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Validating the City Region Food System Approach: Enacting Inclusive, Transformational City Region Food Systems

Alison Blay-Palmer [1,*], Guido Santini [2], Marielle Dubbeling [3], Henk Renting [4], Makiko Taguchi [2] and Thierry Giordano [2]

1 Department of Geography and Environmental Studies, Wilfrid Laurier University, Waterloo, ON N2L 3C5, Canada
2 United Nations Food and Agriculture Organization, 00153 Rome, Italy; Guido.Santini@fao.org (G.S.); Makiko.Taguchi@fao.org (M.T.); Thierry.Giordano@fao.org (T.G.)
3 RUAF Foundation, 3830 AK Leusden, The Netherlands; m.dubbeling@ruaf.org
4 Urban Food Systems, AERES University of Applied Sciences, Almere, Stadhuisstraat 18 1315 HC Almere, The Netherlands; h.renting@aeres.nl
* Correspondence: ablaypalmer@wlu.ca; Tel.: +1-226-772-3070

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Abstract: This paper offers a critical assessment of the value and utility of the evolving City Region Food Systems (CRFS) approach to improve our insights into flows of resources—food, waste, people, and knowledge—from rural to peri-urban to urban and back again, and the policies and process needed to enable sustainability. This paper reflects on (1) CRFS merits compared to other approaches; (2) the operational potential of applying the CRFS approach to existing projects through case analysis; (3) how to make the CRFS approach more robust and ways to further operationalize the approach; and (4) the potential for the CRFS approach to address complex challenges including integrated governance, territorial development, metabolic flows, and climate change. The paper begins with the rationale for CRFS as both a conceptual framework and an integrative operational approach, as it helps to build increasingly coherent transformational food systems. CRFS is differentiated from existing approaches to understand the context and gaps in theory and practice. We then explore the strength of CRFS through the conceptual building blocks of 'food systems' and 'city-regions' as appropriate, or not, to address pressing complex challenges. As both a multi-stakeholder, sustainability-building approach and process, CRFS provides a collective voice for food actors across scales and could provide coherence across jurisdictions, policies, and scales, including the Milan Urban Food Policy Pact, the Sustainable Development Goals, the Habitat III New Urban Agenda, and the Conference of the Parties (COP) 21. CRFS responds directly to calls in the literature to provide a conceptual and practical framing for policy through wide engagement across sectors that enables the co-construction of a relevant policy frame that can be enacted through sufficiently integrated policies and programs that achieve increasingly sustainable food systems.

Keywords: city region; food systems; sustainability; policy coherence

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> "Local actions are critical to achieving the goal of eradicating hunger and malnutrition, guaranteeing more sustainable food systems which are also more resilient to the effects of climate change, and ensuring a healthy and nutritious diet for all . . . FAO supports local governments in their food systems assessments, in the development of urban food strategies and plans, and in the definition of their investment priorities to strengthen linkages with rural areas."
>
> UN-FAO Director General da Silva, 2017 MUFPP meeting in Valencia Spain.

1. Introduction

A radical change is needed to address the problems identified by FAO Director General da Silva in the fall of 2017 at the Milan Urban Food Policy Pact (MUFPP) meeting. As part of the solution, our paper offers a critical assessment of the value and utility of the evolving City Region Food Systems (CRFS) approach to improve our insights into flows of resources—food, waste, people, and knowledge –from rural to peri-urban to urban and back again, and the policies and process needed to enable sustainability. While recent papers and other literature have addressed the potential and provide examples of cities working on CRFS [1–5], this paper builds on existing findings to reflect on (1) CRFS approach merits when compared to other approaches; (2) the operational potential of applying the CRFS approach to existing as well as on-going research projects (building on [4,5]); (3) the identification of gaps that need to be addressed to make the CRFS approach more robust and to further operationalize the approach [6]; and (4) the potential for the CRFS approach to address complex challenges including integrated governance, territorial development, climate change, and migration.

The paper begins by discussing the rationale for using city region food systems as both a conceptual framework and an integrative operational approach whose application can help to build increasingly coherent transformational food systems. To set the context for these insights, CRFS is differentiated from existing approaches including alternative food networks, short food supply chains, urban-rural linkages, sustainable food systems, foodsheds, bioregions, territorial development, and integrated policy frameworks. Building from this understanding about the context and gaps in theory and practice, we then explore the strengths and weaknesses of CRFS through the conceptual building blocks of 'food systems' and 'city-regions', and the capacity to address pressing complex challenges such as climate change, water availability, and poverty. As our analysis will demonstrate, a CRFS lens integrates flows across sectors and resources, for example, the water/food/energy nexus. Accordingly, the CRFS approach offers an integrative method with which to consider and develop policies and programs across scales including urban, peri-urban, and rural, as well as providing more integration for regional and national governance considerations. As both a multi-stakeholder, sustainability-building approach and process, CRFS provides a collective voice for food actors across scales and has the potential to provide coherence across jurisdictions and policies from local to national and international levels including the MUFPP, the Sustainable Development Goals (SDGs), the New Urban Agenda (NUA), and the Conference of the Parties (COP) to the 1992 United Nations Framework Convention on Climate Change (UNFCCC) (COP21). As demonstrated through the analysis of case examples, CRFS responds directly to calls in the literature to provide a conceptual and practical framing through broad-based engagement across sectors that enables the co-construction of relevant integrated policy frames to achieve increasingly sustainable food systems [7].

2. CRFS Context and Rationale

2.1. Context

With 5.5 billion people living within contiguous rural-urban spaces, it makes sense to understand how we can improve city region food system dynamics [2]. In many cases, rural to urban migration drains rural areas of youth, entrepreneurs, and the people needed to produce food. It also places pressure on urban areas that face land, employment, and food access pressures. The increasing disconnection between urban and rural spaces has a negative impact on the viability and resilience of smallholder farmers and urban agriculture producers, processor and trader livelihoods, and the health of vulnerable people in cities and rural communities, as their right to food and nutrition is compromised [4,5,8], particularly in the context of a changing climate [9]. On the flip side, better urban-rural linkages can improve food and nutrition security, enhance urban and rural producer livelihoods, and improve environmental quality through climate resilient food systems. Increasingly coherent city region food systems are recognized as a pivot point for sustainability [9,10]. In the face of complex social, economic, and ecological challenges, the CRFS approach provides an integrative,

holistic conceptual approach and analytical basis to improve food system dynamics. The CRFS approach operationalizes these connections from the explicit perspective of both rural and urban dynamics and needs. To better understand the merits of CRFS, we first define the goals for a CRFS. We then compare various food system approaches to highlight the benefits and drawbacks of the CRFS approach.

Defining the CRFS Approach

A handful of reports offer operational definitions of the CRFS and its potential for facilitating change. In 2015, the City Region Food Systems Alliance provided this definition for CRFS and described how it provides an integrative 'manageable' approach for research into and support for sustainable food systems:

> the complex network of actors, processes and relationships to do with food production, processing, marketing, and consumption that exist in a given geographical region that includes a more or less concentrated urban center and its surrounding peri-urban and rural hinterland; a regional landscape across which flows of people, goods and ecosystem services are managed. The term 'City region' refers not only to megacities and the immediate proximate rural and agricultural areas surrounding them, but also to small and medium-sized towns that can serve to link the more remote small-scale producers and their agricultural value chains to urban center and markets in developing countries . . . Improved rural-urban connectivity is critical to achieve sustainable food systems, and the city region food system framework provides a manageable approach. [3]

Building from this definition, a sustainable, resilient CRFS aspires to enhance sustainability across scales and sectors as it:

Increases access to food. Both rural and urban residents in a given city region have access to sufficient, nutritious, safe, and affordable food. It supports a local food culture and sense of identity;
Generates decent jobs and income. It provides a vibrant and sustainable regional food economy with fair and decent jobs and income opportunities for small-scale producers and businesses involved in food production, processing, wholesale and retail marketing, and other related sectors (such as input supply, training, and services) in rural, peri-urban, and urban areas in a given city region;
Increases the region's resilience against shocks and lessens the dependence on distant supply sources;
Fosters rural-urban linkages. It connects food, nutrient, and resource flows across urban and rural areas (i.e., the use of urban organic wastes and wastewater as resources in the urban agro-food system) and prevents/reduces food wastes in a given city region. It harnesses more integrated urban-rural relations, strengthens social relations between consumer and producers, and promotes the inclusiveness of smallholder (and urban farmers) and vulnerable groups across the supply chain;
Promotes ecosystem and natural resources management. It promotes agro-ecological diversity and protects urban ecology/ecosystems. The ecological footprint of the city region food system is minimized from production to consumption, and it lowers greenhouse gas emission in food transport, processing, packaging, and waste management;
Supports participatory governance. It fosters food policy and appropriate regulations in the context of urban and territorial planning. It also fosters transparency and ownership across the food supply chain. (FAO-RUAF in [6] (p.35)).

Hamm adds that optimally, CRFS would ensure food security as a human right, and that this would be taken up as a community responsibility; that livelihoods provide, at minimum, a living wage; that the food system is diverse, flexible, adaptable, and seasonal; that 'people eat within 'health' and 'sustainability' guidelines; and that 'external inputs to a region's food system are minimized or eliminated' [11] (p. 4). Additionally, Hamm recognizes that robust CRFS may need to be integrated into sustainable national and global food supply chains (see also [12]). The CRFS approach recognizes the

reality that while people may live in one place (e.g., a rural community), their livelihood and quality of life is often directly linked, or not, to whether they can connect to peri-urban and urban food spaces [2]. Equally, cities depend on surrounding peri-urban and rural areas for food and ecosystem services. These complex concepts require supportive tools to integrate cities and rural spaces so they can develop mutually beneficial relationship and networks. In this context, the City Region Food System approach is a promising analytical and theoretical tool. Within this context, it is important to recognize the debate in the literature about the relative benefits of local and global food systems [13–15]. In particular, are discussions about relative GHG emissions for local versus global food systems (e.g., [9,16,17]).

Before we can fully understand the benefits and potential of applying a CRFS approach, it is useful to consider other food system approaches. So, next we compare and contrast dominant concepts for understanding the role of food as a development entry point. We also assess whether the CRFS approach provides both a coherent conceptual framework for rural and urban food systems and acts an approach that helps city regions transform towards increasing sustainability, including resilience and inclusion.

2.2. Existing Approaches to Food Systems, Sustainability, and Place

This section considers various dominant conceptual and practical tools that help one to understand food systems that contain and interact with urban agricultural initiatives including bioregions, foodsheds, alternative food networks (AFNs), short food supply chains (SFSCs), rural-urban linkages, sustainable food systems, and territorial development and integrated policy. While acknowledging that they are not mutually exclusive, there are relatively discrete literatures related to each approach and so each is addressed in turn below.

2.2.1. Bioregions and Foodsheds

Bioregions are defined by the interaction between local ecologies and their resource flows with(in) human settlement. Berg and Damsann (1977) [18] described the bioregion as referring, "both to geographical terrain and a terrain of consciousness—to a place and the ideas that have developed about how to live in that place. Within a bioregion the conditions that influence life are similar and these in turn have influenced human occupancy" [12] (p. 399). The bioregion is about synergies between people and place with biophysical conditions, including climate, physical landscape, flora and fauna; this is the starting point from which to understand these relationships. However, within this biophysical realm the final boundaries, "are best described by the people who have long lived within it, through human recognition of the realities of living-in-place" [12] (p. 399). Friedmann explicitly connects food to bioregional well-being as, " . . . food to nourish people and communities can only be linked to agriculture in harmony with nature, by means of chains of commerce and transformation located as much as possible within regions" [19] (pp. 55–56).

Also grounded in ecosystem considerations, the foodshed begins from the premise that the land and what it can grow defines the perimeters of a food region. It puts food at the center of identifying what is possible and moves us away from the market considerations that dominate mainstream debates around food sourcing and supply chains. For example, an excellent analysis connecting dietary needs to food production was conducted for Philadelphia [20]. Foodsheds can also shift us from value to values chains. Building on the work by Hedden and Escuardo-Getz [21,22], Kloppenberg describes a foodshed as, "streams of foodstuffs running into a particular locality, their flow mediated by the features of both natural and social geography" [23] (p. 12). These material flows between different places are negotiated by both the physical world, as well as by people and their cultures. Kloppenberg begins with Getz's simple question of "Where is our food coming from and how is it getting to us?" [23] (p. 12) to include three other considerations. First is the moral economy and the need to embed considerations of ethical food access in human needs and ecologies and not economic ones. Second is the opportunity to build community commensality so that social networks are revived and appreciated. The final consideration is to value place [24,25].

While foodsheds and bioregions help to reconnect people to their food, they do not explicitly consider the diverse and complex relationships between urban and rural beyond food flows. Further, these framings engage minimally, if at all, with institutions and multi-level governance. With notable exceptions (e.g., work on bioregions in British Columbia Canada http://www.kpu.ca/isfs/swbcproject), they also do not typically offer insights into market flows (Table 1 compares core goals for key food system approaches).

2.2.2. Alternative Food Networks (AFNs)

The concept of Alternative Food Networks, defined as oppositional to global, industrial food system [26,27], has become an important denominator in the last decade for debates on dynamism in food system configurations at the local level. Maye and Kirwan's review (2010) of the AFN literature identified three key empirical themes: global AFNs with a focus on fair trade and certification in the context of threats from mainstream global actors [28]; the 'quality turn' [29] that links quality products and places, including local food and short food supply chains (SFSCs); and organic food [28]. Three dominant conceptual foundations are identified as (1) Convention Theory drawing on "the practices, routines, agreements and their associated informal and institutional forms which bind acts together through mutual expectations" [30] (p. 174 quoted in [28]). Here, food injects culture and values into economic relations by incorporating dimensions related to commercial, proximity, civic, and ecological conventions facilitating complex hybrid interpretations of AFNs [31]; (2) Social embeddedness as foregrounding the role of social relations, webs, and capitals in the context of economic relations. This view includes cautions about power relations and the need for a more critical engagement with 'social' [32]; and (3) Short food supply chains—a particularly relevant category of AFNs for the CRFS approach—are discussed in more depth in the following section. AFNs explicitly consider consumer and producer motivations and the links between them. Consumers are seen as interested in food values and food quality, with preferences emerging from mounting food safety concerns around, for example, food scares and/or genetic technologies, as well as ethical considerations (e.g., animal welfare) [28]. On the production side, the alternative versus conventional paradigm review by Beus and Dunlap (1990) summarizes the binary, polarized conceptualization of industrial food systems broadly characterized as centralized, dependent, competitive, dominating nature, specialized, and exploitative, while the alternative is defined as decentralized, independent, community-focused, harmonious with nature, diverse, and restrained [33] (the LISA (Low Input Sustainable Agriculture) program brought in by the USDA in the 1980s was called 'LILO—low input, low output' and 'instead FIDO, a 'real dog', Few Inputs, Declining Outputs' by CONAGRA rep' 1990:610). Over the last decades, variations on alternative food networks have emerged each with their own framing and solutions to the problems created by the industrial food system. That said, as Born and Purcell (2006) point out, there is nothing inherently 'better' about local [15].

Short-Food Supply Chains (SFSCs)

As the name implies, SFSCs are characterized by shorter links between producers and consumers so that food relations are re-socialized and re-spatialized [34]. As part of the AFN concept, these chains emerge and are defined in opposition to the conventional, industrial (long-food supply chain) system. These short chains include considerations of food values, food quality, and preferences. This could include characteristics such as, for example, local and/or organic food, provenance, and/or the distance food travels. Relationality is a key common denominator for SFSC, with an emphasis on as few intermediaries as possible between producer and consumer [34]. Producer-consumer relations are 'shortened' and redefined by communicating about the origin and quality attributes of food so that products reach the consumer with a significant degree of value-laden information [26]. In SFSCs, "The foods involved are identified by, and traceable to a farmer. The number of intermediaries between farmer and consumer should be 'minimal' or ideally nil" [27] (p. 13).

As unmediated food-based interactions, SFSCs put more power into the hands of producers and consumers than the conventional food system, as they typically involve face-to-face exchanges, are spatially proximate, or, when spatially extended, are mediated through a trusted third-party certifier (e.g., PGI product) [26,34,35]. According to [36], the rationale for the consumer to participate in SFSCs includes food quality including healthfulness, safety, taste, flavor, how the food is grown, and ethical considerations. Examples include more traditional variations such as on-farm stores, or food boxes through Community Supported Agriculture/association pour le maintien d'une agriculture paysanne (CSAs/AMAPs) [37]. Third party certification of local producers is also included through localized procurement by restaurants or public institutions. This requires appropriate arrangements (e.g., circuit court in France, Italian regulation of farmers' markets [35]) and associational relations for long-term viability [26]. Benefits of SFSCs in the EU include links to improved social capital, especially in rural settings; improved rural economies, particularly employment; and hybrid food channels that can provide market resilience for producers [34,38]. More recently, SFSCs became part of GHG emission and waste reduction strategies through targeted EU policy [36]. That said, SFSCs are limited, particularly in their original conception in the early 2000s as rural development opportunities in the Global North [34] (p. 424) [39]. Additional challenges include risk of social exclusion (e.g., [14]), higher operational costs as a threat to operational longevity, risk of co-option by multi-national corporations [26,40], and land pressures and potential environmental impacts on land close to cities (e.g., [36]). As an operational and assessment concept, SFSCs can be contingent and ill-defined, making comparison difficult. For example, 'local' depends on whether local is defined in a regional or national context [35]. In some EU cases, SFSCs are used as a policy concept and are now clearly part of EU policies within the CAP Rural Development program and act as an important instrument for food system relocalization in EU [37,41–43]. SFSCs are also geographically relative; so, for example, local in Canada or the EU may be very different in terms of distances.

So, while SFSCs can be a 'building block' towards understanding broader food systems, they are limited in practice primarily to localization considerations (e.g., [43]).

The AFN and SFSC approaches are valuable in the sense that they help to go beyond linear commodity/value chain type of approaches and think in terms of networks. However, they do not incorporate explicitly the importance of the territorial and spatial dimension. It is exactly here that other approaches that operate in terms of territoriality, including rural-urban linkages and foodsheds, can add important dimensions.

2.2.3. Rural-Urban Linkages

While AFNs and SFSCs tend to be applied more in the Global North, the literature on rural-urban linkages focuses primarily on generalized development in the Global South in which rural-urban linkages are offered to bridge the development and planning divide between the two spaces. These initiatives are founded on calls for policy reciprocity alignment between urban and rural spaces to avoid treating rural communities as recipients of urban 'backwash' or the recipients of 'cheap food' [31,39]. When more directed towards food, integrated rural development (IRD) is largely limited to agricultural market considerations and, in contrast to AFNs and SFSCs, originated as a top-down process. As a result, this area of research highlights the need for rural-urban linkages between people, production, commodities, capital and income, and information to realize benefits.

As a spin-off from IRD, the agropolitan approach identified three factors—access to land for agriculture and water, using national policy to support agricultural diversification, and devolving policy and administrative capacity to the local level—as necessary conditions for urban-rural linkages that result in positive community development [44]. They also identify other factors that can "foster a virtuous cycle of development" [44] (p. 25), including local processing and value-added for basic products and the purchase of local inputs.

While not always explicitly considered in rural-urban linkages, peri-urban agriculture is also important and, along with other production in the rural-urban continuum, can enhance household

food security, especially in times of crisis [45]. Rural-urban linkages viewed through a food lens help planners and policy-makers consider more interconnected development, as food production is linked to multiple resources including water quality, soil health, and other biotic functions across the region, as well as other food systems dimensions such as transportation distances and waste [37,46]. There are also challenges related to rural influences on urban agriculture, in particular, animal husbandry, odors, the presence of animals in urban contexts, and related planning contexts and ordinances. Also of note in the US context but relevant elsewhere are three key gaps identified as the need for a regulatory typology for planners outlining all potential situations, a more comprehensive analysis of multi-scaled barriers and enabling factors for urban agriculture, and evidence of the sustainability benefits of urban agriculture [47]. If properly leveraged, urban-rural linkages and new governance mechanisms offer multiple dividends as they, " ... allow citizens and farmers to govern their food according to their own values and principles. Without such governance structures that interconnect and strike the right balance between key rural and urban actors, improved rural-urban linkages would not be possible" [37] (p. 8). While these connections are important, especially in putting rural on a more even footing with urban considerations, they do not always explicitly consider sustainability, particularly, food access, equity, and livelihood issues.

2.2.4. Sustainable Food Systems

While 'sustainable' is more often paired with agriculture and production than with a wider food systems approach, there is an established and evolving literature that defines the field. In 1997, Feenstra provided a review of community-led, alternative, sustainable food systems in California that she described as, " ... alternative systems [that] may be characterized as more environmentally sound, more economically viable for a larger percentage of community members, and more socially, culturally, and spiritually healthful. They tend to be more decentralized, and invite the democratic participation of community residents in their food systems. They encourage more direct and authentic connections between all parties in the food system, particularly between farmers and those who enjoy the fruits of their labour—consumers or eaters. They attempt to recognize, respect, and more adequately compensate the laborers we often take for granted—farmworkers, food service workers, and laborers in food processing facilities, for example. And they tend to be place-based, drawing on the unique attributes of a particular bioregion and its population to define and support themselves" [46] (p. 100). Koc et al. (2008) define sustainable food systems characteristics as:

> " ... diverse and comprehensive: they include sustainable production, harvesting, processing, and distribution methods that cumulatively deliver health, economic, environmental, and social benefits to the communities where food is grown". [48]

Combining many of these considerations, the High Level Panel of Experts states, "a sustainable food system (SFS) is a food system that delivers food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition for future generations are not compromised" [49] (p. 31). Building from the work of Carey et al. (2016, see also [11] for the importance of resilience), Dubbeling, Carey, and Hochberg (2016) [6] add resilience as a necessary building block for sustainable food systems. In keeping with the work by Gunderson et al. (2001), resilience provides the capacity to rebound and adapt to shocks or stresses through systems that are diverse, flexible, and dynamic, and have built-in redundancy [50].

2.2.5. Territorial Development, Food and Integrated Policy Frames

The territorial approach can address a range of challenges, including food security and nutrition (e.g., [51,52]), within regional agri-food sectoral development (e.g., [53,54]). Similar to AFNs, the territorial approach to the agri-food sector emerged in the EU in opposition to the agro-industrial paradigm and uses territorial provenance combined with a consideration of socially proximate relationships as a conceptual and analytical lens to understand, " ... localised initiatives aimed

at re-connecting production and consumption on the basis of shared goals of environmental and social sustainability" [55] (p. 131). An often-overlooked feature of territorial development is the role of local government and the importance of devolving both resources and power at the local level [54]. A report prepared for the EC defines the territorial development approach as, " ... a dynamic bottom-up and long-term process based on a multi-actor and multi-sector approach, in which different local institutions and actors work together to define priorities, and plan and implement development strategies" [54] (p. 5). In a paper addressing food security and governance issues as territorial, Cistulli et al. (2014) define territorial approaches as ones that adopt, "an integrated approach which politically takes into account "the geographical, territorial and institutional dimensions seriously [...] thinking about the extent to which institutions and governance interact with geography [...] and how these factors may themselves be both part of the obstacles and of the solutions to development" [53] (p. 887). Using examples from Mozambique and Ecuador, they emphasize the potential as a development tool for rural areas. Forster and Mattheieson (2016) speak specifically to the relevance of the territorial approach for the Global South [8].

Globally, more than 80% of smallholders operate in local and domestic food markets. These highly diverse markets, in which most of the food consumed in the world transits, can range from local to transboundary to regional and may be located in rural, peri-urban, or urban contexts or span these contexts, and are directly linked to local, national, and/or regional food systems. This means that the food concerned is produced, processed, and traded within these systems. These value adding processes can help to create employment and contribute to local, social, and economic development, in which the benefits of value addition circulate within the local, national, and regional systems. They can take place in structured arrangements or in more ad-hoc or informal ways, which provide greater flexibility for smallholders and fewer barriers to entry. They perform multiple functions beyond commodity exchange, acting as a space for social interaction and exchange of knowledge [8] (p. 42–43).

Further, it is extremely important, " ... to avoid the trap of limiting the understanding of these markets to the purely 'local' and 'informal', and thus downplaying their significance as the dominant modality of food provision worldwide" [8] (p. 43).

According to a joint OECD/FAO/UNCDF report (2016), territorial approaches in the context of food security and nutrition policy, " ... place the functioning of institutions (formal and informal) at the core of development initiatives and require strong local participation and representation in the policy process—implying strong vertical and horizontal coordination—to define local priorities." [51] (p. 4). The report highlights the need for policy responses that are more cross-sectoral, multidimensional, and facilitate inclusive participation from actors and institutions across multiple scales. Social participation is also an important ingredient for successful implementation, as well as the confirmation of the centrality of place (cf. [24,55]) [51] (p. 4).

While a territorial approach is important and useful, as it highlights the key role of smallholders and rural communities, its more generalized framing of spatial boundaries challenges us to find common entry points for analysis of food systems that explicitly include urban and peri-urban spaces. While 'Integrated Territorial Development' is gaining traction, 'territorial' is not palatable for some policy-makers [56]. Given the growing concentration of people in urban areas, both mega and otherwise, and the opportunities to reduce harm and capture positive synergies for food access, livelihoods, and the environment, ensuring an explicit 'city' focus has critical value for development. As well, a territorial approach is not explicitly concerned with sustainability considerations.

2.3. Understanding the Potential of a CRFS Approach: The Building Blocks for Integrated Sustainable Food Systems and Governance

Given the various analytical and theoretical approaches just described, it is useful to reflect on the merits and constraints of adopting a combined 'food systems' and 'city region' approach to integrate and complement across the existing approaches with a view to fostering increasing food system sustainability.

2.3.1. Why 'Food Systems'?

Food is connected directly to many dimensions of community sustainability including urban-rural food flow linkages, gender and equity, climate change, water quality and availability, land tenure and economic opportunities including livelihoods, and good health through access to adequate amounts of nutritious and culturally appropriate food (for example, [9,57,58]). Food systems can use these as entry points to develop a holistic understanding of food to include short food supply chains/local food systems to create direct links between growers and eaters so that rural spaces and small/mid-size cities and towns are enabled to foster their own well-being and not be seen to be at the service of larger city centers; agroecology/ecological farming as a transformational solution to cool and feed the world; healthy food to address the double malnutrition burden; and territorial and related bioregional areas as the basis for closed-loop resource flow analyses [59].

A holistic approach in keeping with food systems recognizes these interconnections and offers synthesis across both scales and sectors, and can help develop integrated policy tools. More specifically, within the growing and dynamic multi-scaled policy context, regional integration through food can also act as a transformational lever across, for example, the SDGs, the Milan Urban Food Policy Pact, and the New Urban Agenda. Specifically, in the case of the SDGs, enhanced urban-rural connections address SDG goals to end poverty and hunger; improve employment opportunities; build scale appropriate infrastructure; and foster social inclusion and sustainability across the urban, peri-urban, and rural continuum through improved national and regional planning (Figure 1). Given global pressures including climate change and migration, sustainable food systems that include resilience and inclusion offer a transversal space to address the Sustainable Development Goals (SDGs) from the city-region. Local food systems offer practical entry points to operationalize the SDGs and are recognized as providing place-based spaces to animate the SDGs [8,10]. These challenges and opportunities are increasingly apparent as the Voluntary National Reviews are undertaken and countries grapple with how to put the SDGs into practice [60]. The Guidelines for implementing the 2018 handbook offers examples about key contributions at the local scale including the role of local governments in multi-scaled consultation, education, and implementation processes; as sites of actions that can be captured as good practice to inform implementation in other countries; and as places where the SDG initiatives can be implemented. That said, there are complex issues that need to be recognized to make this feasible including local regulatory barriers, implementation capacity, and data constraints [60]. The New Urban Agenda supports SDG goals by combining urban and regional planning to address food and nutrition security, coordinate more equitable and less wasteful food systems, and address environmental resilience and biodiversity. The Milan Urban Food Policy Pact provides an entry point for municipalities and surrounding regions to engage in coherent regional food policy and program initiatives that focus on governance; sustainable diets and nutrition; social and economic equity; and food production, distribution, waste reduction, and recovery [1,4,5]. Together, these mechanisms provide the basis for a robust governance framework for city region food system initiatives.

2.3.2. Why City Regions?

Building from a tradition of regional economic geography studies, we know that city regions provide a critical lens through which to understand sub-national dynamics and link economic activity to space [61]. Regions have been lauded as sites for their capacity to foster associational economies [62,63] that enable relevant and coherent policy creation as a 'third way', merging market and state economic approaches, and are more connected to ground up policy approaches. This is consistent with initiatives (particularly in the EU) that adopt subsidiarity and local decision-making as community appropriate policy platforms [64]. While a city region approach may not address all cases—for example, specific contexts such as small island states where, in some cases, there are no defined city territories but rather urban area territories [65]—the city region has also been used to understand more about resource flows to minimize environmental impacts by, for example, understanding and closing waste through more efficient resource use. Generally, a city region encompasses, " ... nodes of human activity [that] tend

to coincide with relatively large cities or with systems of medium-sized cities in close geographical proximity, that articulate the economic and social developments of suburban, peri-urban, and rural hinterlands. This interaction between an urban core and its semi-urban and rural hinterland is the essence of the city region" [66] (p. 1025–1026).

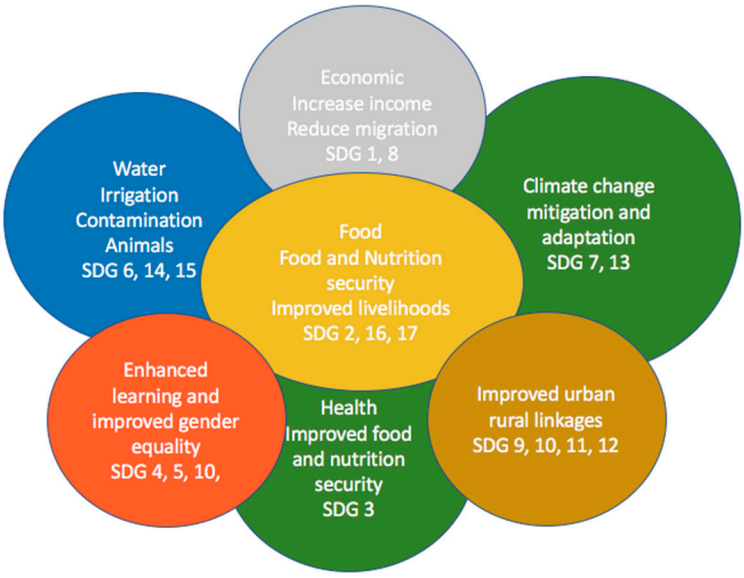


Figure 1. The potential for food as an integrative approach to addressing SDGs. Each circle captures specific sustainability dimensions with related SDG Goals numbered that can be addressed through food systems with food as the central linking point.

In using a city region lens to develop more sustainable food systems, CRFS complements and adds to other approaches discussed earlier. For example, with respect to territoriality the CRFS adds a systems approach as the CRFS concept recognizes "that cities exist within a geography, and that rural and urban areas need to be considered as a single interconnected unit to produce outcomes that are equitable, integrated, and long-term" [3] (p. 28). Combining the concepts of 'food systems' with 'city regions' through the CRFS approach, sustainability is included by definition, particularly access to food, generating decent jobs and income, increasing resilience, fostering rural-urban linkages, promoting ecosystem and natural resources management, and supporting participatory governance (FAO-RUAF in [6] (p. 35)). CRFS offers a unifying approach to align multiple goals to the mutual benefit of all people in rural, peri-urban, and urban spaces. It provides both the assessment potential and focus of other analytical approaches such as alternative food networks, short food supply chains, or rural-urban linkages, and also deliberately includes sustainability and supply chain consideration. It offers more precision and is more targeted than integrated territorial development by explicitly considering flows between rural areas and cities, foregrounding rural needs so they are considered as central in and of themselves and not as being in service to urban centers, thereby facilitating both meaningful rural and urban development [8,66,67]. Consistent with integrated policy approaches, CRFS also provides the focus needed to develop multi-scale policies and programs. For example, in the case of the SDGs, food provides a cross-cutting entry point to support all the goals and can play a central role in achieving both local and global sustainability. Despite this focal role, implementing the SDGs and sustainability more generally is not scale-focused and needs a specific lens to help focus operationalization offered by the CRFS approach [5,12]. Addressing multiple challenges simultaneously, CRFS provide a mechanism for coherent, functional sustainability policy and action [1,4,5] (Table 1). Categories in Table 1 were extracted from the literature review for the various approaches complemented by the overview of the

city regions and food systems literatures with a view to comparing and contrasting the relative merits of each approach. In addition, it helps to frame the case examples provided below.

Table 1. Comparison of food system approaches and considerations including the CRFS, in which ~= some consideration, √ = central consideration, and 0 = no remarkable level of consideration. (Note: R-UL = rural-urban linkages; T&IP = Territorial and integrated policy.

	Holistic Sustainability Approach	Builds City-Rural Links & Capacities	Fosters Coherent Policy/Governance Across Scales	Capacity to Operationalize Research	Fosters Rural Capacity	Used in Global South and North	Addresses Research Boundaries
CRFS	√	√	√	√	~	√	√
AFNs	~	√	0	0	~	0	0
SFSC	~	√	0	0	0	~	0
Foodshed	~	√	0	√	0	0	√
Bioregion	~	0	~	√	√	0	√
R-UL	0	√	0	0	√	0	0
SFS	√	0	√	0	0	√	0
T&IP	~	~	~	0	√	√	0

3. Validating the City Region Food System Approach: Convergent, Co-Evolving Theory, and Practice

The evolving CRFS approach is useful in two ways. First, it is being applied, tested, and revised through on-going FAO and RUAF projects that began in 2015 to intentionally foster more sustainable, integrated food systems in city-regions [4,5]. Second, it is also possible to identify CRFS that have emerged organically/spontaneously before explicit CRFS approach interventions began. Looking at the literature, one could make the case that the CRFS approach emerged from the iterative interplay and convergence between theoretical and applied concepts and practice over the last twenty years. Accordingly, it is possible to identify examples of emergent city region food systems that predate [68] the more recent CRFS approach application. In the next sections, Rosario (Argentina) provides an example of a pre-existing CRFS. Belo Horizonte [69], Bristol [70], and Toronto [71–73] are other examples where this is also the case. Deliberate, targeted CRFS approach interventions are applied by RUAF and FAO in eight city regions: Kitwe and Lusaka, Zambia; Dakar, Senegal; Quito, Ecuador; Medellin, Colombia; Toronto, Canada; Utrecht, The Netherlands; and Colombo, Sri Lanka. These living labs contribute to our understanding of the challenges and future opportunities in applying the CRFS approach. The CRFS pilot research allows researchers and decision-makers to assess and develop CRFS as a planning and information-based decision-making methodology and tool. In these cases, deliberate interventions were undertaken, including, for example, the determination of sustainability visions defined at the outset of each pilot project by stakeholders to set out collective, aspirational guiding principles for the project. It provides guidance for investment, policy, and strategy prioritization to improve the resilience and sustainability of food systems [6].

3.1. A Pre-Existing CRFS Project: Rosario, Argentina: City Region Food System Sustainability

Rosario provides an excellent example of a city region food system that evolved prior to the launch of the CRFS pilot projects. As part of the response to the 2001 economic, political, and social crisis in Argentina, urban agriculture (UA) was developed to provide both healthy, agro-ecological food and direct sales for local farmers. Following the crisis, UA was incorporated into municipal policy [65]. Beginning in 2014, the municipality of Rosario and the Province of Santa Fe collaborated to re-localize their food system working through the horticulture greenbelt that has traditionally supplied a large part of Rosario's consumption needs for fresh fruits and vegetables. Part of these efforts aimed to reduce chemical use in horticulture to improve farmer health and food quality and decrease the city region foodprint. Three initiatives were undertaken to this end: promotion of ecological production practices, substitution of products from distant areas, and fostering short food supply chains including direct farmer to consumer markets. These initiatives were tied to local, provincial, and national programs and laws on pesticide use and ecological production, as well as

support for family farmers. Specific initiatives included municipal protection of peri-urban land for agriculture, publically developed technical support for ecological production, low-interest loans for farm equipment, direct market links to hotels and restaurants that also helped to raise public awareness about regional foods, and improved distribution networks. Although it was put on hold due to a change in government, the program is being revived. The projects received financial and human resources support through the Santa Fe Ministry of Production and the Rosario Municipal government. There has also been policy coordination across various municipalities located around Rosario including municipal secretaries and engagement with civil society organizations for technical, research, and administrative support. The private sector has participated by providing new market linkages for ecological products. Rosario provides a good example of alignment between various levels of government, public, civil society, and private actors as they build a City Region Food System. Given the focus on social, environmental, and economic sustainability in the context of linked up policy, this example helps us to understand more about the opportunities and challenges in applying the CRFS approach (Dubbeling and Terile in [4]).

3.2. Medellin and Quito: New Interventions in the Context of Existing CRFS

3.2.1. Medellin, Colombia

Applying the CRFS approach to assess the status of Medellin prior to the CRFS intervention made it more apparent that institutional and political, as well as production, considerations are key to the regional food system and that there is the need to further integrate Medellin within the Antioquia region. Accordingly, the CRFS intervention supports several new inter-institutional initiatives including new food and nutrition security monitoring and evaluation frameworks; the creation of regional participatory governance and food planning mechanisms, tools, and partnerships emanating from the Metropolitan Area of the Aburrá Valley; linking low-income consumers more directly to small food producers through urban markets; and redesigning urban spaces to include food activities that enhance food and nutrition security through, for example, community gardens and popular canteens. These activities have provided a platform for increased inter-institutional integration through the "Alianza por el Buen Vivir" task force that includes the Medellin Mayor's Office, the Government of Antioquia and the Metropolitan area and that weaves together various administrative levels. Moving forward, with a view to working across political, administrative, and economic priorities, the CRFS task force will support improved crop production, as well as distribution systems and local supply chains, to improve access to safe, diverse, healthy food for urban consumers [5].

3.2.2. Quito, Ecuador

As with Medellin, regional food system work Quito predates the CRFS approach interventions [74]. Since 1988, the Metropolitan District of Quito (DMQ) has provided more integrated land use and growth planning, as well as coordination across governments. This facilitated a regional perspective on the food system and fostered urban-peri-urban-rural linkages through AGRUPAR, a participatory urban agriculture program that began in 2002 that now includes 87% of urban and 82% of rural parishes. AGRUPAR promotes agro-ecological production and marketing. In addition, new organic/ecological markets have been established in support of organic/ecological producer groups from areas surrounding the DMQ that now have the opportunity to sell their produce to Quito's population. Consistent with CRFS goals, the existing AGRUPAR program aims to (1) improve food and nutrition security; (2) increase farmer income; and (3) enable the participation of youth, elderly, and women across rural and urban parishes in the Metropolitan District (The AGRUPAR program includes 2500 gardens over 27 hectares that produce over 105 food products. Most of the gardens are on private land, with some exceptional cases of public land or land owned by institutions (churches, for example). Nearly half are sold through urban and rural local bio-markets. Rural production adds diversity to the horticulture offerings from AGRUPAR's urban gardens and allows access to foods

that require larger growing areas (e.g., pork, trout, honey, eggs, grains, and beans). The AGRUPAR program includes more than 12,000 households, and provides set-up infrastructure and technical training, producing more than 400,000 kilos of food and increasing household food security through access to healthy, organic food; improved income stability for marginalized households through more than 1050 community, household, and school gardens, and over 300 small livestock production units; and more than 100 micro-enterprises that grow and process food. Production has helped strengthen food security and diversification of the diets of the 12,000 involved urban farmers and their families. On average, producer families earn USD 55/month from product sales and save another USD 72/month on food purchases. Total savings are 2.5 times the value of the governments' human development voucher. 17% of involved households engaged in more commercial enterprises reported supplementary income of 300 USD/month. Direct sale of approximately 100,000 kilos of food through bio-markets served over 17,000 consumers across a range of income levels in urban and peri-urban settings and provided opportunities for rural vendors [74]).

Since 2015, Quito has participated in the CRFS project. This engagement further increased awareness and priorities regarding the importance of food. As a result, the DMQ committed to develop a city region food policy building on its urban agriculture program and to strengthen linkages between Quito and surrounding municipalities and provinces through various institutional initiatives. CONQUITO, the local economic development office, integrates its actions with other municipal and provincial entities to use food to address challenges related to health, housing, social inclusion, child development, sustainable consumption, and climate-resilient small holder production. This is complemented nationally by the Strategic Development Plan (SDP) (2015–2025). Through its efforts to improve livelihoods, the SDP tackles health including food and nutrition insecurity and diet-related diseases; income and employment with support to sustainable, local value chains across the urban-rural spaces; and land use planning to protect agricultural land and water resources. International cooperation has played an important role in the start-up and expansion of the program through support to training, infrastructure investment, research, and impact monitoring. UN Habitat was a key supporter of the start-up of AGRUPAR. RUAF, through the joint RUAF-FAO CRFS program, is supporting the CRFS assessment and development of the food policy strategy with municipal departments across the city region and the Province of Pichincha.

Building on the remarkable achievements of the AGRUPAR program through the DMQ, the intervention based on the CRFS approach extends this work by creating connections between the DMQ and neighbouring municipalities and provinces. The CRFS project helped people working in the Quito city region to understand the need to look beyond the DMQ boundaries to understand that their food system relies on important food supply and food processing from outside the DMQ area. This is a key challenge to creating and planning for a more coherent, integrated city region food system. Through on-going multi-stakeholder dialogue, the practice is now being included in provincial legislation and operational programs.

Finding ways to include more rural communities and to protect peri-urban land are on-going challenges to realizing the multiple benefits of city region food systems. So far, the concept of urban and peri-urban agriculture (or metropolitan agriculture) is still not explicitly recognized in Quito's land use plans. The development of a new territorial food policy now faces the challenges to work at this larger city region level and across different jurisdictions. Nonetheless, the CRFS approach has already resulted in the following achievements:

1. Increased awareness among government and multiple stakeholders on Quito's food system dynamics
2. Understanding the need for radical changes for ensuring the Right to Food, enhancing inclusive rural urban linkages, guaranteeing consumer health and nutrition and a more participatory governance
3. Inclusion of food in Quito's resilience strategy
4. Inclusion of food in Vision 2050 consultations

5. Resilient and sustainable food systems will be an indicator for the certification of Quito as a healthy municipality
6. Elaboration of a Quito territorial food policy and creation of a technical and political board; the inclusion of the food policy in a municipal ordinance is foreseen in 2018 [74].

This case is instructive, as, while Quito applied a regional perspective to development with their metropolitan government prior to CRFS intervention, the CRFS approach led them to consider new areas of interventions that helped to accelerate food-based sustainability initiatives. This exemplifies the progressive iteration possible using the CRFS approach.

3.3. Targeted CRFS Approach Intervention: The Case of Colombo

Quito and Medellin were presented as on-going projects and so are key examples of change over time based on informal and now more formalized actualization of the CRFS approach. Colombo demonstrates impacts from a deliberate CRFS intervention. Building on previous food-related projects in Sri Lanka, including a RUAF flood zone management in urban and peri-urban areas as both a food security and disaster management strategy [4], the Colombo CRFS project was launched in 2015 with the support of the local FAO technical expertise and the International Water Management Institute (IWMI) (a RUAF partner). The Colombo Municipal Council acted as the institutional focal point for the project, with additional links to the Western Province Ministry of Agriculture. As part of the CRFS approach, an in-depth analysis of the CRFS was undertaken including a food flow analysis for key crops. Based on the findings from the CRFS assessment, several interconnected themes emerged as key areas for food system improvement: there is a disconnect between income and food security, so while there are relatively low poverty levels, food insecurity impacts 1/3 of the population in the Colombo Metropolitan District; food safety is increasingly of political and consumer concern; food waste is the largest part of the 700 MT in waste produced daily in Colombo City, with room for improvement identified through better storage, education of middle and high income households to improve food use habits, and improved transportation and food handling; and climate change.

In Colombo, the CRFS approach developed assessment and planning processes linked to existing areas of political interest such as health, food safety, food waste, and climate vulnerability. Building on these concrete entry-points, the CRFS approach formed the basis for broader food system assessment and strategy formulation. In the field of food waste for example, the CRFS approach is helping the Colombo city region to

- Implement a quantitative analysis of rural-urban food flows
- Quantify any food waste generation and current use along the food chain
- In the field of climate vulnerability, another local priority, the CRFS process helped to
- Identify vulnerable food chains and commodities
- Analyse why and how these food chains are affected
- Analyse who is affected (spatial analysis and duration)
- Suggest local adaptation strategies for increasing the resilience of the urban food system

The impact of using the CRFS approach has been threefold. First, there is now a more robust network of policy-makers and institutions attuned to the benefits of adopting a CRFS approach. The recognition of the need for integrative policy and programs to address the challenges identified through the CRFS approach can be used as levers for positive change. Second, by-laws directly related to the CRFS approach work are being developed to address food waste and loss, and food safety. The city region food system concept, natural resource management, and climate change are being included in the national Food Act, as well as relevant provincial policies (reference to CRFS fact sheet). Third, the increased profile about the transformative potential for food means there are new opportunities to have food as key dimension of the Colombo megapolis initiative (in Colombo, the Megapolis is now set up as a new unit for regional development and will replace the Colombo

metropolitan region) moving forward, providing the potential to be a central consideration in this new administrative initiative.

4. CRFS Contributions and Challenges

The case examples validate and point to the opportunities and challenges in applying the CRFS approach. As a process of constant (re)evaluation and implementation, the CRFS approach offers a way to build on-going food system sustainability to achieve economic development, food and nutrition security, and environmental management including water quality, biodiversity protection, and climate resilience, among others. Even though the CRFS approach is very new and ultimately will rely on longer-term policy changes to achieve structural transformation, it is possible to identify areas where positive impacts have been achieved (Table 2).

Table 2. Summary of results for CRFS and related projects.

	Rosario	Medellin	Quito	Colombo
Holistic sustainability approach	Environmental, economic, social	Economic, social	Environmental, economic, social	Environmental, economic
Builds city-rural links & capacities	Fostering short food supply chains	Direct links between low income consumers and producers	Enhanced support for rural-urban connections	Food flow analysis helps identify levers along the food chain that intersect with various challenges (e.g., food waste, climate change)
Fosters coherent policy/governance across scales	Local, provincial, and national ecological production programs and support for family farmers	Inter-institutional initiatives for food security, planning, and production between Medellin Mayor's Office, the Government of Antioquia, and the Metropolitan area	Identified need for and fostered metropolitan and provincial links, as well as coherence with national programs	Resulted in by-laws to address food waste and loss, food safety, natural resource management, and climate change
Capacity to operationalize research	N/A as pre-existing CRFS	Facilitation of increased connections between multi-scale institutions	Facilitated increased institutional connections between multi-scale public institutions and between public sector, civil society, and private sector	Built on existing partnership, used a food flow analysis of key crops
Fosters rural capacity	Revival of Horticultural Greenbelt, capacity building for civil society organizations, engagement with private sector	Improved opportunities for small holder farmers	Reinforced need to support healthy food access and income in rural areas	Fostered links with provincial Ministry of Agriculture, additional links provide levers for change
Addresses research boundaries	N/A as pre-existing CRFS	Combination of political boundaries and food provisioning	Political boundaries for the municipal district and provinces	Political boundaries combined with food flows

The pilot projects point to two types of outcomes. First, the CRFS approach changed perspectives to focus on regional development. For example, in Colombo the Megapolis that was set up as a new unit for regional development and coordination will replace Colombo metropolitan region with food as part of the agenda, for example, through solid waste management. Second, different interventions take place at different scales. For example, strengthening climate resilience in the Colombo CRFS may call for interventions in other parts of the chain and outside the city. Additionally, in Quito, the DMQ is now working with the province to realize more benefits from the CRFS. As a result, the CRFS approach points out that multi-scalar considerations are needed when looking at the city region.

More specific outcomes to date from applying the CRFS approach include the following:

1. The increased profile of food system sustainability. In all CRFS pilot sites, food was more explicitly part of policy agendas. This has resulted in increased food security, better waste management, improved rural and urban incomes for low income households, and improved land use planning;
2. (Enhanced) linkages between urban and rural dimensions of the food system and the capacity to work beyond urban boundaries. This facilitates the operationalization of rural urban linkages and

the understanding that a city depends on a vibrant rural area, and a vibrant rural area depends on exchanges with the city;

3. New food-based regulations, laws, and policies that support holistic sustainability;
4. Increased inclusion of food as part of emerging agendas and institutional planning on multiple scales so that upper level initiatives such as the Quito national ecological certification and the recognition of urban agriculture will activate access to agricultural support programs and public procurement opportunities;
5. Providing the basis for evidenced-based policy and program development targeted to meet specific community needs;
6. Creation of new and support for existing food system networks focused on sustainability and integration across the city region.

While many benefits are associated with the CRFS approach, it is important to acknowledge the challenges encountered in practice and implementation with a view to identifying possible challenges to operationalizing the CRFS approach for future research. (This section is complemented by the beta version of the CRFS Toolkit available at http://www.fao.org/in-action/food-for-cities-program/toolkit/introduction/en/). The challenges to date include defining the CRFS boundaries (Table 3), data availability, and engaging stakeholders, as well as coordinating cross-jurisdictional boundary actions among different stakeholders and levels of government. In considering CRFS boundary issues, there are two points that need to be distinguished from each other. On the one hand, while the CRFS approach focuses on specific city regions, this takes place within larger food networks that link city regions to national and global food systems [3,10,68]. While understanding regional food provisioning capacity makes it clear what can be supplied from the CRFS—for example, in Canada it is not possible to grow pineapple, bananas, tea, or coffee—it is important to state that food systems and food exporting will continue to be part of global food flows and also backfill gaps in local systems. The three rings described for Quito provide an excellent example of how this can be operationalized (Table 2). On the other hand, there is a logistical challenge in operationalizing CRFS and defining boundaries for a particular project. Approaches used by seven of the pilot project cities are summarized in Table 2. In some cases, food flows or production areas were used to determine the boundaries. In other cases, existing political boundaries served to delineate the extent of the city region food system. Hybrid cases also emerged in which a combination of multiple approaches was used. It is suggested that these logistical questions need to be addressed in a flexible manner, as the process of working with the CRFS approach is one of building networks and integration across scales; the boundaries may shift over time.

Table 3. City-region delimitations [68] and maps to provide general sense of how and why the boundaries differ for each CRFS project. Please note that the key considerations are italicized in the description for each CRFS [75].

City-Region and Its Delimitation	Map Displaying Key Delimitation Considerations
Colombo, Sri Lanka The Western Province or "Western Megapolis" region is a new, very recent *administrative unit* for regional economic development in the Western Province. This administrative unit will replace that of Colombo Metropolitan Region and explicitly refers to city region development, although it does not yet address food issues. The megapolis area will be the most suitable territorial area when (food system) land use planning is concerned.	

Table 3. *Cont.*

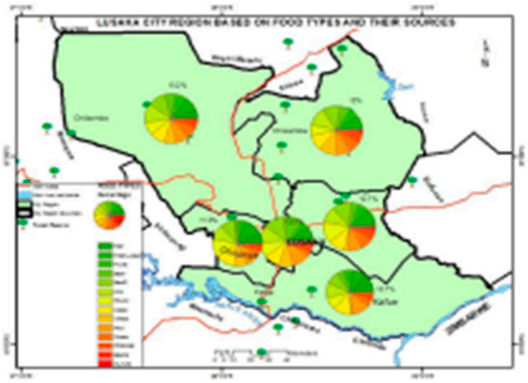
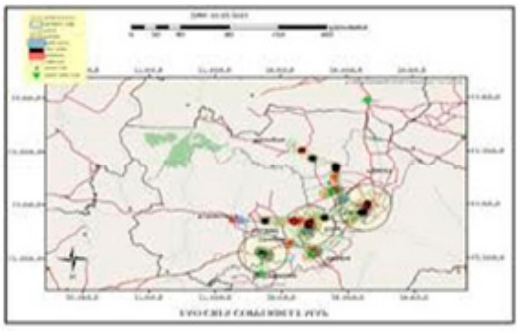
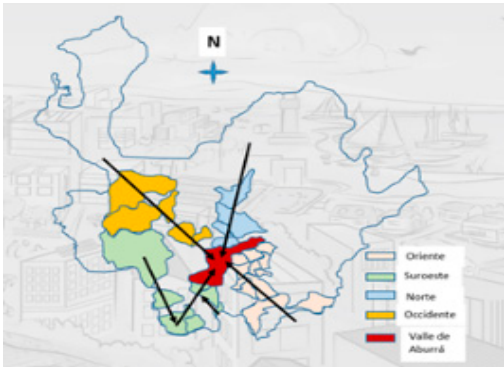
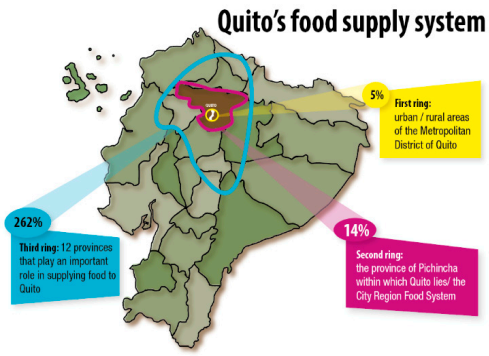
City-Region and Its Delimitation	Map Displaying Key Delimitation Considerations
Lusaka, Zambia For Lusaka, the city region was defined taking into account nearby *production areas* for main commodities consumed in the city, including fruits & vegetables, livestock (beef, poultry, and pork), dairy products, and fish, as illustrated in the map. The city region thus involves Lusaka province and its neighbouring districts, an area that had already been identified as a new future area for joint development planning.	
Kitwe, Zambia In Kitwe, the city region encompassed the *city of Kitwe and its adjoining food production areas*, including the districts of Chambeshi, Kalulushi, Luanshya, Mufulira, and Ndola, mainly situated in the Copperbelt province. It is acknowledged that the city region is dependent on complementary food supply from more distant areas for specific agriculture and livestock/poultry products.	
Medellin, Colombia The city region is defined as a group of 31 municipalities in the Province of Antioquia that, according to five criteria, play a key role in the food provisioning of Medellin City and the surrounding Aburra valley: (i) food provisioning: municipalities contributing more than 1% to food flows reaching wholesale markets in Aburra valley; (ii) food production: municipalities contributing more than 1% of the total provincial food production; (iii) proximity: municipalities in the Aburra valley with any agricultural production; (iv) areas of agricultural expansion; and (v) municipalities with an important political role in territorial governance.	
Quito, Ecuador The *Province of Pichincha* is identified as the most appropriate scale for the city region. The three rings in the image identify the degree of self-sufficiency of food for the given territory (ring). The image compares total food consumption (by weight) of the population in the given territory for specific products with actual production in that area. Consumption figures are based on household consumption data multiplied by population figures. Production data are based on agricultural census. The calculation does not account for any food imports or exports. The second ring was identified as the city region, as it includes key production areas and major food processing industry, and allows for cross-jurisdictional planning coordination between the city of Quito, surrounding municipalities, and the Province.	

Table 3. *Cont.*

City-Region and Its Delimitation	Map Displaying Key Delimitation Considerations
Toronto, Canada The City Region Food System encompasses the Greater Golden Horseshoe area including Toronto city plus surrounding peri-urban and rural region in fifteen counties. This area is a *recognised territorial area*, and as such data exist for this area and joint land use, and regional planning is also taking place.	
Utrecht, The Netherlands The City Region Food System is defined as the U10 region, which is an *inter-municipal platform* of the city of Utrecht and 9 neighbouring municipalities which whom Utrecht already collaborates in other policy areas.	

In terms of lessons learned, the examples point to and reinforce the importance of having projects using the CRFS approach embedded in and supported by cross-cutting technical teams that have core programmatic financial and political support. This helps to ensure uninterrupted progress as in Quito, where AGRUPAR is part of CONQUITO. Toronto and its Food Policy Council is another good example, as it is permanently located within the Toronto Department of Public Health [71,73]. It is also important to clearly articulate the goals for regional food system production in urban and peri-urban areas so that they are in line with other programs such as food security and economic development. To track and assess successes and areas for improvement, good baseline and on-going data collection is required [4–6]. This baseline data can be problematic, as it may not be available consistently across jurisdictions used for the CRFS or may simply not be available and will need to be gathered. In future, it is also important to have comparable data and processes to facilitate developing validation for the CRFS approaches. Drawing from the pilot projects applying the CRFS approach, it is possible to identify key governance levers that can be activated to enable support for small scale producers, distributors, and traders, as well as poor, marginalized consumers, while also improving the efficiency and resilience of natural resources:

1. Institutionalization of CRFS policies and programs on multiple scales;
2. Facilitation and support for horizontal and vertical government integration, cooperation, and dialogue; and,
3. Development of food-centered policies and programs to support sustainability.

As demonstrated in the case studies, city regions require work across institutions, as well as innovative approaches to governance with power devolved to local authorities within a supportive macro-policy and planning environment. These complex, sub-national mechanisms involve negotiating the needs and interests of multiple actors and institutions, and require trade-offs to find equitable solutions that support small scale farmers and rural communities, as well as poor and marginalized eaters.

5. Next Steps: Applying the CRFS Approach to Complex Problems

The CRFS approach offers a much-needed entry point to conceptualize and enact more sustainable food systems. As CRFS simultaneously engages multi-sectoral actors across the city region, it provides the basis for building on existing initiatives to amplify regional food system capacities as economically robust, fair, and green, which engage actors from the private, public, and community spheres. As a result, the CRFS approach can be used to address complex, dynamic challenges. The cases elaborated in this paper and elsewhere [4,5] demonstrate that the CRFS approach is a concrete way to enhance sustainably focused, multi-level policy. Given the existing challenge to both act on the SDGs and the opportunity to connect these actions with other initiatives such as the New Urban Agenda and the Milan Urban Food Policy Pact, the CRFS approach provides both a conceptual framing and operational approach to support transformational change. As illustrated, supportive governance mechanisms can enable city region food system initiatives to improve food and nutrition security for vulnerable communities; improve livelihood opportunities to smallholder farmers, producers, and traders; and regenerate environmentally degraded land. As demonstrated in the cases of Quito and Colombo, climate change can be addressed along the food chain [74] through coherent city region policy and programs offering increased benefits through sustainable agriculture practices that provide both climate mitigation and adaptation opportunities. In turn, the production of local food helps to reduce dependence on imports and market price volatility that is predicted under a changing climate [68,69]. Moderated heat island, windstorm, run-off, and flood risk effects are all physical benefits from increased agriculture in city regions [76,77]. Agriculture is also linked to improved resource efficiencies and increased biodiversity [77–79]. Agroecological methods that can help "reduce vulnerabilities to climate variability include crop diversification, maintaining local genetic diversity, animal integration, soil organic management, water conservation and harvesting" [80] (p. 869). In Quito, the collaboration with the Museos de la Ciudad has helped integrate the cultivation of food and medicinal plants with awareness-raising on sustainable consumption in public social meeting spaces. In collaboration with the Secretary of Environment, a new project on 'farms adapted to climate change' is being set up in the DMQ's rural parishes, seeking to develop and promote new climate-smart production technologies that can be easily adopted by local farmer. AGRUPAR's policy influence has also led to the recognition of the role of urban and peri-urban food production in the DMQ's climate change adaptation and mitigation strategies. Climate change mitigation and adaptation has been incorporated as one of the key sustainability indicators in the Development Plan of the city, and urban and peri-urban agriculture is highlighted as one of the relevant carbon compensation mechanisms. The AGRUPAR program already promotes specific production techniques to adapt to a changing climate, including small greenhouses, drip irrigation, rainwater harvesting, and reforestation, amongst others.

While recent efforts to understand, assess, and improve sustainable food systems have resulted in a number of framings and tools, a lack of coherence exists [7]. As the world looks for multiple dividends through programs such as the SDGs and the New Urban Agenda, to date approaches have frequently been developed and/or implemented in silos and have lost their potential for wider sustainable systems transformation. Integration is key to addressing multiple goals. As demonstrated in the case examples, the CRFS approach offers an actionable, flexible pathway towards sustainable transformation.

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