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**Where are the Opportunities for Accelerating Food Systems Innovations
for Healthier Diets?**

Findings and Lessons from Viet Nam

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ABSTRACT

This paper examines how research on the impacts of food systems innovations can accelerate their contributions to healthier diets and to equitable and sustainable food systems more generally. Building on research from the CGIAR Research Program on Agriculture for Nutrition and Health (A4NH) flagship on Food Systems for Healthier Diets, the paper looks at how evidence from past studies of the impacts of food systems innovations on diet-related outcomes maps to current food system priorities in Viet Nam, one of the program's focus countries. It then explores what the studies can tell us about the impact pathways from innovations to healthier diets and other outcomes. The findings highlight some promising innovations that have potential for further research and scaling. A revised impact pathway is also proposed based on a new understanding of how the concept of the food environment can be integrated into an impact pathway framework. The new impact pathway and associated assumptions—taken together, the theory of change—can support better understanding and analysis of the impacts of food system innovations on diets.

Keywords: food systems, healthy diets, food environment, impact pathways, Viet Nam

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ACRONYMS

A4NH	CGIAR Research Program on Agriculture for Nutrition and Health
DBM	Double burden of malnutrition
FAV	Fruits and vegetables
FSDH	Food Systems for Healthier Diets, an A4NH flagship research program
LMIC	Low- and middle-income countries
MDD	Minimum dietary diversity
NNS	National Nutrition Survey
PGS	Participatory guarantee system
WHO	World Health Organization

I. INTRODUCTION

Food systems innovations can push food systems toward sustainable paths resulting in healthier diets (HLPE, 2017; de Brauw et al., 2019a). Evidence from research on the impacts of food systems innovations is expected to contribute to that process. Since 2017, Food Systems for Healthier Diets (FSHD), one of the flagships in the CGIAR Research Program on Agriculture for Nutrition and Health (A4NH), has conducted detailed analyses of diets and food systems in four focus countries, Bangladesh, Ethiopia, Nigeria, and Viet Nam, in order to provide a deeper understanding of diets and food systems interactions at national and sub-national levels. These countries were selected by A4NH for its second phase (2017-2021) because they provided a range of diet and (sub-)national food systems contexts at various stages of food systems transformation and urbanization (McDermott & de Brauw, 2020).

However, an analysis of 150 studies of food systems innovations targeting the food environment and consumer behavior in the four FSHD focus countries and other low- and middle-income countries (LMICs) by Lecoutere et al. (2021), finds that not all studies assess changes all along the innovation's impact pathway, nor do they look at outcomes across the food system beyond those of interest to the study authors. This raises questions about the extent to which lessons from impact evaluations of actual or potential food systems innovations can inform policy and practice related to improving the performance and sustainability of food systems.

To better understand how impact evidence can contribute to accelerating food system transformation, this study focuses on one country—Viet Nam—where there is a good understanding of the current food system (Raneri et al., 2019; Hernandez & Lundy, 2020) and where a relatively large number of studies of food systems innovations have been implemented and evaluated. This paper provides two types of results. First, we analyze the set of studies of food system innovations to see how well they address Viet Nam's priorities and how much they tell us about the innovations' potential to influence the food system.

Second, we review the FSHD impact pathway for innovations in food systems and suggest some modifications to improve the feasibility of future impact evaluations and the contribution of findings to food system insights.

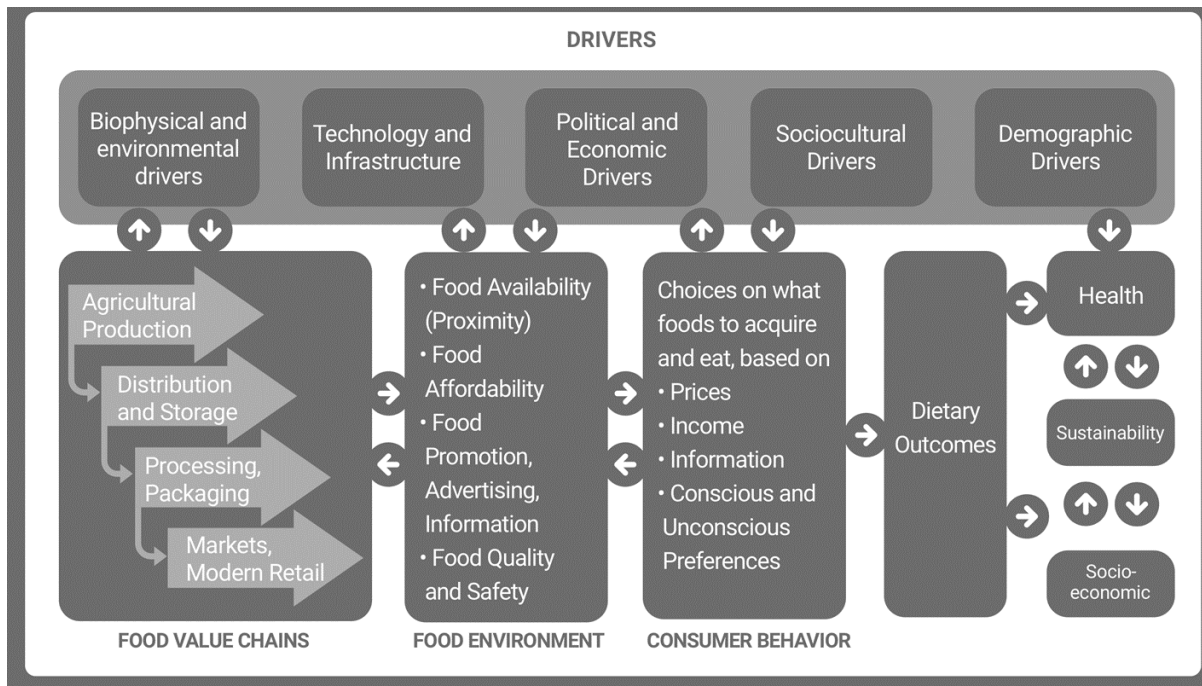
The paper is organized as follows. Section 2 provides background on food systems innovations and their impacts, drawing on research from FSHD. Section 3 presents the Viet Nam context and looks at the extent to which the innovations address identified diet-related priorities. Section 4 looks at a particular impact pathway for food systems innovations targeting diet-related outcomes and assesses the extent to which evaluations of innovations address the key actors and intermediate and final outcomes. Section 5 suggests a revised version of the impact pathway (and theory of change) designed to address food systems innovations focused on improving diets. Section 6 concludes with implications for research and policy.

II. FOOD SYSTEMS INNOVATIONS AND THEIR IMPACTS

In recent decades, with globalization, urbanization and income growth, and other food system drivers, people are experiencing new food environments, expanding their food choices, and diversifying their dietary patterns (HLPE, 2017). Urbanization has been linked to more work-away and eat-away from home habits and to the demand for ultra-processed food. A rise in income leads to changes in diet composition, including a growing demand for animal-based protein. Technological innovations, intensification, and homogenization processes have led to increased agricultural production, while climate change is expected to lead to a general decline in production of several key crops in the next two to three decades (Béné et al., 2019). LMICs are experiencing the transition from a traditional to a modern diet, and are faced with the double burden of malnutrition (DBM), due to both deficit and excess (World Food Programme, 2017; Popkin et al., 2020). According to the most recent surveys, of the 126 LMICs with data from the 2010s, the number of countries facing the DBM was 48 (38 percent) (Popkin et al., 2020).

The concept of food systems and related empirical approaches reflect these multiple development concerns (Pinstrup-Andersen, 2007; HLPE, 2017; Béné et al., 2019). As illustrated in Figure 1, dietary and other outcomes are potentially determined by three primary elements of food systems: food value chains, the food environment, and consumer behavior – which interact with each other and with food system drivers. Because food systems research draws people from a range of disciplines and perspectives, we define key terms used in this paper in Box 1 to facilitate understanding.

Figure 1. Conceptual framework of food systems for diets and nutrition

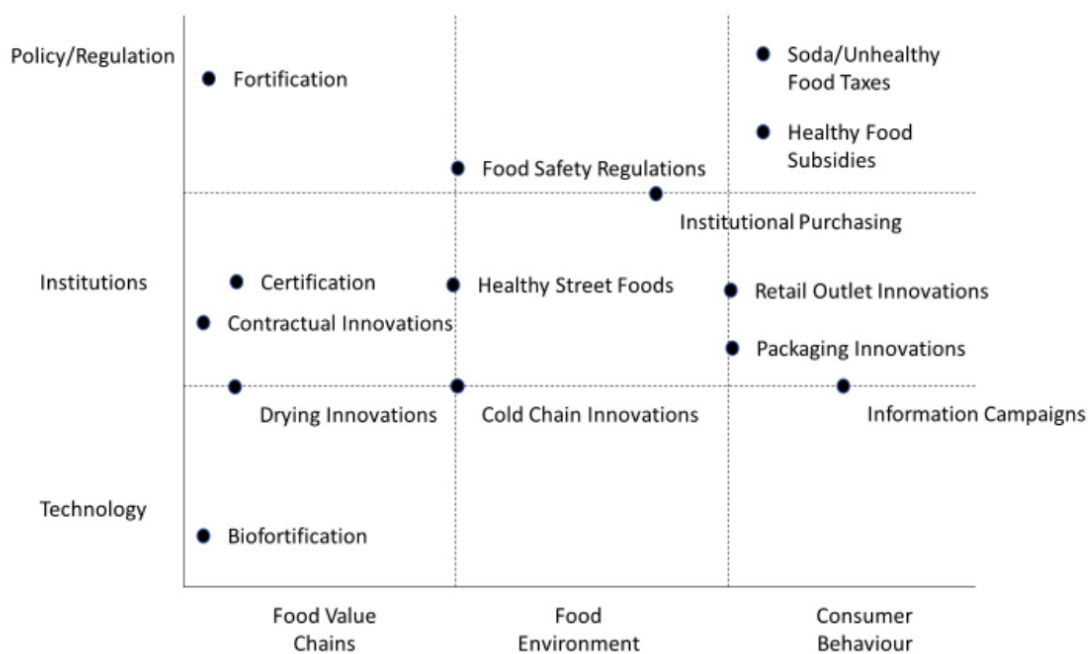


Source: Brouwer et al. (2020), from de Brauw et al. (2019a), adapted from (HLPE, 2017).

FSHD took healthy diets as a starting point and designed its research agenda around improving diets using food system approaches tailored to specific country contexts. One component of this agenda focused on methods, tools, data, and indicators for assessing food systems from a dietary perspective and diagnosing gaps and opportunities globally (e.g., Kennedy et al., 2020) and for the four focus countries specifically (Gebru et al., 2018; de Brauw et al., 2019b; Raneri et al., 2019; Maziya-Dixon et al. 2021).

Building on this detailed understanding of specific food systems, researchers seek to contribute to food system transformations through identification of potential innovations (Ruben et al., 2018; de Brauw et al., 2019a). Assessments of potential innovations should consider interactions between the elements of the food system in order to create dynamic effects that go beyond one particular element to impact diets on a wider scale in the system, as part of system transformation. De Brauw et al. (2019a) considered this complexity and developed a typology of food systems innovations for healthier diets (Figure 2).

Figure 2. Typology of food systems innovations for healthier diets (de Brauw et al., 2019a)



Note: In this diagram, dots that are on the border between two cells represent innovations that could be either type (in the case of rows) or target either domain of the food system (in the case of columns). For example, innovations in institutional purchasing could be policies or institutions. Packaging innovations could target the food environment or consumer behavior.

In this study, we use the typology to structure a review of 24 impact evaluations of food system innovations conducted in Viet Nam (Table 1). Nineteen of the studies are from the Lecoutere et al. (2021) inventory. Because Lecoutere et al. (2021) excluded innovations focused on certain parts of the food system (e.g., food value chains) and on certain outcomes (e.g., food safety, supply of nutritious foods) we also conducted a secondary search to fill these gaps. We identified five additional studies that met the Lecoutere et al. (2021) criteria for study quality.

The most common type of innovation was information campaigns (nine studies), followed by fortification (five) and institutional purchasing (four) (Table 1). Six studies described interventions that were composed of innovations of more than one type. Only five innovations addressed more than one aspect of diet quality (Kennedy et al., 2020); 14 innovations addressed dietary diversity; ten addressed nutrient adequacy; and five addressed moderation.

In terms of methodology, we only differentiate between experimental and observational studies.¹

Experimental studies, indicated by an asterisk in Table 1, were all focused on pilot programs such as information campaigns, fortification, and institutional purchasing (e.g., school feeding programs).

Observational studies were more likely to look at impacts on dietary diversity, while experimental studies were more likely to focus on adequacy and moderation.

¹ Experimental studies involve treatment and control populations where the treatment group is deliberately exposed to an innovation through some type of intervention. Observational studies focus on the natural diffusion of an innovation through a population over time.

Box 1. Definitions of key terms used in this paper

Food systems change, food systems transformation: While ‘food systems change’ refers to the processes that food systems undergo due to material drivers such as agricultural intensification, rural finance, technology change, or urbanization, ‘food system transformation’ refers to desired food system outcomes that can be achieved through actions from food system actors/stakeholders. Food system transformation has been recognized by LMICs as a pillar of economic development (Brouwer et al., 2020). We use ‘food systems transformation’ to refer to the desired goals of policies and programs. We use ‘food systems change’ to refer to outcomes in particular studies, recognizing that some of them are desired (and therefore part of hope for transformations) and others are unintended and could be positive or negative.

Food value chain, food supply system: As shown in Figure 1, food value chains comprise the food supply system from agricultural production through trade and process to retail markets. Value chain actors include farmers, processors, traders, wholesalers, retailers, restaurant owners and staff, or institutional food suppliers, etc. We use ‘food supply system’ and ‘food value chains’ synonymously.

Food environment: Like Turner et al. (2018), we see the food environment as the “interface that mediates people’s food acquisition and consumption within the wider food system” (p. 95). Turner et al. recognize two dimensions of the food environment, the “external dimensions such as the availability, prices, vendor and product properties, and promotional information; and personal dimensions such as the accessibility, affordability, convenience and desirability of food sources and products” (p. 95). In our proposed impact pathway for food systems innovations for healthier diets (*Figures 4 and 5*), we emphasize the personal dimensions because the external dimensions on their own do not make a strong enough link to the consumer. The external dimensions are certainly part of the theory of change for the innovation, but to make the case that an innovation can contribute to improved diets, it should target specific consumers or groups of consumers by improving the personal dimensions of their food environments.

Food systems innovations and food systems interventions: De Brauw et al. (2019a) define a food systems innovation as “a policy or regulation, an institutional process, a change in knowledge, a technology, or combination thereof that is either not used or not widely used within a food system, but has the potential to change diets on a wider scale.” Food systems interventions are a subset of innovations that take place largely through public investment, rather than by the private sector alone, or through public-private partnerships. Since most of the innovations that we focus on in this paper are interventions, we use the terms synonymously.

Impact pathways and theories of change: In this paper, ‘impact pathway’ refers to the sequence of expected outcomes from an intervention. ‘Theory of change’ refers to the impact pathway and the accompanying assumptions/risks that are associated with the causal links in the impact pathway. The generic intermediate outcomes along the pathway are reach/reaction of target group, capacity change, and practice change. Since reaching the target group involves some level of engagement, the reach of the target group to the intervention is also included. ‘Capacity change’ is defined broadly to include knowledge, awareness, attitudes, and skills. ‘Practices’ include behavior and practices.

Healthy diets and diet quality: By ‘healthy diet,’ we mean a diet that is adequate in energy and all essential nutrients, promotes all dimensions of individual health, and prevents malnutrition in all its forms (undernutrition, micronutrient deficiencies, overweight/obesity) and diet-related noncommunicable diseases, such as cardiovascular disease or diabetes (Ruel & Brouwer, 2021). Diet quality in this paper contains three dimensions – nutrient adequacy, food variety or diversity, and moderation of foods, food groups, or nutrients that can be unhealthy when consumed in excess (Kennedy et al., 2020; Trijsburg et al., 2019). In this paper, we consider food safety as a necessary condition for both healthy diets and diet quality.

Table 1. Innovations from Viet Nam and the food systems challenges they addressed

Reference	Innovation Type**	Short Description of Innovation	Aspects of Diet Quality **
Rocha et al. 2018*	Mixed – Contractual Innovation, Fortification, Institutional Purchasing, Information Campaigns	Small-scale food processing for fortified complementary foods	Adequacy
Lien et al. 2009*	Mixed – Fortification and Institutional Purchasing	School-based distribution of milk and fortified milk	Adequacy
Hall et al. 2007*	Mixed - Fortification, Institutional Purchasing, and Information Campaigns	School-based distribution of fortified biscuits and milk with nutrition education	Adequacy & Diversity
Saenger et al. 2014*	Mixed – Certification and Contractual Innovations	Independent agency engaged to verify quality of dairy supplied by smallholder farmers to a milk processing company	Not measured
Pimhidzai et al. 2020*	Mixed - Information Campaigns, combined with infrastructural improvements to improve market linkages	Community-based livelihood support groups with nutrition education	Adequacy & Diversity
Nguyen et al. 2020*	Mixed - Information Campaigns and Institutional Purchasing	School-based distribution of fresh fruit with nutrition education	Diversity
Daudt et al. 2018*	Information Campaigns	Nutrition education in primary schools	Diversity & Moderation
Do et al. 2016*	Information Campaigns	Communication for Behavioral Impact (COMBI), included mass media, school interventions, and community programs to reduce salt intake	Moderation
Ha & Chisholm 2011	Information Campaigns	Mass media campaign to reduce salt intake	Moderation
Hop et al. 2011	Information Campaigns	Food-based Dietary Guidelines	All
Rana et al. 2018*	Information Campaigns	Community-based infant and young child feeding support groups	Diversity
Nga et al. 2009*	Fortification	School-based distribution of multi-micronutrient fortified biscuits with de-worming	Adequacy
Van Thuy et al. 2005*	Fortification	Household distribution of NaFeEDTA-fortified fish sauce	Adequacy
Trinh et al. 2020	Retail Outlet Innovations	Supermarkets and consumer behavior	Adequacy & Diversity
Rupa et al. 2019	Retail Outlet Innovations	Supermarkets and consumer behavior	Diversity
Figuié & Moustier 2009	Retail Outlet Innovations	Supermarkets and consumer behavior	Diversity
Heard et al. 2020	Cold Chain Innovations	Household use of fridge	Diversity
Rinkinen et al. 2019	Cold Chain Innovations	Household use of fridge-freezers	Diversity
Luong & Vu 2020	Unhealthy Food Taxes	(Proposed) tax on sugar-sweetened beverages	Moderation
Zeza & Tasciotti 2010	Land Use Regulations	Urban agriculture	Diversity
Cuong 2013	Cash and/or In-Kind Transfers (policy)	Social security transfers including contributory pensions and social allowances mostly in cash	Diversity
Cazzuffi et al. 2020	Agricultural commercialization (policy and technology)	Agricultural commercialization (sale of rice and overall crop sales)	Diversity
Nguyen et al. 2019	Agricultural production innovation (technology)	Rice production package - high dikes, fertilizers, pesticides, and pumping technology	Adequacy
Nguyen et al. 2018	Agricultural production innovation (technology)	Rice intensification and hydraulic changes (observational)	Adequacy

Notes: *Indicates that the study was experimental. **Categories for innovations and aspects of diet quality come from FSHD. Innovation types came from the de Brauw et al. (2019a) typology. Aspects of diet quality came from Kennedy et al. (2020) and Trijsburg et al. (2019).

III. VIET NAM'S FOOD SYSTEM AND DIET-RELATED PRIORITIES

Against the backdrop of global changes, Viet Nam offers a vivid example of local food systems in rapid transformation. During the country's steady economic growth following the economic reforms of the Doi Moi, the average caloric intake increased in almost all regions of the country, as did protein-rich consumption (Molini, 2007; B. K. Le Nguyen et al., 2013). Over the past ten years, the prevalence of undernourishment has decreased from 18 to 11 percent (FAO et al., 2018). At the same time, Viet Nam has been undergoing a transition toward unhealthy food consumption patterns such as high intake of salt, ultra-processed foods (including instant noodles) and sweetened non-alcoholic beverages, as well as lower consumption of fresh fruit, vegetables and seafood (T. T. Nguyen & Hoang, 2018). In 2018, it was estimated that the average Vietnamese person consumed twice the World Health Organization (WHO) recommendation for salt (Jensen et al., 2018). In 2015, more than half of adults in Viet Nam were found to not meet the WHO recommendation for fruit and vegetable (FAV) consumption (T. T. Nguyen & Hoang, 2018). Latest figures estimate that 9.7 percent of children and adolescents, 25 percent of women, and 20 percent of men are overweight (WHO, 2016). Concerns regarding food safety are high among consumers, and the status of antibiotic residues and reported resistance is alarming, with an increasing trend over time (World Bank, 2017). While the country's food system is experiencing rapid innovation and modernization, it still relies on the traditional and informal sectors, such as traditional retail systems, and cultural practices (Hernandez & Lundy, 2020). This makes Viet Nam a "mixed food system" (HLPE, 2017), whose lessons on food system innovations can be useful for similar contexts.

Acknowledging the national context, the Vietnamese government has committed to addressing these emerging challenges by issuing strategic policies. The most recent National Nutrition Strategy (NNS) for 2011–2020, with a vision toward 2030, is considered "an essential tool that cannot be detached from the economic and social development strategies of the country" and aims to improve the average diet in terms of quantity, nutritional quality, hygiene, and safety, tackling both undernutrition and overweight and

obesity to control nutrition-related diseases. The government explicitly aims to reduce food safety incidents through a combination of legislation (e.g. the Food Safety Law) and retail modernization (e.g. incentive mechanisms for supermarket construction).

A common research agenda on food systems for healthier diets was co-developed by A4NH researchers from FSHD (“the Viet Nam team”) and stakeholders in Viet Nam (Raneri et al., 2019). The development of the priority research agenda involved an extensive review of literature and data across multiple disciplines, several rounds of multisector stakeholder consultation and knowledge exchange, and a ranking exercise. This systematic and multidisciplinary approach helped to expand the focus of the food systems priorities beyond a single domain such as nutrition, health or agriculture. A food systems profile for Viet Nam was developed, covering all the components of the local food systems. Based on the key insights from this profile, following a sustainable food system country brief for Viet Nam (Hernandez & Lundy, 2020), in September 2020, the Viet Nam team mapped current food systems challenges to key dimensions of the food system (Huynh, 2020). For this study, we focused on the priority food system challenges mapped to three dimensions of the food system – diet quality, consumers, and the food environment (*Table 2*).

Table 2. Priority food systems challenges in Viet Nam for three dimensions of the food system (adapted from Huynh Thi Thanh Tuyen, 2020)

Diet Quality	<ul style="list-style-type: none"> • Consumption of FAV is below WHO recommendations • Fat intakes are lower than recommended, especially for children • Share of children meeting minimum dietary diversity (MDD) is higher in urban areas, among the majority ethnic group (Kinh), and in higher economic quintiles
Consumers	<ul style="list-style-type: none"> • Preferences are shifting to increased consumption of meat • Most food is bought in the local community and in wet markets • Consumer behavior and preferences are not well understood
Food Environment	<ul style="list-style-type: none"> • Nutritional value of food available is questionable • Small producers are resistant to changing their practices • Nutrition education interventions are not widespread • Large share of food loss and food waste • Nutritional labelling of pre-packaged foods is voluntary • Food safety is a concern, especially in wet markets and collective kitchens

To see how well the innovations evaluated in the studies address the food system priorities for Viet Nam, we mapped the studies to the priorities. Table 3 looks at challenges relating to diet quality, Table 4 looks at consumer priorities, and Table 5 looks at food environment priorities. In each table, a green cell indicates that the food systems priority was a (measured) objective of the study. A yellow cell indicates that while the food systems priority was not an explicit objective of the study, some evidence on the priority was generated by the study. A blank cell indicates the food systems priority was not addressed in the study. For example, Hall et al. (2007) looked at the impact of a school nutrition program on the schoolchildren's weight-for-age and height-for-age. They did not look at or measure fat intake or dietary diversity, however, the nutrition program included milk, which could potentially impact both of these, so these boxes were shaded yellow. The study reported significant challenges in securing a sufficient supply of milk for the nutrition program which could have implications for the appropriateness and feasibility of this approach to address these dietary gaps in the study location.

Table 3 shows that only five of the 24 studies were focused on one or more of the diet quality priorities. Low FAV intake was the most commonly addressed priority, with four studies addressing it directly. Two studies directly targeted dietary diversity in children. Because more studies indirectly referred to priority topics, it is possible that more can be learned from the studies that is of relevance to the priorities.

Table 3. How innovations mapped to priority food systems challenges relative to diet quality

Reference	Innovation	Low intake of FAV	Fat intake too low, esp for kids	Inequities in share of kids meeting MDD
Rocha et al. 2018*	Small-scale food processing for fortified complementary foods			
Lien et al. 2009*	School-based distribution of milk and fortified milk			
Hall et al. 2007*	School-based distribution of fortified biscuits and milk with nutrition education			
Saenger et al. 2014*	Independent agency engaged to verify quality of dairy supplied by smallholder farmers to a milk processing company			
Pimhidzai et al. 2020*	Community-based livelihood support groups with nutrition education			
Nguyen et al. 2020*	School-based distribution of fresh fruit with nutrition education			
Daudt et al. 2018*	Nutrition education in primary schools			
Do et al. 2016*	Communication for Behavioral Impact (COMBI), included mass media, school interventions, and community programs to reduce salt intake			
Ha & Chisholm 2011	Mass media campaign to reduce salt intake			
Hop et al. 2011	Food-based Dietary Guidelines			
Rana et al. 2018*	Community-based infant and young child feeding support groups			
Nga et al. 2009*	School-based distribution of multi-micronutrient fortified biscuits with deworming			
Van Thuy et al. 2005*	Household distribution of NaFeEDTA-fortified fish sauce			
Trinh et al. 2020	Supermarkets and consumer behavior			
Rupa et al. 2019	Supermarkets and consumer behavior			
Figuié & Moustier 2009	Supermarkets and consumer behavior			
Heard et al. 2020	Household use of fridge			
Rinkinen et al. 2019	Household use of fridge-freezers			
Luong & Vu 2020	(Proposed) tax on sugar-sweetened beverages			
Zeza & Tasciotti 2010	Urban agriculture			
Cuong 2013	Social security transfers including contributory pensions and social allowances mostly in cash			
Cazzuffi et al. 2020	Agricultural commercialization (sale of rice and overall crop sales)			
Nguyen et al. 2019	Rice production package - high dikes, fertilizers, pesticides, and pumping technology			
Nguyen et al. 2018	Rice intensification and hydraulic changes (observational)			

As shown in Table 4, only six of the 24 studies focused on food systems priorities related to consumers. The most common consumer priority addressed was the need for a better understanding of consumer behavior and preferences (five studies), followed by the importance of local and wet markets (three studies). Interestingly, the number of studies that indirectly addressed consumer-related outcomes is much

fewer than was the case for diet quality outcomes. One possible explanation for the relatively low focus on consumer preferences is that most of the experimental studies that involved feeding trials had limited scope for consumers to express preferences.

Table 4. How innovations mapped to priority food system challenges relative to consumers

Reference	Innovation	Preferences for meat consumption increasing	Purchases mostly local and from wet markets	Knowledge gaps on consumer behavior and preferences
Rocha et al. 2018*	Small-scale food processing for fortified complementary foods			
Lien et al. 2009*	School-based distribution of milk and fortified milk			
Hall et al. 2007*	School-based distribution of fortified biscuits and milk with nutrition education			
Saenger et al. 2014*	Independent agency engaged to verify quality of dairy supplied by smallholder farmers to a milk processing company			
Pimhidzai et al. 2020*	Community-based livelihood support groups with nutrition education			
Nguyen et al. 2020*	School-based distribution of fresh fruit with nutrition education			
Daudt et al. 2018*	Nutrition education in primary schools			
Do et al. 2016*	Communication for Behavioral Impact (COMBI), included mass media, school interventions, and community programs to reduce salt intake			
Ha & Chisholm 2011	Mass media campaign to reduce salt intake			
Hop et al. 2011	Food-based Dietary Guidelines			
Rana et al. 2018*	Community-based infant and young child feeding support groups			
Nga et al. 2009*	School-based distribution of multi-micronutrient fortified biscuits with de-worming			
Van Thuy et al. 2005*	Household distribution of NaFeEDTA-fortified fish sauce			
Trinh et al. 2020	Supermarkets and consumer behavior			
Rupa et al. 2019	Supermarkets and consumer behavior			
Figuié & Moustier 2009	Supermarkets and consumer behavior			
Heard et al. 2020	Household use of fridge			
Rinkinen et al. 2019	Household use of fridge-freezers			
Luong & Vu 2020	(Proposed) tax on sugar-sweetened beverages			
Zeza & Tasciotti 2010	Urban agriculture			
Cuong 2013	Social security transfers including contributory pensions and social allowances mostly in cash			
Cazzuffi et al. 2020	Agricultural commercialization (sale of rice and overall crop sales)			
Nguyen et al. 2019	Rice production package - high dikes, fertilizers, pesticides, and pumping technology			
Nguyen et al. 2018	Rice intensification and hydraulic changes (observational)			

Table 5 presents the results of the mapping of study objectives to key food environment priorities.

Eighteen of the 24 studies focused on at least one of the identified priorities. By far the most commonly addressed priority was nutrition education (eight studies). Five studies measured changes in smallholder farmer behavior.²

Table 5. How innovations mapped to priority food system challenges relative to the food environment

Reference	Nutritional value of available food	Smallholder practices	Nutrition education	Food loss and waste	Labeling only voluntary	Food safety in wet markets
Rocha et al. 2018*						
Lien et al. 2009*						
Hall et al. 2007*						
Saenger et al. 2014*						
Pimhidzai et al. 2020*						
Nguyen et al. 2020*						
Daudt et al. 2018*						
Do et al. 2016*						
Ha & Chisholm 2011						
Hop et al. 2011						
Rana et al. 2018*						
Nga et al. 2009*						
Van Thuy et al. 2005*						
Trinh et al. 2020						
Rupa et al. 2019						
Figuié & Moustier 2009						
Heard et al. 2020						
Rinkinen et al. 2019						
Luong & Vu 2020						
Zezza & Tasciotti 2010						
Cuong 2013						
Cazzuffi et al. 2020						
Nguyen et al. 2019						
Nguyen et al. 2018						

Overall, relatively few studies address the priority topics related to diet quality or consumers. Most studies addressed at least one food environment priority, though even there several priorities were not directly addressed by any studies. Assuming that the topics of the studies respond to sectoral priorities,

² In Viet Nam, which has a mixed food system that covers both modern and traditional food value chains (HLPE, 2017), smallholder producers play a crucial role not only in food availability, but also food accessibility as retailers of their own products. These considerations make small producer-oriented interventions part of food environment interventions in Viet Nam.

these findings suggest that taking a food systems approach leads to different priorities than more sectoral approaches to priority setting. The fact that many studies indirectly addressed some priorities suggests that the innovations studied are potentially relevant to the food system priorities. In addition, given that the food systems concepts are relatively recent, it is likely that these findings reflect a time and/or publication bias in terms of the kinds of food systems innovations that are happening in Viet Nam. A time bias would occur if the types of innovations implemented change over time, while a publication bias would occur if the types of innovations that are subject to rigorous, published impact evaluation are not representative of all innovations taking place. Box 2 looks at how ongoing food system interventions address the priorities.

Box 2. How well do recent interventions target priority food system challenges for Viet Nam?

We reviewed the grey literature and consulted with the Viet Nam team to identify projects that were designed with a food system focus and targeted diet quality, consumers, and/or the food environment. The purpose of this exercise was not to compile a comprehensive list, but rather to get a sense of how well more recent interventions target the priority challenges for food systems in Viet Nam. We identified six interventions. As expected, these interventions address more priorities across more components than did the interventions assessed in Tables 3-5. However, shortcomings in the evaluation designs in some cases limit the extent to which they can measure impacts on all relevant outcomes.

The interventions described in LIFSAP (2016) and Rikolto (2018) both looked at how smallholder-friendly certification schemes have the potential to support smallholders in increasing quality, especially in food safety, of agricultural and livestock products. Although the Participatory Guarantee System (PGS) included consumers, their participation was limited due to lack of visibility and trust, which illustrates the challenge of involving consumers in smallholder-oriented interventions.

The Project “ProPoorPotato,” which aimed to develop a sustainable potato value chain in Viet Nam, presented a theory of change that tackled supply side, demand side, and private sector development, connecting the various value chain actors to each other (Rougoo et al., 2019). On the supply side, the agricultural practices and use of (less chemical) inputs by farmers have improved. On the demand side, the project conducted several consumer studies and marketing campaigns, and consumer awareness of nutritional values of potatoes increased. However, the project lacked reliable baseline figures to evaluate its true impacts.

The intervention described in Hennessey et al. (2020) recommended behavioral nudges, such as language framing and the use of visual imagery, to disseminate food safety information among traditional retailers of pork. Their suggestion is quite novel given that the use of nudges has mostly been considered a potential element of consumer-side innovations (de Brauw et al., 2019a). The next steps involve a field trial to measure behavioral changes among traditional retailers.

In the final report for the project “From Field to Fork,” Hoi et al. (2016) described how nutrition-sensitive agriculture interventions can improve the local food environment. As the project’s beneficiaries were poor farming households in one of the most disadvantaged communities, supporting their production (supply side) also improved their consumption (demand side). The intervention households who were provided with chickens to raise consumed more eggs and chicken meat than the control group. Positive spillover of the project was also recorded: for example, several households began chicken raising, and several households planted the same vegetable species/varieties as the interventions in their home garden. This evidence suggests that it is worth considering the specific context to evaluate if an apparent supply-side intervention actually creates impacts in the local food environment (especially availability dimension) and consumer behavior.

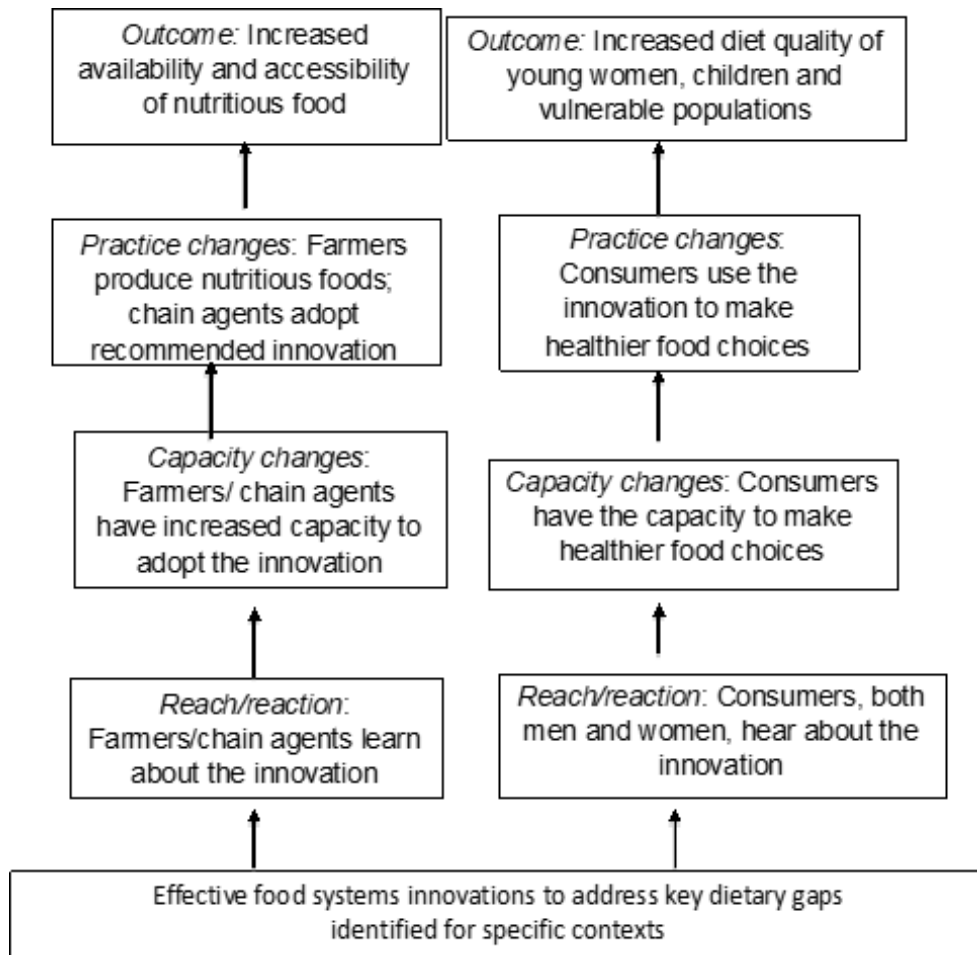
The FSHD team has an ongoing intervention in peri-urban Hanoi to increase FAV intake of low-income populations (personal correspondence). The project has several activities which improve consumer access to FAV through the diversification of retail outlets, enhance affordability through a client-specific coupon system, and boost acceptability through promotional campaigns involving public and private stakeholders and civil society organizations. To date, the team has completed formative research, including a food environment assessment, market assessment, and baseline dietary intake, which were used to inform the design of interventions (Pastori et al., 2020; Hernandez et al., 2020; Meldrum et al., 2020). The formative research responds to and, in some cases confirms, the priority food system challenges for Viet Nam. Analysis shows that there is a great diversity of FAV available (64 species of fruits, 45 species of leafy vegetables, 50 species of non-leafy vegetables), (Meldrum et al. 2020). Trade of select FAV is vastly dominated by “traditional” types of retailers, especially informal wet market retailers; there is very little presence of “modern” sector actors, other than a few scattered modern convenience stores. Baseline data showed that almost all adult respondents did not meet the WHO recommendation for daily FAV intake of at least 400g (>95%). Almost all respondents fell below the fruit and, to a lesser extent, vegetable intake recommendations. An intake of vegetables below the recommendation was seen more frequently in women than in men (Pastori et al., 2020).

<i>Box 2, continued</i>				
Reference	Innovation Type Short Description	Priorities Addressed		
		<i>Italics distinguish priorities that will be assessed by interventions that are planned and/or ongoing</i>		
		Diet quality	Consumer behavior	Food environment
LIFSAP 2016	Certification scheme The Livestock Competitiveness and Food Safety Project (LIFSAP) (2010 – 2015) implemented VIETGAP standards for safe pork, training in practices for smallholder pig producers, application of technical measures, and upgrading of slaughterhouses.		<ul style="list-style-type: none"> • Preferences for meat consumption increasing • Purchases mostly local and from wet markets 	<ul style="list-style-type: none"> • Smallholder practices • Food safety in wet markets
Rikolto 2019	Mixed - Certification scheme; Informational Campaign Participatory Guarantee System (PGS) (2008 – 2018) is a low-cost, locally based participatory certification system that involves farmers, consumers, retailers, NGOs and local authorities in agricultural products' quality assurance.	<ul style="list-style-type: none"> • Low intake of FAV 	<ul style="list-style-type: none"> • Purchases mostly local and from wet markets 	<ul style="list-style-type: none"> • Smallholder practices • Food safety in wet markets
Rougoor et al. 2019	Mixed – Contractual arrangement; Informational Campaign ProPoorPotato (2014 – 2019) aims to create a sustainable value chain for potato in Viet Nam by establishing markets for new potato varieties, improving production systems for small farmers, and increasing consumer awareness of the nutritional value and versatility of potato consumption		<ul style="list-style-type: none"> • Knowledge gaps on consumer behavior and preferences 	<ul style="list-style-type: none"> • Smallholder practices • Nutritional value of available food • Food safety in wet markets • Nutrition education
Hoi et al. 2017	Mixed – Contractual arrangement; Informational Campaign From Field to Fork (2013 – 2016) identified and implemented local solutions to improve nutrition and food security amongst smallholder farmers in rural upland communities in Viet Nam (and Thailand), complemented by nutrition education to maximize the use of these nutrient-rich food sources.	<ul style="list-style-type: none"> • Fat intake too low, esp for kids • Inequities in share of kids meeting MDD 	<ul style="list-style-type: none"> • Knowledge gaps on consumer behavior and preferences 	<ul style="list-style-type: none"> • Smallholder practices • Nutrition education
Hennessey et al. 2020	Retail outlet innovation Mixed methods study part of a larger project called SafePork (2017 - 2022) which assessed what food safety behaviors could be amenable to improvements through 'behavioral nudges' such as language framing and the use of visual imagery in traditional pork retail outlets.		<ul style="list-style-type: none"> • <i>Preferences for meat consumption increasing</i> • <i>Purchases mostly local and from wet markets</i> 	<ul style="list-style-type: none"> • <i>Smallholder practices</i> • <i>Food safety in wet markets</i>
A4NH 2019	Mixed – Retail outlet innovation and information campaigns Fruits and Vegetables Intake in Vietnam and Nigeria (FVN project (2018-2021) is testing the impact of strategies to diversify retail outlets, promotional campaigns, and a client-specific coupon system on fruit and vegetable consumption of low-income consumers in peri-urban Hanoi.	<ul style="list-style-type: none"> • <i>Low intake of FAV</i> 	<ul style="list-style-type: none"> • <i>Knowledge gaps on consumer behavior and preferences</i> • <i>Purchases mostly local and from wet markets</i> 	<ul style="list-style-type: none"> • <i>Nutrition education</i>

IV. WHAT DO THE STUDIES TELL US ABOUT HOW INNOVATIONS CONTRIBUTE TO FOOD SYSTEM CHANGE IN VIET NAM?

How FSHD expected food system innovations to lead to impacts was described in their impact pathway (*Figure 3*). It emphasizes that food systems innovations work through two routes, or sub-pathways: the food value chain (left-hand side) and consumers (right-hand side). FSHD's rationale for showing these two sub-pathways was to address a gap in past analyses of value chain innovations that did not consider their implications for consumers or, ultimately, for diets. Simplistic assumptions were often made, such as that increases in income or in the supply of nutritious food would automatically lead to better diets. The same was also true for consumer innovations where attention was not paid to implications for food value chains, especially their incentives for supporting or scaling innovations beyond pilot projects. FSHD's work on food systems innovations, and its approach more broadly, has been focused on ensuring the work is consumer-oriented (keeping in mind that consumers can also be producers and retailers) and that diet is appropriately integrated into food systems thinking and planning, including as outcomes in impact pathways.

Figure 3. Impact pathway for food systems innovations for healthier diets



Source: Updated in the 2019 Plan of Work and Budget from the theory of change prepared for the A4NH Full Proposal for Phase II.

Both the value chain and the consumer pathways include four outcomes which are common in impact pathways: reaching the target population; changing their capacity (which includes knowledge, attitudes, and skills); changing their behavior; and ultimately achieving development outcomes. One interesting note is that the development outcome in the food value chain pathway—increased availability and accessibility of nutritious food—is expressed in food environment, rather than food supply, terms. This suggests that the concept and role of the food environment in the impact pathway is not clear, a topic that we return to in Section 5.

In their analysis, Lecoutere et al. (2021) note that most studies in their inventory do not address changes all along the impact pathway. To see what that looks like in the Viet Nam context, we map the (implicit) impact pathways of the innovations assessed in the 24 studies to these eight outcomes from the two sub-pathways in the FSHD impact pathway (Table 6).

The results show that the set of studies from Viet Nam focused much more on outcomes in the consumer pathway than in the value chain pathway (Table 6). This is because most of the studies that focused on consumer or food environment innovations did not look at outcomes related to the value chain pathway. For example, innovations that involved school feeding or community-based fortification contracted with producers to provide the needed food (value chain pathway–development outcomes) and they documented consumption of the targeted food by participants (consumer pathway–behavior outcomes), but neither of these outcomes reveals much about how these actors might behave in the real world, outside of the experimental setting in which they were incentivized to participate.

Of the six papers on value chain innovations, five looked at outcomes in both pathways. Rocha et al. (2018) described a study that came the closest to addressing all outcomes in both pathways. They evaluate a ten-year program to build a value chain for fortified complementary foods in a local food system. On the value chain side, a small-scale food processing facility for fortified complementary foods was established and local farmers were trained and incentivized to supply it. Given the time frame, they were able to take a longer-term approach and stated explicitly that criteria for identifying partners in the food supply system included a willingness to share in the investment and the risks and a shared motivation to improve the local food system. They also provided a long-term contract with a cooperative for the inputs and established distribution channels through public sector and private sector incentives.

The Rocha et al. (2018) study provided rich detail on the innovation design and on what seemed to work, however, the evaluation itself was of poor quality Lecoutere et al. (2021), highlighting potential tradeoffs

between studies that provide useful information on comprehensive, systems-oriented interventions and rigorous impact evaluations. This is important for FSHD and other programs that seek to design and rigorously test innovations via pilot interventions. For more information on findings from the studies relative to how future studies of innovations could be designed to contribute to the transformation of food systems towards healthier diets for Viet Nam, see Box 3.

Table 6. Outcomes from the two sub-pathways of the FSHD impact pathway measured in studies from Viet Nam

Reference	Value Chain Pathway (retailers and institutional purchasers)				Consumer Pathway			
	Reach	Capacity	Behavior	Dev. Outcomes	Reach	Capacity	Behavior	Dev. Outcomes
Rocha et al. 2018*								
Lien et al. 2009*								
Hall et al. 2007*								
Saenger et al. 2014*								
Pimhidzai et al. 2020*								
Nguyen et al. 2020*								
Daudt et al. 2018*								
Do et al. 2016*								
Ha & Chisholm 2011								
Hop et al. 2011								
Rana et al. 2018*								
Nga et al. 2009*								
Van Thuy et al. 2005*								
Trinh et al. 2020								
Rupa et al. 2019								
Figuié & Moustier 2009								
Heard et al. 2020								
Rinkinen et al. 2019								
Luong & Vu 2020								
Zezza & Tasciotti 2010								
Cuong 2013								
Cazzuffi et al. 2020								
Nguyen et al. 2019								
Nguyen et al. 2018								

Note: Dark blue shading indicates that a particular outcome was measured and light blue shading indicates that it was measured but with limited ability to learn from the outcome. No shading indicates that the particular outcome was not addressed.

Lecoutere et al. (2021) also observed that few studies in the inventory addressed any outcomes outside of those in the FSHD impact pathway (economic and food supply on the value chain side and consumption,

diet, and nutrition on the consumer side). The FSHD impact pathway for innovations does not explicitly include other outcomes, such as those related to sustainability (in terms of environmental, ecological, social, economic, and so forth) or equity. However, the fact that these are interventions in food systems that are expected to have both direct and indirect effects means that attention should be paid to how the interventions are likely to affect the larger food system. Success of an intervention over time and at scale will depend on its ability to trigger synergies and mitigate negative consequences for other actors. Two studies (Nguyen et al., 2019; Nguyen et al., 2018) addressed tradeoffs among outcomes (economic, nutritional, and environmental) directly and disaggregated by wealth levels. However, most studies addressed other outcomes only indirectly. One study mentioned increased energy use associated with fridge-freezers, to the extent that some people have them but leave them unplugged most of the time (Figuié & Moustier 2009). Food waste, alluded to by Nguyen et al. (2020), is a priority sustainability outcome, so could be a focus for further study. On the consumer side, issues of convenience, mentioned in the studies on supermarkets and fridge-freezers, imply time savings and potential implications for gender equity.

Box 3. Some findings and their implications for food system innovations for healthier diets in Viet Nam

Zeza and Tasciotti (2010) addressed outcomes in both pathways. They used nationally-representative datasets to look at the magnitude of urban agriculture (both in terms of households engaged in agricultural activities and income deriving from it) and its association with household food security and dietary diversity outcomes. In Viet Nam, they find that a large share (70 percent) of urban households earn income from urban agriculture (producer pathway-behavior outcome). However, they also report that urban agriculture is largely for home consumption (consumer pathway-behavior outcome). Practicing urban agriculture is not correlated with dietary diversity in Viet Nam, but it is correlated with average number of foods consumed in the household. Zeza and Tasciotti hypothesize that a reason why urban agriculture rates are so high in Viet Nam is that urban people still have strong links to the land and that freshness of food is very important to them. The study is based on datasets from the late 1990s, so it would be interesting to update this study to see whether the situation has changed and what role urban agriculture could, with policy or other support, play in addressing food system priorities.

Rinkinen et al. (2019) look at use of fridge-freezers in Hanoi and Bangkok. They report that in 2002, only 10.9 percent of Vietnamese households owned a refrigerator. By 2012, this had grown to 49 percent of households, and it is still rising. They find that while in Bangkok, fridge-freezers fit into shopping patterns relying on supermarkets or ready-made meals and (frozen) 'modern' foods, in Hanoi, they fit into shopping patterns relying on fresh foods (mainly vegetables, meat, fish, and eggs) from nearby rural areas that were perceived to be safer and of better quality than food purchased in urban retail outlets. The households in Hanoi also stored food purchased from supermarkets, which were a convenient outlet for dairy products or snacks, in their fridge-freezers. There was a great deal of information in this study about the supply and demand side factors that influenced the spread of fridge-freezers globally and in Viet Nam, as well as about consumer preferences and attitudes toward food quality and safety and the parallel systems of food provision common in urban Viet Nam. The study was done among well-off consumers, and while nutrition was not the main reason they purchased fridge-freezers (compared to convenience or prestige), the authors find that having a fridge-freezer expanded the household's food environment by allowing them to keep food longer and to shop in both rural and urban markets. This shows that a particular innovation can have different effects in different food system contexts.

Heard et al. (2020) used quantitative data from two panels of the Vietnam Household Living Standards Survey (VHLSS) 2004–2014 to evaluate how refrigerator ownership influenced diets. They found that owning a refrigerator was associated with households substituting lower-nutrient foods with higher ones and increased dairy consumption. The complementary findings of these two studies suggest mixed methods are ideal to study food systems, especially to account for the temporal dynamics of food systems drivers, such as income growth and urbanization.

Several studies focused on school feeding programs but only two paid attention to the actors who currently supply food to schools (value chain pathway). As part of their comprehensive, integrated intervention to reduce salt consumption, Do et al. (2016) trained school cooks and staff responsible for school meals and menus, but do not report any results about them. Nguyen et al. (2020) worked with an outside contractor to provide the fruit snacks they offered in their experimental study, and while they do not mention working with school meals providers, they mention in the narrative that children do not like the vegetables currently served in school meals and do not eat them. This detail reveals several interesting points: schools are already serving vegetables to children, they are not eating them, and addressing this could improve diets and reduce food loss and waste. This could be the basis for a promising intervention, complementing their results related to capacity and behavior change (consumer pathway, see more below) and having the potential for scaling within the food system.

Five studies measured impacts on consumer capacity. While results were only measured for a subset of consumers (students not parents or school meals staff) or on a subset of topics on which training was conducted, the results were generally positive (knowledge increased). Most interventions tried to tailor the design and implementation of the nutrition education materials to the context, working through trusted sources and making sure materials were appropriate for the main target groups. One study (Nguyen et al. 2020) also measured impacts on consumer attitudes and behavior and did not find any change despite the positive impacts on knowledge. The fact that students increase knowledge without changing attitudes challenges the assumption that capacity change itself requires commitment to the issue. This is important because other studies that only measured capacity used their positive results as justification for scaling the program. Studies that do not directly measure behavior should at a minimum measure attitude or intention to try and understand this.

Three of the six measured outcomes related to the food environment. Nguyen et al. (2019) and Nguyen et al. (2018) look at the impacts of changes in water management, rice production, and agricultural diversification on agricultural production, food consumption, and the environment. They find that changes in water management and related changes in agricultural production increased production but reduced habitats for fish and other wild food. Access to common areas was also reduced. The authors conclude that this contributes to a reduction in collection and consumption of wild foods. Access declines for the general population but impacts vary by socioeconomic group. Availability of common-pool aquatic resources is both a food environment outcome and an ecological outcome.

In their evaluation of a commune-level poverty reduction intervention that included agricultural elements, Pimhidzai et al. (2020), measured transport connectivity and explored its implications for greater access to food markets (a food environment effect) and for livelihood diversification. While descriptive statistics show that much of the improvement in household dietary diversity was in terms of consumption of meat and milk products, the authors did not find an impact on share of land in perennial crops or share of households raising livestock among project households as compared to control households. They conclude that better connectivity strengthened non-farm participation of program households.

V. A REVISED THEORY OF CHANGE FOR FOOD SYSTEMS INNOVATIONS

The previous section suggests that the present impact pathway for food systems innovations for healthier diets (*Figure 3*) presents challenges for evaluating food systems innovations, at least in the Viet Nam context. Few producer-oriented innovations sought to demonstrate their dietary impacts beyond small-scale producers to consumers. Few consumer-oriented innovations had meaningful links to the food supply system. How, then, can we retain the link to diets but still look at innovations that target actors in the food supply system in a meaningful way? One possibility involves re-visiting the concept of the *food environment*. “In recent years, food environments have attracted considerable interest, with a growing number of studies focusing on understanding the impacts they can have on food choices and ultimately on diets” (Kennedy et al. 2020, p 18).

5.1. Re-visiting the concept of the food environment

In the food systems conceptual frameworks used by FSHD, the food environment occupies the space between the food value chains and consumers. How to incorporate the food environment in an impact pathway is not clear. While conceptual frameworks describe systems, impact pathways describe how change is intended to happen in the context of an intervention. While it may be implicit that the change is happening in a system, the impact pathway generally focuses on specific actors with whom the intervention will engage, and the expected changes in their knowledge, attitudes, and skills (together referred to as ‘capacity’ in *Figure 3*) and their behavior. This is because interventions seek to change behavior and in doing so contribute to development outcomes. There is no reason that an impact pathway cannot look at a broad range of actors and outcomes, however the time-bound nature of most interventions, combined with their ability to monitor and evaluate outcomes, generally leads to a focus on direct participants and beneficiaries.

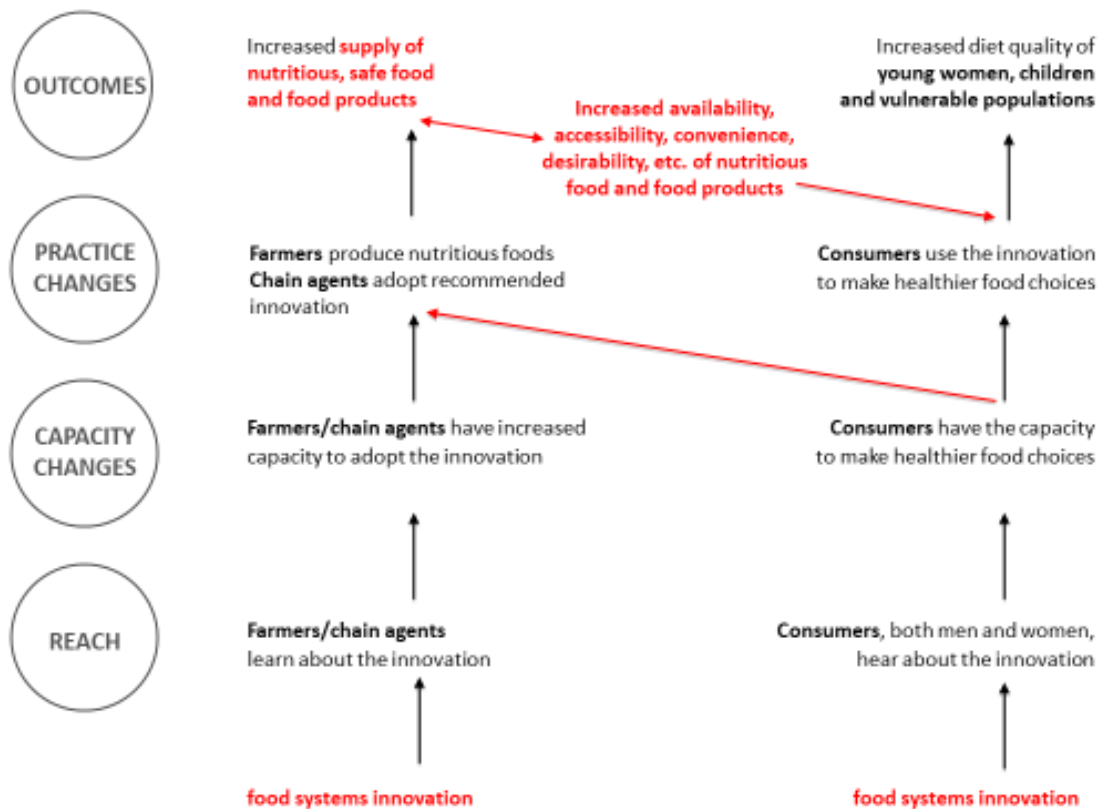
While ‘food environment’ is well-described in the food systems conceptual framework, it is not clear how it fits in an impact pathway framework. Turner et al (2018) define food environment using two dimensions—the “external dimensions such as the availability, prices, vendor and product properties, and promotional information; and personal dimensions such as the accessibility, affordability, convenience and desirability of food sources and products.” In an impact pathway framework, many of what Turner et al. (2018) refer to as ‘external dimension’ would be captured within the value chain impact pathway which is focused on the characteristics and actions of specific actors and on the outcomes of those actions in terms of supply, price, quality of nutritious food. The personal dimension, however, would not be captured in either the value chain or the consumer pathway since they are jointly defined by the value chain actors and consumers. Accessibility, affordability, convenience, or desirability must be defined in terms of both the food and the consumer.

Measuring food environment outcomes accurately will require doing so for specific value chain actors and consumers. While not directly related to diets, well-defined food environment outcomes can be linked to target consumers and, as such, go some way toward bridging the gap between food supply outcomes and diet outcomes. Some examples, inspired by the studies in the inventory, include:

- Innovations among value chain actors who already serve the target consumers (e.g., school meal providers),
- Innovations for producers or processors who provide food that has the specific characteristics that the target consumers prefer (e.g., mobile vegetable sellers),
- Innovations that would improve supply enough to reduce prices to a level that is known the target consumer could afford (need evidence of this threshold), and
- Agricultural production system innovations with externalities affecting common-pool resources (e.g., fish, fruits) to which the target population has access and which are important to their diets.

Figure 4 shows what such an impact pathway might look like. Food system innovations can target either the value chain or the consumer, but in both cases, they should include impact on the food environment. In the case of value chain innovations, this means being clear about how and for which consumers a specific food will become more available, affordable, convenient, etc. This may have implications for who the target value chain actors need to be, in order to reach these consumers. Similarly, for food systems innovations focused on consumers, how they could potentially affect the value chain in a way that makes them economically sustainable in the absence of an intervention or program needs to be clear. The requirement to show this is part of what makes a *food systems* intervention different from a *public health nutrition* intervention.

Figure 4. Revised impact pathway for food systems innovations



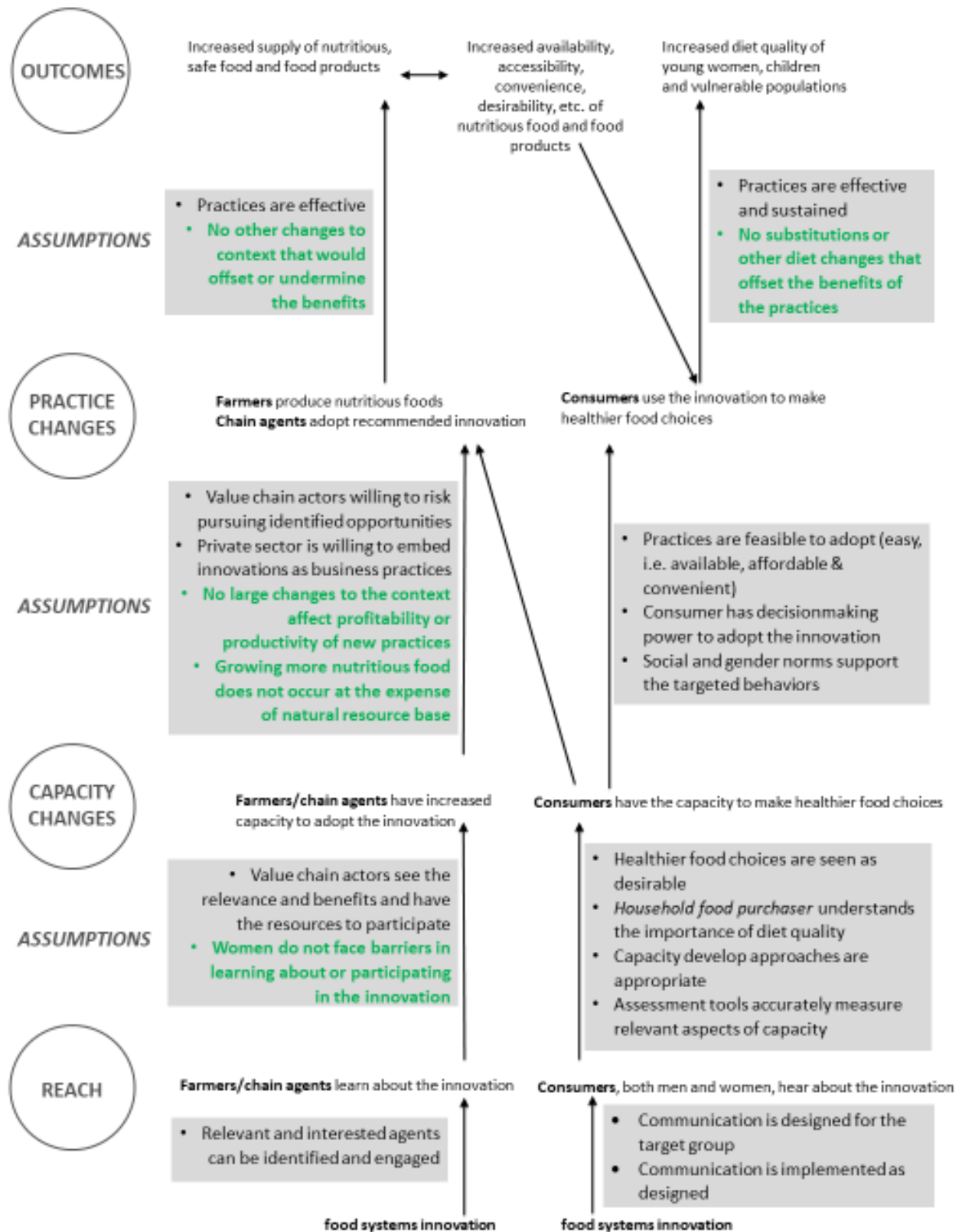
Red = proposed new

5.2. Incorporating other relevant outcomes beyond nutrition and diets

While this proposed impact pathway supports analysis of a broader range of food systems innovations, it still doesn't address the issue of other outcomes, such as equity or environmental sustainability. One way to address this is to make those linkages more explicit in the assumptions underlying the expected causal linkages, in other words, through the theory of change.³ Figure 5 shows some potential assumptions that could be important in a theory of change for food system innovations. Since assumptions are closely related to the type of innovation and the context in which it is being implemented, a theory of change is most useful when it is developed for a specific innovation rather than for a generic one. The purpose of the theory of change in Figure 5 is to highlight that in the case of food systems innovations, identification of key assumptions and risks should focus on both what is needed to achieve the target outcomes for the target groups as well as potential indirect effects on target outcomes for non-target groups or non-target outcomes, such as environmental sustainability or equity, more generally (highlighted in green in figure). While it will almost certainly not be possible to measure all these outcomes in a single evaluation, clarifying them up front forms the basis for defining a research agenda around understanding and measuring the impacts of a particular innovation in the context of a particular food system.

³ As noted in Box 1, the theory of change includes both the impact pathway and the assumptions underlying the links along the causal chain.

Figure 5. Theory of change for food systems innovations



VI. DISCUSSION

This paper uses key FSHD outputs from across the program to identify opportunities where research can contribute to understanding and accelerating food systems innovations in Viet Nam.

The first set of findings is in the area of study priorities. We mapped the topics of 24 evaluations of food system innovations conducted in Viet Nam to the food system priorities that FSHD identified. The results show that only five studies addressed diet quality priorities, six addressed consumer priorities, and 18 addressed food environment priorities. These findings suggest that using a food systems lens for priority setting may lead to a different set of priorities than more sectoral approaches. The fact that it identifies different priorities shows the value of the food systems perspective, but it also means that efforts must be made to build awareness of and support for these priorities so that they can influence research and policy beyond those working within the food systems perspective.

Next steps in terms of research would be to identify which priorities received an adequate answer through existing (impact studies of) food systems innovations and what policy recommendations follow from that, and to make recommendations for (impact studies of) food systems innovations for the context of Viet Nam. A subsequent activity could detail what priorities still need attention, what assumptions and risks should be made explicit, and how effects across the food system (food supply, food environment, consumer) could be triggered and measured. This exercise could also serve to validate/update the priorities and to clarify how a research agenda on food systems for healthier diets should be designed to address them. For example, depending on the target population and their health or nutrition concerns, *shifting consumer preferences for meat consumption*, one of the consumer priorities, could be something to support or mitigate. Similarly, emerging evidence and analysis related to both food safety and to the role of supermarkets versus wet markets (e.g., Bene et al., 2020; Wertheim-Heck, & Raneri, 2020) could have implications for how priorities and policies are formulated.

In this study, we also sought to validate the FSHD impact pathway for food systems innovations. According to that pathway, food systems innovations should address both value chain actors and consumers. The results showed that most innovations focused on one sub-pathway or the other (value chains or consumers) and few addressed both in a meaningful way. Few studies addressed development outcomes beyond diets and nutrition, for example economic, social, environmental or equity outcomes. This is consistent with what Lecoutere et al. (2021) find for their multi-country inventory of evaluations of food system innovations.

Based on these findings, a new theory of change for food systems innovations is proposed. Rather than requiring that an innovation address both value chain and consumer pathways, the innovation could address one or the other but should include as an outcome the relevant food environment outcomes (i.e., accessibility, affordability, convenience, or desirability). These outcomes, which are jointly defined by value chain actors and consumers, should be feasible to include and to measure in the context of an evaluation. In the case of value chain interventions, including these food environment outcomes can help make the link to consumers and diets even if it is not possible to measure those outcomes rigorously in an evaluation. In the case of consumer innovations, including these outcomes requires thinking carefully about how value chain actors would need to change their behavior in order for the food environment changes to be realized, and how likely that it is happen and to be sustained beyond the life of an intervention.

The analysis of study priorities showed that most studies addressed food environment priorities, however those priorities were all defined in terms of external dimensions of the food environment (using Turner et al's definition). This is not surprising, especially since external dimensions are more easily and objectively measured. Operationalizing concepts such as convenience, accessibility, and affordability will require further research and methodological innovations.

Some of the 24 studies reviewed offer interesting results that could be built on for further research or pilot testing. Applying the revised theory of change to these or other potential innovations could be a good basis for identifying next steps for analysis, stakeholders, etc. It is likely to take multiple studies to generate the evidence to validate a theory of change on the potential of a food systems innovation to contribute to transformation. Therefore, it will be important that a promising innovation become not just a topic for a one-off study but rather the basis for a broader research agenda. That agenda should include impact evaluations and other types of studies that generate evidence on a range of hypotheses and outcomes that derive from a detailed theory of change informed by the context and underlying drivers of change in the food system. This will likely require mixed methods approaches and offers scope for methodological innovation.

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