992) can demonstrate how disease and its management are configured in specific socioeconomic and material contexts, risk management strategies, and mundane interactions (Brown and Kelly, 2014; Hinchliffe et al., 2016; Høg et al., 2018). Whilst the contamination model emphasises pathogen containment, surveillance and boundary

maintenance, in the configurational model the presence of pathogens are but one component in a complex process involving matters of geography, sociology and risk.

Likewise, when innovating for disease management, prospects for successful implementation are reduced if innovations are developed using perspectives provided by a narrow technical analysis of a technology's intrinsic properties. Akrich et al. (2002a; 2002b) refer to this model of innovation as 'diffusion'. Similarly, in their review of innovation approaches in global aquaculture in the Global South, Joffre et al. (2017: 132) found the "linear diffusion and adoption model" of technology transfer to be the dominant approach, focused on improving productivity and financial returns through capacity building and education (ibid.: 135). They argue that aquaculture innovation research, driven by researcher-led knowledge transfer, and offering limited user feedback, "remains linked to development project interventions at farm level [that] fails to integrate institutional context and policies" (ibid.: 140). They go on to state that if these approaches are to gain purchase, more attention must be paid to social relations and institutional challenges, calling for an alternative approach that "could be integrated in […] technology-driven research to better illustrate what needs to be implemented *beyond* technology to enable innovation and co-evolution between technology and context" (ibid.: 145, emphasis added).

Responding to this critique, we suggest an approach to innovation planning inspired by ANT and Science and Technology Studies (STS): a sociotechnical method of analysis based on *interessement*. First applied by STS scholar Michel Callon (1986) in his analysis of a novel strategy for domesticating scallops off France's Brittany coast, *interessement* refers to the ongoing assembly of allies (human and nonhuman) required to stabilize a sociotechnical network or an assemblage. Akrich et al. (2002a; 2002b) further advanced that whilst the diffusion model emphasizes an innovation's intrinsic qualities that are technological in nature, it is the *interessement* model which evaluates the capacity of the innovator or research team to connect with actors, intermediaries and use environments upon whose participation the fate of the innovation rests. This proves difficult if the innovation does not fit the context. Thus, they argue, the success of an innovation rests upon being responsive to the interests and expectations of these allies, intermediaries, and use environments, and the challenges that they raise.

In terms of biosecurity innovations, this means examining the underlying models that are used to analyse and respond to the presence of pathogens, or for explaining disease outbreaks, to understand their shortcomings. For example, as stated above, whilst the contamination model favours technical solutions (promoted by diffusion), a configurational model analyses how disease and its management are configured in socioeconomic and material contexts, risk management strategies, and mundane interactions (which requires *interessement*). This was the method of analysis we applied to our survey and interview data, and associated article review. Our results highlighted the economic, institutional and environmental dynamics underpinning the operation of Bangladesh's hatchery sector, which operate beyond the scope of technical solutions alone. In the following sections, we highlight the multifaceted socioeconomic, market, and biological elements of Bangladesh's food production ecology that need to be considered if seed testing and quality improvement innovations are to gain purchase. First, we detail our methodology.

Methodology

This article draws upon data from the project *Production Without Medicalization*, designed to assess the socioeconomic and risk-related drivers of antibiotic use in Bangladesh's shrimp and prawn aquaculture sector. The data were collected primarily during a fieldtrip undertaken in March 2017, and a survey of hatchery characteristics conducted in June 2017. We augment the results of the hatchery study with interviews and discussions with farmers, seed traders, and AIN officials during a further fieldtrip in October 2017, as well as results pre-

sented in reports and articles associated with AIN and Bangladesh's shrimp and prawn hatchery sector and grow-out farms.

During the initial trip, the research team conducted semi-structured interviews with eight hatchery technicians and five hatchery supply shop owners in Cox's Bazar and around Khulna City in southwest Bangladesh (see Figure 1). Interviews lasted between 30 and 45 minutes and were used to gain a working sense of the key issues for the sector, including production challenges, processes, treatments, and any recent changes. A member of the research team familiar with the sector facilitated interviews, which were conducted in both Bangla (Bengali) and English. Given the mix of language and often simultaneous translation in the field, the interviews were not recorded and transcribed. Instead, researchers kept detailed notes and checked these with participants to ensure an accurate account of the issues discussed.

Figure 1: Map of Bangladesh, showing Cox's Bazar in the southeast where the shrimp hatcheries are located; and Khulna Division in the southwest where the farms and prawn hatcheries are located.

The team used the interview data to design a survey questionnaire that included questions on hatchery characteristics, productivity, threats to production, and economic performance. After piloting with two hatchery technicians, the questionnaire survey was implemented face-to-face in May 2017 with 15 shrimp hatcheries in Cox's Bazar (approximately half of all operational hatcheries), seven shrimp larval rearing and nursery centres in the southwest, and four prawn hatcheries (all those attempting production in 2017) also in the southwest. Given the limited size of the survey and our method of sociotechnical analysis, the compiled results were analysed qualitatively, though where appropriate we present summary descriptive results in numerical form.

Our sociotechnical method of analysis, based on *interessement*, was developed through an iterative process of close reading of survey results, field notes, interviews, and the programme reports. Codes were compiled according to key themes of market and investment challenges, biological complications, and compatibility with grow-out farming systems. We structure our results accordingly before returning to the research questions and our suggested approach towards a resolution, in the discussion section.

Bangladesh's Shrimp and Prawn Hatchery Production

Hatcheries are cultured systems of aerated tanks and water filtration that recreate aquatic habitats for hatching and nursing fish and crustacean seed or postlarvae (PL). They operate by taking either wild-caught or specifically bred broodstock and inducing them to reproduce. Suboptimal culture environments are a primary source of broodstock and PL stress, rendering them highly susceptible to production diseases. Therefore, avoiding disease requires technicians to manage stress and monitor culture environments. Probiotics, biocides and, at times, antibiotics are utilized to this end.

Bangladesh's shrimp hatchery sector began expanding in the 1980s. There are currently around 35 operational facilities (60 if we include non-operational facilities), mainly located in the southeast of the country close to Cox's Bazaar. They aim to supply seed to over 200,000 shrimp and prawn aquaculture ponds, located mainly in Khulna Division, in the southwest of the country (see Figure 1).

The hatcheries were originally established with financial support from Asian development banks to supply 21 intensive shrimp farms operating in the Cox's Bazar region during the 1980s (Debnath et al., 2015: 3). In the early 1990s, an outbreak of a lethal and highly contagious disease called White Spot (associated with the

White Spot Syndrome Virus, WSSV, a viral infection lethal to paneaid shrimp) devastated shrimp farming in Bangladesh. Exposed to the greatest risk, the intensive farms collapsed, leaving the hatcheries to re-orient their market to the largely extensive shrimp farms in Khulna Division. Unlike the intensive, industrialised production of PL, these farms are heterogeneous in terms of size and feeding regimes, and often incorporate integrated or alternated rice production, polyculture and multiple cropping as methods for distributing economic risk (Hinchliffe et al., 2018). The farms initially relied on wild seed collected from rivers and mangrove wetlands. Indiscriminate collection of wild PL was however linked to ecological degradation of riverine habitats (Akber et al., 2017; Paul & Vogl 2011). In 1999 the Government of Bangladesh's Department of Fisheries (DoF) therefore banned their collection in order to protect riverine ecologies, prevent disease cycling from estuaries to ponds, and possibly also as a means to increase the commercial viability of the domestic hatcheries.

The prawn hatchery sector developed later in the 1990s when the Bangladeshi NGO, BRAC, opened its first facilities. Despite the high commercial value of prawn on the global market, prawn hatcheries did not receive overseas financial investment or technical backing, and relied instead on financial support from private enterprises and regional NGOs. Compared to shrimp, juvenile and mature prawn are more disease resilient in grow-out phases. However, hatchery-reared prawn PL are highly susceptible to disease, resulting in considerable production difficulties in the hatcheries (Hossain et al., 2016).

A particularly critical point in seed production is the introduction of broodstock to the hatchery. The shrimp hatcheries rely principally on shallow water wild-caught broodstock from the Bay of Bengal. The presence of WSSV tends to be high in these warmer shallow waters, with 65% of landed stock testing positive for the virus during May and June when sea temperatures rise (Debnath et al., 2014; Iqbal et al., 2011). White Spot and other diseases not only affect hatchery performance, they also pose significant risks to farmers as pathogens can be vertically transmitted to their spawn, and passed to grow-out ponds via infected PL (Debnath et al., 2014). All prawn broodstock are wild-caught from nearby rivers, with similar issues for production success and disease transmission to ponds (Ahmed, 2008).

Improvements and Innovations

The threat of hatchery disease and pathogen transferral prompted a number of responses and joint policy initiatives involving the DoF, international aid organizations, and private investors. These included investment in improved biosecurity innovations, broodstock genetic enhancement, and schemes for the testing and accreditation of seed. This led to the 2011 Department of Fisheries Hatchery Act, which stipulated that all hatcheries must ensure the quality and safety of their larvae by maintaining proper feed and input regimes, regulating the use of antimicrobials, and certifying all seed to be free from specific viral and bacterial pathogens before onward distribution (Keus et al., 2017: 20).[1]

The USAID-funded AIN programme, delivered by regional NGO WorldFish from 2011 to 2016, offered technical support for the Act's implementation. AIN aimed to increase aquaculture output by building technical and compliance capacities in hatcheries for improved seed quality, and enhancing the farm management skills of smallholder farmers (ibid.: 5). By improving hatchery compliance and seed quality, the Hatchery Act and AIN aimed to establish a shrimp PL market oriented towards competition based on quality as well as price, to support an export product market responding to importer safety regulations (Callon et al., 2002; Islam, 2008).

By establishing BMP in the hatcheries, AIN steered production protocols towards the testing of broodstock and PL as a key biosecurity measure. As part of AIN, the DoF and WorldFish partnered to re-open laboratory facilities located in Cox's Bazar and train laboratory staff (ibid.: 9).[2] The laboratory enabled Polymerase Chain Reaction (PCR) testing of both broodstock and PL for key production diseases of shrimp ahead of stocking

[1] This includes finfish hatcheries, although they do not form part of this discussion.

[2] Originally established in 2003 by USAID's Agrobased Industries and Technology Development Project (ATDP), the facilities had lain dormant since 2011.

and before onward sale. Hatcheries were encouraged to follow a 'one mother, one tank' (OMOT) process, that is, the solitary stocking of tested pathogen-free broodstock in individual tanks. The resulting PL would, given good levels of additional biosecurity, be low-risk in terms of tested diseases. Further PCR testing of seed prior to onward sale would, in theory, provide a guarantee for farmers that they were stocking with seed free from White Spot or other problematic diseases. Branding and traceability techniques would allow hatcheries to recoup production and testing costs, thus incentivizing businesses to invest in BMP compliance technologies.

As well as OMOT, AIN introduced a further quality seed initiative: the establishment of Specific Pathogen Free (SPF) shrimp PL production facilities in Bangladesh (Keus et al., 2017: 10). SPF ventures are domestication programmes offering genetic improvement of broodstock in a captive breeding programme (Barman et al., 2012). Broodstock 'lines' are repeatedly bred in special facilities under controlled, disease-free conditions that allow them to maintain their SPF designation, with their resulting PL 'guaranteed' to be free from specified viral and bacterial pathogens. In 2017, Bangladesh had one facility for producing SPF shrimp PL, located in Cox's Bazar, although there were plans to upgrade more facilities with this technology.[3]

The hatchery's managers partnered with a Hawaiian marine biotechnical company collaborating with USAID's 'Feed the Future Partnering for Innovation' programme to introduce SPF broodstock and PL, with AIN and the DoF providing funds to purchase the necessary hatchery equipment (Keus et al., 2017: 20). They operated a unique procedure with rigorous biosecurity measures, a diet of certified organic artemia and algae, maintained their own indoor algae laboratory to ensure organic status and biosecurity, and had a strict policy of no antibiotic use.

In comparison, the prawn hatchery sector was characterised by much lower levels of investment, and thus was left behind by programmes that concentrated on the more globally developed shrimp sector. Since 2010, prawn hatcheries have experienced severe mortalities, in part a reflection of a lack of investment in water filtration and other biosecurity measures (Briggs, 2013). By 2017, only four facilities were able to produce — with total production of PL down from 200M to 15M over the previous five years (according to respondents). Macrobrachium Rosenbergii Noda Virus (MrNV) was identified as the underlying cause (Keus et al., 2017: 16), although Hossain et al. (2016) reported that samples taken in 2012 contained bacterial agents that had developed resistance to multiple drugs, potentially a result of indiscriminate antibiotic use in this sector.

The opportunities the innovations provided for improving the quality of shrimp seed appeared promising, nevertheless, and a study concluded that farmers producing with disease-free seed had experienced better production success, particularly when combined with the adoption of improved management practices on their farms (Rahman et al., 2018). Despite these positive findings, our review of the literature and AIN report suggested that securing the intended policy outcomes and improvements that BMP compliance aimed to achieve would require the following socioeconomic challenges to be addressed. Firstly, given the initial investment requirement and higher production costs, the extent to which hatcheries would find a commercial opportunity in the quality seed market or continue to compete on price alone became a key question for policy success. Secondly, if the capacity for hatcheries to source enough pathogen-free broodstock to meet industry needs was uncertain, the extent to which broodstock health limited investment would need to be assessed. Thirdly, the uncertainties created by the multi-factorial nature of hatchery and grow-out farm problems, many of which would not be addressed by testing or SPF seed alone, raised the question of whether the focus on BMP compliance would be sufficient to reduce the burden of disease across Bangladesh's aquaculture production. We therefore developed our method of sociotechnical analysis to test the viability of the AIN programme's innovations for addressing these specific challenges.

Results: The Outcomes of Implementation

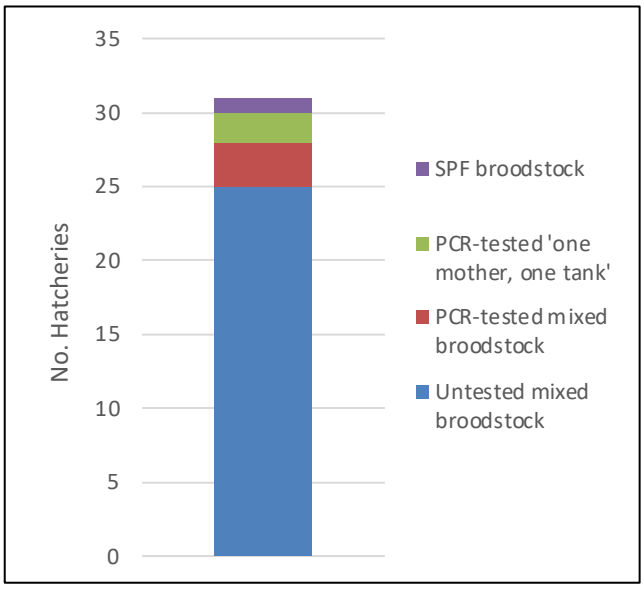
[3] According to an unpublished report, a new facility was to be trialled in 2018 in the Satkhira district of Khulna Division, and there are anecdotal reports of as many as four SPF facilities now in operation.

We present the results of our sociotechnical analysis under the following headings: market and investment challenges; biological complications; and compatibility with grow-out farming systems.

Market and Investment Challenges

Testing and securing healthy broodstock and PL requires laboratory and production capacity, both of which rely on significant human, technical and financial resources (Keus et al., 2017: 28). Likewise, secure production using OMOT requires an increase in production cost per unit and may reduce throughput from the hatchery. Thus, hatcheries would have to see an effective mark-up in terms of the price they could charge for tested seed if they were to implement BMP compliance. PCR-tested and SPF shrimp PL producing hatcheries did report higher and more stable selling prices; in 2017, the average price for accredited seed was $12.50/1000 pl, compared to the lower and fluctuating prices for untested PL ($2.50-9.50/1000 pl, depending on supply and demand dynamics). Industry specialists assumed that the higher selling price would incentivise hatcheries to upgrade their management practice and expand tested/accredited production. However, according to our survey, in addition to the single SPF producer, only five of the 22 shrimp hatcheries surveyed reported PCR-testing their broodstock ahead of stocking (see Figure 2). Just two of these five had adopted OMOT for a proportion of their output. The considerable majority of shrimp and prawn hatcheries reported continuing to utilize untested broodstock.

Figure 2: Hatchery broodstock management practices



Our study found that barriers to uptake of BMP compliance related to price competition, weak diagnostic capacity, and the absence of compensation should a hatchery cycle fail. Hatchery respondents claimed that the market for quality seed was limited, which they attributed to weak farmer purchasing power and competition from non-tested sources. PL can be a farmer's most significant production cost, and on small, open system farms, the productivity premium for 'higher quality' seed may be less obvious to the farmers (see *compatibility with farming systems* section below). Furthermore, technicians complained of markets oversupplied with cheap PL from low-quality operations, the illegal collection of wild PL sources, and illegal imports smuggled across the border from India. Few hatcheries sold their PL directly to farmers; the majority sold their product wholesale to seed traders at the wet markets in Khulna Division. Quality was not the primary driver for these traders, who also dealt in illegal PL sources, and thus they were able exercise bargaining power that forced hatchery gate prices downward (see also Høg et al., 2018). Accredited hatcheries reported finding an alternative market by supplying directly to farms (primarily the few semi-intensive farms in operation) or providing NGO-run programmes with the quality seed required for their farming improvement schemes. This may explain the relative price stability, but this market was nonetheless limited.

Low selling prices were exacerbated by rising production costs, with businesses reporting increased costs for live feed, inputs, medicines, labour, energy, and transportation. Shrimp hatcheries in Cox's Bazar were particularly exposed to transport costs, as they had no option but to ship their PL 700km via one of the two daily flights to Jessore and then via jeep to the wet markets in Khulna Division, with seed traders and farmers reporting PL weakened by the long journey.[4] Rising costs tightened the economic margins of many businesses, meaning few possessed investment potential to upgrade their facilities. Furthermore, whilst the SPF facilities received financial support as part of AIN, there was little in the way of government investment to support facil-

[4] The problem has been partially alleviated by the establishment of nurseries in the southwest, which has allowed hatcheries to transport Nauplii to the nurseries in greater numbers, at lower cost and with less risk to their health than in later stages of development.

ity upgrades; nor was there any kind of business protection, with the economic burden for production collapse being borne by the producers themselves. The majority of hatchery operations were financed by bank loans with little or no access to insurance or compensation in the event of production collapse.

A further barrier to uptake cited by hatchery respondents was the shortage of laboratory capacity and access to diagnostic technologies, with a single independent laboratory for testing broodstock and PL in Cox's Bazar, and the absence of any equivalent in southwest Bangladesh close to the prawn hatcheries. Without the ability to test, there was no incentive to invest in BMP compliance. The relative scarcity of accredited PL presumably contributed to their higher price.[5]

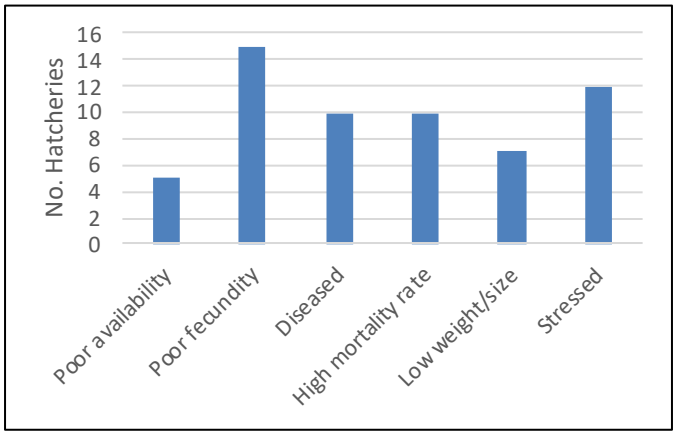
Low farmer demand, an unfavourable market, lack of investment potential, and insufficient laboratory capacity meant shrimp hatcheries found little commercial viability in the premium quality PL market. As a result, most had little choice but to continue competing on price rather than quality. For the prawn hatcheries, the margins were arguably biological rather than economic, with mass mortalities being the significant barrier to production (although, as stated above, the absence of laboratory facilities in the southwest foreclosed any opportunities for implementing seed-testing and BMP compliance). Prawn PL prices for 2017 started at US$18/1000 pl and reached as high as US$27/1000 pl, reflecting the limited supply with farmers almost wholly relying on illegal wild caught PL.

Biological Complications

Respondents reported multiple biological production challenges that reduced the viability of seed testing, such as deteriorating broodstock health, poor culture environments, and frequent disease outbreaks. As stated above, with the exception of the SPF facilities, the sector relied on wild-caught broodstock, which were increasingly likely to harbour production diseases. For shrimp, broodstock trawlers and wholesalers sold their catch at a single undifferentiated price, set daily depending on the size of the catch with a price variation ranging from BDT 2,500 (US$ 30) to BDT 12,000 (US$ 140) (Debnath et al., 2014: 76; unpublished report). The single market price meant that trawler crews had no commercial incentive to journey to deeper waters, where broodstock are less likely to harbour production diseases (Debnath et al., 2014: 76). Furthermore, none of the hatcheries — including the SPF hatchery — had quarantine facilities (unpublished report).

Poor broodstock quality was a common complaint in both shrimp and prawn hatcheries (see Figure 3). Shrimp technicians complained of broodstock arriving at the hatchery gate smaller in size, in poor physical condition, and frequently suffering high levels of stress (most likely a result of poor nursing practices onboard trawlers; see Debnath et al., 2015). They reported an increase in bay-caught mothers already displaying visible signs of disease, particularly from April onwards when ocean temperatures begin rising. Furthermore, technicians reported reduced reproductive success, and failures in tried and tested (if contentious) techniques for inducing reproduction using eyestalk ablation. Therefore, low numbers of healthy broodstock further reduced the commercial viability of OMOT.[6]

Figure 3: reported broodstock complications



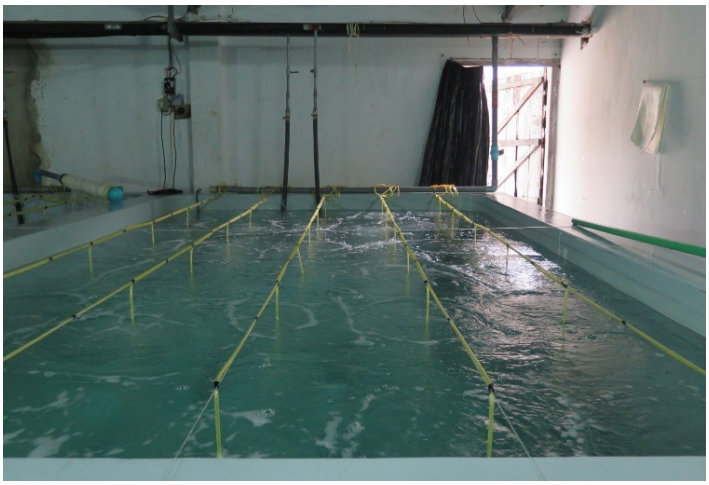
Similarly, prawn technicians attributed reduced reproductive capacity to the smaller size and poor physical condition of broodstock. Despite policy stipulation, difficulties sourcing healthy broodstock (along with the lack of laboratory access discussed above) meant

[5] Although not explicitly stated by our respondents, one can speculate that fears of oversupplying the market with quality seed, thus reducing the selling price, also acted as a barrier to uptake.

[6] Losses resulting from the destruction of disease-positive PL may also act as a barrier to uptake; see Rahman et al., 2018.

that 85% of PL from surveyed hatcheries were sold untested, with a high risk of transferring bacterial infections, viral infections, and pathogenic micro-organisms to grow-out ponds.

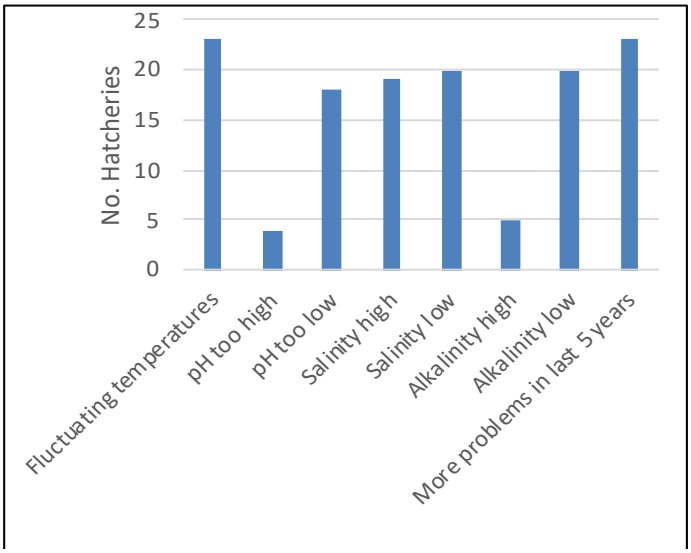
Figure 4: Broodstock Tank



Poor broodstock condition was further exacerbated by difficulties maintaining good culture environments (see Figure 5). This was particularly acute for the prawn hatchery sector, with respondents blaming poor water quality for the widespread PL mortality they experienced. They reported a significant decline in water quality from local rivers, requiring them to transport clean water across longer distances in order to produce. Despite installing seawater filtration systems and other technologies for maintaining good culture environments (e.g. temperature controls and oxygenation), maintaining the optimal water parameters was difficult across the board. Respondents attributed deteriorating water quality to an increasing frequency in extreme weather events (such as droughts and flooding), pollution from industrial and agricultural wastes, inadequate sewerage and wastewater treatment infrastructure, and (for shrimp hatcheries) the high number of hotels in Cox's Bazar.[7]

Hatcheries relied instead on more cost-effective strategies for managing disease outbreaks that included treatment with chemical inputs, probiotics and, when necessary, antibiotics. Chemical treatments and biocides functioned to disinfect the broodstock and their eggs ahead of stocking or to prevent fungal and protozoan infections, while probiotic remedies improved the culture environment and the digestive systems of the broodstock and PL. Probiotics were a key component of shrimp operating procedures, with technicians reporting improved PL growth and healthier culture conditions. Farm supply shops reported a significant increase in probiotic sales over recent years, with a corresponding reduction in antibiotic sales. Nevertheless, with the exception of the SPF facilities, all respondents — including those from BMP compliant hatchery facilities — reported resorting to antibiotics to rescue a cycle from collapse due to a suspected bacterial infection, sometimes in relatively large quantities. Whilst the most common antibiotic in use was Oxytetracycline (approved for use in aquaculture), respondents also reported using antibiotic classes that were either prohibited or classed as being critically important for human health by the World Health Organization (for example Furazolidones, Nitrofurans, and Chloramphenicols).

Figure 5: Reported difficulties with water quality



Respondents claimed that decisions to use antibiotics were taken as a last resort, when all other attempts at treatment had been exhausted, and the risk of cycle collapse was immediate. However, the combined effects of tight economic margins and frequent biological complications meant that — for now — antibiotics remained a necessary component of disease control, with the potential dissemination of resistance-conferring microbes

[7] The survey was undertaken ahead of the current refugee crisis in Bangladesh's southeast. Almost one million Rohingya Muslims fleeing violence and persecution in Myanmar are currently sheltering in camps near Cox's Bazar, with frequent disease outbreaks being reported.

and their genes to the tens of thousands of ponds that stock PL from these hatcheries.

Figure 6: Water filtration and ingress

Compatibility with Farming Systems

A further question for policy was whether requirements for farming with domesticated seed were compatible with extensively managed smallholder aquaculture ponds. During interviews, farmers expressed concern regarding the ability of hatchery-reared seed to tolerate the open, low-input pond conditions. Many reported a preference for stocking with wild PL sources, which they claimed were better able to tolerate the culture environment compared with domesticated seed raised in the artificially recreated and relatively sterile hatchery tank environments. This was particularly the case in coastal regions supplied by highly saline tidal rivers. Farmers here reported a decline in production when using SPF PL, which they attributed to the poor tolerance of hatchery-reared seed to the saline environment. Technicians, on the other hand, claimed that *the farmers* were responsible for the poor productivity of premium quality seed, complaining that they were not making the necessary pond modifications or adjusting their farming methods to support domesticated PL health and growth. However, the situation on the farms themselves was more complex.

Switching to premium quality seed requires farmers to modify their farms, their farming practices, and their cropping patterns in ways that are not compatible with extensive farming systems and technologies, or with the commercial risk management strategies that they currently practice (Hazan et al., 2020; Hinchliffe et al., 2018; Rahman et al., 2018; Hinchliffe et al., 2021). For example, to farm with domesticated seed, farmers were expected to practise single stocking with disinfecting and drying of ponds between production cycles. However, farmers of extensively managed ponds practised polyculture (stocking of multiple species of crustacean and finfish) and multi-stocking (the continuous stocking at regular intervals across the season). In biosecurity terms, multi-stocking increases the risk of disease outbreaks, but it also allowed farmers to manage the financial risks, offering them a certain amount of security by spreading the costs and income throughout the season (Hinchliffe et al., 2018). The modifications also required farmers to deepen pond depths to a minimum of one metre (see also Rahman et al., 2018). Again though, the majority of small-scale farmers practised integrated agriculture, supplementing their incomes by cultivating rice paddy in their ponds either concurrently, or alternating between shrimp and rice according to seasonal salinity levels. Whilst those practising concurrent rice/shrimp and prawn production were able to dig a deeper ditch around their paddy field to accommodate their aquaculture, seasonal rice growers had to maintain a pond depth suitable for rice paddy cultivation (between 50 and 100cm). Furthermore, in situations where farmers were leasing their ponds, landowners could refuse permission to make the necessary modifications (Joffre et al., 2017).

Figure 7: Chemical inputs for managing tank environments and shrimp health, including a tub of Oxytetracycline

Finally, farmers were required to acclimatise hatchery-reared PL to the new conditions before stocking. A lack of nursing facilities meant farmers were expected to create homemade nurseries by netting off a corner of the pond. Farmers with limited pond space reported finding it difficult to section off their ponds for this purpose.

Figure 8: Integrated rice aquaculture. The pond on the left produces rice and prawn concurrently. The pond on the right practices alternative shrimp and rice production. In this photograph, the shrimp season has ended, and the farmer has shifted to rice cultivation.

Along with the intermediary interests and transportation issues discussed above, our results determine that many of the challenges posed by professional practices and culture environments in the wider production ecology will not be addressed by testing or SPF seed alone. Altogether, several factors coalesced to produce a weak environment for innovation in Bangladesh's shrimp and prawn hatchery industry: the combined and interrelated consequences of unsupportive markets; the absence of insurance or compensation; inadequate laboratory capacity; high frequency of diseased broodstock; polluted and fluctuating aquatic environments; incompatibility with extensively managed farming systems; and the unlikeliness of BMP costs being recouped in hatchery gate prices.

Concluding Discussion: Rethinking Innovation Models

A key aim of the Hatchery Act was to improve hatchery management practices, establish seed testing, and prevent the transmission of pathogens onto the farms (and by extension reduce antibiotic use). The DoF partnered with AIN to achieve these objectives. It made clear business sense to intervene in broodstock management, given their crucial role at the very beginning of production. It also made sense to target technical interventions at the relatively small number of hatcheries, rather than some 200,000 shrimp and prawn ponds. A partnership has been established with the Hawaiian-based biotechnical company and USAID collaborator that developed and marketed the SPF technology (Keus et al., 2017). A study has confirmed the relative success of the technologies for containing pathogen transmission and reducing or preventing disease outbreaks on farms when combined with the adoption of improved management practices (Rahman et al., 2018). The intrinsic qualities of the technologies and procedural innovations were evident, and the arguments for adding value were persuasive. However, as our results demonstrate, multiple challenges and factors relating to markets and investment, biological challenges, and on-farm practices that could not be resolved by seed testing alone prevented users from finding an investment opportunity. The innovation environment remains focused on improving seed quality, more specifically investment in SPF technology, which industry specialists argue is the only viable solution for reducing the disease burden, improving biosecurity, eradicating disease, and producing sufficient quantities of certified disease-free PL (Debnath et al., 2015; Keus et al., 2017). Introducing imported domesticated broodstock removes the reliance on disease burdened wild broodstock sources, and the only hatchery not to report antibiotic use was the SPF facility. This was a result (the technicians argued) of developing a high-quality system for the breeding and nurturing of domesticated broodstock that comprises effective use of probiotics and imported, certified organic live feed. Nevertheless, questions remain over SPF technology's capacity to reduce the disease burden and improve grow-out production. One key question is technical and relates to the contamination model of disease. As both PCR testing and SPF facilities target known pathogens,

they cannot guarantee freedom from diseases arising from newly emerging or mutating pathogens, or from adverse pond conditions (Barman et al., 2017: 67). However, our sociotechnical analysis of the use environment suggests that the implementation of SPF technologies will likely face similar obstacles to OMOT's implementation as outlined above. Given their own tight margins, it is likely that farmers will struggle to pay the higher cost per 1000 PL for SPF, especially if grow-out results are uncertain.

Within diffusion-based technology models, examination of the social and use environment tends to be shallow, and limited to cost-benefit analysis, improved productivity output, or quality that can be optimally achieved with the right technical modifications. As our study has demonstrated, this can lead to unintended outcomes and a limited diffusion of the technology. Nevertheless, our study has also demonstrated the possibilities offered by a social science-influenced innovation model for improving awareness of the social conditions and key relations a technology will encounter and become embedded within, thus enhancing the prospects of success. Just as models have been developed to improve awareness of how disease and pathogenicity are configured by microbial, environmental and socioeconomic drivers and interactions (Leach and Scoones, 2013; Rosenberg, 1992), similar models can be applied to improve awareness of how the fate of an innovation will be shaped by the drivers and interactions occurring in the intended use environment. Following Akrich et al. (2002), we therefore advocate the combination of a model of diffusion with interessement for the purposes of assessing the viability of technologies and management practices for improved seed quality. Such an approach can take the form of ethnographic studies or participatory modelling workshops with key actors, with the aim of providing a space for all those involved to reflect and interact, test assumptions, and identify uncertainties to be investigated and challenges to be resolved.[8] Here, the goal of interessement is to bring innovators and policy makers into contact with multiple sources of additional expert knowledge produced by those who engage with different elements of the use environment daily, and who have a sound appreciation of the complexities not easily captured by technical analysis alone.

By positioning itself "at the exact place where innovation is situated, in this hard-to-grasp middle-ground where technology and the social environment which adopts it simultaneously shape each other" (Akrich et al., 2002: 205), the interessement method of sociotechnical analysis has demonstrated how innovation is shaped by socioeconomic and material contexts, risk management strategies, and mundane interactions in an ecology of production practices. Taking Bangladesh's shrimp and prawn hatchery sector as our case study, we have examined the capacity of an innovation programme — designed to enhance seed quality, improve disease and production management practices, and by extension reduce reliance on antibiotics — to adapt to established breeder practices and the wider ecology of shrimp and prawn production. Our results and sociotechnical analysis have demonstrated how, when implanted into Bangladesh's export aquaculture production ecology, the relationships established and interactions encountered modified the technological innovations and defined their value: trawlers decided on which quality broodstocks were commercially available; market intermediaries decided on pricing and competition; farmers decided the value of PL sources according to their financial and adaptive capacities. The multi-factorial nature of shrimp and prawn production in Bangladesh placed limits on investment capacity and the capacity to implement BMP compliance, further driving risky disease control measures and limiting the successes of technical interventions for improving the seed quality.

When a novel technology becomes available, there is a risk that providers will assertively promote its diffusion without considering the suitability of the use ecology. Innovation requires supportive institutional, physical and market environments, which were missing in our case study. We suggest considering at planning stage whether the technology's diffusion can be sustained and what it would take to sustain it. This offers opportunities to include complementary social science perspectives that provide greater contextualization of the situation on the ground. This kind of validation improves knowledge and understanding of the innovation

[8] The authors of this article held participatory workshops with farmers, technicians, and other industry specialists, where we collaborated to produce a digital model that generated information on potential pathways and drivers of antibiotic use and AMR in the sector for the project (Hinchliffe et al. 2018).

environment, particularly when designing programmes that aim to deliver capital intensive and technically complex innovations in a farming context where preventing disease outbreaks requires more than the implementation of technological innovations for broodstock domestication and seed testing. Diffusion defines the intrinsic qualities that users will be receptive to (in this case the opportunities for reducing disease and antibiotic use in the hatcheries, and preventing pathogen transfer onto farms), but interessement generates information about the use ecology that the innovation will be implanted in: the relationships established and interactions encountered that modify the innovation and decide its value. To move beyond the normative practice of applying technical solutions to problems that are both social and technical, we recommend developing complementary models that can combine technical analysis with an analysis of the diversity of commercial and production practices, risk perceptions, and social and environmental relations in a production ecology. Applying a sociotechnical model of interessement can provide policy makers, producers, and other industry actors with multiple perspectives for understanding the often complex and multifaceted nature of disease outbreaks and their management in food producing sectors. These can either complement and enhance the outcomes of innovation programmes, or can indicate that a more socially and institutionally sustainable course of action is required.

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Institutional food literacy in Japan's Children's Canteens: Leveraging food system skills to reduce food waste and food insecurity via new food distribution network

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Abstract

One third of world food production is not consumed, and yet food insecurity is pervasive. Food waste is an issue whose resolution can contribute to more economically efficient and environmentally sustainable food systems. Previous studies on food waste reduction suggest that higher domestic competencies are associated with reduced food waste at the individual and household level. Based on a study of the nascent kodomo shokudō or Children's Canteen (CC) movement in Japan, this paper more broadly conceptualizes these competencies under the framework of food literacy, and demonstrates the mechanisms whereby food literacy can be engaged to reduce food waste. The paper furthermore shows how food literacy can combine synergistically in groups or organizations to form 'institutional food literacy' that is better suited to tackle broader problems of food insecurity, waste, and social alienation. Although the CC movement emerged primarily in response to the recognition of child food poverty in Japan, its popularity and rapid diffusion across the country since 2014 have made it a significant player in the food waste sector. Unlike food banks and other professionalized welfare supports, the CCs derive their expertise and orientation from the distinctive values and lay skills associated with food literacy. Through participant observation in a CC in Okinawa, we demonstrate how the value of these lay skills, particularly when combined in institutional settings, can play a significant role in food waste reduction. In particular, institutional food literacy can contribute to reducing food waste through: (1) efficient management and leveraging of localized food (re)distribution networks, (2) increased capacity for absorbing and utilizing erratic food donations, and (3) rendering food literacy, and its associated benefits, more visible and transmissible to children and other adults.

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1. Introduction

Addressing future food insecurity will undoubtedly require not only the rethinking of food production but also the improvement of distribution and the reduction of food loss and waste, which account for one third of world food production (Gustavsson et al., 2011). However, because food loss (in the value chain) and food waste (retail to consumption) arise from extremely complex social, institutional, and logistical factors, resolving them requires engagement at many levels and creative solutions. This includes recycling (i.e. composting), reusing (e.g. donating, re-cooking, preserving, etc.), and even re-purposing potential waste (i.e. animal fodder) across the food sector (Parfitt et al., 2010; Godfray et al., 2010, 2014). The multilateral institution best poised to address this issue, the UN Food and Agriculture Organization (FAO), set up its own initiative (*Save for Food*) alongside the broader urban food agenda. Within this initiative, the agency of individuals, families, and local institutions to conscientiously interact with, and efficiently manage, the food entering their domains constitutes a major contribution to optimizing food usage (FAO, 2019). The capabilities that facilitate this are understood to be lifelong food skills, or food literacy, which define how proficiently people can engage with the increasing complexity of modern food systems to feed themselves and others sustainably and healthily, while avoiding waste (Cullen et al., 2015). Food literacy, in turn, intersects with broader challenges to food security, including poverty, spatial inequalities in food access, and denigration of local foodscapes (Blake, 2019). As such, one point of intervention, which has garnered attention in the 2030 Agenda for Sustainable Development due to its synergistic resolution of poverty and resource waste, is the area of food charity. This paper outlines recent food charity developments in Japan, drawing attention to the contribution of its constituents and the underappreciated role of food literacy in effectively and dynamically reducing food waste.

To begin with, the very idea of "food waste" represents the discursive shift away from the "surplus" food era of the post-WWII boom years, to a more differentiated understanding of resource use and malnutrition (Hawkes and Webster, 2000). Addressing the food waste problem was part of a broader trend of recognizing inefficiencies of all kinds in the food system from the 1970s, with terms like over-abundance, micro-nutrient deficiency, and obesity becoming part of a common international vocabulary of food insecurity and environmental damage (Wijnhoven, 2015). At the individual level, uneconomical and/or wasteful food habits persisting from the "surplus" era were increasingly recognized as problematic, but there has also been growing awareness of evolving structural conditions underlying some food waste, such as busy lifestyles, deficient kitchens, wasteful packaging, culinary de-skilling and the decline in the domestic labor force (Schubert, 2008). At the very least, these conditions destabilize the assumption that diverting "surplus" or unwanted food toward charity can automatically be understood as preventing food waste. Instead, observers are invited to examine the available resources, as well as barriers, that determine the extent to which intermediary organizations and recipients of food charity are able to consume donated food, or whether that food becomes waste later in the food chain.
The collection and redistribution of food charity to alleviate chronic food poverty is an unpredictable and imprecise project, in which recipients (and related intermediaries) are expected to absorb the inconsistent and skewed flows of donated food. Donations are often nutritionally unbalanced, repetitive, or inconvenient for food preparation. This implies that recipients will need to compensate with superior ingenuity, planning and tolerance. However, as the burden to prevent food waste is additional to the existing structural injustices in the food system facing vulnerable people, scholars have misgivings about advocating too strongly that recipients should take personal responsibility for consuming mismatched food donations (Kimura, 2011). Scholars are moreover equally cognizant of the indispensability of food literacy in its broader definition for engaging constructively with the food system (Caraher, 2016; Sumner, 2013). Here, it is useful to return to one of the earlier definitions of food literacy, as articulated by Desjardins (2013):

> *Food literacy is a set of skills and attributes that help people sustain the daily preparation of healthy, tasty, affordable meals for themselves and their families. Food literacy builds resilience, because it includes food skills (techniques, knowledge and planning ability), the confidence to*

> *improvise and problem-solve, and the ability to access and share information. Food literacy is made possible through external support with healthy food access and living conditions, broad learning opportunities and positive socio-cultural environments (p. 69)*

Over time, scholars have more consistently agreed that food literacy concerns not only diet and health, but also a host of other attributes, among which would be the capacity to creatively resolve ingredient mismatches (to avoid food waste) (NAS, 2016; Perry et al., 2017). However, as this capacity does not exist in a vacuum, the food literacy lens also redirects attention towards related capabilities to understand and proactively interact with the food system. In this study, we explore some of these underlying mechanisms to illuminate the often unrecognized contribution of food literacy in reducing food waste.

While the most common unit of analysis when discussing food literacy is the individual, analyses occasionally focus on the household, where responsibility for planning, purchasing, preparing, and consuming are shared among household members. This paper expands this approach even further by studying meso-level food literacy of non-household institutions, particularly food-sector charity organizations. The more collective type of 'institutional food literacy' they express is formed through the synergistic and complementary combination of community group members' individual food literacy.

The case study that enables us to discuss both individual and institutional food literacy is the Japanese Children's Canteen (CC), or *kodomo shokudō*, a loosely defined charity institution that aims to address child food poverty and related issues at the grassroots level. The CCs usually draw together community members to resolve local food poverty, social isolation, and other forms of insecurity. CCs provide a lens on the interaction of the wider food charity sector, including stakeholders such as food donors (food producers, corporations, manufactures, retailers, etc.), financial and legislative supporters (sponsors, municipalities, and foundations), and recipients (community members and children). Although nominally CCs are understood as a nutrition safety net insofar as they provide essential meals for children, their influence extends from managing donated food to providing supportive co-eating spaces where both the elderly and children can socialize. CCs also simulate the interaction of households and food waste in the struggle to transform (donated) ingredients into meals that balance factors such as variety, nutrition, and cultural appropriateness (for children), while being frugal and avoiding waste. Therefore, this paper's research question is, foremost, how food literacy interacts with the capacity for reducing food waste and, secondarily, how collective or institutional food literacy can be conceptualized outside of the usual household unit of analysis.

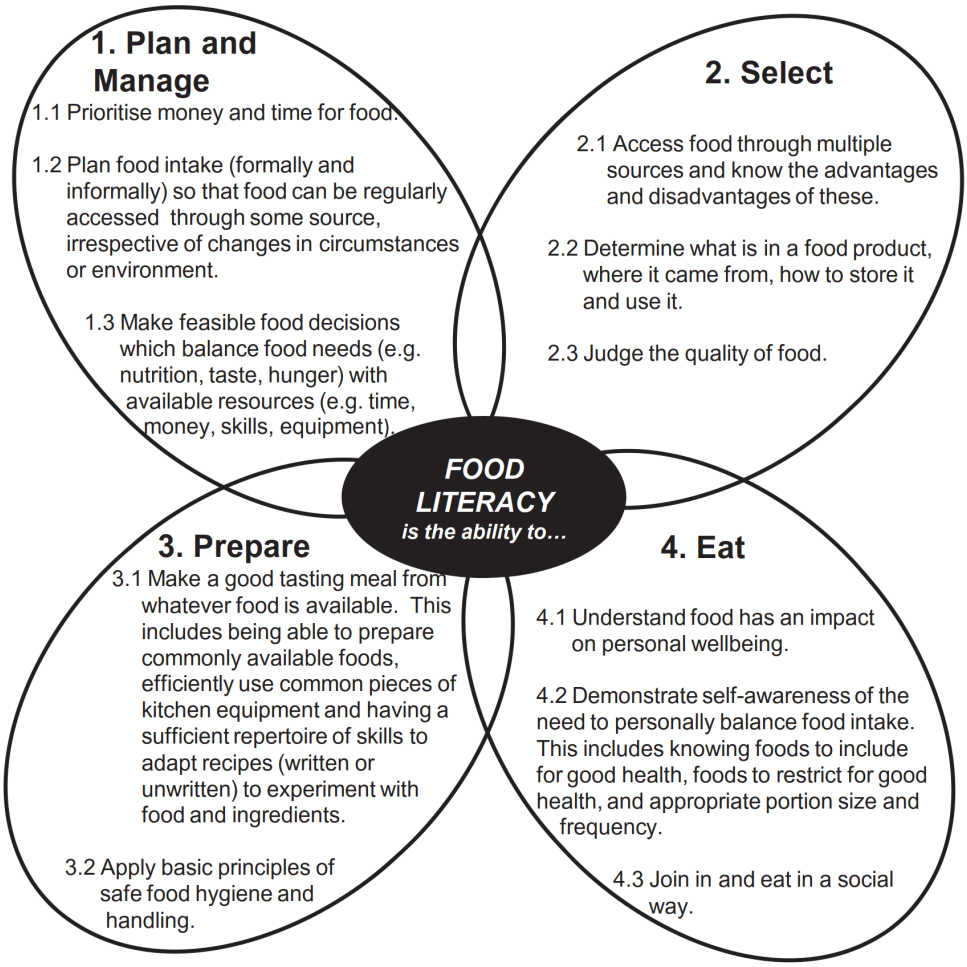
Background and Literature Review

Food banks have been researched for many years from the perspective of logistics, governance, efficiency and management (Warshawsky, 2010; Kobayashi, 2015) and there is mounting criticism about the fundamental suitability of food waste being considered a source of food security. Some researchers see food banks as part of the problem; they claim that food waste, which arises in unreliable quality and quantity, should not be considered a contributor to national food security (Booth and Whelan, 2014; Riches, 2011; Rideout et al., 2007). In particular, food waste is documented as a poor source of food assistance, as it only incidentally meets the nutritional and dietary needs of recipients (Starkey and Lindhorst, 1996; Tarasuk and Eakin, 2005). Precisely those people who face challenging social and economic conditions often struggle to creatively utilize erratic and unbalanced food donations (Friedmann, 1982; Clapp, 2012; Douglas et al., 2015). As the burden to reduce food waste is shifted to recipients, the role of food literacy in managing donations becomes an important arena for analysis.

Reflecting the wider challenges inherent to the modern food system, the term food literacy comprises four pillars: (1) planning and management, (2) selection of food, (3) preparation, and (4) eating (Vidgen and Gallegos, 2014). The components of each pillar are set out in Figure 1. At the household level, both quantitative

and qualitative research provide evidence that food literacy and cooking skills, including well-planned grocery shopping, advance preparation, and creative (re)use of already-purchased food, are important levers in reducing food waste (Quested et al., 2013; Farr-Wharton et al., 2014; Stancu et al., 2016; Romani et al., 2017). In short, it appears that high rates of food literacy among the population decrease household food waste and increase people's ability to efficiently manage seasonal swings and other disruptions in food distribution. However, incidental reduction of food waste through good domestic management is a far cry from the nexus of food poverty and food waste diversion that arises in the case of food charity. To understand how food bank recipients (rather than buyers) manage with the relatively little control they have over food acquisition, it is important to maintain a focus both on the individual's capacity as well as the meso-level interactions of these individuals in the food charity context. To this end, we turn to the case study of CCs in contemporary Japan.

Figure 1. Food literacy pillars and components (Source: Vidgen and Gallegos, 2014)



Broadly speaking, CCs are a grassroots mobilization that emerged to address the broader social and nutritional challenges of food poverty that tend to impact children disproportionately. Axiomatically, they can be defined as a space where young children can receive free or low-cost meals in a community based, self-organized space. Although their activities have often been supported by the food charity sector (namely food banks), they are closer in spirit to meal sharing or urban food commons (Morrow, 2019; Veen, 2019). CCs emerged as a reaction to the sudden recognition of child poverty, the extent of which became a matter of public record in Japan only in 2009. In 2012, Japan scored the highest relative child poverty rate in the OECD: 16.3%. Although the figures improved to 13.9% in 2015 (MHLW, 2016), the scope of the problem remained a shock to the public because many people in Japan believed that food poverty had been eradicated after the post-war boom years.

The foundation of the CC movement began with a volunteer who started to open her home in 2012 as a place for children to dine together, because she recognized the signs of child poverty in her community. This CC became an inspiration for others who wanted to do something about child food poverty in their own communities (Yuasa, 2016). By 2019, there were 3,718 canteens in Japan, up from 319 in 2016 (Yuasa, 2019a). For Japan, the unusually rapid spread of CCs has been associated with a counter movement against alienation and hyper-urbanization, not dissimilar to initiatives in Europe and North America (Blake, 2019; Morrow, 2019; Veen, 2019). According to Yuasa (2019b), this is represented in three predominant ways: 1) the name Children's Canteen itself represents a clear mission against child poverty, 2) cooking and feeding children is familiar to people and seemingly easy to start, and 3) people have a strong image of what an ideal, loving family should look like, and sharing meals is considered to be the potent symbol. CCs have been covered by the media as a heart-warming story to counterbalance darker reports about the high child poverty rates.

As the CC movement grew in size and influence, its intersection with the issues of food loss and food waste was inevitable. Food donations usually include food that is diverted by upstream actors before being discarded, usually by food processors, farm cooperatives, or grocery stores. Food banks or other intermediary organizations may receive these donations, after which they sort out what can be (legally) donated. Food banks, in turn, can pass the donated food on to individuals but often the food is transferred to intermediary organizations that have better access to needy people. The efficiency with which individuals and recipient organizations re-organize and transform the donated food determines the final proportion of the donated food that is wasted. For donors, CCs are an especially helpful intermediary organization as they use donated food to contribute to the fight against child poverty. Makoto Yuasa, the president and CEO of the NPO Japan Kodomo-Shokudo Support Center (musibie, for short), commented that, "CCs have started to become infrastructure in Japan, which means that the existence of CCs has become normalized" (Yuasa, 2019a). Yet, CCs, unlike many other recipient organizations in the food donation sector, do not usually start out professionalized; they are often established by interested individuals in a home or community center. In practice, they use their ingenuity to make use of available food, monetary donations, and space to create suitable environments for co-eating (Veen, 2019). This flexibility and ingenuity, which we argue often originates in food literacy, is aligned with the challenging process of transforming mismatched or skewed food donations into nutritionally and socially appropriate meals.

One of the common inspirations for establishing a CC is the desire to counteract what is perceived in Japan as the increasingly atomized and socially alienated modern meal. The Japanese word *koshoku*, which bears a pejorative connotation, was invented to describe people who eat alone. In contrast, *danran* is the word used to describe sharing meals together convivially, especially among family members. Social interaction at mealtimes has been studied keenly by many social scientists, with meal timing, setting, seating order, etiquette, conversation, and food preparation all understood to have important impacts on, and meaning for, people's maturation and socialization (Hemar-Nicolas et al., 2013; Crowther, 2013; Ochs and Shohet, 2006). Furthermore, the memory of home cooking – mostly by mothers or grandmothers but increasingly by CCs – is associated with experiences of caregiving, love, altruism, and *danran* (Ishige, 2016; Moisio et al., 2004). For many, *koshoku* is a reflection of dietary deskilling, in which the value of being able to plan, shop, prepare, and eat a meal together diminishes from one generation to the next (Noda, 2015). Although there are more structural factors at work, such as the shrinking size of families, busy hyper-urban lifestyles, outsourcing of food preparation to corporations, and a general lack of confidence in cooking, many view CCs as a home-grown, community-based method of revitalizing mealtime sociality. These institutions view the effort of creating a convivial space, which often includes ingenious efforts to combine mismatched food donations in creative ways, as symbolic of care.

Food waste may be understood, in turn, as the expression of a lack of care, where the opportunity for nutritious and socially meaningful interaction is devalued and taken for granted. Although food waste used to be a sym-

bol of wealth and abundance (i.e. 'surplus') its understanding has radically shifted in the context of growing food poverty (Rietkerk, 2016). With structural inequalities perpetuating food insecurity even in the Global North, figuring out targeted and effective ways of redistributing food has become an enduring challenge (Evans et al., 2013). Initially, food banks were viewed as a sensible convergence of food waste reduction and poverty alleviation, achieved by operating as an intermediary between people who have food surplus/waste and needy people. However, their social and cultural disconnectedness in many contexts has raised questions about their potential for meaningfully invoking the feeling of care (Evans et al., 2013).

CCs, whose purview goes beyond nutrition assistance and whose (young) recipients are uniquely sensitive to stigmatization, avoid some of the rigidities that impact food banks. Although the CC movement developed in response to poverty in Japan, most CCs are open to the community regardless of need, thereby avoiding the class-based stigmatization often associated with government welfare (Yuasa, 2019b). CCs are also commonly called *ibasho*, meaning "safe space," with the connotation of being nurtured and cared for (Nanahoshi, 2018; Yuasa, 2019a; Tamura, 2016). The main conduit for this care is the accessible and hospitable food experience for the community, which must be achieved despite the challenges of sourcing suitable ingredients. Unlike individual recipients, who can cognitively tolerate the dietary consequences of inconsistent and unbalanced donations, CCs must be more performative—they must deliver attractive and healthy food to attract young people.

Despite the popularity of CCs among academics and journalists in Japan, little attention has been paid to the crucial role of CCs in managing the broader food systems, particularly with respect to the ecosystem of food donations. Food literacy is expressed in everyday CC operations, ranging from sourcing food and planning meals to improvising when ingredients are poorly matched. With food coming from all sorts of donors, including farmers, corporations, manufacturers, retailers, and individuals, high institutional food literacy can be an indispensable asset in handling unpredictable food flows. The following section describes how this expression of food literacy was captured in a case study in Okinawa, Japan.

3. Research Sites and Methodology

The Children's Canteens movement is already prevalent in every prefecture in Japan. For a larger project, we surveyed 20 CCs across Japan, usually by participating in the operation as a volunteer, as well as interviewing and observing the staff and children (more detail in Nomura *forthcoming*). Although we refer to this body of data incidentally, the primary empirical basis of this paper is an in-depth and long-term organizational ethnography in Okinawa. With the highest rate of poverty and child poverty in Japan, the range and intensity of challenges facing CC organizers is more visible in Okinawa than in most parts of mainland Japan, and therefore more readily captured in research.

During the long-term ethnographic fieldwork, conducted intermittently over 5 months, from July 2017 through March 2018, one of the authors was stationed at a children's canteen in Naha city, Okinawa, hereinafter referred to as Nahano CC. The Nahano CC was uniquely suited to intensive fieldwork because it operates every day, except Sunday mornings. This regularity was an important research consideration as it permitted participant observation to be conducted in a limited time period and to take stock of the more typical day-to-day expressions of food literacy.

The location of Nahano CC is also an important research consideration, as it is readily accessible (by foot or bicycle) for a wide demographic group, whose conditions could be observed. Most significantly, it is close to many schools (see Table 1), which means that children, even younger children, can access the CC independently (often in walking distance). Elementary school B and Junior high school C are a little farther from Nahano CC, but children often still accessed the CC on foot or bicycle. Beyond schools, Nahano CC is within

walking distance of a big municipal-run housing complex, in which many of the residents are low-income families or elderly people. These residents are thus included among the informants in this research.

Table 1. Accessibility of Nahano CC from local schools

	Distance to Nahano CC	Means of transportation
Elementary school A	450 m	On foot
Elementary school B	1.2 km	On foot or bicycle
Junior high school C	1.2 km	On foot or bicycle
Nursery school E	300 m	On foot
High school D	270 m	On foot

Our primary source of ethnographic data stems from embedded participant observation among the children and staff of Nahano CC. However, the ethnographic scope extended beyond the CC to include a wide range of informants connected to the Nahano CC, including municipal officials, parents, neighbors, donors, other NPO/NGO staff, university professors, schoolteachers, and religious leaders. For donors, we conducted short semi-structured interviews to identify who donated what food, as well as their reasoning and motivation. In this category, informants included representatives of food companies, farmer/fishery unions, wholesalers, retailers, the US military base, and religious groups. These interviews occasionally took place 'on the job' (during interactions with CCs) or in discrete interviews. Recipients (usually children's parents) were another group of informants that were sought out. Semi-structured interviews of less than one hour were mostly conducted on site at various CCs, focused on why the person used the CC, what aspects determined their level of participation in the CC, their views on food use/waste, and their feelings toward the CC model of food charity. Due to the sensitivity of the research subject and ethical considerations, as well as consistent privacy requests by many actors in the food chain, field notes were the exclusive method used for data gathering. These were captured either as interview notes, which were annotated and analyzed thematically, or as ethnographic field notes written on-the-spot and recorded/transcribed in a daily summary. For the field notes, a range of Qualitative Content Analysis approaches were employed. These included thematic analysis of capabilities relevant to food literacy, and hermeneutic analysis of on-the-job activities. Photographs were taken casually to facilitate memory and aid in field note transcription but were not analyzed discretely in this research. The findings presented below focus primarily on the narrative, inter-workings, and systems embeddedness of the Nahano CC in a context of food literacy.

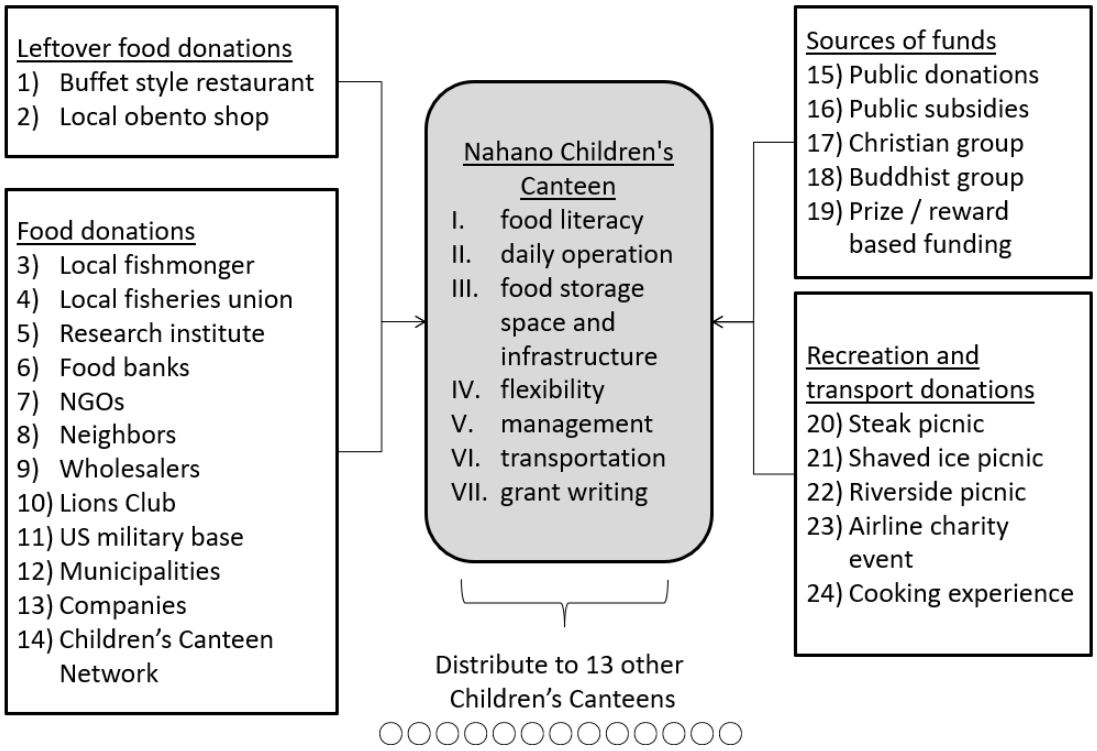
4. Empirical Results

4.1 Establishing a food distribution network on the basis of food literacy

Across Japan, CCs rely heavily on food donations to reduce the material cost of their operations. This how-

ever complicates their mission to provide attractive and culinarily balanced meals for children or vulnerable people. While the audience of some meal centers can tolerate less presentable food or an unsociable atmosphere, the identity of CC as *ibasho* and the types of visitors demand a congenial environment (Psarikidou et al., 2019). As such, in addition to nutritional and hygiene considerations, CCs must be creative as regards the food they source and how they do so, to ensure that children or the elderly will consistently return. At regular CCs, such as Nahano, it is therefore unsurprising that food donations come from all sorts of organizations and individuals. By being open every day and mobilizing a robust network, the Nahano CC ensures its own food sourcing and can even function as a local hub of food distribution. The operation time is (after school) 15:00 – 18:00 from Monday to Friday, 10:00 – 18:30 on Saturdays, and 14:00 – 18:30 on Sundays.[1] Throughout the long summer and winter vacation periods, Nahano CC opens from 10:00 – 18:30. This regular schedule is an outlier among the CCs in Japan, many of which operate either once a week or once a month. This regularity is due to the ideology of Nahano CC's organizer who notes, "children who are in need, need help every day, not just a certain day of the week or month." For unorthodox donors, such as restaurants and farmer/fisher cooperatives, who often have excess food on a daily basis, the reliability of Nahano CC makes for a good partnership. Figure 2 illustrates Nahano CC's food distribution network, including where donations are sourced, and what resources Nahano CC contributes to facilitate further redistribution. There are 13 other CCs in Naha city affiliated with Nahano CC, that can serve as destinations for further distribution. This network is by now quite robust and positioned to absorb a wide range of varying quantities of donated food.

Figure 2. The food distribution network of Nahano Children's Canteen and institutional resources facilitating distribution (in grey)



The development and continued maintenance of the network depicted in Figure 2 is indicative of the expression of food literacy, both short-term (managing daily flows competently) and long-term (efficient planning around the food system). Being both recipient and distributor requires a considerable amount of managerial experience, with many of the necessary competencies being similar to the components of the four pillars of

[1] Nahano CC reduced their opening days slightly from May 2018, by closing on Tuesdays.

food literacy articulated by Vidgen and Gallegos (2014) in Figure 1. For example, the short-term expression of this is acutely visible in the interactions between Nahano CC and a restaurant owner who donates leftover buffet food daily (see Figure 2). Donations started in May 2017 and involve daily phone calls to the restaurant to determine the suitability of the leftovers (an expression of the *Select* pillar of food literacy). Even if the amount or type of food is uneconomical, Nahano CC often accepts it in order to maintain their strong network (*Plan and Manage*), and because they are confident that they can compensate through improvisation (Prepare). Once the CC organizer has brought back the leftovers, the staff decide how to re-arrange or adjust the taste for children (*Select*) and then execute the transformation (*Prepare*). By presenting the food in a form accessible and interesting to children, they raise the chances that it will be received enthusiastically (*Eat*). These short-term expressions of food literacy, which allow CCs to confidently and assertively accept food, must also be supported by longer-term engagement to ensure a stable and acceptable supply of food (and experiences).

The variety of food donors in Figure 2 is driven both by Nahano CC's demand for a versatile and wide range of ingredient donations, and by the supply of donations that require a flexible and reliable destination. Creating and maintaining this wider network entails a lasting commitment at the food system level, undergirded by a confident capacity to absorb or re-distribute donations (Blake, 2019). For example, a local fishmonger donates frozen fish from time to time and can simply call ahead, knowing that Nahano CC will receive his excess. Similarly, the local fisheries union donates freshly caught fish, such as tuna and squid, to avoid having to dump part of the catch that exceeds quotas. For both of these unpredictable deliveries, Nahano CC can accept their offer because the staff have learned how to effectively cook the fish for children (*Prepare*), and they have large refrigeration capacities and freezers to store the raw fish (*Select*). Using its re-distribution network shown in the middle of Figure 2, Nahano CC can store or pass on ingredients to affiliated CCs which do not operate every day (*Plan and Manage*). By working simultaneously as an intermediary and recipient, Nahano CC increases its long-term capacity to accept and re-distribute donations, which in turn makes it a more desirable partner for donors at various scales and with different schedules.

The convergence of food literacy at both short- and long-term horizons plays out most decisively in the case of large one-time donations or unorthodox donors. Such donations usually involve disproportionate volumes of specific foods, and therefore demand considerable ingenuity at the CC level and systems level to avoid generating waste. For example, a local agriculture research institute once donated many boxes of lettuce, which were harvested for research purposes but could not officially be sold on the market. Nahano CC was willing to accept the sudden influx of fresh vegetables because they could absorb a large amount themselves, and had many possible connections, both up- and downstream in the food chain, through which the lettuce could be utilized. Similarly, Nahano CC absorbs the irregular donations of neighbors, the local Lions Club, or other local organizations that drop in to donate their garden vegetables, leftovers, or any other random food items. The US army base is another source of challenging donations, as the food they offer is often materially different from food in the local markets. For example, the base made a considerable donation of military rations, primarily hardtack, which Nahano CC creatively integrated into various foods. In general, the flexibility and improvisational skills of the staff, as defined by the first three pillars of food literacy (*Plan and Manage; Select; Prepare*), allow for a wide range of donors and stakeholders to readily interact with Nahano CC.

With its wider view of managing food poverty, which includes providing fun events and holiday activities for children, Nahano CC is also open to absorbing donations that are not strictly tied to the mission of feeding children. This can include material donations, such as the discarded snacks and candies donated from a nearby pachinko gambling parlor, as well as in-kind donations. To enable and facilitate their primary mission (food poverty alleviation), they also work to create fun and enjoyable spaces that are likely to attract children (Hemar-Nicolas et al., 2013). Much as a household would do, CCs often seek out some form of entertainment or diversion to complement the culinary atmosphere they create. As a result, recreation and special activities are also relevant donations (see Figure 2). The Nahano CC organizer, working with another local organiza-

tion dedicated to rehabilitation of former prisoners, organized a steak picnic and a shaved ice dessert picnic. Low-income families are less likely to have the resources to provide these types of activities and events, so Nahano CC can help manage social class stigma. Sometimes the events are simple, such as a riverside picnic with a simple obento (lunch box) for children to experience an open-air picnic. They may also broaden into more pedagogically meaningful activities, such as occasional educational cooking experiences. Airlines have also hosted charity events at Naha airport, which included a factory and aircraft tour that further deepen the socialization component of the meal space. These types of activities demonstrate an awareness and realization of the 4th food literacy pillar, *Eat*.

Naturally, operating a CC also tests the financial management of the organizers, which is broadly in line with the 1st pillar of food literacy (*Plan and Manage*). Some structure exists to support these organizations, such as the Children's Canteen Network, an online resource connecting CCs in all Japanese regions. The registered organizers receive e-mails about funding opportunities or food donations. It is however also important to generate locally embedded resources. In Nahano CC's case, they have cultivated a separate network for financial donations (see Figure 2). First, they have their own website and account that can accept public donations through money transfers. Second, they receive financial subsidies from the Naha municipality. They have been receiving 100,000 yen (USD 930) every month and, although this does not begin to cover all the expenses for the running of Nahano CC, it has been a major financial source to cover their non-food expenses. Third, they have a strong connection with the Christian and Buddhist communities, and can thus tap into religious charity. Finally, they garner occasional funding by applying for grant and prize funding. Either through information sent by Children's Canteen Support Network or through local information, Nahano CC organizers have a strong capacity to seek out and competitively apply for alternative funding.

So far, CCs have been described largely in institutional terms, with the capacities of a CC somewhat awkwardly equated with food literacy, which is designed to measure the skills of individuals. The next section addresses this dilemma by unpacking the individual contributions and associated food literacy of the CC staff and describing how the various individuals complement each other to foster a broader and more comprehensive "institutional food literacy".

4.2 Institutional Food Literacy

One of the weaknesses of the advancing conceptualization of food literacy is the limited attention paid to how food literacy operates at the meso and macro levels. Even at the household level, there are no models to explain how the differing levels of food literacy among family members interact to produce certain outcomes. In this section, we aim to make a first step in this direction by outlining how the food literacy of CC staff combines in ways that amplify the organization's capacities, much as two parents' combined skills complement each other in a household. This metaphor is useful in the context of CCs as, similar to parenting, there is no unified definition or operational style, only a basic focus on food provision and meal sharing. The CC organizers interpret the concept by comparing the needs of local children to their own childhood or to certain idealized visions of childhood. This leads to a diversity of approaches to care and a wealth of individual skills, habits and tendencies that they are able to contribute to the operation of the CC. How the respective capabilities of the staff combine (or clash) is therefore expressed in the overall functioning of the CC. This shared institutional food literacy is thus a product of synergies and complementarities arising from the individual food literacies of the contributors to an organization.

There is a common narrative that the uniqueness of the CC movement arises from the managerial input of laypeople (Tamura, 2016; Yoshioka and Saito, 2019): work-at-home mothers, retired men and women, and other community members who are empowered to establish spaces to combat food insecurity and social alienation. In other research (Feuer and Nomura, forthcoming), founders talked about their experience and memories of

their own difficulties raising their children, especially if they were single parents. Organizers often expressed sympathy for the current generation of child-raising mothers and fathers, and felt obliged to offer their help even though they do not consider themselves experts or professionals. In this context, lay experience arising from food literacy appears to be the basis for the grassroots surge of new CCs across Japan (Yuasa, 2019b). The lack of specific experience in food service implies a concomitant valorization of food literacy as an asset in engendering spaces for engaging with child food poverty.

In Nahano CC, the synergistic leveraging of food literacy is visible in the division of labor based on individual competencies that shapes their collective management approach. For example, there were five volunteers in charge of cooking meals, including the participating author at the time. None of the volunteers were professional cooks, yet they gravitated to jobs in which they excelled, while contributing more passively in other domains. Two regular volunteers acknowledged that they were good at cooking, particularly quick, child-friendly meals. They were also knowledgeable about the local food system and cuisine, so could provide a distinctive Okinawa approach for the children. In contrast, the chief figure in Nahano CC admitted that she was not as good at cooking, but rather good at shopping, sorting, and keeping track of food stocks. Similarly, another long-time volunteer was also not confident in meal preparation but enjoyed clearing, washing up, and overseeing the food presentation for children. The author, who could contribute by cooking and serving as sous-chef, was also indispensable in translating labels from foreign products that were donated by the US military base. Yet the division of labor cannot be reduced to assigning specialists as there are many topics and activities which fall between discrete roles or spark more extended discussion. Furthermore, individual food literacy in such contexts is not static; often volunteers quickly upgraded their food literacy out of interest or to be able to more fairly and efficiently distribute certain responsibilities. Since most volunteers are good at taking care of children, they can usually revolve between the kitchen and play/eating area to help diversify their job. Overall, institutional food literacy in Nahano CC is less a "sum of its parts" and rather an organic, negotiated, and evolving expression of individual competencies and collective effort.

The synergistic characteristic of institutional food literacy is expedient for managing complex and integrated challenges, such as reducing food waste. The collective goal to achieve food usage efficiency, balanced against the imperative to create a welcoming shared meal space, is a meta-level goal that guides the individual activities of each member. The numerous activities associated with feeding children, which include managerial activities before meals, and creative re-use afterwards, converge to determine how efficient the CC is in this mutual endeavor (i.e. how much waste can be diverted). This process begins, firstly, with the managerial initiative of members who interact with the CC's donors, which requires them to weigh the needs of the donor network (the timing and amount to be donated) against the shared capacity of their members, the children, and the larger re-distribution network to absorb donations. Secondly, upon receipt of donated food, the staff can use their skills to sort and select which foods should be prepared that same day, which should be kept in storage, and which should be redistributed within their network. Feedback is also likely to flow back to planners and managers. Thirdly, staff collectively engage to optimize the use of leftovers, new ingredients and food from storage to design a healthy and attractive menu. Fourthley, staff prepare meals with a child-friendly taste, while simultaneously preserving perishable food by boiling, pickling, drying, or freezing. Finally, they create a suitable space for co-eating that is inviting for children. After the meal, some leftovers are eaten by the staff, some are given away if the children/parents or staff wish to take them home, some are kept for reuse the next day, and some become waste. Naturally, CCs are not waste free, but their existence as intermediary recipients of potential food waste, and their internal mechanisms, help to minimize waste.

The relative institutional food literacy of different groups often determines how efficient they are in absorbing potential food waste. The divergence in performance between different organizations was illustrated in the case of an extremely large donation of *wakeari* (imperfect but edible) vacuum-packed corn that was received by the municipal welfare office in Naha. This office, which oversees and supports a variety of social support

services, also pools donations for CCs. In this case, the welfare official re-distributed 924 boxes of 30 cobs of corn – with 6-months remaining until expiration – to a variety of institutions (see Table 2), without determining the nature of the defect nor providing a warning to the recipients. After distribution, the officer began receiving complaints from recipients that the corn's color was dull, and it both tasted and smelled unpleasant.

Table 2. Distribution of *wakeari* vacuum packed corn in Naha city area

Recipient of vacuum-packed corn	unit: box of 30 corn cobs
Children's Canteens	411
Nursery schools	75
Local welfare commissioners	248
Social workers group for single parents	41
Nursery day-care service	82
Zoo	67
Total	**924**

As recipients began to return the corn, the official evaluated the corn herself and sent letters to inform remaining recipients that the corn might be better cooked rather than eaten directly. She also confirmed that the dull color of the corn was harmless. However, unable to persuade various partners to take the corn, she finally donated the rest to the zoo to be used as animal feed. Upon review of her experience with various recipient organizations, the official remarked that, "Of course, there are people who would still take it to use it in their cooking, but I will be more careful next time and I will inform all the recipients that this is *wakeari*." Nahano CC, which received many of these boxes, was readily able to utilize the corn by integrating it into soups, baked dishes, and other creative arrangements so that even children were not disturbed by the color and smell. Their more expansive institutional food literacy enabled Nahano CC to revitalize foods that other organizations and individuals struggled with. Most of the institutional food literacy that enables Nahano CC to function derives from the interaction between the regular staff and volunteers. Yet food literacy as a lay skill can also inform the actions of many actors associated with the CC, such as parents, neighbors, and donors. For example, community members often bring food surpluses or garden produce and suggest to CC staff how to effectively cook the various foods. The idea that food literacy aggregates in spaces such as CCs makes them attractive to others with food literacy – a kind of club effect. The case of Ms. H illustrates how 'external' food literacy can be readily absorbed and institutionalized. Ms. H is a single mother of three children in Naha city. She had divorced due to domestic violence and was unemployed due to chronic illness. She was living in the housing complex run by the city and was receiving social welfare assistance. She discovered the Nahano CC through her youngest daughter who attended. During one visit, a staff member started talking about the difficulties of dealing with so many donated winter melons. Because Ms. H was good at cooking and familiar with winter melons, she suggested dishes that could be made with them. Thereafter, she developed a steady relationship with Nahano CC, so that every time she visited, the staff asked her what could be done with food they had at the time. Her participation became a regular contribution to Nahano CC's institutional food literacy.

Given the examples presented above, of how institutional food literacy can be leveraged to overcome the more structural challenges presented by fickle donors, demanding children, limited resources, and a weak social safety net, some have questioned whether CCs can be a force for promoting alternative food system values (Tamura, 2016; Yuasa, 2019b). In this conceptualization, institutional food literacy not only builds food literacy among group members, but also creates generalized spaces of food education and culinary socialization. This was referenced above in the context of cooking presentations and the cultivation of *ibasho,* spaces that encourage food socialization (*danran*) and charge food with cultural and societal meaning. Donors are also a possible prompt for food education, as they donate not only excess food but also items they believe children

should eat, for nutritional or cultural reasons. In one case, the fisheries union in Naha decided to donate fresh, highly perishable raw fish to Nahano CC, despite the potential logistical difficulties. In addition to providing food aid to children, the aim was to combat the contemporary decline in fish consumption and the generalized lack of interest in fisheries among young people. The union leader managed to persuade municipal officials to allow him to donate fresh fish to CCs in Okinawa, but he admitted that the union did not have the resources to deliver and coordinate with all 14 CCs, particularly as the fresh fish had to be delivered and consumed promptly. As a "partner" sharing the normative vision of the fisheries union, the Nahano CC mobilized its network and social capital to store, re-distribute and create a special event out of this fresh fish so that disadvantaged children could appreciate fresh local fish. In this case, institutional food literacy for logistics, cooking, and education, combined to create an opportunity for children to meaningfully encounter the traditional food system.

5. Conclusion

As a lay form of knowledge, food literacy is widespread in society but relatively unrecognized. Past research suggests that high domestic competencies contribute to individual and household food waste reduction (Farr-Wharton et al., 2014; Stancu et al., 2016; Romani et al., 2017), but that these competencies are often conceptualized simply as skills and knowledge. This paper expands on these findings by demonstrating that the mechanisms by which actors are able to reduce food waste are rooted in food literacy, a broader set of food systems proficiencies that have been articulated recently by Vidgen and Gallegos (2014). The food literacy lens (Figure 1) was used to draw attention to, and understand, the overt and subtle means whereby Japanese Children's Canteen staff and volunteers could not only optimize food utilization in their operations but also facilitate the efficient utilization of food donations. CCs, which usually comprise laypeople with generally high food literacy, are able to mobilize their collective domestic skills to create effective spaces for nutritious co-eating, while absorbing and minimizing waste from erratic food donations. Through an empirical analysis of the individual and shared expressions of food literacy in an Okinawan CC, this paper extends the conceptual utility of food waste by broadening the unit of analysis beyond the individual and household, to understand how groups combine and integrate individual proficiencies to form collective 'institutional food literacy'. The expression 'institutional food literacy' in Japanese CCs involves combining, complementing and creating synergies between the individual skills, knowledge and experience of both staff and participants.

We find that the soft or passive skills underlying food literacy, which include proactive systems-level engagement in the food system to effectively plan, manage, select, and eat, enable CCs not only to transform potential food waste into nutritious food, but also to do so while maintaining an attractive atmosphere, and appealing food, for children and other vulnerable demographics. While staff of CCs are usually credited with transforming food donations into meals, contributions of food literacy can come from multiple sources, including children's parents and some donors. What emerges from these disparate influences is a collectively maintained food distribution network that is able to dynamically absorb and redirect donated food within a lay network (including other CCs, neighbors, and other charities) to avert food waste. Institutional food literacy, in this sense, is a common-pool asset that responds fluidly to the ad-hoc contribution of peripheral actors in the wider food system, while remaining anchored in the capacities of core actors. A suitable metaphor would be meetings of extended family for ceremonies and holidays, in which relatives' respective planning skills, recipes, cooking aptitude, management capabilities, and shared execution contribute to an efficient and gratifying celebration for the whole family.

The flexibility and improvisation characterizing food literacy are even more critical for the management of food donations and potential waste, as they fill gaps in the institutional rigidities found in food banks, municipal nutrition support systems, and other food aid services. More precisely, donors rely on the food literacy of recipients and intermediary organizations to ultimately transform erratic donations into consumed food (Nomura, 2020b). Intermediary organizations, such as CCs, create meta-level capacity to receive and trans-

form the large or awkward donations received from unorthodox donors, such as restaurants, farmer and fisher cooperatives, army bases, and wholesalers. These findings suggest that food literacy has a viral quality, in which collective action is not only amplified beyond individual capacities (institutional food literacy), but also attracts and engages peripheral actors.

The challenges of the contemporary food system call for structural changes in how agriculture, markets, and food distribution work, but the short-term task of surviving in the food system, and the long-term task of realizing systemic changes, can simultaneously be advanced by cultivating food literacy in society. Given the wide range of proficiencies required to encounter the complexity of the food system, formal knowledge-based pedagogy such as food education is unlikely to engender food literacy in a comprehensive way. Spaces with accumulations of food literacy, such as CCs, extended families, and shared living arrangements, render the value of food literacy more transparent and transmissible, and are thus a potentially suitable context for cultivating food literacy. In Kagoshima, a local organization promoting children's encounter with nature has used a CC as a venue (Yoshioka and Saito, 2019). In reviewing the space for action in some CCs, Kamiya (2019) reports that she sees an opportunity for CCs to provide food education which schools normally cannot provide to children within their curriculum. In general, the value of food literacy in diverting potential food waste and encouraging deeper food system engagement is being recognized both in its individual and its institutional form.

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Collaborating for Change: A Social Practices Approach to Partnerships for Sustainable Food and Agriculture

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Abstract

Worldwide, partnerships are popular vehicles for addressing (agro-food related) sustainability challenges. Their popularity is reflected in a proliferation of studies on partnerships. Yet, the current body of literature does not sufficiently take into account: (i) the importance of the institutional contexts in which the partnerships are embedded; and (ii) how interactions and tensions between the different partners influence the process of shaping the partnership over time. Therefore, in this paper, we aim to gain in-depth insights on processes of shaping a partnership for sustainable agriculture and food, and the role that the context in which a partnership is embedded plays in these processes. Our findings are based on the single case study of a participatory action research project of a partnership in Belgium. In our analysis, we take a social practices approach and thus conceptualise partnerships as different sets of practices from which a new set of practices is created. The results show that in talking about the sustainability of agriculture and food, it is important to take into account existing practice bundles because: (i) they set the scene in which sustainability innovations are shaped; and (ii) they create the boundaries for possible kinds of change. Participating in a new set of practices requires a move away from 'normal' ways of working. Yet, although there are shared goals and practices, each partner organisation is also constrained by and working towards its own goals. This is likewise the case for how 'sustainability' is shaped, implying that existing practices play an important role in shaping 'sustainable' practices. In turn, these findings highlight the need to not simply assume that partnerships will contribute to sustainability transitions, but also to reflect on: (i) whether and how this might be the case; and (ii) who or what factors have the power in shaping and defining 'sustainability'.

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Introduction

Worldwide, agro-food networks are facing the double challenge of meeting the needs of a growing global population, while facing a range of sustainability challenges, such as climate change, soil erosion (IPCC, 2019), and loss of biodiversity (Tilman, et al., 2017). There seems to be consensus on the need for food system transitions towards sustainability, to meet the needs of future generations (e.g. Spaargaren et al., 2012; Dentoni et al., 2017; Kirwan et al., 2017). It is also widely accepted that no individual organisation or stakeholder can solve sustainability problems unilaterally (Voss & Kemp, 2006; de Wildt-Liesveld et al., 2015). Instead, the inherent uncertainty and complexity of these problems require emergent and adaptive governance approaches, including multiple stakeholders from different sectors, such as agribusiness firms, (local) governments, businesses, knowledge institutions, civil society (organisations) and non-governmental organisations (NGOs) (Bryson et al., 2006; Dentoni & Bizter; 2015; Dentoni et al., 2018). Partnerships in the fields of food and agriculture have increased rapidly in number, ranging from global initiatives, like commodity round tables for sustainable soy, palm oil and seafood (Cheyns & Riisgaard, 2014; Dentoni & Bitzer, 2015; Kirwan et al., 2017), to local food councils (Kirwan et al., 2017).

The increasing popularity of the potential of partnerships is reflected in the Sustainable Development Goals (SDGs) of the United Nations, with SDG17 stating that "*[a] successful sustainable development agenda requires partnerships between governments, the private sector and civil society"* (United Nations, 2019). Over the last two decades, studies of partnerships have also proliferated (Dentoni et al., 2018), with a tendency to look at partnerships in terms of an antecedent–process–outcome model (Bryson et al., 2006; Thomson & Perry, 2006). As such, partnerships are seen as a space where a set of (rational) actors aim to address a common problem or work towards a shared goal within a specific context (i.e. antecedents), by bringing together complementary skills and resources in a way that would not be possible if they addressed these problems individually (i.e. process), and thus create a win-win situation for all of the partners involved (i.e. outcome) (Dentoni & Bitzer, 2015; Nicholls & Huybrechts, 2016; Spielman & von Grebmer, 2006). Partnerships are thereby associated with collaborative advantage (Huxham, 1993), or the assumption that by collaborating in sustainability goals all partners can benefit. Hence, the increased popularity of the potential of partnerships to solve wicked problems reflects "*a tendency (...) to portray these forms of collaboration as a kind of magic bullet capable of providing solutions to diverse development problems across a variety of settings through win–win situations where all stakeholders benefit*" (Rein & Stott, 2009, p. 80). In the field of food and agriculture, partnerships have also been viewed as a way to integrate the interests of diverse stakeholders and to create buy-in, in food system policies (Clayton et al., 2015), as well as to stimulate diversity and resilience in food provision (Dunning et al., 2015).

However, the role of partnerships in sustainability transitions generally, and food and agriculture studies more specifically, is not unproblematic. For instance, it has been claimed that sharing goals, resources and capabilities between partners is not a guarantee for the success of a partnership (Gray & Purdy, 2018), and that "*[t]he normal expectation ought to be that success will be very difficult to achieve"* (Bryson et al., 2006: 44). The literature on the role of partnerships in food transitions towards sustainability faces several challenges related to understanding how partnerships are shaped and what their role and impact may be. First, the existing body of literature on partnerships does not sufficiently take into account the importance of the institutional contexts in which the partnerships are embedded (Hall, 2006; Spielman & von Grebmer, 2006; Vurro et al., 2010). Vurro et al. (2010) argue that institutional logics influence how partners are selected in a partnership, what role businesses play in the partnership, what leadership style to adopt, and what governance structure is implemented. Second, there is a lack of insight on the way in which interactions and tensions between the different partners influence the process of shaping the partnership over time (Moragues-Faus, 2020; Thomson & Perry, 2006). Third, the terms 'sustainability' or 'sustainable agriculture and food' are contested concepts, which may mean different things and may be shaped in different ways (Galli et al., 2016). Fourth, the social dynamics and partner interactions are complex processes that will have to be taken into account in order to

enhance the transformational potential of partnerships (Van Tulder & Keen, 2018).

Hence, there is a need for more nuanced discussions on the role of partnerships in (shaping) sustainability debates (Shove & Walker, 2007; Voss & Kemp, 2006). To facilitate such discussions, there is a lack of approaches providing in-depth insights into the processes of how partnerships are set up and develop over time, including more rich accounts of the influence of the contexts in which partnerships are embedded in these processes. In this paper, we aim to address these concerns by taking a social practices approach to study partnerships. The study is based on a participatory action-research approach of a partnership between five different actors in Belgium that took place over the course of three years. The purpose of the project was to explore ways to feed a growing population by fostering a societal debate about food and sustainability, and by developing and marketing 'sustainable' food supply chains. Hence, the findings of the paper are based on a rich body of data that afford in-depth insights into the processes of shaping a partnership in the agri-food sector.

In the following section we further explain the social practices approach used in this paper. Section 3 consists of an introduction to the case-study and the methodology used. Section 4 presents the key findings from the case study. In the fifth and last section we discuss these findings.

A Social Practices Approach to Collaborations

In the past 10-15 years, Social Practice Theories (SPTs) have become increasingly popular in studying transitions towards sustainability in agro-food systems (El Bilali, 2019), because of the rich, detailed and nuanced accounts that they offer on social change. Social practice theorists have argued that social phenomena (organisations, education systems, corporations, science, power) consist of bundles of practices and material arrangements (Schatzki, 2005; Shove et al., 2012; Watson, 2012). In doing so, they aim to go beyond classic agency-structure debates. Instead of conceptualising social change as a result of individual agency or social structure, SPTs look at change as resulting from and rooted in the ongoing dynamics of social practices (Arts et al., 2016; Shove et al., 2012). Theories of social practices have been widely used to study how (un)sustainability is an outcome of the routinised performances of social practices of consumption (e.g. Shove, 2003, 2010; Spaargaren, 2003; Schelly, 2016; Fyhn & Baron, 2017). Recently, several authors have attempted to apply SPTs to other types of practices such as fertilisation (Huttunen & Oosterveer, 2017), growing urban food (Dobernig et al., 2016) and retailing fair-trade food (Oosterveer et al., 2014). Moreover, several authors have attempted to apply this theoretical lens to more large-scale phenomena, such as the management of organisations (Feldman & Orlikowksi, 2011), markets, governments and educational systems (Schatzki, 2016), global forest governance (Arts et al., 2016), and conservation tourism partnerships (Lamers & van der Duim, 2016).

The choice for a practices approach was based on an iterative process that was influenced by the Participatory Action Approach taken within this study. In a first instance, we studied the partnership based on the more 'traditional' antecedents–process–outcome model that was mentioned in the introduction of this paper. Within this approach, we also conceptualised each of the partners as individual, agentic actors (Welch & Yates, 2018). Yet this approach left little room for appreciating the ways in which the individuals within the partnership, and the different ways of functioning of each of the partnering organisations, influenced how the partnership was shaped and developed over time. This was something that we found to strongly affect the collaboration process. Moreover, such an approach left little room for identifying the factors that played a role in how sustainability was shaped, since it assumed 'sustainability' to be the ultimate goal of the partnership, rather than a highly fluid and negotiated concept that was shaped through the interactions between the partners.

A social practices approach was considered more suitable since, in SPTs, organisations or institutions are not necessarily seen as coherent actors, but instead are constituted from the constant and daily performance of activities (Watson, 2016). In other words, a practices approach allowed us to appreciate how organisations

and partnerships are made and constantly reproduced throught the daily actions of individuals, while these actions are at the same time influenced by the context in which they take place. Moreover, taking a practices approach allowed us to shed light on how 'sustainability' was constructed within and through the performance of practices that shaped the partnership, rather than being a concept that was predefined and consequently implemented in practice. A practices approach thus allowed us to gain nuanced and rich understandings of: (i) how the partnership was shaped and the role of the context in which it was embedded; and (ii) to identify the role that the interactions between the partners played in how sustainability was shaped.

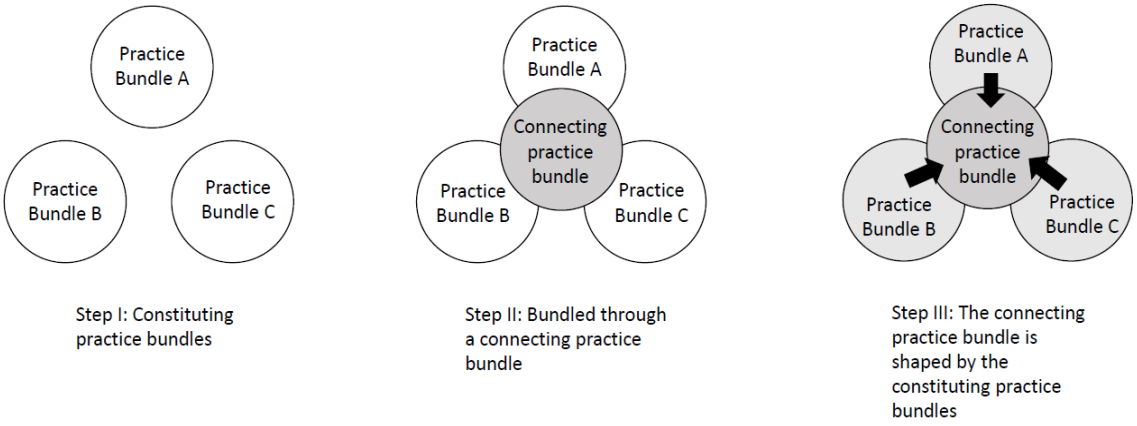
This paper mainly builds on the theory of practices as formulated by Schatzki (2005, 2012, 2016). Schatzki conceptualises practices as doings and sayings that are situated in time and space. Practices are organised by rules, practical and general understandings, and teleo-affective structures. With practical understandings, the know-how of performing a practice is conveyed. The general understanding is the meaning that is attributed to, and the common idea of, what it means to perform a practice. Rules are the explicit formulations of how a practice should be performed. The teleo-affective structure is the goal or purpose for which the practice is performed. Finally, there is always a strong link between practices and material entities, such as objects, infrastructures, and technologies. Practices and material arrangements therefore form practice-arrangement bundles (Lamers & Van der Duim, 2016; Schatzki, 2005, 2012, 2016). Based on Arts et al. (2016), we view these practice elements as important in understanding how 'sustainability' is translated into real-life practices. Individual practices may affect and be affected by other practices, as they hang together in more or less complicated bundles of practices. The connections between practices in bundles can be loose or tight to varying degrees. Generally, through consistent reproduction, connections between practices become tighter (Schatzki, 2005; Shove et al., 2012; Watson, 2012; Lamers & Van der Duim, 2016). An important consequence of such a view is that organisations or institutions "*take form as distinctive social phenomena through shared, collective, predominantly tacit ways of shaping, enabling, disciplining and aligning a multitude of largely mundane practices"* (Watson, 2016: 7). In other words, organisations consist of autonomous practices (e.g. administration, fundraising, marketing, research and sourcing practices) that are tied together in bundles that may be mutually dependent or else facilitate or compete with one another for time, attention or resources (Feldman & Orlikowksi, 2011; Lamers & Van der Duim, 2016; Schatzki, 2005).

Hence, partnerships are not merely spaces in which different organisations pool their resources to create positive outcomes. Rather, they are social spaces where different 'constituting' practice bundles (i.e. the partner organisations) are brought together and interlinked "*to create distinct nexuses of practices and material arrangements"* (Schatzki, 2016: 20) through 'connecting practices' (i.e. the partnership). These 'connecting practices' are performed in time and space with the aim of tackling societal challenges (Lamers & van der Duim, 2016).

The process of bringing together practice bundles and shaping a 'new' connecting bundle – the partnership – is depicted in Figure 1. In Step I, different bundles of *constituting practices* – i.e. the partner organisations – are shown, each consisting of their own specific configuration of rules, practical and general understandings, and teleo-affective structures. In this paper, the term 'constituting practices' thus refers to the bundles of practices of each of the five partner organisations within the partnership. Each of these organisations pursues its own goals and operates according to specific logics. In Step II, these constituting practices get bundled together through the *connecting practices* that constitute the partnership. In the specific case of this paper, this means that the five different partners come together around shared goals through shared activities, such as meetings, events and discussions. Moreover, this bundle of connecting practices also consists of a specific configuration of practical rules, understandings, teleo-affective structures, and general understandings. Step III shows how the practices constituting the partnership are influenced by the relationships between the constituting practice-arrangement bundles and the connecting practice. The partnership is created as the result of the interactions between the constituting practice bundles, and the facilitating or competing relationships that may exist

among them (Lamers & van der Duim, 2016). In other words, the partners within the partnership pursue a shared goal – in this case coming up with sustainable solutions within the fields of agriculture and food. However, the partnership is not built within a vacuum, but comes forth from, and is constrained by, the different constituting practice bundles (partners), and their specific goals and ways of operating.

Figure 1: Steps in the process of practice bundles becoming bundled through a connecting practice bundle (Based on Lamers & van der Duim, 2016)



Materials and Methods

The Partnership

To grasp what the connecting practices that shape a partnership look like – and how they connect to the constituting bundles of practices – we study the situated performances of connecting practices. To do so, we examine a single case-study of a partnership between a provincial government agency, a non-governmental organisation (NGO), a retailer, and two institutes of higher education.

The partnership was a three-year project that was started and financed by a provincial government agency in Flanders, Belgium, in April 2015. The Province had been involved in development cooperation in the global South. However, a need for renewal of the development programme was identified to increase its legitimacy amongst the citizens under its jurisdiction and to prevent budget cuts for development cooperation. Based on two exploratory meetings, it was decided that collaboration between different societal domains was crucial if societal challenges were to be met. The decision was therefore taken to set up partnerships with other organisations, instead of financing the activities of development organisations. Two multi-actor projects were created around the themes of healthcare and agriculture & food. This paper focuses on the latter.

In September 2015, a steering committee was set up, consisting of what the provincial government agency considered the most relevant players in global agriculture and food, based within their jurisdiction: a university, a large Belgian retailer, and a Belgian NGO that focuses on global food and agricultural issues. Later, a second higher education institution (a university college) joined the partnership. From each organisation, two or more people became members of the project steering committee. The NGO also provided a facilitator to guide the collaboration process. The goal of the partnership was to develop a project in which players in the fields of food and agriculture would search together for ways to sustainably feed a growing global population. The way in which the partnership was shaped and developed over time is further discussed in Section 4.

Data Collection

Several authors have highlighted the importance of the active engagement of universities in societal sustainability debates and collaborations, which implies a shift away from the traditional role of the researcher, and the use of a different set of methods (Dentoni & Bitzer, 2015; Huzzard et al., 2010; Samanta et al., 2019; Trencher et al., 2013; Wittmayer & Schäpke, 2014).

The first and third authors of this paper were present throughout the full stretch of the partnership. From the beginning of the partnership onwards, it was agreed that the researchers would fulfil several roles, such as: observing, documenting and analysing the interactions between the participants during steering group meetings and events; helping to shape the partnership and participating in the practical execution of several of the activities; facilitating the learning process of the participants on the basis of a learning history of the partnership; and supporting the partnership with scientific knowledge (Wittmayer & Schäpke, 2014). This meant that we were engaged in setting up the partnership and carrying out the partnership's activities. Our role thus extended beyond the traditional role of the 'neutral scientist'.

Concretely, our primary role was to capture and document the collaborative process. The data were collected by observing, documenting and evaluating the interactions between partners during steering committee meetings over the three-year period of the partnership (see also Lamers et al., 2010). During the meetings we took notes that we arranged afterwards into a learning history (Roth & Bradbury, 2008). We noted events on the one hand, and our thoughts and interpretations of these events on the other. This information was further summarised into a detailed table with a chronological account of all events and meetings during the project. With this, we aimed not only to more deeply understand how the connecting practices were shaped, but also how the partnership was built, and what we could learn from this.

The learning history was used as the basis for two evaluation workshops that were organised in March 2017 and March 2018. The main goal of these workshops was to reflect with the participants of the steering committee on the project until that point, to draw lessons, and to discuss how these lessons could be used to organise the remainder of the collaboration process more effectively.

The method for the first evaluation workshop was based on the timeline method developed by Van Mierlo et al. (2010). During this workshop, we prepared a timeline of the project until that point in time. We also prepared a more detailed table with an overview of all meetings and events until then. All the partners were asked to prepare themselves for the workshop by reading the timeline and the table, and to reflect on their own experiences. The meeting was facilitated by the first author of this paper. We first discussed the timeline, which was depicted on A0 papers and attached to the wall so that it was visible for all participants. After this, the partners were asked to add the elements they thought were missing. A discussion was then organised around three topics that were decided beforehand in consultation with the participants. The workshop revolved around: (1) the dynamics between the partners; (2) the focus of the project and its activities; and (3) visions for the future. The whole discussion was recorded, and detailed notes were taken by a note-taker.

The second evaluation workshop was organised during a full-day meeting. This day was meant to evaluate the partnership and to think about possible steps after the finalisation of the partnership. An external facilitator was hired to enable all the partners to actively participate. The activities were prepared in close collaboration with the facilitator. During the evaluation, each partner had 15 minutes to share their experiences, the difficulties they had encountered, why this project and this method of collaborating were important for their organisation, and what they had learned from the project as an individual and as an organisation. Detailed notes of these testimonies were taken and analysed afterwards. We had then prepared a document and presentation with our findings, on which this paper is based. These findings were discussed with the project partners whose input was used to fine-tune the findings. Furthermore, documents and annual reports from the partners were used for

triangulation of the findings during the steering group meetings.

Navigating between different roles came with a specific set of challenges (Trencher et al., 2013; Dentoni & Bitzer, 2015). First, each of the partners had to be flexible, as roles in the partnership changed throughout the project. Second, taking up several roles within the partnership could generate ambiguity or bias (Lamers et al., 2010; Dentoni & Bitzer, 2015). For example, we were at times perceived as the partner that could increase the legitimacy of the choices within the partnership, in the public's eyes, by providing research to support the choices that were made. Although it would be impossible not to be influenced by these dynamics, we aimed to minimise this effect and nuance our views by triangulating the data, openly communicating about our role in the partnership, and organising the evaluation workshops (Huzzard et al., 2010; Lamers et al., 2010). Moreover, being part of the steering committee and taking part in all decision-making processes and activities allowed us to gain in-depth insights into the processes of collaboration and the connections and interactions between different partners.

Results

Identifying the constituting bundles of practices of the partnership

The partnership emerged out of five constituting practice bundles. Each of these bundles was organised according to a specific set of general and practical understandings, rules and teleologies, and bundled with specific material arrangements. We discuss below the most important characteristics of each of the constituting practice bundles.

The provincial government department that initiated the project was responsible for development cooperation. In the past, this mainly meant that the department granted funding to development organisations. However, in the new format, funding was granted to collaborative projects in which the department participated. Communication about the activities within the partnership, to the provincial council and to the citizens in the jurisdiction, was seen as crucial to increase the legitimacy of such an approach. Moreover, all the department's activities were generally structured according to predefined frameworks and rules that were approved by the provincial council. Lastly, the provincial government operated on the basis of four-year governing cycles. After the governing cycle 2014-2018, elections were held and a new council was chosen. Securing re-election was therefore an important teleology for provincial representatives in the partnership.

The retailer was one of the three largest retailers in Belgium. Its core business was to set up supply chains and market products to a wide audience. The economic performance of these supply chains and products was a key teleology for the retailer. Procedures were strictly defined to ensure the coherence and efficiency of all activities. The protection of sensitive corporate information was considered of utmost importance to obtain and retain its strong market position, *and* to maintain its legitimacy in its customers' eyes. However, the non-profit pillar of the retailer that focused on increasing the economic, ecological and social sustainability of its practices also played an important role in the partnership. Finally, the practices bundle that constituted the retailer was large and stretched out over the globe, consisting of many stores and employees, and different types of activities. The partnership formed only a very small part of the retailer's activities.

The NGO was an international network organisation whose main goal was to contribute to ensuring healthy, sustainable and affordable food for all. Some of the core activities of the organisation were to support farmers, connect farmers with retailers and food businesses, work together with retailers, and ensure food education in schools. Moreover, an important goal for the organisation was to secure legitimacy among its followers, donors and funding institutions. Communicating about (the impact of) its activities was therefore considered important.

The university's main activities were researching, writing, publishing and teaching. The participating research group's work focused on agriculture, food and sustainability transitions in food systems. While neutrality was seen as an important aspect of the academic work, in this particular department researchers were encouraged to explore opportunities for action research. One major goal of the individuals working in the research group was to publish their results in peer-reviewed journals. Moreover, the practices that shaped the university were generally organised in longer term cycles, in which the publication of results can potentially take years.

Finally, the main practices of the university college were connected to educating students in a multidisciplinary way as well as teaching professional skills. Specifically, the departments of marketing studies and of food and dietetics were involved. For both departments an important goal was to attract new students by making the college an attractive place to study. The time available to the college teachers for research activities was limited.

Understanding the connecting practices that shape the partnership

From these constituting practice-bundles, the partners engaged in a bundle of connecting practices consisting predominantly of face-to-face meetings between the members of the steering group. During these meetings, common rules, understandings, material arrangements and teleologies were formed and (re)produced.

Concretely, the initial teleology was to bring together important partners in the fields of food and agriculture within the jurisdiction of the provincial government, to jointly seek ways to sustainably feed a growing global population. The goal was to do so in two ways. First, the idea was to develop (or improve) at least three 'sustainable' supply chains in collaboration with a range of global actors that had their main seat within the jurisdiction of the provincial government. These supply chains were supposed to provide an answer to different sustainability challenges and to make these challenges and solutions visible. The products – labelled 'foods for the future' – would be commercialised and offered to consumers within the jurisdiction through the outlets of the retailer. Second, the goal was to use the commercialised products as catalysts to inspire the societal debate on how to supply a growing global population with sustainable and healthy food.

Criteria were set for choosing the products. The products needed to be nutritious, ecologically sustainable, economically viable, and high in non-animal proteins. Some criteria were more specific to the project, for example the products needed to create visibility and be relevant for consumers in Belgium. It was also deemed important that these supply chains be realised through a collaborative process, in which value would be created for all participants. Furthermore, the product had to be sourced in the global South and create added value there, since the funding was meant for International Development projects. The commercialised products also needed to be used as a catalyst to inspire a societal debate around the future of our food. Lastly, a desire was expressed to involve young people as "consumers of the future".

At the start of the partnership, there was a search for products that might fit the criteria. The search ranged from highly innovative products (such as 3D printed pineapples), to 'taboo' foods (such as insects), and more well-known products (such as quinoa). The decision was made to further work around pulses, algae and quinoa as these products were thought to be feasible, given the retailer's infrastructures, while matching the eleven criteria.

The individuals in the steering committee agreed that a linear approach would be neither sufficient nor effective in dealing with sustainability problems. Consequently, flexibility was an important shared understanding. This translated into a constant negotiation of the boundaries and the focus of the project and the corresponding activities, especially during the first half of the project. It was illustrated by a continuous search for activities within the scope of the project and alliances between the project and other organisations working on similar topics or product groups. Hence, there was a constant back and forth between the setting of goals and aiming

to implement them, then re-opening the goals of the project, (re)defining pathways of implementation, and thus redefining the roles and responsibilities of the different partners. The project was thus characterised by cycles of defining and implementing goals, rather than by pre-defining the path of the project at the start. This also meant that some of the activities developed out of serendipity, rather than because of pre-set goals and predefined activities.

The flexibility of the project was illustrated by the fact that halfway through the project, the goal changed due to difficulties in the creation of the three food supply chains. From an early stage it was acknowledged that some of the supply chains would be more complex to put in place than others. As a result, the focus of the project shifted to a *search* for solutions to sustainability issues in the agro-food system. It was thus turned into a platform for debates on the future of food, by organising a wide range of activities such as movie nights, workshops, and thematic days. In this, the three products were used as illustrations. The renewed focus required most partners to step outside of their traditional roles. This was possible partly because no formal agreement between the partners had been signed in which the roles of the participants were clearly determined. Instead, trust that each of the partners would fulfil their role and not share sensitive information was built through regular face-to-face meetings between the members of the steering group committee. However, as the project became more concrete, the stakes for each of the partners became larger and the need for such an agreement grew.

Analysing how the constituting practices influence the outcomes of a partnership

The constituting bundles of practices that shaped the partner organisations played an important role in the shaping of the connecting practices. They functioned in a complementary way, with each of the partners bringing in their strengths to establish more than they could have done alone. However, the specific configurations of the constituting practice bundles also set the boundaries for what was possible within the project, and in some cases, the constituting practice bundles conflicted with one another, impacting how the connecting practices were shaped. In this section, we first discuss examples that illustrate how the constituting practices were complementary. We then discuss the tensions between the constituting practice bundles, and the way in which the constituting practices determined how the connecting practice bundle was shaped.

Complementarity

The partners all brought different but complementary competences and resources into the partnership. The provincial government brought in the funding for the project and had access to a network of contacts in the fields of food and agriculture. It also owned the facilities, connections and expertise to organise and host events. The retailer had knowledge on how to create food supply chains and market new products. It also had access to a wide client base, and was thus able to convey the partnership's story across to many consumers. Furthermore, the retailer played an important role in many of the side-tracks of the project. For example, it had the facilities and expertise to organise product development workshops for youngsters, and and to produce marketing videos of these activities. The NGO had specific expertise on development cooperation, setting up sustainable supply chains in the Global South, and a global network of connections in the fields of food and agriculture. It also had previous experience in collaboration mechanisms and was therefore responsible for coordinating the partnership. Finally, the NGO played an important role in organising workshops for young entrepreneurs in the Global South. Its worldwide network of offices facilitated this process. The university supported the project scientifically with its knowledge on agro-food systems and sustainability. Through Bachelor's and Master's theses, knowledge was obtained on the three product groups. The university additionally documented the collaboration process and distilled lessons learned. Its employees, in collaboration with the NGO, produced an educational package for children to stimulate thinking about the future of our food system. Lastly, the university college brought in expertise on marketing techniques and the development of new products. For example, students from the department of marketing developed a 'food truck for the future'

with which they attended festivals and public events, to foster debate on the topic of the future of food.
A specific example in which the complementarity of the different constituting practice bundles was shown, was the creation of a quinoa supply chain. The retailer and the NGO, for example, had expertise in creating supply chains and the needed connections in the Global South. The university was able to work from its expertise in impact studies, to explore the environmental, social, nutritional and economic impact of the supply chain. The university college contributed by developing innovative recipes based on quinoa, and marketed this product among young people, for example during festivals. Lastly, the Province had many contacts and facilities in the jurisdiction to make the product known. It was able to link the lessons learned from setting up the quinoa supply chain from Peru with experiences in cultivating quinoa within the region.

Tensions and Differences

Differences and tensions between the constituting bundles had a strong impact on how the partnership was shaped. We illustrate this by elaborating on the geographical orientation, the choice of products, the flexible nature of the partnership, the way in which success or failure was defined, and the way in which some constituting bundles had a stronger influence on how the partnership was shaped than others.

First, the leading role of the provincial government as funder of the partnership had important geographical implications. Although the project was aimed at addressing global problems, it was deemed important that all partners have their main seat within the jurisdiction of the provincial government, and most activities were supposed to be organised within that jurisdiction. There was also a strong focus on the sourcing of products from the global South because the project was funded by the development cooperation pillar of the provincial government. Moreover, for the retailer, the feasibility and marketability of the products were deemed to be crucial factors in choosing the 'products for the future'. Thus, despite the initial 'wide focus', the boundaries of the constituting bundles of practices – especially those of the retailer and the provincial government agency – restricted the discussion on the choice of products and narrowed down the scope of possible discussions on sustainability.

Second, the constituting practices were generally organised according to more strict procedures and linear methods. The flexible way of working that characterised the partnership was thus new to most partners. Most partner organisations viewed the partnership as a space in which they could experiment with such a new way of working. Yet the continuous revisiting of the goals and activities also created friction with the explicit efforts that had to be made to legitimise the project in relation to the constituting bundles. For example, feedback (as a group) towards the home organisations, public events, and evaluations were organised to retain the mandate to work in such a way. During the final phase of the project, it won a prestigious award which provided it with a lot of extra publicity, This also enhanced the partnership's legitimacy within the home organisations. Third, the goals of each of the partners were different, which affected how the success or failure of the partnership was perceived. The more concrete the partnership's activities became, the clearer these differences appeared. The issue of external communication illustrates the tensions between the different constituting practice bundles. For some of the partners – for example the NGO and the provincial government, for which the project was of great importance – external communication was seen as an important way of making the project and its activities known to their followers. For other partners, for example the retailer, the project was just one small project out of many. Communicating about activities externally was a sensitive issue, and a coherent and careful external communication policy was deemed important to keep the legitimacy it enjoyed amongst its customers. In other words, for some of the partners it was important to communicate as much as possible about the activities within the project, to gain legitimacy, while for others, external messages had to be carefully scrutinised to maintain coherence. To deal with these differences, a specific 'communication group' was created, in which members from the steering group, as well as communication professionals from each of the partner organisations, got together on a regular basis to discuss a strategy for communication on the project. Moreover, it was agreed that nothing would be communicated before each of the members of the communica-

tion team had received approval from their home organisation.
Fourth, some of the constituting practice bundles had a stronger effect on shaping the partnership than did others. The operationalisation and marketing of quinoa illustrates this. The packaging of the quinoa was developed by the retailer. However, once the design was finalised and the product was ready to be launched, neither the partners nor the project were mentioned on it. For some of the partners, especially for the provincial government, this came unexpectedly. Being on the packaging was seen as an important element to create visibility for the concrete outputs of the project and the province's role in it, which generated feelings of frustration. During several meetings, the steering and communication groups discussed the issue in an effort to resolve it.

The retailer explained how the development of the packaging had been organised, and the strict rules that the packaging needed to comply with. This situation was followed by discussions on a field trip to Peru to visit some of the quinoa farmers and the production facilities. Various members of the project consortium were supposed to go, as well as buyers from the retailer and representatives from an NGO representing quinoa farmers in Peru. The main goal of the trip was to check whether the production was ready to deliver to the retailer. Next to these participants, the NGO invited a journalist along, to document the process of setting up the supply chain. However, the retailer did not want the journalist there, as the outcomes of the trip were too unsure. This again triggered a discussion, after which it was decided that the journalist would not join the field trip. Both issues were resolved through extensive communication by the individuals working for the retailer. They explained the strict procedures and methods of setting up supply chains and marketing products, both within the steering group and to the home organisations, so that understanding about their way of working was created. The relationships of trust that were previously built throughout recurrent face-to-face meetings between the individuals that participated in the steering group proved crucial in this regard.

Fifth and last, during the final phase of the project ample time was devoted to discussing possible future steps and the continuation of the project's activities. The first steps for this were made during the second evaluation event. Discussions around this topic also arose during steering group meetings. However, due to the different working cycles of the organisations and the different mandates of the steering group members, it turned out to be difficult to plan for, or even think about, activities happening after the closing event of the partnership. For example, for the province, the upcoming election made it impossible to think about continuation. This also meant that funding for a potential follow-up project had to be found elsewhere, as the funding was crucial for the survival and continuation of the project.

Discussion

This paper has provided an in-depth account of the process of shaping a partnership and the interactions between the partners, from a SPT perspective. The in-depth single case study and use of SPT to examine the partnership provides a nuanced and insightful perspective on the ways in which partnerships are shaped, and the role they may play in (shaping) sustainability debates and transitions.

By taking a social practices approach, our study analyses how different sets of practices came together in a partnership. Through recurrent face-to-face meetings between representatives, a new set of connecting practices (i.e. the partnership) was developed from the partners' different constituting practice-bundles. The connecting practices took many shapes, such as steering committee meetings, events, workshops and activities to set up the supply chains.

In the starting phase of the collaboration there was a strong focus on finding a common goal, to which each of the partners could contribute, based on their own strengths. Participation in the partnership did nevertheless generally require each of the partners to move away from their main goals and 'normal' ways of working. As such, participating in the partnership required each of them to develop new skills and perform new roles out-

side of their traditional roles. The partnership was seen as a 'bubble' or 'safe space' to try out such new ways of working and build the skills necessary to do so. This potential role of the partnership was further explored particularly in the second phase of the partnership, where the explicit goal became to collaboratively search for ways to contribute to sustainability transitions. A partnership can thus be seen as a co-created "*inter-organizational space in which logics can be rendered more fluid and flexible than in their core ideal-types"* (Nicholls & Huybrechts, 2016: 710).

The effects and added value of such a collaborative space for fostering sustainability transitions might be hard to point out directly. Yet wicked problems are unlikely to be solved by linear methods and ways of working; they require more reflexive and flexible approaches (Dentoni et al., 2018). In addition, given the fact that in wicked problems a final common ground is inherently impossible, a space needs to be created for their management in which diverse viewpoints can come together and common challenges can be faced. Creating such a 'safe space' where new ways of working together can be tested might thus well be one of the main added benefits of partnerships within sustainability transitions. In other words, although in the traditional partnerships literature there is a strong focus on the outcomes of the collaboration process, our research suggests that the main added value of the partnership might actually be in the process of collaborating itself.

It is important to realise that although the partnership provided a safe place to test out new ways of working, there was no *unlimited* space to do so. While flexibility was considered an important guiding principle in the partnership's activities, the constituting practices were generally organised according to more linear and predefined working methods. The partners were limited in the extent to which they were able to move outside of these boundaries. Some partners were moreover more limited than others in this regard. This was mainly because the importance ascribed to the project differed for each of the partners, and differing levels of flexibility allowed partners to move away from 'normal' ways of working. Especially towards the end of the partnership, the partners deemed it more important that the actions within the partnership be aligned with their constituting practice bundles. In other words, although the partners shared the goal of finding solutions for a more sustainable future for food and agriculture, the practices that constituted each of the partner organisations and the context in which they acted created boundaries for what was possible in reality.

In talking about sustainability of agriculture and food it is thus important to take into account existing practice bundles because: (i) they set the scene in which sustainability innovations are shaped; and (ii) they create the boundaries for what kind of change is possible. This was illustrated by the way in which 'sustainability' was defined and shaped within the partnership. During the first phase of the partnership, the participants put a lot of time and effort into finding a common definition of what exactly was meant by 'sustainable' food and agriculture. The resulting definition was heavily negotiated and ended up being unique within the context of this particular partnership. While scientific studies on sustainability played a role, the boundaries of the constituting bundles of practices limited the discussion on the choice of products and narrowed down the scope of sustainability options. The focus on the global South and the need for feasibility and marketability of the products are two examples that show that the provincial government agency and the retailer strongly determined how the partnership was shaped. This also excluded the possibility of an open discussion on local and global food supply chains and the way in which these concepts are connected to sustainability.

The findings thus show that existing practices play an important role in how 'sustainability' is shaped. This implies that it is important not simply to assume that partnerships will contribute to sustainability transitions, but also to reflect on: (i) whether and how this might be the case; and (ii) who or what factors have the power in shaping and defining 'sustainability'. The issue of power has not been addressed much by theorists of practices. Yet it is important to be aware of the relationships of power that exist between different bundles of practices, and to consider the ways in which some (bundles of) practices have the capacity to shape others (Watson, 2016). This becomes especially important within the context of partnerships since "*power-free*

spaces do not exist" (Wittmayer & Schäpke, 2014: 486). Researchers and facilitators involved in partnerships need to consider these differences in power and the way in which they influence the collaboration process (Wittmayer & Schäpke, 2014).

Most of the partners had a 'dual identity', in the sense that they wanted to serve the goals of the project while answering to the needs of the home organisations at the same time (Thomson & Perry, 2006). The extent to which the partners had to move outside of their own identity and learn new skills was different for each of them, since they differed from one another in terms of speed of working, visions and values. Thus, although every partner organisation aimed to work towards the same goals, they were also constrained by, and working towards, the goals of their own organisations. This had an impact on the process itself and the partners needed to learn to respect and accept one another's differences for the partnership to be successful. Being able to answer to and work with the tensions between these different needs and rhythms turned out to be of the utmost importance to bring the project itself to a successful end. This is illustrated by the issues around external communication. In our case study it was shown that it is crucial to recognise and communicate about the differences in the constituting practice bundles (e.g. through the monitoring and evaluation of the cooperation process, and conscious communication and feedback loops in which the different ways of working were discussed) and to adapt roles, expectations and activities accordingly (Le Ber & Branzei, 2010).

While studies on partnerships tend to focus on interactions between organisations, the case study in this paper illustrates that within a multi-actor cooperation, individuals do have agency in shaping the partnership, although they are at the same time constrained by the practices they are accustomed to and the context in which they act. As such, the paper highlights the importance of not looking at organisations or partnerships as individual actors, but rather thinking of them as consisting of the recurrent performances of social practices by individuals as performers of these practices (Shove et al. 2012). The individuals played a crucial role in shaping the partnership, by representing the partner organisations and being intermediaries between the constituting and connecting practice bundles, building links and generating understanding (e.g. about the flexible way of working) between them (Lamers & van der Duim, 2016).

This relates to the perpetuation of the partnership. Our case study shows that without the recurrent involvement and performance of the constituting practices, the partnership perishes. For partnerships to have a real effect and to contribute to a transition towards sustainability, it is important that they be perpetuated beyond the demarcated timeline of the partnership agreement. The study thus highlights the importance of giving individual employees the mandate, time and resources to participate in and perpetuate such partnerships, for them to have a lasting effect. Or as Thomson & Perry (2006: 28) put it: *"The most costly resources of collaboration are not money but time and energy, neither of which can be induced. Public managers must take this time element seriously if the benefits of collaboration are to be realized"*.

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Food Utopias, (Mature) Care, and Hope

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Abstract

The current period is one of worry and concern over collapse. While many still go hungry, we anticipate a future of food without farmers. Yet in the wake of multiple disasters, the new can emerge. With a focus on food systems centred on care, utopias provide us with tools for dialogue that communicate problems, but also point to possible pathways forward. Following a theory of (mature) care focused on agri-food, food utopias offers a trialectic of critique, experimentation, and process to shape agri-food scholarship of the hopeful, care-centred stories of food and transformation. In combination with ideas about agri-food systems futures, this paper offers examples of care and food utopias from the US Midwest. This is an invitation to combine feminist ideas of care theory and food utopias scholarship that can help broaden our understanding of justice and scholarship around food, farmers, community, and feeding the world.

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Imagination, (Mature) Care, and Food Systems

Imagining the future evolution and outcomes of our food systems remains a vital and important collective exercise to be undertaken at multiple community scales. All too often we relegate our choices to an either/or dichotomy: local/global, rural/urban, organic/conventional. Not only do these dichotomies start pulling us into theoretical cul-de-sacs (e.g., organification vs. conventionalization), they also encourage competition rather than an orientation to the common good. The food utopias framework is an example of thinking about future food systems while examining cases from the United States Midwest as an illustration of the (bio)diversity and vitality of these models. Underpinning many of these discussions of the future of food systems are normative assumptions about what and whom are cared for and what we conceptualize as "good", related not just to food but also to what our future societies feel and taste like.

In imagining futures of food systems, we can start with a very specific place (See Figure 1).

Figure 1.

This is a farm 50 km from my campus, in a different county with slightly different laws and values regarding the role of agriculture and farming in the contemporary world. It is about 40 kilometers from the nearest major urban center. The farm is surrounded by a relatively major road, and the warehouses in the background belong to a lifestyle clothing company and FedEx. Tyson (chicken), Amazon (the online retailer), and Garmin (the GPS company) have large facilities down the road (e.g., Horsley, 2018).

We have plenty of theoretical agri-food tools to justify saying: "Wow, this is terrible – for the land, the farmers, the family, the community, the ecosystems!" "This is capitalism run amok." "It abandons the importance of the rural and of local food production." "How can this community treat its farmers this way?" But to leave our analysis only at the level of critique obscures our vision about emerging food system experiments. Think about trying to defend studying urban agriculture in the 1970s. What would the reaction have been? My guess is it would have been ridiculed both because it was a rare actual occurrence and because the theoretical landscape

did not exist for it to have been thinkable as an agri-food topic. Forty years later, the landscape—geographically and theoretically—is far different. Just as the land around this farm has changed dramatically, so too has the realm of what is thinkable about the future of food systems. This paper therefore explores food futures by looking forwards in time, at tomorrow's agri-food systems. It develops an agri-food theory of care, describes the food utopias framework, and then illustrates some examples from the US Midwest that might be interpreted as caring possibilities going forward.

* * *

Horsely (2018) lays out the competing values between a rural idyll or countryside (see also Shucksmith, 2016; Little and Austin, 1996), and an economic development model predicated on growth. Michael Bell's study (1994) of the changes that came with population growth of a rural English village highlighted this very real strain on people's identity and relationship with the natural world. Much of the residents' consternation revolved around a struggle to maintain their own sense of self as a "real country person" compared to the interlopers from the city. Lowe et al. (1997) traced the evolution of what it meant to be a good farmer, related specifically to agricultural pollution, and how that changed as urban folk impinged on the countryside and introduced urban environmental values (see also Burton et al., 2021). Justin Farrell (2016) describes these kinds of conflicting environmental values as competing sets of moral orders. By drawing on what we mean by care in relationship to other people, nature, and the food system we can articulate the kinds of food futures we might be hoping for when we talk about more just food systems. This exercise in combining mature care (adapted from feminist theory) and a food utopias framework offers new ways to talk about just food futures.

Developing an Agri-Food Theory of Care

Care in agri-food literature often equates with care farming or the feminist care ethic (for a good summary see Hassink et al., 2020). Care farming refers to agricultural ventures with therapeutic aims for the participants (for an example see Stock and Brickell, 2013). Care ethics incorporates feminist moral philosophy and theory, often as a direct counterweight to justice orientations (Gilligan, 2003; Held, 2006; Noddings, 1984; Tronto, 1993).[1] In agriculture, care ethics examples exist, but have not been fully integrated into agri-food scholarship (Beacham, 2018; Cox, 2010; Cox et al., 2013; Curry, 2002; Mol et al., 2010; Miele and Evans, 2010). I propose some literature on care to help integrate care perspectives more fully into our agri-food theorizations. Why do we need to think more about care in relationship to agriculture and food? First, in the agri-food literature, too often the incorporation of care stops at what is called care work (Curry, 2002; DeVault, 1994; Shisler and Sbicca, 2019). According to some feminist care ethicists, care work is an immature theorization of care in that it is too focused on the selfish aspects of care, where those who do the actual work of care (of elders, children, etc.) are un- or under-appreciated and thereby taken advantage of. This kind of unidirectional care is not a proper, full and mature care (to be fully developed a bit further on). Pettersen (2008), extending Carol Gilligan's work on the ethics of care, argues: "The selfish as well as the selfless care are pathological rather than ethical and are not what an ethic of care should be founded on" (Pettersen 2008: 59). An agri-food of care based on mature care helps develop a significant theorization of care-filled and potentially flourishing food futures (Stock, 2015).

Second, whether unfairly or not, arguments originating in feminist literatures get pigeon-holed and sidelined (Brandth, et al., 1994; Jarosz, 2011; 2014; Wells and Gradwell, 2001; Wilmer et al., 2019). As Petterson (2008: 125) argues, "when care-work like nursing is associated with altruism, while male-dominated occupations like the fire service are not, it is probably an expression of gendered history and culture". Yet, "If we believe that care is a value that deserves to be appreciated more and protected, the best way of achieving this would be to

[1] Pettersen (2008: 94ff) offers a nice discussion on the relationship between care and justice that moves beyond this binary assumption and puts forth a possibility that, "Care and justice are 'reconcilable'. By 'reconcilable', I mean that the two moral approaches can be brought together in ways that put an end to the conflict between them" (p. 96). See also Stock and Szrot (2020).

insist on a gender-neutral ethics of care. If care is a valuable moral ideal, it is valuable for women as well as for men" (Pettersen, 2008: 27). Just like Indigenous, Black, and other marginalized scholarship, these important arguments are redlined out of our mainstream literature, to our detriment.

Third, often agri-food scholars argue ethical discussions via relationality with non-humans and the language of affect, agency, and responsibility, while avoiding engagement with Indigenous cosmologies and ontologies that also take relationships with non-human others seriously (Whyte and Cuomo, 2016). The avoidance of writing about these relationships in the plain language of care and love of one another, animals, plants, crops, soil, organisms, and the planet that sustains all life indicates a deep separation from relationality rather than its so-called embrace. While there is limited space here to develop these claims in depth, it strikes me that much theorization of relationality and affect serves only to deflect our concerns down theoretical rabbit holes rather than acknowledging a collective level of concern we share. There is no way to "solve" these major dialogues in one article, but I do hope to open up some discussion on the fact that there has been a drift towards putting animals and other non-humans on the same moral plain in our sociological investigations, which tend to be ideological in orientation rather than empirical. These assumptions deserve our attention as much as do our conclusions stem from our investigations. I hope this article can contribute to such a discussion.

Mature Care

Here I build on the work of Tove Pettersen's (2008) Comprehending Care, Tzevetan Todorov's (1996) care as a humanistic virtue, and Monica White's (2018) collective agency and community resilience articulated in Freedom Farmers. As Todorov (1996) writes (following Noddings, 1984), "An ethic of caring is practical and made for this earth" (p. 128). Together we can build care as an umbrella concept that partners with justice and envelops the family of liberatory, exploratory, and innovative practices and theorizations related to current challenges and the hope for a flourishing of global agriculture (along with the persons involved).

"Flourish" offers an explicit telos or goal for what we, as scholars, advocate, and (possibly) what farmers, citizens, and community members hope for. While it is impossible to find a single definition of what flourishing might mean, from a humanist perspective, we can articulate some semblance of universal goals that include clean air and water, unpolluted food, and the balance of what's included in the Declaration of Human Rights, sustainable development goals, happiness indexes, and sovereignty manifestos.

It is also important to acknowledge that just not doing harm[2] is not care. Pettersen (2008) argues that "Caring, however, is not only refraining from harming, it also involves active beneficence" (p. 41; see also p. 174). What is care if it is not just not doing harm? What is care if it is not just care work? These become eminently important questions if we are to formulate (mature) care as foundational ontologies for developing food utopias and food futures.

Following Gilligan (and keeping in mind she was studying moral development), Pettersen (2008: xiii) demonstrates three distinct types of care: selfish, altruistic, and mature. Petterson would classify care work (mentioned critically above) as immature care insofar as it is a one-way relationship, either because it is selfishness or because it is construed as self-sacrifice (Pettersen, 2008: 14). The most important contribution that Gilligan and Pettersen offer us in the sociology of agriculture and food related to mature care, is exemplified in a balance between self-care and care for others within specific contexts or situations (Pettersen, 2008: 14). Pettersen (2008) also distinguishes between thin and thick care. Thin care occurs between persons without significant intimacy. "Thick care is carried out towards those we have concrete and established relationships with, such as family and friends—our related others" (Petterson, 2008: xv. See also p. 145).

[2] Pettersen (2008: 152) declares, "I will . . . take for granted that the failure of care causes injury." And this can be sociological, too. See, for examples, the experiences of Vietnam soldiers (Shay, 1994) and the violence of climate change (O'Brien, 2017). The failure of care in agriculture leads to many problems that we can equate to trauma, such as the experience of farmers in the wake of mass elimination of cows during a foot and mouth outbreak (Law, 2010) or the willful neglect of officials that knew of disease outbreaks (Leighton, 2018). Sometimes there exist competing notions of harm (Kessler, Parkins, and Kennedy, 2016).

"Mature care implies the ability to balance between different groups of potential recipients as well as between the interests of self and others. Hence, the concept of mature care defies those care theories based on an altruistic conception of care" (Pettersen, 2008: xv). Mature care, so balanced, can then begin to extend beyond one's immediate circumstance so that care can eventually be extended to animals and the planet. In all cases, mature care is considered a virtue or the right thing to do. Like Todorov (1996), each instance of care is specific to the person doing the caring.

Tzvetan Todorov (1996), in his examination of morality in the Nazi concentration camps, focuses on the importance of care as an ordinary virtue that contributed to some persons surviving the experience. Todorov (ibid.: 27) "uses the extreme as an instrument, a sort of magnifying glass that can bring into better focus certain things that in the normal course of human affairs remain blurry". In parallel to Petterson's mature care, Todorov describes care as an ordinary virtue and "acts of ordinary virtue are undertaken not in behalf of humanity or the nation but always for the sake of an individual human being [person]" (ibid.: 17). Channeling Martin Buber, Todorov writes, "The moral action par excellence is 'caring.' Through caring, the 'I' has as its goal the well-being of the 'you' (whether singular or multiple)" (ibid.: 287).

Mature Care in Agri-Food

This ethics of care in agri-food is often based on a food justice-oriented relational ontology (e.g., Leslie, Wypler, and Bell 2019; for a criticism of justice in agri-food, see Stock and Szrot, 2020). But relationality, the connectedness to other persons and beyond, moves away from principle-based forms of care for others and maybe even conservation. Care is about practice and actions; behaviors towards others as opposed to an ethical system of shoulds. The idea of relationality, along with feminist and Indigenous perspectives, aim to recoup a holism, humanism, and cosmology that Eurowestern thinking replaced with the autonomous individual.

I propose, along with care, that agri-food scholars will benefit from following personalism's emphasis on flourishing and dignity with an emphasis on connectedness. Counter to much Eurowestern celebration of the autonomous individual, personalism as an ontological starting point sees human persons as persons with centers and those persons are ineluctably connected with other persons, both from a biological origin standpoint (e.g., biological parents) and in their inherent dignity as human beings (Stock, 2014; Stock and Szrot, 2020; Smith, 2010; 2015). "Persons . . . are originally, constitutively, and inescapably social, interactive, and communicative in origin and being. Sociality helps constitute the essential character of personhood." (Smith, 2010: 67–8) In conversation with personalism, both Bernard Charbonneau (2018) and Jacques Ellul (1980) emphasize the centrality of person-to-person work when addressing issues of planetary healing.

Care also aligns with a different concept from Ellul. More often than not, we try to understand "alternative" agricultural examples belonging to movements in search of enough momentum to wrest power from capitalist-controlled food systems. Yet what if, following this care line, such examples of alternative agriculture were in pursuit of what Ellul (1980: 245-247) calls non-power? While we read much about smart farming or the big data revolution in agriculture (Bronson and Knezevic, 2019; Carolan, 2016), these are examples of techniques and the pursuit of power (see Stock, 2014, 2015). As Todorov (1996: 52) writes, "The appetite for power is not transitive; it does not lead to anything beyond itself. The quest for power today is not a way of doing good or of serving some ideal. Power is sought for its own sake; it is an end, not a means". Non-power, on the other hand, does not pursue power even when it could; but nor is it impotent or passive. By choosing to care for persons (and thereby places and plants), it is care-filled and thus an authentic expression of freedom (Ellul, 1980). We can see how care is an embodiment of the telos of flourishing. Our framework of care and agri-food here offers a key example of specific persons involved in specific relationships as a path for enacting care within food relationships (Pettersen, 208: 174-175).

Connectedness gives us a language to discuss issues without silo-ing them as being only about gender or only about Indigeneity, or moving towards putting persons and bacteria on the same ethical level, so to speak, as we often encounter with more-than-human formulations. There is real value in being able to theorize persons in relationship with one another and other species and ecosystems without completely flattening the relationships such that power (for good or for ill) disappears.

As an example of care in agriculture, White (2018), based on the documentation and theorization of African-American agriculture after the US Civil War, offers the collective agency and community resilience (CACR) framework. This framework provides a telos of care that is "working toward and practicing freedom—freedom to participate in the political process, to engage in an economic model that was cooperative and fair, and to exchange ideas with others who shared their goals" (ibid.: 5). White illustrates an embodiment of (agricultural) care (historically) in pursuit of both economic and social flourishing, based on historical examples of agricultural experimentation, knowledge sharing, and cooperative enterprises. As Robin Kimmerer (2013: 20) puts it, "All flourishing is mutual." By prioritizing cooperatives, "Collective agency and community resilience . . . are strategies that have to be understood within a particular social context . . . While not uniformly successful, through cooperatives, the community response to crisis was the one that engaged in reflection on structures of power" (White, 2018: 143). By foregrounding the experience of African-American farmers, White emphasizes that:

> *Excluding black farmers and others like them from the historical account has made a group of signally important actors in the struggle—namely farmers—seem passive or distant from the black freedom struggle. As a result, the histories of African Americans in agriculture do not inspire communities to reconnect with that heritage. (ibid.: 145)*

While helping to rectify the perception of black farmers' role both in the civil rights movement and in American agriculture, White also provides a model that can be adopted more broadly. White (2018: 61) furthermore adds to the literature that aims to understand farmers, autonomy, and freedom (Nelson and Stock, 2018; Forney and Stock, 2014; Stock and Forney, 2014). Care then can serve as an umbrella for various liberatory and emergent examples, including the categories of equity, justice, sovereignty, flourishing, and community.

In this way, care approaches to agri-food systems transformations are in good company with related theoretical projects like Gibson-Graham's (2008) focus on diverse economies, resilience (Dwiartama and Rosin, 2014), the prefigurative (Breines, 1980; Wald, 2015), no growth economics (Jackson, 2009), Slow Food (Piatti, 2015), biological economies (LeHeron et al., 2016: 8-9), and food utopias (Stock, Carolan, and Rosin, 2015).

With regard to moving past dichotomous thinking in the future of agri-food systems, we call to mind Mike Goodman's (2004) important work on paradigm change. Part of Goodman's argument amounts to a warning not to suffocate the new. Academic agri-fooders in particular (but also those involved in alternative agro-food networks (AAFN) work more generally) can be susceptible to an urgency and defense of the new premised on a belief in progress – all new things must be an improvement. The new paradigm of post-productivism? Let's throw a party! Local or organic? A party! Agri-environmental schemes that help protect and encourage ecosystem services? You're on the guest list. Goodman's (2004) many critiques of the celebration of AAFNs (and agri-fooders suckered in) can be summarized as follows:

> *advocacy of paradigm change that envisages AAFNs as new vectors of farm income diversification embedded in the cost-containment logic of non-commoditized production circuits seems far removed from pressing contemporary rural development issues and more aligned with an idealized*

vision of a rural Europe of resourceful yeoman farmers and the era of 'high farming' (ibid.: 7-8).

All too often, changes documented in farmers' practices reflect adaptations to economic realities (like ecosystem payments) rather than a fundamental shift in their personal values (or moral orders) towards the environment (Goodman, 2004:11).

What Goodman's prescient warnings about getting too giddy about AAFNs indicates is that there is not one solution. The food-related social movement is not one single thing, nor will it solve all the problems. At the time, Goodman (2004) warned, along with Guthman (2004) in organics, and others, that uncritical celebration of the new might yet sustain inequitable power and patriarchal relationships, particularly in regard to workers and on-farm work dynamics.

So what values underpin what we have and what values will underpin what we will have? Here, the reference to "continuity and incrementalism" of Goodman (2004: 12) retains some conservative appeal yet also a desire for progressive agri-food futures that would feed people calorically without undermining culture, race, identity, sex, gender, sexuality, or relation(ality). In other words, food sovereignty/justice/equity. Yet, can we envision the various ways in which agri-food systems could be arranged if we confine ourselves to "continuity and incrementalism"? The focus on values means we have to articulate more clearly what exactly a just agri-food system looks like, and what a flourishing food system(s) means. Smith (2015: 212) argues in the wider idea of societal flourishing that, "The promotion of personal flourishing toward the common good is the criterion by which all societies must be judged, the central standard of any social ethic". By extension then, how persons experience food systems is just as important, if not more so, than the food system's market successes. To get there, to that teleological end of better food systems, we have to flex our imaginations (Meadows, 1996).

Food Utopias

As a sociologist I am familiar with problems – of injustice, of racism, inequitable housing, and pay gaps between men and women. But also as a sociologist I am trained to not be very good at saying what a good society is. We are far more comfortable pointing out what is bad and what is broken than we are at saying: "I want it to be this way," especially in a way that does not demean or insult others. Utopias allow us to use our imagination and powers of observation to think up something, put something into practice, study something that is intended to work differently—to actively create a good society (Bell, 2018; Smith, 2015; Stock, Carolan, and Rosin, 2015). Utopias are often ridiculed as impossible, childish, unimportant—and not worth spending valuable time thinking about. And yet, following Donalla Meadows' (1996) ideas about envisioning a sustainable society, we have to use our imaginations.

If we can get away from the utopia as the blueprint of a perfect future, we can use utopian stories, thinking and imaginings as a springboard. As Carolyn Steel (2009: 305) argues in her book Hungry City, "Utopianism represents the nearest thing we have to a history of cross-disciplinary thought"—an important consideration for agri-food scholars. If we think of utopias in the plural we might be able to start identifying the seeds of the future. Utopian scholar Lyman Tower Sargent (1994) describes three faces of utopia: the literary; intentional communities; and utopian social theory that articulates a "philosophy of hope". In all three, utopias provide us with stories, both fictional and empirical, that illustrate the many ways the world can be different. Rather than blueprints, green utopias, as Garforth (2018: 3) describes them, indicate that, "Desires for a better greener future are still there, but they are less explicit and powerful, more fugitive and fleeting, often framed by narratives of loss and mourning". These other possibilities help us to prefigure the future (Breines, 1980; Wald, 2015). They also help us to work across disciplinary boundaries. Utopias offer us powerful stories that help

us read our own world for difference. Rather than just looking at the stories that we can critique as bad and unhelpful for enacting social change, a utopian imagination helps us to look for the small and the experimental as potential change agents in our world. As sociologist of utopia Ruth Levitas (2013: 120) argues, "Utopias enable us to explore the structural limits of what is thinkable".

As we expand what is thinkable we also put ourselves in a position to make a choice as researchers. J.K. Gibson-Graham (2014: s151) wrote about doing research: "This involves a political choice to enact a revolution of sorts, one that makes faint glimmers of hope into prefigurative elements of a becoming economy". When we talk about this in terms of food, we cannot just critique policies as harmful to farmers and local ecosystems. We are called to make difficult choices that identify what our utopian futures might look like. This comes through in the projects we pursue, the communities we work with and in, and what we write for the world to read. The practice of reading for economic difference expands the possibilities for making other worlds realizable. In our case, they expand into food utopias with more than just a single goal of producing enough calories to feed the world.

Food utopias draws on the three faces of utopias, as well as on feminist theory (especially care and the work of J.K. Gibson-Graham), and on a significant history of agri-food theory to describe this framework as a way to highlight and tell interesting and potentially transformative stories of things currently happening in food and agriculture. Most importantly, these stories of the new represent multiple, not singular, methods that pose a dichotomous future which leave us with either a utopian or a dystopian choice. Food utopias as a research agenda uses the following three tools: critique, experimentation, and process.

Critique

First, food utopias is about exploring what is going wrong. The connections of utopias and ideology allow us to tackle the distortions in the logic of capitalism run amok. This kind of critique is typically associated with political economy. The ideology of capitalist agriculture that will make family farms irrelevant is predicated upon cheap, often immigrant and child labor, new markets, and economic logic. Yes, there are many things going wrong. Many utopian stories serve as satires to critique the contemporary age. And that's a great way to understand the old story of agriculture. Critique is vital and a mode of theory we are used to; the wider food movement is great at critique.

Concerns over GMOs and the movements they inspire (e.g., Tucker, 2013) offer one example where we still have extensive room to critique. But what about the other ways we have harnessed scientific breakthroughs to change seeds at a genetic scale? The history of mutagenesis is filled with both celebratory and worrisome stories (e.g., Howorth, 1960). In parallel with moments like the Cuban Missile Crisis we were also trying to harness "Atoms for Peace" in pursuit of great breakthroughs in agricultural yields (Alario and Freudenburg, 2007). In trying to harness Caesium 137 and other isotopes we have used mutagenesis without much or any regulatory oversight, nor studied its effects or the decision-making processes that went into it. Mutagenesis is a major part of the productivist era and yet we are woefully uninformed about its role in the contemporary food system. The point here is that there are many processes and institutions worthy of agri-food critique. In many ways, atomic farming represents one kind of experimentation that food utopias might examine.

Experimentation

Second, food utopias highlights experimentation. What are the experiments, risks, and projects happening now that might give us a glimpse into the future? And what have been the experiments in the past that started out small, but that have had a major impact on good things happening now? Much of the work on alternative or sustainable food systems focuses on the experimenters on farms and in kitchens doing interesting things. But we also should not fall victim to what Phillipov and Goodman (2017) describe as the "celebrification" of

farmers and others in the food movement.

Specifically, in imagining and designing future agri-food systems we might highlight oft-ignored stories of cooperatives (Emery et al., 2017), state-supported programs that belie free-market trade trends like the burley tobacco program in the US (Wright, 2005) or Canada's supply management program in dairy (Muirhead and Campbell, 2012), anarchism (Ashwood, 2018; Wald and Hill, 2016; Stock, 2014), and food sovereignty (Desmarais and Wittman, 2014; Grey and Patel, 2015). In short, there will not be a single solution or model to agri-food systems futures.

This "celebrification" is much of what passes for food studies and is proud of it. Nor is it enough to presume the moral certitude of the local, as Born and Purcell (2006) outlined with their description of the local trap. Maybe we can look to some communal food experiments at places like Findhorn in Scotland (Sargisson, 2001; Sanford, 2017)? Or in my own work I have tried to document the experiments of the Catholic Worker movements farms, as well as what I called original care farming experiments as mental health treatment (Stock, 2014; Stock and Szrot, 2020, Stock and Brickell, 2013).

The more we examine experiments in tinkering with the everyday and identify possibilities of a path forward, the less we may find ourselves in physical or intellectual dead ends (Winance, 2010; Stock, 2015). And some of this experimentation is so old it just looks new. The farmers markets and heirloom tomatoes simply make visible what had been rendered almost unthinkable in a productivist mindset. By thinking with experiments we recognize that the new examples of agri-food futures do not emerge out of thin air, but evolve out of multiple processes of trial and error.

Process

Science fiction writer Kim Stanley Robinson (1990: 95) writes, "Utopia is the process of making a better world, the name for one path history can take, a dynamic, tumultuous, agonizing process, with no end. Struggle forever". Food utopias examines the how—the process. How do we incubate new ideas long enough without them getting crushed because they did not achieve economies of scale? How do we get new products to market? How do we connect more people together? How do we create "welcoming communities of alternative food practices" (Carolan, 2018: 180)?

An emphasis on process recognizes that not all of these experiments will yield success. In fact, many things that farmers, communities, and businesses do try, fail, for many different reasons. But these so-called failures also have stories that should be told (Stock, 2014). In many ways it is important to tell them, for it enlarges and enlivens what we think possible; it helps create the difference we are reading for in the first place.

It is important to note that food utopias is not aiming to supplant or undermine other ways of understanding or writing about the complex relationships in pursuit of just food systems. If nothing else, the hope is that by encouraging some utopian imagining around what might be a part of a just food future, we might simply be able to talk about these things with more people in new and creative ways. In these ways, food utopias connects to other frameworks like biological economies, human economy, new political forms, and new research methods seeking to reimagine how we do scholarly investigations and what we investigate, without only offering critiques because a new agri-food innovation did not lead to the revolution.

We are all trapped in our own ideologies. As Paul Ricoeur (1986) argues, we cannot escape ideologies, but we can identify them, recognise that we have one, then outline our utopias and do the best we can (Rosin, 2012; Rosin, 2014). Utopian stories and intentional communities challenge our day-to-day life in unconventional ways. Restrictions on child labor started out as fiction, so too did universal healthcare (for some), and credit

unions. These are what sociologist Erik Olin Wright (2011) might describe as real utopias—things that have existed at some scale that we can adopt; (but we cannot remain as narrow as Wright was because he was tied solely to a socialist imagination). The utopian can become reality. But how do we start to talk about and envision new ways of doing, growing, and sharing food?

By all accounts this is a difficult moment. We began our investigation in this paper with the image of a farm surrounded by warehouses. In neighboring Iowa, the state decided to defund the Leopold Center for Sustainable Agriculture at Iowa State University (Cullen, 2017). There are many stories of things going wrong.

Just as the productivist ideology of feeding the world gives us what Raj Patel (2007) describes as the paradox of the stuffed and the starved, and thus confined to an immature form of care, we also need to think about what the future should look like if we are going to highlight these stories.

Methods

The stories illustrated below reflect more than six years of engagement, participant-observation, teaching, interviews, and workshops related to my work at the University of Kansas since 2012. In the spring of 2013, I hosted the Food Utopias Workshop at the Commons at the University of Kansas that featured three days of conversation on the future of agri-food systems with activists, farmers, scholars, students, and community members. Out of those conversations, Food Utopias (Stock, Carolan, and Rosin, 2015) was published, featuring many of the academic participants' contributions. That specific food utopias work has also been in conversation with the biological economics project and the various projects from Ruralis (Norway) involving scholars from Norway, Australia, New Zealand, and Canada, among others (LeHeron et al., 2016; Almås and Campbell, 2012). Also evolving from the Food Utopias work has been the New Farmers Project. New Farmers is a documentary ethnographic examination of people new to farming in Kansas, that combines sociological interviews, photography, and graphic design (see newfarmersproject.com; Darby, Hossler, and Stock, 2019; Stock, Hossler, and Darby, 2019). The examples offered here do not exist in a vacuum; many of the participants are involved in multiple efforts to build agri-food futures in the region. To frame these examples of caring food utopias in the US Midwest, this paper organizes them around the idea of what good food should look like.

Good Food, Mature Care, and Hopeful Futures

There are any number of hopeful examples of things going on in agriculture and food: farmers markets, agri-environmental schemes, home gardening, farm to school, agri-tourism, amazing restaurants celebrating local, innovation, and experimentation, children learning how to cook, new programs that recognize the importance of empowering women in communities, the various initiatives to try and match land and farmers that are operating at a human scale, and all the ideas we have not yet thought were thinkable.

So what is in our food utopias? Succinctly, Ricardo Salvador (Anderson, 2009; Gillo, 2014), of the Union of Concerned Scientists, lays it out best: "Good Food should be healthy; it should be environmentally benign; it should be fair (produced without causing exploitation of workers or consumers); it should be affordable; and it should be all of those things simultaneously". Salvador has worked closely with a constellation of grants and programs related to growing the National Good Food Networks at various scales (see http://ngfn.org/ for details). For our purposes, this description of good food can help frame how we understand these examples of mature care.

Food utopias is about seeking out the hope in food futures, in possibility, in enacting new ways of doing food

and community. This paper offers some existing examples to illustrate the diversity of experimentation in just one place, in the hope that we can begin to see the small experiments happening in many places as part of a larger desire for a better future. Again, our existing ways of thinking about alternatives to our food systems are not in question here. However, as we think of these experiments in food utopias we might also think of how intimately our desire to study these things is linked to our educational institutions, and so to encouraging students, courses, partnerships, and research collaborations that might promote and encourage not only good food, but also, paraphrasing Claude Levi-Strauss, the idea that utopias are fun to think with (Stock et al., 2015: 5). To that end, here are some of the witnesses doing and experimenting with care and good food on their farms that embody some food utopias experimentation and processes (see Stock and Szrot, 2020). The examples offered below could just as easily have been chosen to highlight almost any one of the following categories. Here, I use Salvador's good food formulation as a heuristic tool to illustrate some emerging examples of care and food utopias in agri-food systems.

Healthy

The Bauman family started farming after a long history in the furniture business. With six children and no real farming experience to speak of, the family set out to challenge the norms of farming in Kansas. Since then they have started a farmers market in the small town nearest them. They also produce some of the best eggs in the region, have started a non-GMO chicken feed company, have bought and saved a local butchery (including 40 jobs in the nearby service town), and built and operate an on-farm chicken slaughter operation with the children taking responsibility for various parts of the operation while decisions are made by consensus (for a brief overview see http://kansasruralcenter.org/kansas-farm-profile-baumans-cedar-valley-farms/). Their operation aims to provide healthy food to people and animals, that also contributes to the health of the community.

Part of this comes from their Anabaptist tradition and faith in God, but more importantly, it can be attributed to a willingness to take risks with community support. The meat plant was supported by Slow Money investors (more on that in a second). Most recently they have been trialling a mobile meat market (they drive available meat around the region with predetermined locations, along the same lines as a book mobile) to provide access though different marketing and distribution networks. They have extended their caring relations through a partnership with a Ugandan coffee cooperative fostered through engagement with an international young farmers conference. Above all, they identify their mission to provide healthy food to the community.

Without a grand expansion plan, their farm's growth exhibits a critique of the existing ways of doing things (why have someone else process our meat when we can do it ourselves?) and experimentation (they had never been a part of any of the kinds of operations they now successfully run, in particular the coffee partnership). Finally, each of their new operations has been carefully debated within the family and made with the consideration of neighbors, competitors and markets in mind. Various members of the operation stay involved in various regional networking conferences and events to share their process of decision-making and success.

Environmentally benign

Salvador's second point is that good food should be environmentally benign. In this respect, raising animals for consumption ranks as a major contributor to carbon emissions and many of the ills of agriculture in a productivist era. That being said, there is a network of farmers practicing and evangelizing regenerative agriculture practices that prioritize soil health. One such organization promoting regenerative techniques is the Savory Network and their holistic management strategies. As part of the wider Savory Network (https://www.savory.global/), following the ideas of Allan Savory, a global network of farmers, families, researchers, and scientists promotes regenerative practices, including rotational grazing and other systems planning to restore both the ecological health of grasslands, and the financial health and well-being of family farms. In Kansas, the multigenerational Mettenburg family farm–very near where the Bauman's are–has enrolled as a Savory Network

hub called the Tallgrass Network. As part of the global network, the Tallgrass Network (https://www.tallgrassnetwork.com/) joins other farms and families and research teams to share knowledge, experiments, and ideas across languages and time zones. In short, the idea is that raising cattle can restore the ecological health of the farm by closing the ecological systems of waste, productivity, and biodiversity. The Savory Network's holistic management strategy is betting that systems-level thinking can help navigate both the ecological and the social hurdles, to provide hope in agri-food systems of the future.

The network represents an embedded critique of grassland conservation strategies as well as mainstream on-farm decision-making. By adopting a radical shift in on-farm decision making, the Savory Network models a process for improving certain farm health measurements based on trial and error experimentation.

These examples should not be construed as endorsements. Allan Savory is a contentious figure in the wider world of sustainability advocacy (Gosnell et al., 2020; Sherren and Kent, 2017). Much of this has to do with metrics and what is measured as indicative of health (Burch et al., 2018). Nonetheless, it is fascinating to see the role that the cult of personality can play in how we understand what are deemed good or bad practices. As agri-food scholars we are torn between the necessity to study the world and its projects as they are, while reigning in our hopes for a desired world as it could be. This struggle illustrates both the utopian lens and Goodman's (2004) caution against celebrating the new too much.

Fair (without causing exploitation)

Fairness in food, one of the key components in food justice, incorporates issues of sovereignty and scales of decision-making (Stock and Szrot, 2020). Most notable in the discussion of fairness is how workers are treated and remunerated, including battles for wage increases amongst fast food workers and agricultural workers who do not share the same protections as other workers (Wolf and Bonanno, 2013; Sbicca, 2017).

Fairness also implies working in the here and now, like another program based out of Kansas City called New Roots for Refugees (NRFR) (https://catholiccharitiesks.org/new-roots-for-refugees/). The program is a non-profit collaboration between Cultivate KC (http://www.cultivatekc.org/)–a typical foodie and local agriculture advocacy group–with the local Catholic diocese. New Roots for Refugees offers training, start up capital, access to land, and overall support to help women refugees–primarily from places like the Sudan, Somalia, Burma, and Burundi—to develop entrepreneurial undertakings and small businesses. Based at a training farm for urban gardening and small business development, New Roots for Refugees offers food for these families as well as nascent business opportunities, thus offering both a welcome to the community and caring support to create a livelihood.

NRFR marshals local resources to help integrate new refugees into the local community and thereby demonstrates a food utopian process. While the refugees' new business entities are encouraged to experiment with new kinds of crops and ventures, including raising prickly pear cacti as both a food ingredient and home decoration, they are also afforded some incubatory support by the institutions.

Affordable, Not Cheap

As documented by many people, but most clearly by Michael Carolan (2011), the policies and practices of agriculture since World War II constitute a system of cheap food. A system built upon cheapness leaves us just where we are, with perpetual hunger and crisis (Rosin, Stock, and Campbell, 2011). How do we make food affordable?

In Lawrence, Kansas city-owned land is offered (essentially free) to anyone with a plan to make a business growing food. This is essentially a usufruct relationship where the city owns land and offers its use to anyone

who makes a claim that they will make productive use of it. This Common Ground[3] program (https://lawrenceks.org/common-ground/) receives annual requests for plots on city-owned land that either cannot be built on or is otherwise unusable for other city purposes.

A farming couple from the New Farmers project who started their community-supported agriculture (CSA) business on Common Ground land, is now also offering partnerships for a seedling business, and a few other endeavors. Community gardens also operate on multiple sites of the Common Ground program, which also hosts a community orchard. Here a local government program enables a process of experimentation over time to develop a business strategy might successfully mature out of the usufruct relationship and stand on its own. Thus, the critique embedded in this system validates claims like those of Carolan (2017), that if food is different to most commodities, then we need to offer space for food ideas to incubate, like in this example.

Many of these examples are also involved in Slow Money relationships. Slow Money evolved in the wake of Slow Food, but for financial relationships. As one of the Slow Money principles states, "We must learn to invest as if food, farms and fertility mattered. We must connect investors to the places where they live, creating healthy relationships and new sources of capital for small food enterprises" (https://slowmoney.org/about/principles). In Kansas, the Slow Money (https://www.slowmoneynekansas.org/) group hosts entrepreneurial showcases where farmers or other farm-related entrepreneurs pitch their project or idea to potential investors in the community. If there is a project an investor likes, then the loans and terms are worked out in private. This has two effects: first, it keeps investment dollars regional; and second, it helps us reimagine the relationships around capital, banks, credit, and ownership. This international organization offers examples of local and regional investment with healthy soil at the root of healthy communities. Slow Money also demonstrates a mature care relationship as it fosters person-to-person relations that then cascade down to the local community, the soil, and other species.

All of these things simultaneously

In a recent article a student and I put the experiences of sustainable and organic farmers in Kansas in the context of Ploeg's (2009) ideas of repeasantization with an emphasis on "autonomy, co-production, and diversification" illustrating "openness to agricultural practices intended to create income, livelihoods, food, fibre, and ecological and social well-being" (Nelson and Stock, 2018: 91-92). Again, food utopias tries to imagine different ways of thinking about food. Does imagining Kansas farmers as peasants solve anything? Maybe not, but it can open up some dialogue and conversations that might not have happened otherwise, about identifying common hurdles (like access to land and credit) as well as shared assets (like female leadership and practices to counter climate change).

An organization that began around 2013 as an idea committed to justice and equity around food access opened a physical space in 2016. On the property of what was a nursery/garden store in the middle of this town of 85,000 people, the Sunrise Project (https://sunriseprojectks.org/about/) aims to "envision a resilient community that provides for its own needs and offers opportunities for all people to grow and eat culturally appropriate foods, care for the land and one another. We are committed to creating an equitable system in which people of all ages and experiences live self-determined, healthy and meaningful lives."

With an emphasis on food and gardening, the Sunrise Project endeavours to develop healthy food relationships across racial, ethnic and class divisions. Although they are a non-profit entity, they have partnered with a local soy/tofu company that will move its production facility to the property. Seeds of Italy, a distribution company, will also house their permanent facility on site. The large greenhouses provide space both for year-round

[3] There is also a program called Common Ground based in Wichita, KS. This program emphasizes access and food insecurity issues. More information here:
http://www.ksre.k-state.edu/news/stories/2018/11/Kansas-Profile-Common-Ground.html

community gardening, and for an entrepreneurial company growing trees and starters for sale. There is kitchen and classroom space, as well as a retail space that briefly operated as a coffee shop.

The Sunrise Project maintains partnerships with the city, the county, private entities, farmers, educators, and schools. They also leverage partnerships with local granting agencies, government, NGOs related to food and social justice, and educational institutions. This is a unique, real-time food utopian experiment that fosters food and farming as seeds to nurture justice, experimentation, and community.

* * *

Taken individually these people, projects, farms, and relationships might indicate one-off experiments fraught with failure (like the Sunrise Project's brief coffee shop business or the couple that attempted to raise crickets for human consumption). However, given the overlapping interests, relationships, investments (like Slow Money investors offering financial support to New Roots for Refugees participants), this constellation of efforts in Kansas exhibit the diversity and difference that indicate caring examples of possibilities for agri-food futures. It is clear that no single one of these efforts will revolutionize the agri-food system; however in conjunction with the development of food policy councils, a state-level task force, foundations supporting healthy food initiatives, and the development of a regional food hub featuring many of the same actors, Kansas may just become known as an agri-food hub and not just along the lines of productivist and commodity production. As agri-food observers we know that these physical spaces of caring activity are unequally distributed, so we will need to continue to examine factors such as education, access to land and credit, attention to issues of justice and equity, government infrastructure, transportation, water, and all the other things that contribute to these positive developments in agri-food systems.

* * *

I have highlighted examples close to me for a reason. Critique as a mode is at its easiest when it is vague and distanced. Care is intimate. Just as farmers are embedded in places, so are we as researchers and teachers and community members. My intention was therefore to look at experiments working in an unfolding process of making the not-yet become – as Ernst Bloch would describe this utopian way of thinking (Levitas, 1990: 102).

Granted, each and every example highlighted here will not feed the world, but they are all experiments in how to grow food for specific people in specific places and, often, in support of and in relationship with each another. As George Washington Carver (1914: 5) wrote in "Being Kind to the Soil":

> *Unkindness to anything means an injustice done to that thing. I am unkind to you I do you an injustice, or wrong you in some way. On the other hand, if I try to assist you in every way that I can to make a better citizen and in every way to do my very best for you. I am kind to you.*
>
> *The above principles apply with equal force to the soil.*

Conclusion

There are plenty of stories to fill our journals and conferences about unkindness to the soil and to each other. Just as feminist care theory argues that just not doing harm (e.g., like using less cancer-causing pesticides) is not caring, Carver outlines an agriculture of care as central to the future of raising and distributing good food.

In order to work towards a more just and kind world of food and community, we need to seek out the stories of kindness and care, of food that is healthy, environmentally benign, fair, and affordable, and all of these things

simultaneously.

This will take a collective effort of mature care that cannot solely rely on the state, geared towards raising incomes, increasing autonomy, not relenting to corporations, heart to heart talks, humility, and love – love of the land and each other. It requires that we use our imagination by thinking with utopias. Much of food studies stops at the celebratory and misses the structural elements hidden by the many complex relationships. Highlighting these food utopias and examples of care in practice is a start. We have a responsibility in our research and teaching, to highlight what we can actually do to work towards the food utopias we imagine.

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