frontiers | Frontiers in Sustainable Food Systems

TYPE Original Research
PUBLISHED 02 December 2022
DOI 10.3389/fsufs.2022.993892

OPEN ACCESS

EDITED BY
Tapan Kumar Nath,
University of Nottingham Malaysia Campus, Malaysia

REVIEWED BY
Salvatore Ammirato,
University of Calabria, Italy
Md. Wasiul Islam,
Khulna University, Bangladesh

*CORRESPONDENCE
Sofia Anna Enrica Cavalleri
Sofia.cavalleri@sei.org
Puntita Tanwattana
Puntita.t@chula.ac.th
Clemens M. Grünbühel
clemens.grunbuhel@aciar.gov.au

SPECIALTY SECTION
This article was submitted to Land, Livelihoods and Food Security, a section of the journal Frontiers in Sustainable Food Systems

RECEIVED 14 July 2022
ACCEPTED 14 November 2022
PUBLISHED 02 December 2022

CITATION
Cavalleri SAE, Tanwattana P and Grünbühel CM (2022) Systemizing a rural livelihood diversification framework for sustainable community-based agritourism: A participatory approach to ensure resilience.
Front. Sustain. Food Syst. 6:993892.
doi: 10.3389/fsufs.2022.993892

Systemizing a rural livelihood diversification framework for sustainable community-based agritourism: A participatory approach to ensure resilience

Sofia Anna Enrica Cavalleri[1,2]*, Puntita Tanwattana[3]* and Clemens M. Grünbühel[1,4]*

[1]Stockholm Environment Institute, Stockholm, Sweden, [2]Department of Environment Development and Sustainability, Chulalongkorn University, Bangkok, Thailand, [3]Environmental Research Institute, Chulalongkorn University, Bangkok, Thailand, [4]Australian Centre for International Agricultural Research, Canberra, ACT, Australia

Introduction: Situated approaches of rural livelihood diversification, such as community-based agritourism, can localize sustainable food systems at the regional level. This research advances an integrated framework of indicators to assess the interdisciplinary benefits of rural livelihood diversification practices for sustainable local food systems and community resilience.

Methods: We built a framework on four dimensions deducted from secondary data: (1) environmental, (2) sociocultural, (3) economic, and (4) health. These were validated with an inductive analysis of primary data, which we collected from a panel of experts with a content validity index and tested in three rural case studies with shadow observation and qualitative interviews. We conducted both in-depth interviews with community leaders ($n = 10$) and semi-structured interviews with multi-sectoral stakeholders ($n = 40$).

Results: Findings (1) identify a comprehensive list of indicators to assess environmental, sociocultural, economic, and health dimensions of rural livelihood diversification practices and (2) advance a participatory approach to prioritize indicators according to their regional relevance (co-developed with stakeholders involved in Bangkok's local food systems). Food tourism connects the four dimensions by (1) preserving local agrobiodiversity (2) preserving rural communities' traditions (3) creating new capacity building opportunities for community-driven socio-economic development and (4) recognizing the health benefits of indigenous foods.

Discussion: This study contributes to a value-added conceptualization of community-based agritourism as a rural livelihood diversification practice. Such research effort highlights the importance of co-producing and ground-truthing indicators for rural livelihood diversification practices localizing sustainable development goals.

KEYWORDS

rural livelihood diversification, community-based agritourism, sustainable rural development, sustainable local food systems, community resilience

Introduction

The research presented in this paper categorizes rural livelihood diversification practices for sustainable community-based agritourism in the context of sustainable local food systems. There is a need to advance indicators that can be applied "to measuring various aspects of social, economic, and environmental sustainability at a community level" (Duxbury and Richards, 2019, p.11). Food production is a major aspect of local sustainability in agricultural communities. However, it has become increasingly difficult to base livelihoods on food production alone (Gebru et al., 2018). Recently, there has been an emerging movement toward a diversification of income sources by local smallholders. During the 1980–1990's additional income was only possible in urban centers and we have seen massive movements of population from rural to urban areas in search for jobs. With closer connectivity through digitalization, mobile networks and the internet, at the start of the millennium, economic diversification became possible *in situ*. Smallholders were able to either direct market their products or host urban customers in their communities, to experience rural lifestyles and learn about food production and land use. Diversification improved the sustainability of local food systems and the resilience of local communities to withstand external shocks such as market fluctuations, natural disasters, or pandemic crises. Simultaneously, the "re-regionalization of food" brought "scalar dimension to the practice of doing food justice, which extends beyond local initiatives to consider broader fundamental land-use planning challenges around circular economies and ecosystem services" (Nunes, 2017). Food production is not merely a separate sector with the intent of providing sufficient food to urban centers. It is integrated in rural livelihoods with deeper connections to resource and land use systems, as well as the overarching regional consumption patterns. This offers the opportunity to prototype and research alternative economic models such as how rural communities can localize sustainable development with "agritourism rural network" hubs (Ammirato and Felicetti, 2014; Ammirato et al., 2020), de-centralizing and re-distributing development from urban to rural areas.

The scope of this research understands local food-related initiatives as connected to regional food systems. As a growing megacity, Bangkok is heavily dependent on surrounding agriculture to effectively feed its urban dwellers (Boossabong, 2019). This represents a food policy issue as well as a research gap. More studies are needed to understand how to measure, analyze and plan sustainable local food systems at the city-regional level and localize sustainable development in rural areas (Gallent, 2006; Haidar, 2009; Zhao, 2012; Fayasse et al., 2019). We investigate livelihood diversification practices as strategies to localize sustainable food systems. For this study, an integrated set of indicators was co-developed to describe the sustainability of environmental and socio-economic resources, socially conditioned resource access, diverse livelihoods, as well as health components of seasonal local diets and indigenous native foods.

This research aims to explore how indicators of rural livelihood diversification can localize community-based food initiatives within the context of regional sustainable food systems and measure their impact on community resilience. Two research objectives were developed:

1) Identify key indicators of rural livelihood diversification practices for community resilience.
2) Prioritize indicators to assess sustainable community-based agritourism practices which can lead to sustainable local food systems in Bangkok and surrounding provinces.

The main research assumption is that sustainable local food systems and community resilience must be planned with a situated approach, since overarching complex food systems are resistant to change (Conti et al., 2021). A re-localization of food can support to reconnect the macro, meso and micro levels of governance and effectively transition toward sustainable food systems. As stated by Nunes (2017, p.447), "alternative, local responses to conventional food systems" are increasingly needed. Local food systems (LFS) "have emerged against industrial and transnational food chains as different socioeconomic and geographic structures, relocalizing production, while building closer links to urban consumers" (Zazo-Moratalla et al., 2019, p.2). Recent literature suggests that scalable practice models to achieve sustainable local food systems can be supported in various ways, from adaptive governance mechanisms (such as public private partnership or PPP schemes) to corporate social responsibility (CSR) schemes, to emerging alternative, bottom-up agri-business models (Akber et al., 2021; Anselmi and Vignola, 2021; Kasimba et al., 2021; Perez-Neira et al., 2021; Santiago-Vera et al., 2021; Winter et al., 2021). In each case, LFS involve people, institutions, resources, and logistics platforms, alongside intertwined relationships, to produce, distribute, and consume food. "'Local' is defined by a triple proximity between producers and consumers: physical, social, and identitarian" (Zazo-Moratalla et al., 2019, p. 2).

To give an overview of the structure of this paper, a literature review is presented in the following paragraph, after which the research methodology is explained in paragraph 3 by listing the different methods used, including content validity index, shadow observation and qualitative interviews. Research results are summarized in paragraph 4 and discussed more in depth in paragraph 5, advancing the main conclusions of this study.

Literature review

Academic and gray literature related to sustainable local food systems was reviewed. Research fields related to food sovereignty, food security and nutrition (FSN), sustainable

development (SD), agroecology, sustainable livelihood (SL), agritourism (or agro-tourism), community-based tourism (CBT) and community-based agritourism (CBAT), Thai sufficiency economy philosophy (SEP), socio-ecological systems (SES), traditional ecological knowledge (TEK) and local ecological knowledge (LEK), community resilience were reviewed among others. Key literature streams are visualized in the conceptual representation of Figure 1.

A recent theoretical framework of indicators was advanced from research conducted in Mexico, conceptualizing CBT and CBAT as practice models to diversify sustainable rural livelihoods and localize current agri-food systems (Sosa et al., 2021). Due to the interdisciplinary nature of sustainable CBAT and to a lack of coherent definitions from the existing literature, interdisciplinary research fields were considered to build the integrated framework of indicators of this study. These are presented in the figure below, by intersecting the sectors of agriculture and tourism with the paradigms of sustainability and resilience.

Following this conceptual representation, the extensive body of literature was systematically structured into four dimensions: environmental, sociocultural, economic, and health. These four common dimensions emerged as common points from the theoretical frameworks intersecting both sustainable food systems and sustainable tourism. As represented in the first column of Table 1, [1] the four pillars of food security and nutrition were integrated with [2] the three pillars of sustainable development and [3] the five pillars of sustainable livelihood. Table 1 was compiled by selecting the most recent state of the art, published between 2000 and 2021, considered relevant for the research objectives of this study. Scholars exploring different literature dimensions were grouped in relation to the main theoretical frameworks of:

[1] Food Security and Nutrition (Nunes, 2017; FAO, 2018; Abu Hatab et al., 2019; Boossabong, 2019; Zazo-Moratalla et al., 2019; Béné, 2020; Anselmi and Vignola, 2021; Conti et al., 2021) focusing on four pillars related to food availability, access, stability and utilization.

[2] Sustainable Development (Wiskerke, 2009; World Tourism Organization, 2009; Valdés and Foster, 2010; Srinivasan et al., 2011; Zhao, 2012; Sachs, 2015; Thorbeck and Troughton, 2016; FAO, 2018; Rigg et al., 2018; Wang et al., 2018; Barzola et al., 2019; Leach et al., 2020) focusing on three pillars related to planet, people, profit. This was integrated with the health pillar, following the One Health approach (Garcia et al., 2020).

[3] Sustainable Livelihoods (Chambers and Conway, 1992; Scoones, 1998; Haidar, 2009; Valdés and Foster, 2010; Mphande, 2016; Thorbeck and Troughton, 2016; Serrat, 2017; Gebru et al., 2018) focusing on five pillars related to natural, social, physical, financial, human capital.

The Food and Agriculture Organization of the United Nations (FAO) has defined sustainable food systems as delivering "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. This means that: it is profitable throughout (economic sustainability); it has broad-based benefits for society (social sustainability); and it has a positive or neutral impact on the natural environment (environmental sustainability)" (FAO, 2018).

This definition has provided the opportunity to move away from the rural-urban divide narrative and toward a more regionally integrated adaptive realm (Wiskerke, 2009; Nunes, 2017), opening space to explore alternative economic models de-centralizing development from urban to rural areas (Ammirato and Felicetti, 2014; Ammirato et al., 2020). Food systems involve broader "matters of production, reproduction, distribution, consumption–and the interlinkages between these, across global, national and local scales" (Leach et al., 2020, p. 2).

Due to unchecked industrialization and unplanned urbanization, mainly industrial, residential and commercial land-use plans have been prioritized in urban and peri-urban areas in and around Bangkok[1], instead of preserving their traditional agricultural use (Zasada, 2011; Le and Dung, 2018; Boossabong, 2019). As a result of that, the resilience of Bangkok city-region and similar megacities depends on the resilience of its sub-systems at the community level to effectively deliver sustainable local food systems. Thus, when considering resilience to shock and stressors (such as pandemics and other external elements) the scope should shift to focus at the local scale, to ensure positive ripple effects for urban, peri-urban or rural communities (Béné, 2020).

Research methodology

Research case studies

Three rural communities were selected for this research based on a set of inclusion and exclusion criteria, as well as geography. The case studies were selected in a radius of 200 km from Bangkok city center (Figure 2). Notice that the radius in Figure 2 shows the aerial distance in kilometers (200) from Bangkok city center; nonetheless, the actual distance by car is sometimes greater. A 200 km distance was suggested by preliminary key informant interviews as a scope to explore sustainable consumer-producer relationships, as it enables Bangkok consumers to reach rural communities with a weekend trip or even with a 1-day trip. Another criterion for selection required communities to have prototyped livelihood

1 The current population in the Bangkok Metropolitan Area or BMA is of 5,666,264 people as registered in the year 2019 (Office of the Permanent Secretary, Ministry of Education Thailand, 2019). BMA comprises the inner city but excludes the Bangkok Metropolitan Region or BMR, which further extends the scope to suburbs and provinces surrounding Bangkok.

10.3389/fsufs.2022.993892

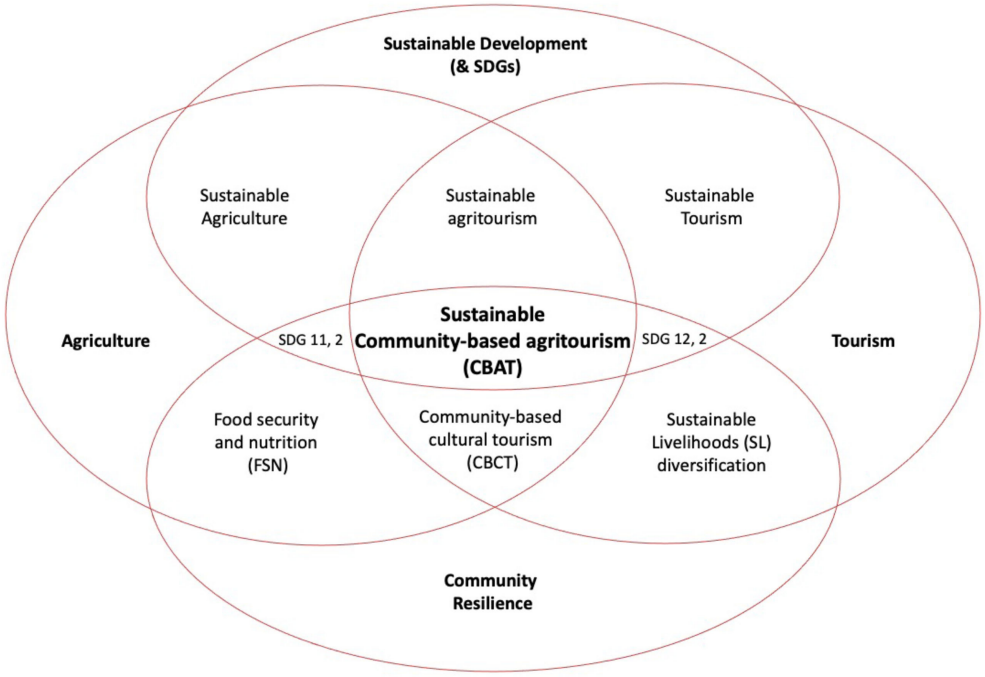

FIGURE 1
Conceptual representation of community-based agritourism (source: authors).

TABLE 1 Four common literature dimensions emerging from 3 theoretical frameworks (source: authors).

3 Theoretical frameworks (with pillars)	4 Literature dimensions			
	Environmental	**Social**	**Economic**	**Health**
Food security and nutrition [1]	Food availability	Food access	Food stability	Food utilization
Sustainable development [2]	Planet	People	Profit	Health (integrated One Health approach)
Sustainable livelihoods [3]	Natural capital	Social capital Physical capital	Financial capital	Human capital
Indicators emerging from the literature	Indicators related to climate adaptation and mitigation strategies in terms of biodiversity preservation and habitat provision. Sustainable resource management to preserve all 4 groups of ecosystem services: provisioning, regulating, cultural, and supporting.	Indicators related to intersectional access and control over natural resources. Measuring community participation and equity, community integrity, biocultural education, social inclusion.	Indicators related to poverty alleviation: use-value (related to monetary income) and non-use value (related to community resilience, capacity building, skills development and assets which cannot be monetized).	Indicators related to proper biological, medicinal, nutritional value of native, indigenous, and seasonal foods and diets.

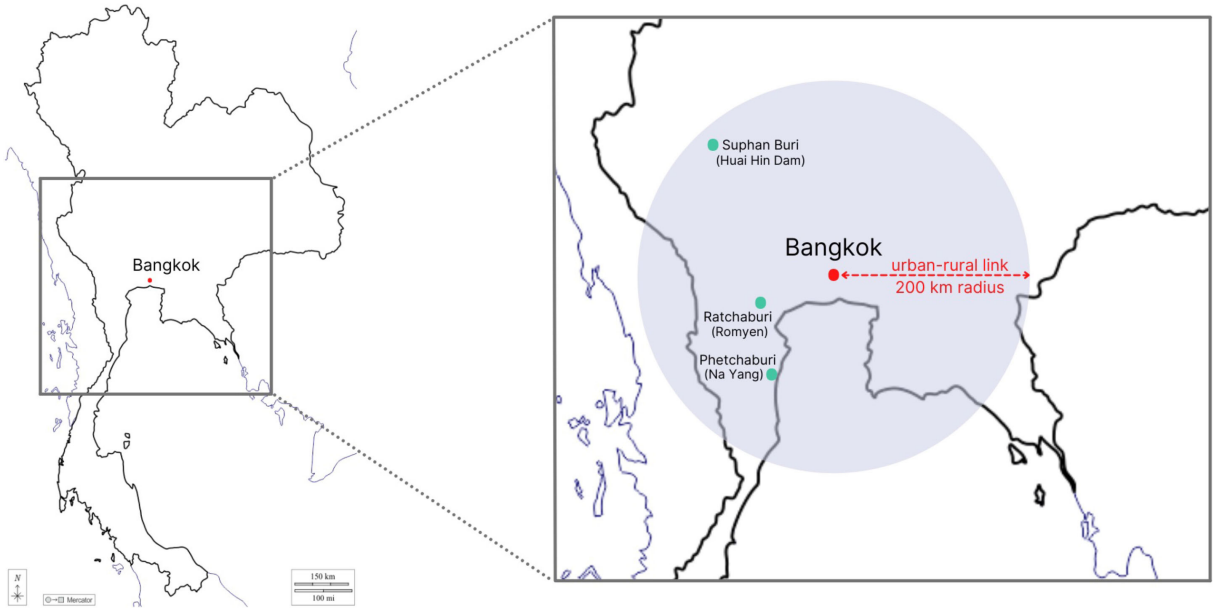

FIGURE 2
Map of the three rural case studies selected (source: authors).

diversification strategies out of farming, investing in non-agricultural products and services. For the initial selection, diversification of livelihoods was simplified to the category of "community-based agritourism"; this was used as a proxy to represent the broader umbrella of rural communities' practices of livelihood diversification. Thus, communities adopting "community-based agritourism" as an additional stream of income in addition to food production/agriculture were selected for this study. Their location had to be in rural provinces surrounding Bangkok, therefore Suphan Buri, Phetchaburi and Ratchaburi were considered as adjacent provinces. Since the scope of this study is mainly related to the production stage of local food systems, the research design was further narrowed down to a target population of respondents, namely rural food producers, as well as other relevant stakeholders (private sector, government, NGOs/CSOs, academia) based in Bangkok. The strategies adopted in the three communities showcase different practice models of rural livelihoods diversification. After the initial selection process, these have been further characterized as following, based on the sectoral stakeholder supporting each strategy:

1) NGO-supported community: the Thai-Karen community of *Huai Hin Dam* in Suphan Buri province, around 200 km by car from Bangkok. The community is collaborating mainly with local NGOs/CSOs to develop its CBAT strategy.
2) Government supported community: the community of *Na Yang* in Phetchaburi province is located around 180 km by car from Bangkok. The community is supported by provincial universities and the local Government to develop its CBAT strategy.
3) Private sector-supported community: *Romyen* farmers' group in Ratchaburi province, around 120 km by car from Bangkok. The community works closely with the private sector to develop its CBAT strategy.

Research methods for data collection

This study is based on a mixed method approach. Primary data collection tools include: (1) content validity index (CVI) performed by 17 experts and co-validated by farmers organizations, (2) shadow observation in the three case studies, and (3) qualitative in-depth and semi-structured interviews. The selection of methods was guided and advised by preliminary key informant interviews conducted with gatekeepers and stakeholders active in Bangkok's local food system.

Content validity index

Content validity index (CVI) calculation was performed with 17 experts and practitioners (Annex 2) to validate and prioritize relevant indicators from a longer list synthesized from

TABLE 2 Content validity index calculation, with non-relevant indicators removed (source: authors).

Dimensions	Indicators		Not relevant (≤ 2)	Relevant (≥ 3)	I-CVI	Interpretation	S-CVI/AVG per section
Environmental (natural resources: provisioning, regulating, supporting ecosystem services)	A. Fresh water		2	15	0.88	Appropriate	0.90
	B. Food/fodder, forest products, fiber		3	14	0.82	Appropriate	
	C. Drought and soil erosion management (upstream plan)		3	14	0.82	Appropriate	
	D. Soil quality and nutrient recycling (downstream plan)		0	17	1.0	Appropriate	
	E. Biodiversity preservation and habitat provision		0	17	1.0	Appropriate	
Sociocultural (access and control over natural resources, equity and social relations, cultural ecosystem services)	A. Social networks and collective organization of farmers		3	14	0.82	Appropriate	0.87
	B. Intersectional participation and social inclusion of vulnerable and marginalized groups		2	15	0.88	Appropriate	
	C. Educational activities for consumers and producers		2	15	0.88	Appropriate	
	D. Community identity and integrity, sense of place		1	16	0.94	Appropriate	
	E. Spiritual values and sacred grounds		3	14	0.82	Appropriate	
	F. Scenery and mosaic landscapes		2	15	0.88	Appropriate	
	G. Access and control over land and natural resources		Added				
Economic (food stability and financial capital)	A. Use-value (products and services)	1. Agri-accommodation services (staying in the local community)	3	14	0.82	Appropriate	0.89
		2. Agri-food services (eating in the local community)	2	15	0.88	Appropriate	
		3. Cultural tourism supporting local products	1	16	0.94	Appropriate	
		4. Primary agritourism workshops	2	15	0.88	Appropriate	
		5. Direct sales	2	15	0.88	Appropriate	
		6. New alternative jobs for community members	2	15	0.88	Appropriate	
		7. Income distribution and local economy development	Added				
	B. Non-use value (not monetized)	8. Local ecosystem services increase in value (as a tourism asset)	2	15	0.88	Appropriate	
		9. Capacity building and skills development for community members	0	17	1.0	Appropriate	
		10. Volunteering activities in the community	Added				
Health (food utilization, local/indigenous diets, nutrition)	A. Seasonal local foods/diets		2	15	0.88	Appropriate	0.88
	B. Native indigenous foods/diets		2	15	0.88	Appropriate	
	C. Medicinal purposes of wild foods		2	15	0.88	Appropriate	

the existing literature review. The resulting indicators were then co-validated by three representatives of farmers' networks based in Thailand. The screening criteria adopted for this approach were retrieved from the literature adopting CVI as a research method (Polit and Beck, 2006).

The content validity index was calculated at the indicator level (I-CVI) and then aggregated at the subsection level (S-CVI) to validate the four dimensions of environment, society, economy, and health. Each indicator was scored on a scale going from 0 (not relevant at all) to 5 (very relevant). The relevance of these was scored in relation to the main research aim and objectives of this study. These were provided to all CVI respondents in a separate information sheet and explained at the beginning of the evaluation form. Respondents were also encouraged to comment on those items which were being rated at the extremes of the scale (with a low value of 0 or high value of 5). Experts in various fields were contacted; ranging from environmental sciences, disaster risk management, development studies, sustainable agriculture and agroecology, social sciences as well as practitioners working in NGOs and think-tanks

related to sustainable food systems, indigenous diets, wild foods, and sustainable development. Priority was given to experts from the region, working in Southeast Asia or Thailand in particular. Nonetheless, all experts were selected based on their previous experience in development research in the Global South. To ensure an intersectional approach, gender balance was encouraged, and female researchers were prioritized as expert reviewers. From a longer list of experts which were firstly identified and contacted, a total of 17 responded (Annex 2). The CVI calculation involved the following stages and is based on a methodological design developed by Polit and Beck retrieved from the literature (Polit and Beck, 2006):

1. **Relevance:** indicators were considered "relevant" if ratings by experts were valued as ≥ 3, not relevant if ratings by experts were valued ≤ 2 (Table 2).
2. **Measurement:** the content validity index has been calculated at the item level (I-CVI) by dividing the number of experts providing a score of 3 or higher (considered as "relevant") by the total number of experts ($N = 17$). Individual I-CVIs were then aggregated into the environment, society, economy, and health subsections by calculating the average or scale content validity index (S-CVI/AVG) for each dimension (Table 2, last column).
3. **Interpretation:** according to the literature, with more than five experts, the I-CVI should not be under the value of 0.78 (Polit and Beck, 2006). Therefore, the interpretation of CVI for this research has screened indicators as "appropriate" only if having an I-CVI ≥ 0.78. Indicators with a CVI lower than this value were removed from the final version (Table 2).

In a second step, a CVI validation stage was added to ensure ground-truthing and confirmation of findings, matching academic and local knowledge with a qualitative approach. Three focal points[2] affiliated with different farmers' networks and with a regional Karen[3] association were interviewed. Respondents were asked to either confirm or reject the selected set of indicators after the CVI calculation (Table 2), with the option to provide any additional input or feedback to further integrate the framework.

Observation

Due to the COVID-19 pandemic, on-site fieldwork was limited and subject to travel, hygiene, and social distancing restrictions. Nonetheless, the first author was able to visit the three sites of Huai Hin Dam, Romyen and Na Yang in the time frame in which Government regulations permitted such visits. Shadow observation was conducted three times in total: in August 2020 in Huai Hin Dam community (Suphan Buri), in December 2020 in Na Yang community (Phetchaburi) and in April 2021 in Romyen community (Ratchaburi). Due to the more severe pandemic outbreak and lockdown measures, qualitative in-depth online interviews were later scheduled *via* video-call. The shadow observation method of data collection involved the researcher taking notes and observing practices in the local rural communities. Field trips involved the main researcher: (1) joining an already existing community-based tourism trip (as a participant), without asking any sensitive information and conducting informal talks with participants and community members and/or (2) following community members with their informed consent in their daily activities without asking any sensitive information and collecting background information (on the farm design, activities and products related to livelihood diversification). Fieldnotes were collected and structured into a checklist form built on the integrated framework of indicators to prototype and test its representativeness and relevance with a ground-truthing approach, combining any missing structural components into it.

TABLE 3 Sectoral profiles of in-depth and semi-structured interviews (source: authors).

Sectoral profile	Number of interviews	Code
Community leaders	10	CL
Community members	14	CM
NGOs (and CSOs)	13	N
Farmers' groups, social and ancestral networks	3	FGN
Private sector	21	P
Government	11	G
Intergovernmental organizations	1	I
Academia (and research institutes)	17	A
Total	90	-

Qualitative interviews

Cluster sampling was used to select research respondents, as the three study communities present different socio-cultural profiles. This selection is also motivated by the barriers encountered in local communities, ranging from language to various levels of literacy of community members, making in-depth interviews with community leaders (CL) the most relevant method to gather significant and qualitatively rich data for the purpose of this research (Annex 1). This selection is also motivated by informal talks conducted beforehand with

2 Representatives operating in Thailand and affiliated with (1) Karen Environmental and Social Action Network (KESAN), (2) The Western Karen Network, (3) Assembly of the Poor.

3 Karen People are a heterogeneous and culturally diverse Indigenous Group predominately living along the Thai-Burmese national borders.

TABLE 4 Interpretation scored with 1 point for CVI > 0.90, 1 point for observation from all fields, 1 point for both in-depth and semi-structured interviews.

Indicators	Description	CVI score	Observation			Interviews		Interpretation (score)
			Huai Hin Dam	Romyen	Na Yang	Confirmed by in-depth (I), semi-structured (S), or both (I,S)	Main findings and keywords across 4 subsections	
1.A	Fresh water	0.88	X	X	X	I	Agroecological design, "water smart agriculture", forest as "a savings account for the community", "forest-friendly production" as an alternative to monoculture/industrial agriculture, "farm driven cuisine" to support local biodiversity.	1
1.B	Food/fodder, forest products, fiber	0.82	X	X		I		
1.C	Drought and soil erosion management (upstream plan)	0.82		X		I		
1.D	Soil quality and nutrient recycling (downstream plan)	1	X	X		I		1
1.E	Biodiversity preservation and habitat provision	1	X	X	X	I, S		3
2.A	Social networks and collective organizations of farmers	0.82	X	X	X	I, S	Farmers' groups, ancestral networks, PGS groups seed exchange networks create common pool of resources. Intersectional community participation, diversification of livelihoods as "a social laboratory for farmer-to-farmer knowledge sharing". The risk of cultural appropriation of tangible and intangible heritage must be considered to preserve the community's sense of place and belonging.	2
2.B	Intersectional participation and social inclusion of vulnerable and marginalized groups	0.88	X			I, S		1
2.C	Educational activities for consumers and producers	0.88	X	X	X	I, S		2
2.D	Community identity and integrity, sense of place	0.94	X	X	X	I, S		3
2.E	Spiritual values and sacred grounds	0.82	X			I		

(Continued)

10.3389/fsufs.2022.993892

TABLE 4 (Continued)

Indicators	Description	CVI score	Observation			Interviews		Interpretation (score)
			Huai Hin Dam	Romyen	Na Yang	Confirmed by in-depth (I), semi-structured (S), or both (I,S)	Main findings and keywords across 4 subsections	
2.F	Scenery mosaic landscapes	0.88	X	X	X	I, S		2
2.G	Access and control over land and natural resources	added	X	X	X	I		1
3.A.1	Agri-accommodation services (staying in the local community)	0.82	X	X		I, S	Flexible agri-camping services, "culinary tourism" and "farm to fork" experiences are emerging as a trend. OTOP is the main marketing channel for regional traditional produces. Common workshops offered by rural communities: crop rotation, soil management, seedling planting, harvesting food in the farm and surrounding forests, organic fertilizer, compost, natural tie-dye and workshops with farm animals. Common alternative jobs for community members to diversify their livelihood: cook, tour guide, workshop demonstrator or educator. Services of livelihood diversification usually managed not at the household level but at the community level (sharing common pool of resources). Long-term volunteering in the farm for farmer-to-farmer knowledge-sharing or for educational purposes.	1
3.A.2	Agri-food services (eating in the local community)	0.88	X			I		
3.A.3	Cultural tourism supporting local products	0.94	X	X	X	I, S		3
3.A.4	Primary agritourism workshops	0.88	X	X	X	I, S		2
3.A.5	Direct sales	0.88	X	X	X	I, S		2

(Continued)

10.3389/fsufs.2022.993892

TABLE 4 (Continued)

Indicators	Description	CVI score	Observation			Interviews		Interpretation (score)
			Huai Hin Dam	Romyen	Na Yang	Confirmed by in-depth (I), semi-structured (S), or both (I,S)	Main findings and keywords across 4 subsections	
3.A.6	New alternative jobs for community members	0.88	X	X	X	I, S		2
3.A.7	Income distribution and local economy development	added	X	X	X	I, S		2
3.B.8	Local ecosystem services increase in value (as a tourism asset)	0.88	X	X	X	I, S		2
3.B.9	Capacity building and skills development for community members	1	X	X	X	I, S		3
3.B.10	Volunteering activities in the community	added		X	X	I, S		1
4.A	Seasonal local foods/diets	0.88	X	X	X	I, S	Medicinal benefits of seasonal local, native indigenous, wild foods: higher phytonutrients, vitamins, minerals, micronutrients, fiber, and proteins.	2
4.B	Native indigenous foods/diets	0.88	X		X	I, S		1
4.C	Medicinal purpose of wild foods	0.88	X		X	I		

Note: table synthesizing research findings (source: authors).

10.3389/fsufs.2022.993892

TABLE 5 Prioritized research findings with a high value of 3 (source: authors).

Indicators	Description	CVI score	Observation			Interviews	Interpretation (score)
			Huai Hin Dam	Romyen	Na Yang		
1.E	Biodiversity preservation and habitat provision	1	X	X	X	I,S	3
2.D	Community identity and integrity, sense of place	0.94	X	X	X	I,S	3
3.A.3	Cultural tourism supporting local products	0.94	X	X	X	I,S	3
3.B.9	Capacity building and skills development for community members	1	X	X	X	I,S	3

Interpretation scored with 1 point for CVI > 0.90, 1 point for observation from all fields, 1 point for both in-depth and semi-structured interviews.

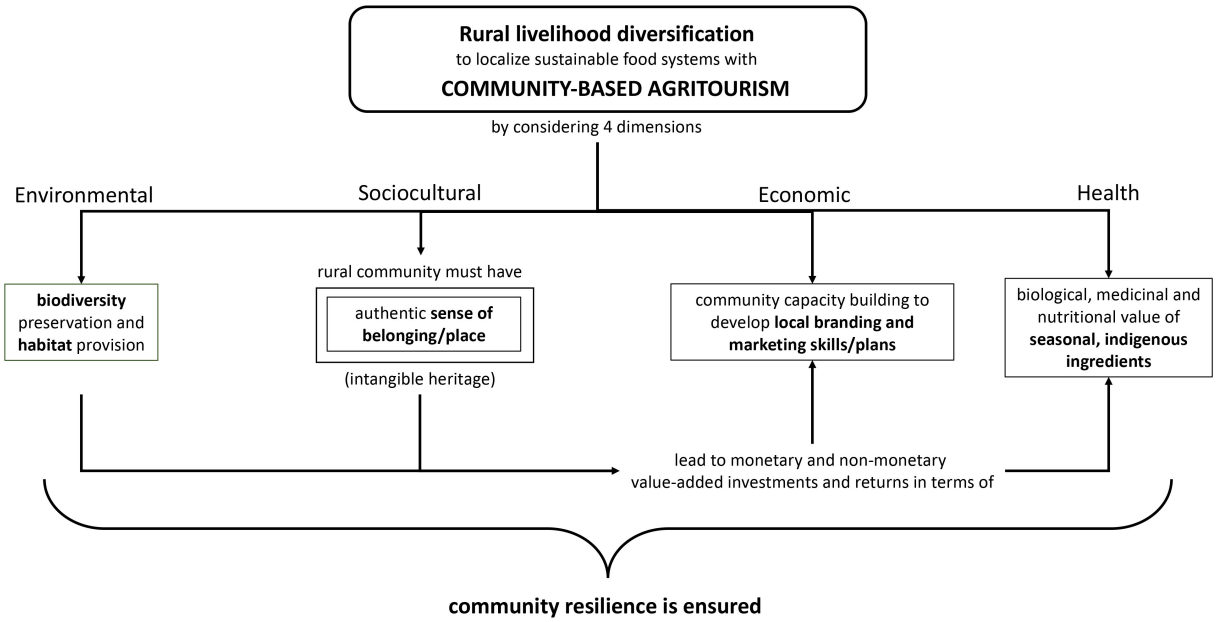

FIGURE 3
Analytical framework (source: authors).

rural community members (CM), suggesting that community leaders have more access to information concerning strategies for diversification of livelihoods. Mixed data was collected at the individual level, to understand the socio-economic and cultural background in terms of experiences, opinions, barriers, drivers, and lessons learned related to CBAT practices and other rural livelihood diversification strategies. The selection criteria for respondents included intersectional considerations to include different gender, age, ethnicity, and socio-cultural characteristics and yield more representative findings. Since all respondents possessed a phone and a mobile messenger app account these were used to conduct video interviews during the period of strict COVID-19 restrictions, from July to September 2021.

Because of the multi-stakeholder nature of sustainable food systems, respondents from different sectors were also interviewed using a semi-structured qualitative method. Stakeholders from the Government (G), the private sector (P), academia and research institutes (A), NGOs and CSOs (N), Intergovernmental organizations (I) were interviewed (Table 3). Respondents from the private sector included mainly stakeholders from the tourism and food and hospitality industry, as well as the agriculture sector. Respondents were contacted among owners of shops, restaurants, hotel

chains based in Bangkok and collaborating directly with rural communities as "middlemen" aiming to shorten the supply chain or supporting farmers in organizing farm visits. NGOs and CSOs working at the local level with Indigenous Peoples, agroforestry projects, community-based tourism and community capacity building were also contacted. Government officials included representatives from the Designated Areas for Sustainable Tourism Administration (DASTA), the Community Development Department (CDD, under the Ministry of Interior), the Tourism Authority of Thailand (TAT), the National Innovation Agency (NIA), the Ministry of Health, the Ministry of Agriculture and Cooperatives and the Ministry of National Parks. Informal talks at the provincial and district level were also conducted prior to these semi-structured interviews; nonetheless, local policymakers suggested to collect data at the national upstream of the policymaking process. Lastly, academic experts and practitioners provided data on context-specific city-regional issues related to Bangkok and surrounding provinces. Academics and researchers were selected from fields related to sustainable development and landscape planning, community development, environmental science and sustainability, resource management, sustainable consumption and production, food security and nutrition, among others.

Research results

Secondary and primary data was analyzed, coded, and later synthesized into Table 4 represented below. Indicators cover the environmental dimension (from 1.A to 1.E), the social dimension (from 2.A to 2.G), the economic dimension (from 3.A.1 to 3.B.10) and finally the health dimension (from 4.A to 4.C). The most significant findings are supported by different methods and highlighted in green in the table. In particular, the raw CVI score (derived from Table 2) is reported in the first column of findings, with high values >0.90 highlighted in green. Shadow observation from the fieldwork checklist is represented in the next column. This is coded and synthesized to register the indicators observed in the three rural case studies and is highlighted in green if present in all fields. Finally, in-depth (I) and semi-structured (S) interviews support each indicator with qualitatively rich data and are findings are highlighted in green if supported by both I and S. Keywords related to the four themes emerged from the qualitative interviews and were coded with a thematic analysis in Excel. These are examined more in detail in the following paragraphs and summarized in the column related to "main findings and keywords across the 4 subsections." Finally, the last column of the table presents the interpretation of findings which will be explained in detail in the Discussion section of this article.

Due to the presence of duplicates in the original longer list of indicators retrieved from the literature, themes were simplified as advised by more than one CVI expert/practitioner. Additional suggestions were also integrated based on the following criteria: (1) if advanced by more than one expert/practitioner, (2) if supported by observation on the field, and (3) if supported by qualitative data collected through the interviews (in depth or semi-structured). These additional indicators include: 2.G "access and control over land and natural resources," 3.A.7 "income distribution and local economy development" and 3.B.10 "volunteering activities in the community" (Table 4). Theoretical frameworks and conceptual tools retrieved from the literature were deleted if considered "not contextually appropriate" by more than one expert (e.g., the double pyramid for sustainable diets). This was motivated by the necessity to study local food systems with a regional, de-colonial approach, since specific socio-economic and cultural Thai context requires a situated analysis of sustainable local diets.

The last column of Table 4 provides the findings interpretation score to highlight in green color the most scalable and relevant indicators in the framework, which are supported by a triangulation of data. For the CVI, a value of 1 was given to CVI scores >0.90. For the interviews, a value of 1 was given when findings were confirmed by both in-depth interviews with farmers as well as by semi-structured multi-stakeholder interviews. For the observation, a score of 1 was given when the indicator was observed in all three communities (Huai Hin Dam, Romyen, Na Yang). Thus, a score from 1 to 3 was given when indicators were assessed with a higher value. Four indicators emerged with a high score of 3 (row highlighted in bold the table), indicating that they were strongly supported by all three methods (observation, CVI and interviews) and thus suggesting their potential scalability in various contexts. These are 1.E "Biodiversity preservation and habitat provision," 2.D "Community identity and integrity, sense of place," 3.A.3 "Cultural tourism supporting local products" and 3.B.9 "Capacity building and skills development for community members" and will be explored in the discussion section.

Findings from the thematic analysis of primary data are presented in the following paragraphs and structured into the four dimensions of the integrated framework (4.1 environmental, 4.2 social, 4.3 economic, 4.4 health). Interviewees' quotes are directly cited by reporting their sectoral affiliation (abbreviations in brackets refer to Table 3).

Environmental dimension

Water smart agriculture to improve community resilience to droughts

Different agroecological practices were observed in the field. In-depth interviews with community leaders confirmed how communities use resources effectively and with a sustainability approach, as their overarching strategy is to act "in harmony with nature rather than against it" (CL). The main knowledge

exchange happening in rural communities revolves around the management of soil-water-forest resources to preserve local cultural landscapes. The concept of "smart farming" and Water Smart Agriculture (or WaSA) is becoming more popular as a community practice for climate adaptation (indicator 1.A). It integrates soil and water management to ensure access to fresh water and enhance agricultural productivity at the community level. Water Smart Agriculture is less labor-intensive and focuses on how communities of smallholder farmers can collect, store and manage water in the most efficient way to be more resilient in the face of droughts.

Forests as a long-term savings account for community resilience

Community forests (indicator 1.B) are used by local communities "as a savings account" (CL) to ensure long-term community resilience to external shocks. Community forests ensure various ecosystem services such as the preservation of local biodiversity, acting as a climate mitigation strategy and as a food security mechanism for the community (G, CL, CM). Other key functions of community forests include sun blockage and protection (limiting the sun exposure for the crops cultivated below it, or canopy farming), and of compost function (leaves are usually mixed with food waste and water to maintain compost moisture). Community forests are often managed by employing concepts of industrial symbiosis and collaborative sustainable resource management (SRM). For instance, in Romyen, neighbors can join pruning and trimming of timber branches in the community forest, they can take the forest products and make biofuel with them or sell any other byproduct. This has been described as "a win-win, zero-waste solution" by a community leader in Romyen (CL). The aim of this emerging "forest-friendly production" (P) trend is to move beyond the concept of organic and toward a holistic, regenerative reforestation one where the focus is both on climate adaptation and mitigation strategies with a life cycle approach (LCA).

Regenerative agriculture: A value-added approach to soil

Staple crops such as maize are often cultivated using monoculture practices, with large quantities of land being reserved for their production. This kind of agriculture is associated with deforestation, soil degradation, agrochemical pollution, and is a significant source of greenhouse gas (GHGs) emissions. This trend is alarming at the national level in Thailand, with 5,000,000 rai (800,000 hectares) of forest being encroached upon for cash crop plantations (WWF Thailand, 2021). Nonetheless, an alternative trend focusing on agri-food systems labeled as "regenerative" (Zazo-Moratalla et al., 2019) has been gaining popularity among scholars and practitioners. Regenerative agriculture values the crucial importance of sustainable soil management by advocating for optimal circular resource uses connected to it. Indicators 1.C and 1.D in the framework reflect what community leaders have expressed as "the added value of good soil" (CL) for local communities. Such value translates in environmental benefits at the upstream of the food value chain, for instance by acting as a drought management system and thus a disaster risk reduction mechanism for the community (indicator 1.C). Nonetheless, more research is needed on the value-added potential of soil at the downstream of the food value chain, with promising examples of this being observed in the field. Soil has been explored by local communities as a combined product-service strategy, with soil compost workshops being organized in the farms. These attract consumers interested in knowing more in relation to the value of "good soil" both for the planet and for human health in terms of food safety (indicator 1.D).

Sociocultural dimension

Regional and community networks to share common-pool resources

Services of rural livelihood diversification are usually offered not at the household level but at the community level. At the community level, households can support each other by integrating products and services with a collaborative approach, by creating a common pool of resources. At the regional level, farmers groups, participatory guarantee system (PGS) groups, seed exchange networks and ancestral networks emerge as the main social networks and collective organizations of farmers (indicator 2.A). Examples in the observed communities include:

- The *Organic Farmers Group* in Huai Hin Dam community. This is an informal group composed of 10 households growing organic fruits such as papayas and bananas, and seasonal vegetables and selling them to regional middlemen.
- The *Women's Group* in Huai Hin Dam community. This is "acting as a community glue" (CL), as the women preserve the intertwined tangible and intangible local indigenous heritage. By doing so, they pass on skills and traditional practices such as weaving, tie dye and how to forage and get organic pigment from the forest, while preserving the ecosystem services in the community forest.
- The *Cha'Am Tourism Club* in Na Yang community. This acts at the district and provincial level (Cha'Am and Phetchaburi), convening different stakeholders to deliver CBT packages and support local practices.
- The *Romyen PGS Farmers' Group* in Romyen community. It acts at the regional level in Ratchaburi and is crucial to share information, skills, and capacity building among

local farmers, with the support of the private sector (Sampran model).
- The *Western Karen Network* or *Network of Karen traditional and natural resource management* in Huai Hin Dam community. It provides resources and access to information for Karen Indigenous Peoples living in the provinces of Suphan Buri, Kanchanaburi, Uthai Thani, Ratchaburi and Phetchaburi. "Members of the network share issues that they are facing and help each other in finding solutions or supporting traditions by taking part in each other's ceremonies" (CL).

Such networks are crucial to ensure intersectional participation (indicator 2.B) when planning sustainable local food systems (Mphande, 2016; Fayasse et al., 2019). In terms of intersectional participation at the local level, community members have highlighted how the role of younger generations must be elevated to that of "mediators and ambassadors, bridging the community with outsiders" (CL).

Co-creation of practices to limit the risk of cultural appropriation

Community members showed a high degree of awareness in terms of the danger of cultural appropriation coming from their interaction with outsiders (indicator 2.D). This risk has been controlled and avoided by not disrupting the ways of life and routines of community members. The most effective practice developed by community members was to prioritize collaborative pre-planned, organized trips compatible with the communities' seasonal calendars and rhythms. Community learning centers emerge as "a classroom, a social laboratory for farmer-to-farmer knowledge sharing" (CL). These can limit the risk of cultural appropriation by emphasizing the community's sense of place. The Karen Museum in Huai Hin Dam provides an example of how the community, supported by a local NGO, has built a cultural bridge to communicate local indigenous values and beliefs to outsiders such as visitors and tourists (N). This facilitates the process of knowledge sharing (indicator 2.C) while reducing the risk of cultural appropriation.

Economic dimension

Value-added from existing community assets

Different arrangements for homestay and agri-accommodation have been prototyped in the selected communities in relation to indicator 3.A.1. A. A community leader in Na Yang shared how, while she does not currently have the financial capacity to invest in developing home stay services and infrastructure, she plans "to provide a more flexible and convenient agri-camping service for visitors" (CL). Indicator 3.A.2 related to "agri-food services" has been used as an umbrella term to include emerging practices of "culinary tourism" or "farm to fork experiences." With such practices, the local communities share home cooked meals with visitors. From the primary data collected, it emerged that leveraging on the value of local foods with tasting experiences can create added value and income streams for rural communities. This can also "build a deeper trust between producers and urban consumers who are not used to cook wild, indigenous foods" (CL).

Diversification of crops

From an economic perspective, the main source of income for most rural communities is agriculture. Although most community members are aware of the negative environmental externalities of monocropping practices, they rely on them as a strategy to ensure a stable income flow for their household (as in the case of maize monocropping in Huai Hin Dam). Industrial farming practices are usually supported by stronger market demands. While these have a negative impact on the quality of the soil and usually degrade it, they can provide a consistent market demand and reliable source of income to farmers. This is why diversifying crops and integrating both staple and cash crops has emerged in the literature (Lin, 2011) and on the field as an acceptable social strategy to enhance community resilience. This research confirms that by growing both staple and cash crops to diversify streams of income, communities can effectively reach diverse markets of consumers with a higher purchasing power.

Rural workshops

The main workshop activities observed in local communities were measured with indicator 3.A.4 and included: crop rotation, soil management, seedling planting, harvesting food in the farm and surrounding forests (e.g., wild chrysanthemum in Romyen, rose apples and coconut in Na Yang, foraging in the forest in Huai Hin Dam), creating organic fertilizer, composting, natural tie-dye workshops (e.g., guided by the *Women's Group* in Huai Hin Dam) and workshops with farm animals (e.g., collecting eggs in Na Yang community). Agri-sports (such as trekking) was suggested as an additional workshop category to be offered in the future, in Huai Hin Dam and Na Yang communities in particular (CL).

Prior to COVID-19, further rural volunteering activities brought additional opportunities for knowledge sharing and skills development at the local level, but these were stopped due to safety concerns. These were divided into (1) farmer-to-farmer knowledge-sharing experiences (farmers exchanged information to learn different agricultural practices) or (2) educational stays (researchers and students from provincial universities conducting their research fieldwork).

New job opportunities (indicator 3.A.6) have also emerged at the community level thanks to rural livelihood diversification

practices. Community members work part-time as a cook, a tour guide, a workshop demonstrator or a so-called "environmental educator" (CL, CM). Community members can generate income from sharing their knowledge with visitors, supported by resources initially provided by regional partners such as the provincial Government or regional universities. Such resources vary from seeds to infrastructure (such as beds and sheets for agri-accommodation services).

Community-driven brands and marketing

Communities' marketing strategies to sell their local products were measured with indicators 3.A.3 and 3.A.5 and can be divided into two categories: (1) sales taking place directly at the farm (farm-gate sales) and (2) sales taking place at re-selling points in urban or peri-urban settings (farmers' markets), mainly in the Bangkok Metropolitan Area (BMA). Younger farmers have also been playing a crucial role in terms of managing social media and co-developing marketing strategies, due to their higher educational background and technological skills, which are usually appreciated by the community elders (CL). Effective communities' strategic marketing practices include a circular, closed loop, zero-waste branding**:** selling byproducts to increase economic revenue and reduce waste. For instance, the byproduct of coffee production, cascara (also known as "coffee fruit"), is used by local communities to make compost, but as mentioned by a community-driven coffee enterprise, "the flower has much more potential to be sold as a byproduct, as tea, to diversify the community's sources of income. In this way, the community benefits from sustainably integrating both coffee and tea production" (P).

Health dimension

Health value of seasonal, native, indigenous foods

Important health benefits of native, indigenous foods and diets have been identified in the most recent report published by FAO, related to Indigenous Peoples' food systems (FAO, 2021) and are supported by primary data collected by this research. Due to an increased focus on the immunological benefits of local diets after the COVID-19 pandemic, there is evidence that native foods and diets (integrated with indicator 4.B) can be more nutrient-dense compared to processed foods (Béné, 2020). Native foods can include local grains, seeds, vegetables, fruits locally produced in a specific area. Other health benefits include the fact that they are higher in phytonutrients, vitamins, minerals, micronutrients, fiber, and proteins (FAO, 2021). As mentioned by a representative of the Ministry of Health, "by connecting the field of public health and sustainable food systems, we can integrate and promote public health policies that support the use of local Thai food as traditional medicine" (G). Traditional practices and wild foods are receiving more institutional recognition for their medicinal value (indicator 4.C), suggesting a transition toward integrated sustainable food and public health planning policies.

Environmental and socio-economic value of seasonal, native, indigenous foods

Seasonal diets (indicator 4.A) were considered as a climate adaptive strategy among research respondents. At the production stage, they ensure food security for communities as they can rely on native, indigenous foods. Seasonal local diets adapt to the constantly unpredictable temperature resulting from climate change, and to any external ecosystem shock such as pest diseases, droughts, and pandemic crises. "Local foods and indigenous crops are used as the main asset in the presentation and preparation of traditional recipes. They become a selling point for eating organic food in local communities depending on what is in season" (N). As mentioned by a chef based in Bangkok, "the food industry is becoming increasingly interested in the so-called *flavor profile* of wild, indigenous, native ingredients as these are different and more nutritious compared to what consumers are used to" (P).

Conclusion and discussion

This article explored how rural livelihood diversification practices, such as community-based agritourism, can effectively localize sustainable food systems by ensuring community resilience. Such practices must be co-developed with an intersectional, interdisciplinary, participatory approach to ensure stakeholder engagement within complex overarching regional food systems. To do so, this study has proven how ground-truthing research methods for data collection and analysis can screen and effectively select relevant indicators to localize sustainable development in rural communities. This can contribute to the process of open science, applied research and participatory action research, ensuring the representativeness and trustworthiness of research findings. The suggested integrated framework was developed with a mixed top-down (CVI) and bottom-up (qualitative interviews, observation) method and it can provide a tool for researchers and practitioners working at the intersection of sustainable food planning, public health officials, community development organizations and NGOs/CSOs working at the forefront of what has recently been defined in the literature as "agritourism rural network" hubs (Ammirato and Felicetti, 2014; Ammirato et al., 2020), effectively achieving sustainable development goals in rural areas. The set of indicators proposed is useful for community self-assessments prior to co-designing livelihood diversification practices, disentangling complex environmental, socio-economic and health dimensions.

Indicators with a highest interpretation score of 3 were selected as the most relevant and scalable findings from the integrated framework (Table 4) and are presented in Table 5. This research has highlighted the importance of co-producing and ground-truthing indicators for rural livelihood diversification practices to localize sustainable development goals.

Findings have important implications for long-term community resilience. As highlighted in the literature review, "diversification could reduce the level of disruption in supply chains faced by producers and other actors along the food supply chain" (Béné, 2020, p.812). Figure 3 translates such findings into the main analytical framework of this research, visualizing the implications of rural livelihood diversification for sustainable local food systems and community resilience.

Summary of managerial implications

More research is needed to deliver an institutional analysis of sustainable local food systems. An important expectation gap between producers and consumers was raised by research respondents and needs to be further explored to understand how to reconnect the upstream and downstream of the food value chain through sustainable local food systems. Additional studies can contribute to fill in those research gaps that were not considered by this study due to COVID-19, time and scope constraints. Despite such intrinsic limitations, this paper is a practical contribution to advance four planning strategies of community-based agritourism. If systematically designed from its early stages of implementation, community-based agritourism can both localize sustainable food systems and ensure community resilience. This study outlines how sustainable community-based agritourism plans need to be designed following one or more of these value-added strategies:

1) To value rural biodiversity preservation. By requiring less inputs in terms of water, pesticides, and fertilizers and by reducing transportation miles, a sustainable local food system contributes to "biodiversity preservation and habitat provision" (indicator 1.E in Table 5). Gastro-tourism or culinary tourism services, "farm-driven cuisines" and "menus supporting local biodiversity" emerged in the Bangkok city-region as strategies to be co-developed with the support of the private sector. Various environmentally conscious chefs and SMEs aim to enrich instead of depleting local ecosystems, by giving more visibility to regenerative agricultural practices in rural communities and by linking such communities with new consumer niches. Such a community-based agritourism trend can support sustainable links between urban food consumption and environmental biodiversity preservation practices in rural communities (Sosa et al., 2021).
2) To value the authentic sense of belonging in rural communities. The complex interrelation of tangible (environmental) and intangible (sociocultural) heritage possessed by a local community is an alternative asset. In Thailand, rural development has been transitioning from a commodity-focused strategy toward a more value-added strategy focused on the unique sense of place/belonging of local communities (Natsuda et al., 2012). This approach to rural development involves a double strategy: knowledge sharing at the national level to segment target markets for local communities and evenly redistributing mass tourism at the provincial level to ensure community resilience. An example of how the aspect of authentic sense of belonging can be translated into community-based agritourism products comes from Huai Hin Dam. Here, two main products are being sold: Karen traditional meals cooked with organically grown vegetables and fabric handicrafts reviving and preserving the community's indigenous traditional ecological knowledge.
3) To value rural communities' unique local branding. "Capacity building and skills development for local community members" (indicator 3.B.9 in Table 5) relates to the long-term value created at the local level for community members. As a top-down approach, the Government or other stakeholders can organize seminars and training programs to empower community members with such know-how. As a bottom-up approach, it can be a more horizontal peer-to-peer, farmer-to-farmer knowledge exchange, for example in the form of the Participatory Guarantee System (PGS) or other informal grassroots networks enabling knowledge sharing. Successful marketing strategies developed by the three case studies observed include circular, closed-loop, zero-waste branding to sell rural byproducts, to increase economic revenue and reduce food waste. This integrates a circularity element in the design of sustainable local food systems. It also provides community resilience in face of external shocks by developing a strong community-driven brand which can target alternative consumer niches and markets.
4) To value the biological, medicinal, nutritional benefits of traditional native foods. When the value of seasonal, indigenous, native produce is recognized by community as an asset, its potential to attract visitors and generate alternative streams of income motivates the community to implement sustainable resource management and preserve their traditional ecological knowledge.

Data availability statement

The datasets presented in this article are not readily available because data is protected due to privacy

considerations. Requests to access the datasets should be directed to Sofia.cavalleri@sei.org.

Ethics statement

The studies involving human participants were reviewed and approved by the Research Ethics Review Committee for Research Involving Human Subjects: The Second Allied Academic Group in Social Sciences, Humanities and Fine and Applied Arts at Chulalongkorn University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

SC: conceptualization, methodology, software, formal analysis, data curation, writing–original draft, and writing–review and editing. PT and CG: supervision, methodology, conceptualization, writing–original draft, writing–review and editing, and visualization. All authors contributed to the article and approved the submitted version.

Funding

This research was supported by the joint doctoral scholarship provided by the Stockholm Environment Institute (SEI Asia) and the Department of Environment, Development and Sustainability (EDS, Graduate School, Chulalongkorn University). Fieldwork expenses were partially supported by Chulalongkorn 90 Years Scholarship.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fsufs.2022.993892/full#supplementary-material

References

Abu Hatab, A., Cavinato, M. E. R., Lindemer, A., and Lagerkvist, C.-J. (2019). Urban sprawl, food security and agricultural systems in developing countries: a systematic review of the literature. *Cities* 94, 129–142. doi: 10.1016/j.cities.2019.06.001

Akber, A Md., Islam, A Md., Rahman, M Md., and Rahman, M. R. (2021). Crop diversification in southwest coastal Bangladesh: insights into farming adaptation. *Agroecol. Sustain. Food Syst.* 46:316–324. doi: 10.1080/21683565.2021.1989105

Ammirato, S., and Felicetti, A. M. (2014). The agritourism as a means of sustainable development for rural communities: a research from the field. *Int. J. Interdiscip. Environ. Stud.* 8, 17–29. doi: 10.18848/2329-1621/CGP/v08i01/53305

Ammirato, S., Felicetti, A. M., Raso, C., Pansera, B. A., and Violi, A. (2020). Agritourism and sustainability: what we can learn from a systematic literature review. *Sustainability* 12, 9575. doi: 10.3390/su12229575

Anselmi, S., and Vignola, R. (2021). Participatory certifications for the sustainability transition of food systems in costa rica: barriers and opportunities for scaling out. *Agroecol. Sustain. Food Syst.* 46:273–293. doi: 10.1080/21683565.2021.1989106

Barzola, C. L., Dentoni, D., Allievi, F., van der Slikke, T., Isubikalu, P., Oduol, J. B. A., et al. (2019). "Challenges of youth involvement in sustainable food systems: lessons learned from the case of farmers' value network embeddedness in ugandan multi-stakeholder platforms," in *Achieving the Sustainable Development Goals Through Sustainable Food Systems*, eds R. Valentini, J. L. Sievenpiper, M. Antonelli, and K. Dembska (Springer International Publishing), 113–129.

Béné, C. (2020). Resilience of local food systems and links to food security – a review of some important concepts in the context of COVID-19 and other shocks. *Food Secur.* 12, 805–822. doi: 10.1007/s12571-020-01076-1

Boossabong, P. (2019). Governing Bangkok's city food system: engaging multi-stakeholders for smart, sustainable and inclusive growth. *City Cult. Soc.* 16, 52–59. doi: 10.1016/j.ccs.2018.05.001

Chambers, R., and Conway, G. (1992). *Sustainable Rural Livelihoods: Practical Concepts for the 21st Century*. Institute of Development Studies. Available online at: https://opendocs.ids.ac.uk/opendocs/handle/20.500.12413/775 (accessed December 20, 2020).

Conti, C., Zanello, G., and Hall, A. (2021). Why are agri-food systems resistant to new directions of change? A systematic review. *Glob. Food Sec.* 31, 100576. doi: 10.1016/j.gfs.2021.100576

Duxbury, N., and Richards, G. (2019). *A Research Agenda for Creative Tourism*. Cheltenham: Edward Elgar Publishing.

FAO (2018). *Sustainable Food Systems Concept and Framework*. (Rome: FAO).

FAO (2021). *Indigenous Peoples' Food Systems*. FAO Alliance of Bioversity International and CIAT. Rome: FAO.

Fayasse, N., Phiboon, K., and Filloux, T. (2019). Public policy to support young farmers in Thailand. *Outlook Agric.* 48, 292–299. doi: 10.1177/0030727019880187

Gallent, N. (2006). The rural–urban fringe: a new priority for planning policy? *Plan. Pract. Res.* 21, 383–393. doi: 10.1080/02697450601090872

Garcia, S. N., Osburn, B. I., and Jay-Russell, M. T. (2020). One health for food safety, food security, and sustainable food production. *Front. Sustain. Food Syst.* 4, 1. doi: 10.3389/fsufs.2020.00001

Gebru, G. W., Ichoku, H. E., and Phil-Eze, P. O. (2018). Determinants of livelihood diversification strategies in Eastern Tigray Region of Ethiopia. *Agric. Food Secur.* 7, 62. doi: 10.1186/s40066-018-0214-0

Haidar, M. (2009). *Sustainable Livelihood Approaches: The Framework, Lessons Learnt From Practice and Policy Recommendations (Expert Group Meeting on Adopting the Sustainable Livelihoods Approach for Promoting Rural Development in the ESCWA Region)*. United Nations Economic and Social Council, Economic and Social Commission for Western Asia (ESCWA). Beirut: UNDP.

Kasimba, S., Covic, N., Motswagole, B., Cockeran, M., and Claasen, N. (2021). Street vending of traditional and indigenous food and the potential contribution to household income, food security and dietary diversity: the case of Gaborone, Botswana. *Agroecol. Sustain. Food Syst*. 46:181–199. doi: 10.1080/21683565.2021.1988799

Le, N. P., and Dung, N. M. (2018). Multifunctionality of peri-urban agriculture: a case study in Trau Quy Commune, Hanoi City. *Int. J. Rural Dev. Environ. Health Res.* 2, 8–19. doi: 10.22161/ijreh.2.4.2

Leach, M., Nisbett, N., Cabral, L., Harris, J., Hossain, N., and Thompson, J. (2020). Food politics and development. *World Dev.* 134, 105024. doi: 10.1016/j.worlddev.2020.105024

Lin, B. B. (2011). Resilience in agriculture through crop diversification: adaptive management for environmental change. *Bioscience* 61, 183–193. doi: 10.1525/bio.2011.61.3.4

Mphande, F. A. (2016). "Rural livelihood," in *Infectious Diseases and Rural Livelihood in Developing Countries*, ed F. A. Mphande (Singapore: Springer), 17–34.

Natsuda, K., Igusa, K., Wiboonpongse, A., and Thoburn, J. (2012). One village one product – rural development strategy in Asia: the case of OTOP in Thailand. *Can. J. Dev. Stud.* 33, 369–385. doi: 10.1080/02255189.2012.715082

Nunes, R. (2017). Rethinking justice in city-regional food systems planning. *Built Environ.* 43, 447–459. doi: 10.2148/benv.43.3.447

Office of the Permanent Secretary, Ministry of Education Thailand (2019). *2562/2019 Educational Statistics*. Bangkok: Ministry of Education Thailand.

Perez-Neira, D., Simón, X., and Copena, D. (2021). Agroecological public policies to mitigate climate change: public food procurement for school canteens in the municipality of Ames (Galicia, Spain). *Agroecol. Sustain. Food Syst*. 45, 1528–1553. doi: 10.1080/21683565.2021.1932685

Polit, D. F., and Beck, C. T. (2006). The content validity index: are you sure you know what's being reported? critique and recommendations. *Res. Nurs. Health* 29, 489–497. doi: 10.1002/nur.20147

Rigg, J., Salamanca, A., Phongsiri, M., and Sripun, M. (2018). More farmers, less farming? Understanding the truncated agrarian transition in Thailand. *World Dev.* 107, 327–337. doi: 10.1016/j.worlddev.2018.03.008

Sachs, J. (2015). *The Age of Sustainable Development*. New York, NY: Columbia University Press.

Santiago-Vera, T., Rosset, P. M., Saldivar, A., Ferguson, B. G., and Méndez, V. E. (2021). Re-conceptualizing and decolonizing resilience from a peasant perspective. *Agroecol. Sustain. Food Syst*. 45, 1422–1440. doi: 10.1080/21683565.2021.1952362

Scoones, I. (1998). *Sustainable Rural Livelihoods: A Framework for Analysis*. Brighton: IDS.

Serrat, O. (2017). "The sustainable livelihoods approach," in *Knowledge Solutions*, ed O. Serrat (Singapore: Springer), 21–26.

Sosa, M., Aulet, S., and Mundet, L. (2021). Community-based tourism through food: a proposal of sustainable tourism indicators for isolated and rural destinations in Mexico. *Sustainability* 13, 6693. doi: 10.3390/su13126693

Srinivasan, A., Ling, F. H., and Mori, H. (2011). *Climate Smart Development in Asia: Transition to Low Carbon and Climate Resilient Economies*. London: Routledge.

Thorbeck, D., and Troughton, J. (2016). "Connecting urban and rural futures through rural design," in *Balanced Urban Development: Options and Strategies for Liveable Cities*, eds B. Maheshwari, V. P. Singh, and B. Thoradeniya (Cham: Springer International Publishing), 45–55.

Valdés, A., and Foster, W. (2010). Reflections on the role of agriculture in pro-poor growth. *World Dev.* 38, 1362–1374. doi: 10.1016/j.worlddev.2010.06.003

Wang, B., Tian, L., and Yao, Z. (2018). Institutional uncertainty, fragmented urbanization and spatial lock-in of the peri-urban area of China: a case of industrial land redevelopment in Panyu. *Land Use Policy* 72, 241–249. doi: 10.1016/j.landusepol.2017.12.054

Winter, E., Grovermann, C., Aurbacher, J., Orsini, S., Schäfer, F., Lazzaro, M., et al. (2021). Sow what you sell: strategies for integrating organic breeding and seed production into value chain partnerships. *Agroecol. Sustain. Food Syst*. 45, 1500–1527. doi: 10.1080/21683565.2021.1931628

Wiskerke, J. S. C. (2009). On places lost and places regained: reflections on the alternative food geography and sustainable regional development. *Int. Plan. Stud.* 14, 369–387. doi: 10.1080/13563471003642803

World Tourism Organization (2009). Tourism and community development: Asian practices. UNWTO, Madrid.

WWF Thailand (2021). Journey of Sustainable Consumption and Production: a Localized Approach. Establishing low-carbon sustainable consumption and production in the food system, Thailand. WWF.

Zasada, I. (2011). Multifunctional peri-urban agriculture—a review of societal demands and the provision of goods and services by farming. *Land Use Policy* 28, 639–648. doi: 10.1016/j.landusepol.2011.01.008

Zazo-Moratalla, A., Troncoso-González, I., and Moreira-Muñoz, A. (2019). Regenerative food systems to restore urban-rural relationships: insights from the concepción metropolitan area foodshed (Chile). *Sustainability* 11, 2892. doi: 10.3390/su11102892

Zhao, P. (2012). Urban-rural transition in China's metropolises: new trends in peri-urbanisation in Beijing. *Int. Dev. Plan. Rev.* 34, 269–294. doi: 10.3828/idpr.2012.20