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The transformative value chain: rethinking food system interventions

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Food value chains (VC) are an integral part of food systems, and (VC) programs remain central in the work of development agencies. Despite their popularity among donors and their attempts to tackle food and nutrition security, poverty alleviation and environmental sustainability, food value chain interventions are at crossroads. The ongoing food system crisis has ultimately put a square emphasis on food as a nexus issue. The objective of this paper is to review the history and conceptual basics behind food VC development and to suggest changes in the way interventions are designed and implemented in order to face the current critical juncture of food systems. The paper reviews theoretical as well as empirical underpinnings of contemporary food value chain interventions. Three transformative concepts, i.e., system thinking, transformative capacity and strong sustainability, embedded within agroecological principals, are suggested to replace the traditional paradigm of the sustainable food VC development. A new, principle-based perspective on food value chain development, "the transformative value chain perspective," is proposed to ensure that future VC promotion contribute to the necessary sustainability transformation of our food systems.

KEYWORDS

food value chains, food system transformation, sustainability, agroecology, transformative value chain perspective

1. Introduction

Food systems worldwide are facing numerous challenges related to environmental hazards, food security and nutrition and social wellbeing (Caron et al., 2018; FAO, IFAD, UNICEF, WFP and WHO, 2021). Currently, most land degradation and loss of biodiversity can be linked to agriculture (IPBES, 2019), which is not only the greatest freshwater consumer (World Bank, 2022) but also generates more than 30% of all greenhouse gas emissions (IPCC, 2022). At the same time, more than 828 million people do not eat enough food (FAO, IFAD, UNICEF, WFP and WHO, 2022), around 3 billion people cannot afford healthy diets, and 2 billion people are overweight or obese (Webb et al., 2020; Stevens et al., 2022). Being major risks to human health, biodiversity, and climate, today's food systems are operating beyond planetary boundaries (Rockstroem et al., 2021; McKay et al., 2022), indicating they require substantial transformation (Sachs et al., 2021). Paradoxically, most of the world's poor and food and nutrition insecure are small-scale agricultural producers living in rural areas (Castañeda et al., 2018; Woodhill et al., 2022), despite targeted development cooperation for improved agricultural production, improved income-generating activities, better access to markets, and vertical integration in the Global South (Humphrey and Navas-Alem an, 2010; Stoian et al., 2016; Donovan and Poole, 2014).

Food value chains (VC) are integral to food systems and remain central in the food security, social justice, and environmental sustainability work of development agencies (FAO, 2015; AGRA and UNDP, 2020; Barrett et al., 2020; IPES-Food, 2020). Food VCs are promoted in many countries through bilateral and multilateral technical cooperation programs with the aim of increasing income for small farming enterprises, boosting employment, and improving regional food supply in target regions. Such programs support smallholder farms increase their agricultural production and income by, for example, supporting their market integration, ensuring jobs in processing, and ensuring a greater portion of value added from agricultural production remains in the region, especially in rural areas (Fan and Rue, 2020). Despite widespread recognition of pro-poor agricultural growth for increasing orientation towards sustainability goals (FAO, 2014; Schmidt et al., 2019), there is no evidence that food VC interventions deliver on the expected sustainability outcomes (Ton et al., 2011; Stoian et al., 2016; Mausch et al., 2020). Consequently, within the framework of development cooperation programs, two pressing questions arise:

(1) How can we ensure VC interventions are integrated in food system transformation agendas in the future?
(2) With regard to their transformative potential, how can concepts like strong sustainability, transformative capacity, and system thinking be integrated in VC interventions?

The aim of this paper is to outline how future VC interventions can contribute towards transforming food systems to achieve sustainability. The paper reviews the status quo in food VC development paradigms and their evidenced impacts, discusses some of the transformative concepts related to food system transformation, and proposes a transformative perspective on food VC design and implementation.

In Section 2, we explore theories and literature underpinning VC interventions in development contexts and, in Section 3, we discuss recent findings and thinking in sustainability and resilience research. Section 4 proposes a way of incorporating the new concepts into the systematic and holistic treatment of VC programs, producing a normative paradigm that we term the *Transformative Food Value Chain (TFVC)*. In Section 5, we provide some pathways for the future of food value chain interventions using the TFVC approach.

2. The value chain approach in international development cooperation

2.1. Origins and baseline concepts

The VC approach stems from and merges several theoretical strands, including agri-business and supply chain management, world-systems theory, and dependency theory (Porter, 1985; Hopkins and Wallerstein, 1986; Kaplinsky and Morris, 2001; Gereffi and Sturgeon, 2013). The origin of the VC approach for development contexts can be traced back to the French *filière* approach of VC analysis in the 1960s, Wallerstein's world-systems theory of the 1970s, and the value system introduced by Porter's competitive advantage theory in the 1980s (Porter, 1985). The filière concept was developed to study export products in former French colonies and gave specific attention to physical trade flows. Porter (1985) competitive advantage theory introduced a value system that enables identification of value addition through every step of the supply chain. In the 1990s, Gereffi and other scholars extended the focus beyond domestic products by framing global commodity chains and analyzing power relations in the coordination of globally dispersed, but interlinked, production systems (Gereffi and Korzeniewicz, 1994; Gereffi, 1994). The global commodity chain framework later evolved into what has become known as global VCs, reflecting a more dynamic view of chain governance (Sturgeon et al., 2008; Gereffi and Sturgeon, 2013). The global VC framework and literature on the global VC framework developed in the last two decades have been broadly used as a basis for donor-led VC interventions.

Following the 2008 release of the World Bank publication *Agriculture for Development* that focuses on agricultural growth, VC interventions regained momentum in agricultural development agendas. Within a large portfolio of tools and approaches, VC interventions emerged as the new development model for achieving the Millennium Development Goals and, later, the Sustainable Development Goals (Donovan and Poole, 2014; Stoian et al., 2021). The underlying idea is that a private-sector-driven VC development process would support inclusion of smallholder farmers in markets, thereby improving livelihood security and guaranteeing a decent standard of living (Donovan and Poole, 2014; Stoian et al., 2021).

In agri-food development programs, the use of VC approaches has especially been driven by growing demand for agri-food products, with a special focus on cash crops and specialty crops considered as having great potential for achieving both economic and social benefits (Humphrey and Navas-Alem an, 2010; Ricketts et al., 2014; Devaux et al., 2018). Over the last two decades, VC approaches have enjoyed widespread popularity among donors, including FAO, the German Ministry for Economic Cooperation (*Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung*: BMZ), the United States Agency for International Development (USAID), the Value Chain Analysis for Development of the European commission (EU) and development agencies such as the German Agency for International Cooperation (*Deutsche Gesellschaft für internationale Zusammenarbeit*; Taglioni and Winkler, 2016).

From a donor perspective, the primary goal of VC interventions has been so-called 'pro-poor growth' under the assumption that VC development with pro-poor growth objectives will help reduce poverty and eradicate hunger (Humphrey and Navas-Alem an, 2010; Springer-Heinze, 2018; Stoian et al., 2021). In addition to addressing pro-poor growth and smallholder-inclusion objectives, VC interventions have increasingly been employed to address sustainability objectives, for example, related to food and nutrition security (De La Peña et al., 2018; Gelli et al., 2020).

As an analytical framework, the VC concept has mainly been used to identify and map the actors, structures, and dynamics involved in VCs (Kaplinsky and Morris, 2001) with analyses focusing on the positioning of chain actors, the linkages between them, the distribution of value added along the chain, and opportunities for upgrading (Gereffi et al., 2001; Kaplinsky and Morris, 2001; Barrientos and Gereffi, 2011). In practice, donor-led VC interventions have tended to follow two common approaches: one focusing on individual junctions along VCs in governance structures and institutional environments (Ponte and Sturgeon, 2014) and the other taking a

firm-centric approach that promotes leading private-sector actors and their direct environment (FAO, 2015).

The VC approach for development assumes that the labor market acts as a central link between economic growth and its social impact. The underlying hypothesis is that faster economic growth leads to a larger number of people who will find work in the formal sector (Kaplinsky and Morris, 2001). The idea that integrating smallholder farmers into partnerships with agri-business firms can generate benefits for national economies, private investors, and livelihoods is at the core of VC interventions in development programs (German et al., 2020).

2.2. Integrating sustainability goals in VC development agendas: the example of FAO's sustainable food VC framework

Over the last two decades, VC approaches have incorporated sustainability concepts and the goals of the Millennium Development and Sustainable Development agendas of the BMZ, FAO, and USAID (Taglioni and Winkler, 2016). A good example of placing food VC development at the core of sustainable food systems with the goals of reducing poverty and food and nutrition insecurity is FAO's sustainable food VC (SFVC) development framework (FAO, 2014).

Conceptually, FAO's SFVC is based on a three-pillar sustainability model (see discussion in Section 3.2), with the underlying assumption that food insecurity is a symptom of poverty (FAO, 2014). According to this paradigm, households escape poverty when they have adequate financial resources, thereby creating additional demand for food supply. In turn, this demand helps drive competition between supply chains, thus decreasing prices. From this perspective, the objective of such interventions is not to preserve smallholder farming but, rather, to alleviate poverty by ensuring broad-based job creation, income growth, and wealth accrual. In particular, FAO (2014) stresses that supporting smallholder farming by means of value chain integration does not contribute to poverty reduction. Rather, the assumption is that trying to keep all smallholder farmers, and more particularly the poorest farmers, in farming and in rural areas may hinder agricultural development, large-scale poverty reduction and hunger eradication (FAO, 2014). Based on that, SFVC proposes that development efforts are focused on the most capable, driven and commercially oriented smallholder farmers. From this perspective, unsustainable food systems are a consequence of poor sector development and poverty. Therefore, poverty alleviation and food security are seen as benefits to be reaped from developing VCs into "agricultural growth engines" (FAO, 2014).

FAO's sustainable development paradigm exhibits most of the features common to the agricultural development processes in most countries of the Organization for Economic Co-operation and Development, including structural change reducing labor, agri-technical innovation and intensification, and social programs for the poorest rural households. The mechanisms driving the paradigm include higher returns on assets for entrepreneurial farmers, salaried incomes for the 70–90% of actors who will be forced to leave farming, and higher tax revenues for distribution to victims of disasters and the extreme poor. According to FAO (2014), SFVC development is intended to benefit farms and firms that "produce particular raw agricultural materials and transform them into particular food products that are sold to final consumers and disposed of after use, in a manner that is profitable throughout, has broad-based benefits for society and does not permanently deplete natural resources" (p. 7).

The FAO framework is based on a triple-bottom-line (TBL) concept of sustainability which identifies sustainability as a set of equally important economic, social, and environmental goals. These goals are presented as measurable outcomes that can be determined objectively. In this understanding, sustainability goals are not integrated but compartmentalized and additive, meaning that they are looked at separately using a variety of indicators, the total sum of the analysis indicating "sustainability." Moreover, there is a tendency to assume a "win-win scenario" where social and environmental goals reinforce economic gains. In particular, the FAO SVCD framework stresses that "social and environmental sustainability are themselves becoming sources of value creation and competitiveness. For example, a greener product image may represent a higher value to consumers and (positively) differentiate the product in the market" (FAO, 2014). Here, economic goals such as profit are depicted as the "main goal" of SVC development, and it is warned that the pursuit of social or environmental goals runs "the risk that […] VC development is confused with social support or environmental protection programs which are of a fundamentally different nature" (FAO, 2015). All in all, the FAO framework and the TBL is a "weak" understanding of sustainability and stands directly at odds with strong sustainability conceptions whereby society and economy are subsystems of the environment and urges to consider both the uncertainty and irreversibility of environmental destruction. Following this line, the integrity of ecological systems must be preserved, meaning that certain thresholds (planetary boundaries) must not be crossed. Setting these thresholds is not only a question of social and political preference but ecosystem resilience: the extent to which an ecosystem is able to recover from shocks and stress.

2.3. Impact of value chain development interventions on expected sustainability outcomes

As shown in the previous section, VC interventions have generally aimed at reducing poverty and eradicating hunger by means of pro-poor growth. Nevertheless, clear evidence of the food security or poverty impacts of such interventions is ambiguous or lacking (Mausch et al., 2020). To date, the most exhaustive review of VC impacts was conducted in Humphrey and Navas-Alem an (2010). Their review of 30 VC interventions revealed that the poorest often do not benefit from VC interventions because of their orientation to "winners" (better-off farmers), thus hindering reduction of average poverty levels and failing to address the most vulnerable as a target group (Humphrey and Navas-Alem an, 2010; Stoian et al., 2016). Similarly, an evaluation of agricultural VC interventions undertaken by German bilateral cooperation programs revealed that smallholders' successful participation in VCs depends on their access to a minimum level of resources before the intervention is applied and that resource-poor households did not benefit from interventions (Kaplan et al., 2016). Other studies have found a positive, but moderate, impact on producer prices and farmer incomes as a result of VC interventions but no positive impact on food security (Herrmann et al., 2018; Ebata and Huettel,

2019). Although the goal of increasing productivity through, for example, increased mechanization and integration of innovations at different VC stages, is at the heart of such interventions, they have paradoxically led to inefficiencies in the food system by, for example, increasing food losses or converting human food to animal feed (Benton and Bailey, 2019).

Moreover, there is little evidence of how such interventions support poverty reduction (Humphrey and Navas-Alem an, 2010; Ton et al., 2011; Höffler, 2020) and food and nutrition security (Gelli et al., 2020; German et al., 2020; Nicholson et al., 2021). Increasing challenges related to the sustainability of food systems ranging from environmental concerns to dietary, health, equity, power, and trade issues are raising doubts that the VC approach, at least in the ways it is currently promoted, is the appropriate instrument for holistically tackling sustainability challenges within food systems (Mausch et al., 2020).

Lack of evidence regarding the impacts of VC interventions is partly due to the complexity of the horizontal and vertical socio-technical structures forming VCs, which entail many actors intervening at different stages and pose challenges for assessment. It is likely that other structural problems, such as criminality or land tenure rights, can impact VC intervention outcomes (Mausch et al., 2020). However, as they are external to the influence of VCs, such factors make the linking of outcomes to interventions during planning and assessment problematic (Donovan and Poole, 2014).

The dearth of proven impacts can be explained not only by lack of evidence in impact assessments but also by an absence of sound statistical design in existing studies. Ton et al. (2011), for example, found that the impacts of VC interventions often rely only on anecdotal evidence. Despite awareness among practitioners of the importance of aggregated poverty impact assessments, no reference is made to national poverty levels or similar quantitative measures of well-being in most project monitoring systems (Höffler, 2020). More importantly, according to Mausch et al. (2020, p. 5), "the limited evidence on the impact of (VC interventions) VCIs further questions the underlying theories of change and impact pathways."

Despite these concerns, agri-food VC interventions have been important components of development cooperation projects and programs that have sometimes achieved success in different terms, with benefits to both farmers and commercial partners (Fan and Rue, 2020). The approaches and concepts underlying their design and implementation have changed over time and, hence, have become woven into many aspects of the sustainable VC agenda in terms of goal setting (FAO 2014b; Schmidt et al., 2019). However, the literature on evaluation of such interventions has revealed that there are many contexts where the success of individual supply chain projects has been limited and hampered by wider sectoral or food-system dynamics. More importantly, it has been found that many such interventions do not improve the overall performance or resilience of the agri-food sector they were aimed at, nor contribute to the sustainability of broader agro-food systems (Molenaar and Vorley, 2017; Borman et al., 2022).

In essence, the VC approach has been criticized as offering linear solutions and technical fixes to complex concerns, whereas a holistic perspective for tackling systemic, root challenges related to food system transformation is needed (Molenaar and Vorley, 2017; Mausch et al., 2020). In recognition of these shortcomings, the following section reviews new ideas about the basic underlying concepts of the VC approach and their capacity to inform reconceptualization of sustainable VC interventions.

3. Rethinking food value chain development: on food systems, strong sustainability, and transformative capacities

3.1. Food system thinking

One motivation for analytically and practically reaching beyond current conceptualizations of VC interventions is that the benefits derived from such interventions have generally not lasted over time, were not scalable, or were related to issues that are not to be decoupled from the sector that is targeted by the interventions.

For decisions on interventions into food VCs, sector development priorities are often already pre-defined in national development plans in accordance with national priorities (International Labour Office, 2015). While development agencies need to take these priorities into account, not all the prioritized sectors will target sustainability problems and food system transformation (Wieben, 2019). Analytically considering political preferences, wider implications of sector governance and institutions, and mapping relevant relationships and interdependencies between prioritized VCs, their alternatives, and the sustainability attributes of the overall food system must therefore become a prerequisite for policy dialog prior to the selection of food VC intervention activities (Schneemann and Vredeveld, 2015).

A natural point of departure for developing a holistic vision of the food VC approach is offered by the Sector Governance Framework (Molenaar and Vorley, 2017). The framework assumes that good sector governance is a much-neglected prerequisite for successful VC initiative, can provide better-targeted VC strategies and may even drive sustainability outcomes. This framework proposes to improve sector dynamics via a set of promising governance instruments (e.g., sector coordination bodies or sector platforms) that are identified, observed, and tested in empirical studies to improve important sectoral functions as well as typical VC features. The framework has been put in practice by development organizations and been applied to public policies for enabling living incomes in global agricultural value chains (Enssle et al., 2022). Strong stakeholder agency and participation are important components of this perspective (Molenaar and Vorley, 2017).

Food system thinking integrates this perspective but goes beyond sector governance by including food production and processing, socio-economic and environmental drivers, and food system outcomes and their interrelations (van Berkum et al., 2018; see Figure 1). Food system analysis centers the food supply system and distinguishes three levels for consideration: (1) food system activities lead to food system outcomes like availability, access, security, agency, health, and human behavior; (2) these outcomes affect the socioeconomic drivers of food system activities; and (3) the environmental drivers of food system activities. Food system thinking highlights interrelationships among food system components and encourages us to consider how modifications to individual components affect system balance; for example, food production enhancement programs must plan for repercussions across interrelated system components such as environmental or social

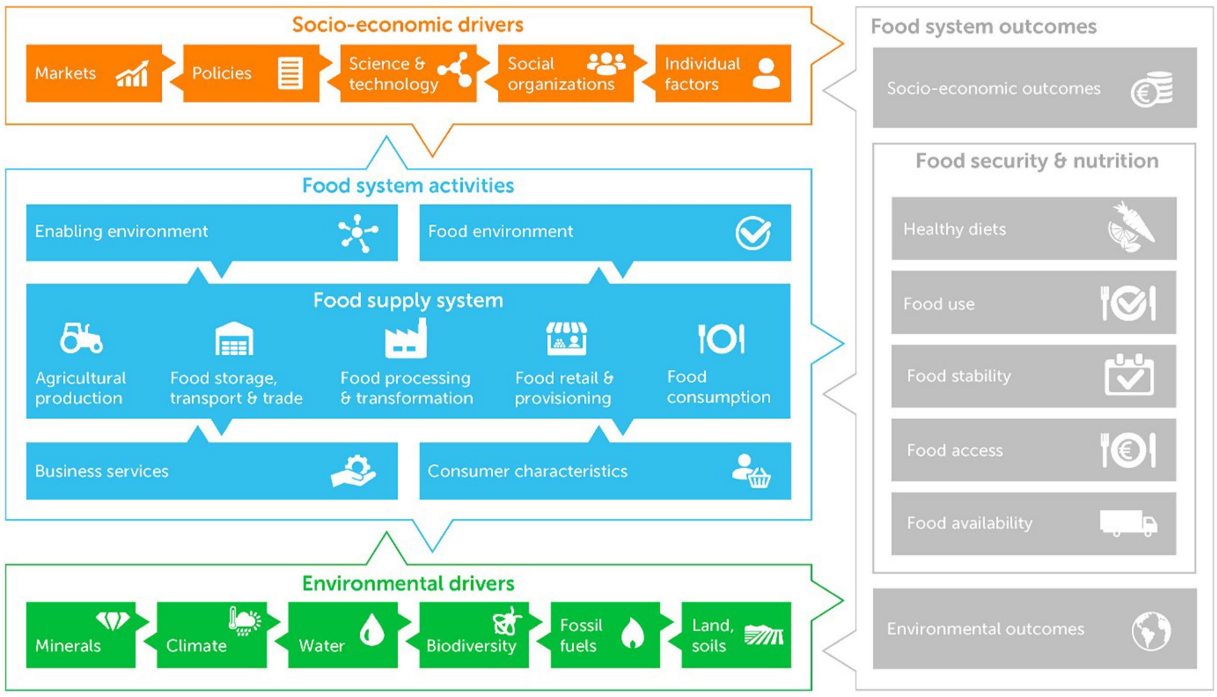

FIGURE 1
Mapping relationships within the food system. (Source: van Berkum et al., 2018).

damage/costs (van Berkum et al., 2018; de Adelhart Toorop et al., 2021). Moreover, a food system perspective accounts for non-linearity and food system vulnerability, promotes studies of food system component interactions, and accounts for externalities.

In view of the current state of global food systems, adaptation or radical transformation may be required to reach long-term local-to-global food system resilience. Innovations may happen at a technical, organizational, political or socioeconomic level. When prioritizing interventions, analysis of causes, effects, and circular relations between drivers and food system outcomes are prerequisites of food system thinking. However, adding analytical levels, sustainability dimensions, and aspects like adaptation and transformation may make setting priorities and entry points challenging.

In this regard, Borman et al. (2022) highlight that holistic "food systems thinking" requires actionable measures and propose that combining the sector governance framework (Molenaar and Vorley, 2017) with food system thinking could provide a useful multi-level analytical framework for sustainable food system transformation.

3.2. Strong sustainability

Considerations around VC interventions are also due to the complexity of the sustainability conceptualization underlying the current VC development approaches. Sustainability, once referred to as a "mobilizing concept" (Blowers, 1993, p. 5), has become a compromise-driven political, normative, and value-laden notion, generating discourses based on a variety of factors, including means of transition, agents of change, and the role of technology (e.g., Lele and Norgaard, 1996; Gibson, 2006; Bell and Morse, 2008; Gasparatos et al., 2008; Bond et al., 2012). The core of the sustainability discourse, which arose from broadly different schools of thought, has given rise to a variety of definitions with ambiguous theoretical foundations. As a result, at least 200 definitions of sustainability have been identified (Kates, 2011; Mark, 2013; Wu, 2013) and are commonly used. At the heart of this debate lies a fundamental cleavage between two dominants yet opposing archetypes, namely "weak" and "strong" sustainability (Daly, 1993). Weak sustainability, a model often illustrated through the "triple bottom line" (Elkington, 2018) or three-pillar models (see Figure 2) is based on substitutability of the three sustainability dimensions (economic, social, and environmental) and argues for allowing trade-offs, such as subsummation of environmental effects by economic goals (Gibson, 2006; Fracarolli Nunes et al., 2020). Advocates of the three-pillar model of sustainable VC development (e.g., FAO, 2015) argue that aspects of economic sustainability need to be prioritized because, it is believed, social and environmental goals of sustainable development may only be met after economic development goals are reached through trickle-down effects resulting from, for example, additional tax income and social and environmental redistribution of the benefits of economic development and growth (FAO, 2014). From this perspective, "manufactured" and "natural" capitals (Daly, 1993) are considered substitutable because no distinctions between the kinds of wellbeing they generate are made (Ekins et al., 2003; Neumayer, 2003, 2012). This model of weak sustainability has informed most manuals on VC intervention design (Donovan and Poole, 2014). For example, FAO's sustainable VC development approach places priority on economic growth by explicitly mentioning trickle-down effects and necessary trade-offs between sustainability dimensions and claims that "*in terms of environmental sustainability, the upgraded VC model should create additional value without permanently depleting natural resources*" (FAO, 2014, p. 25).

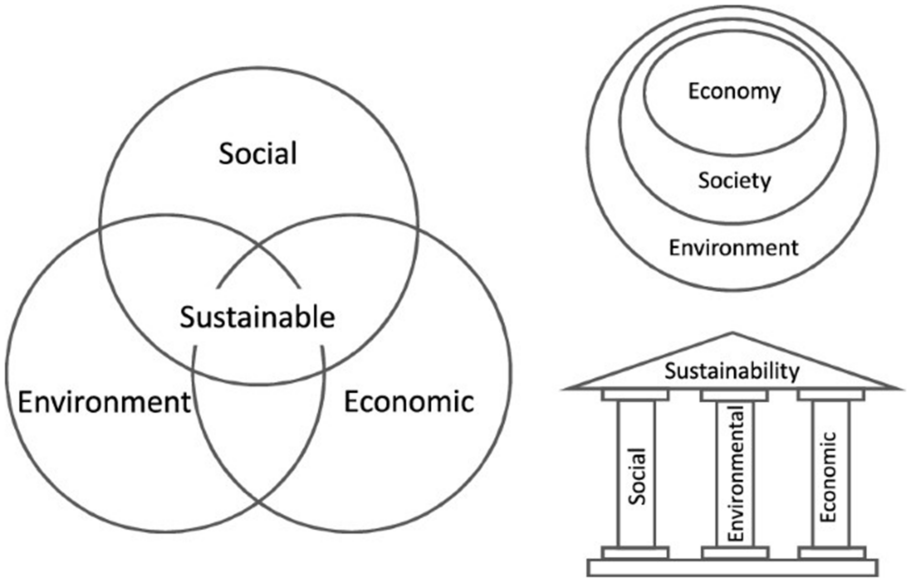

FIGURE 2
Conceptualizations of sustainability: Three pillar (left), triple bottom line (bottom right), and strong sustainability/nested systems (top right). Source: Purvis et al., 2019.

Additionally, the operationalization of sustainability poses numerous challenges because generating indicators based on value judgments is both analytically challenging and intrinsically political (Feindt, 2002; Stiglitz et al., 2008). While sustainability is recognized as being normative, its operationalization requires both explicit description of how it is understood as well as much stronger stakeholder involvement to guarantee agency (Molenaar and Vorley, 2017). Because the three-pillar model assumes that social, natural, and economic components are substitutable, misconceptualization may lead to political compromises favoring economic interests in sustainable development programs and environmental reductionism (Connelly, 2007). However, ongoing crises, increasing food and nutrition insecurity, loss of biodiversity, and increasing social injustice call for a radical change in conceptualizing sustainability towards social–ecological priorities and repurposing economic activities to safeguard natural resources and ensure the wellbeing of all societies, both current and future (Bonnedahl and Heikkurinen, 2018; Gliessman et al., 2019; Rockstroem et al., 2021). In reviewing how the triple bottom line concept and its derivatives have impacted sustainable development, even its architect, John Elkington, has recently warned about the risks of the triple bottom line and suggested a management concept recall: "I'm not sure it's going to be enough. Indeed, none of these sustainability frameworks will be enough, as long as they lack the suitable pace and scale—the necessary radical intent—needed to stop us all overshooting our planetary boundaries" (Elkington, 2018, p. 3). It is inarguable that human activities and their impact on earth system processes have triggered the overshooting of several planetary boundaries (Hickel and Hallegatte, 2022), indicating that treating the economy, society, and environment as interchangeable may to put humanity's safe operating space at risk (Rockström et al., 2009; Rockstroem et al., 2021; IPCC, 2022; McKay et al., 2022). Meanwhile, the strong sustainability paradigm, discussed below, holds that society and economy are subsystems of the environment and takes the uncertainty and irreversibility of damage occurring to the biosphere seriously (Daly, 1993).

3.3. Transformative capacity

A third motivation for reaching beyond today's VC intervention conceptualizations has to do with the notion of food system transformation and the need for placing actors—their knowledge about context and their interpretations of their environment, rights, value networks, and creative capacities—at the center of understanding agri-food system sustainability and development (Folke et al., 2009). Transformation can be described as a significant reordering that questions how a system can function differently if specific steps are undertaken (Meadows, 2008). More narrowly, transformation can be differentiated from resilience (associated with persistence) and adaptation (involving the notion of incremental change; Pelling, 2010; O'Brien, 2012; Brown, 2015). One framing of transformation in science and policy discourses highlights social-ecological transformation, a concept pioneered by researchers at the Stockholm Resilience Centre. Social-ecological transformation can result in novel emerging system properties, changes in critical system feedback (Chapin et al., 2009), and re-ordering of social-ecological relationships (Olsson et al., 2017). Moreover, any transformation typically involves unanticipated consequences that may worsen some conditions (Moore et al., 2014; Olsson et al., 2014). Resilience, in the sense of preserving system stability as well as observing transformation across levels of temporal or structural stability (Garmestani et al., 2009), involves various kinds of agency across system levels (e.g., learning, investment, conflict resolution, cooperation), resulting in complicated processes that cannot be addressed by single and simplistic interventions (Folke et al., 2016).

In order to achieve resilient outcomes, of transformative capacities need to be enhanced as a way to fundamentally rethink the necessary

changes to the current system (Ziervogel et al., 2022), The transformative capacity thinking highlights that systems and the behaviors of actors depend on resources, follow certain dynamics and, depending on the context, need to change fundamentally (transformation) or continuously (transition) to survive (Tendall et al., 2015; Ge et al., 2020). Transformative capacity thinking focuses on the context and what food systems with their actors can put into play to survive in the long term.

In view of crises, the concept of transformative capacity, as proposed in studies from the social-ecological system dynamics and resilience literature, provides a preliminary response for understanding food system actors' roles and capacities to better understand, initiate, and shape own interpretations of sustainability (Boyd and Folke, 2011; O'Brien, 2012; Wolfram et al., 2019). Borrowing from both theoretical and empirical strands of literature, transformative capacity defines the skills and system dynamics needed to re-conceptualize and create a fundamentally new system with new characteristics and new control variables defining it (Berman et al., 2012; Hölscher et al., 2018). Here, transformative capacity involves a potential level of human agency (Kofinas et al., 2013). Approaches for investigating food VC sustainability have used similar notions of "transformative capacity" (Campbell et al., 2018; Barrett et al., 2020; Herrero et al., 2020; Loboguerrero et al., 2020), but they remain focused on particular types of technology (El Bilali, 2019), the innovation "imperative" (Anderson and Maughan, 2021), and different socio-economic upgrading mechanisms (Gradin, 2016; Adetoyinbo and Otter, 2021). However, the transformative capacities of VC actors and how to gauge broader enabling conditions at the policy design stage have yet to be specified.

In the following paragraphs, we provide an interpretation of sustainable VC development that is based on the three transformative concepts discussed above: strong sustainability, system thinking, and transformative capacity. Our aim is to widen the scope of food VC interventions and programs in terms of the objectives pursued and in terms of capacity building and knowledge creation activities along future VC development interventions.

4. Discussion: applying the transformative value chain approach

The aim of this section is to provide a perspective on VC interventions, recognizing that the ways VC development influence food systems need to be fundamentally transformed if sustainability is the goal. The question at hand is not how to develop VC interventions into solutions for solving problems of universal dimensions. Rather, the question is how we can make sure future decisions on the design and implementation of VC interventions prevent the latter from, in effect, exacerbating the social, environmental, and economic sustainability problems within contemporary food systems. Building on our discussion in Section 3, in the next paragraph (Section 4.1) we propose and seek to justify three fundamental conceptual changes in the VC paradigms guiding contemporary food VC interventions. In Section 4.2, we discuss the way decisions about interventions in complex social ecological systems take place.

Our thesis is guided by the assumption that interventions at the level of the food supply system (van Berkum et al., 2018) will remain important components of international development cooperation programs. The guiding question is how future VC interventions at that level can meaningfully contribute holistically to the transformation of contemporary food systems. The following three hypotheses characterize the direction and the trade-offs to be considered when integrating new thinking into interventions at the VC level:

- Though VC concepts need to be further developed to address food system transformation, ultimately, measures must be broken down to actionable levels. In other words, decision makers and practitioners need to be able to focus and decide on interventions being applied to measures and food products (FAO, 2014).
- Given deepening food system crises, decisions on VC interventions as part of development cooperation programs will have to increasingly acknowledge and pursue an even wider spectrum of objectives related to the *transformation of food systems towards sustainability*. As we showed in Section 2, adding sustainability objectives to VC intervention projects obscures impact assessment on the basis of weak indicators and criteria. This may further add complexity to the methods needed to control intervention processes when decisions about interventions are being made.
- Because food system transformation is an open-ended, multi-objective, and context-specific process, active engagement of actors along the VC is a key prerequisite for co-creation of knowledge. Methodologically, this includes the intensification of stakeholder dialogues and participation in development cooperation for process monitoring, reaching consent, and triggering collective action.

In the next section, we propose areas of fundamental change informing future food VC interventions. These changes should not be regarded as being independent but, rather, as complementary.

4.1. The transformative food value chain process

Food VC interventions provide entry points for development cooperation projects at the food supply system level (FAO, 2018). However, the traditional linear view of increasing production, jobs, and profits impedes integrated decision making (Horton et al., 2017) and blind out the complex and problematic feedback within modern food systems (Méndez, 2010; FAO, 2018; HLPE, 2019). A TFVC perspective suggests that VC interventions become instruments for reshaping food supply systems within planetary boundaries. This shift focusses to the selection process, intervention context, and monitoring process for food VC intervention outcomes.

Considering VC interventions as instruments for transformation towards sustainability means to further contextualize them as changeable components of food supply systems, with single sectors as elements. Accounting for good sector governance and the mapping of relevant food system links would then become an important first step towards making decisions on all kinds of VC interventions. Thinking through single-VC levels such as production, processing, distribution, preparation, and consumption as closely embedded in ecology, people, inputs, and institutions (Borman et al., 2022) means applying systemic thinking to what used to be rather linear models of VC development,

with the idea of synergistically combining interventions on multiple levels for supporting or initiating food system transformations towards "strong" sustainability.

Figure 3 describes the process of transformative VC development. It begins with any given or potential set of food VCs that are considered as core element of the food system and consisting of a set of actors performing food production, processing, trade, distribution, and consumption. Still, the correct VC development is driven by the productivity and growth paradigm, whereby value is essentially driven by.

The TVCD applies transformative capacity thinking in that it focuses on activating the creative capacities of local food system actors to assess these problems to rethink and rebuild their food system. This implies that stakeholders of the food system are included in the co-creation of the knowledge that informs food system analysis, finding solutions to food system sustainability problems, and the process of VC intervention design and selection (Folke et al., 2009, 2016). The TVCD perspective, therefore, suggests discussing the actionable consequences of applying transformative concepts like strong sustainability and resilience at the grassroots level, involving the perceptions of the actors, and contextualizing scientific knowledge in ways that enable the design of new food systems. In order to move from the conceptual to the actionable part in VC development intervention, practitioners and decisions makers need clear assessment instruments that allow to detect and to measure sustainability "problems" that my occur along food value chains (Bienge et al., 2009). Those sustainability assessment instruments are then used to design, implement and evaluate food value chain intervention programs.

Transformative capacity thinking has a direct impact on the role of stakeholders and the design of capacity-building activities in development cooperation: targeting actors' adaptation capacities for climate change risks, land fertility loss, decreasing water availability, or loss of relevant ecosystem services may no longer be a sufficient strategy accompanying food VC interventions as doing so may reduce the role of actors to shock absorption and adaptation when proactive engagement for and by the actors is needed to change the root causes of crises and vulnerability. The TVCD perspective targets transformative capacity building, that is, strengthening actors' ability to co-create and discuss "a *fundamentally new system when failures in ecological, economic, or social (including political) conditions reinforce each other and make the existing system untenable…*" (Walker et al., 2004, p. 4). This kind of capacity and system adaptation requires much more active roles at the grassroots, attention to new methods, and new types of capacity building that rely on problem solving and the co-creation of knowledge (Ziervogel et al., 2022).

From a potential set of existing food VCs selected for VC development (center of Figure 3), those that can be directly linked to previously identified hot spots of unsustainable food system outcomes are candidates for interventions alongside new food VC alternatives

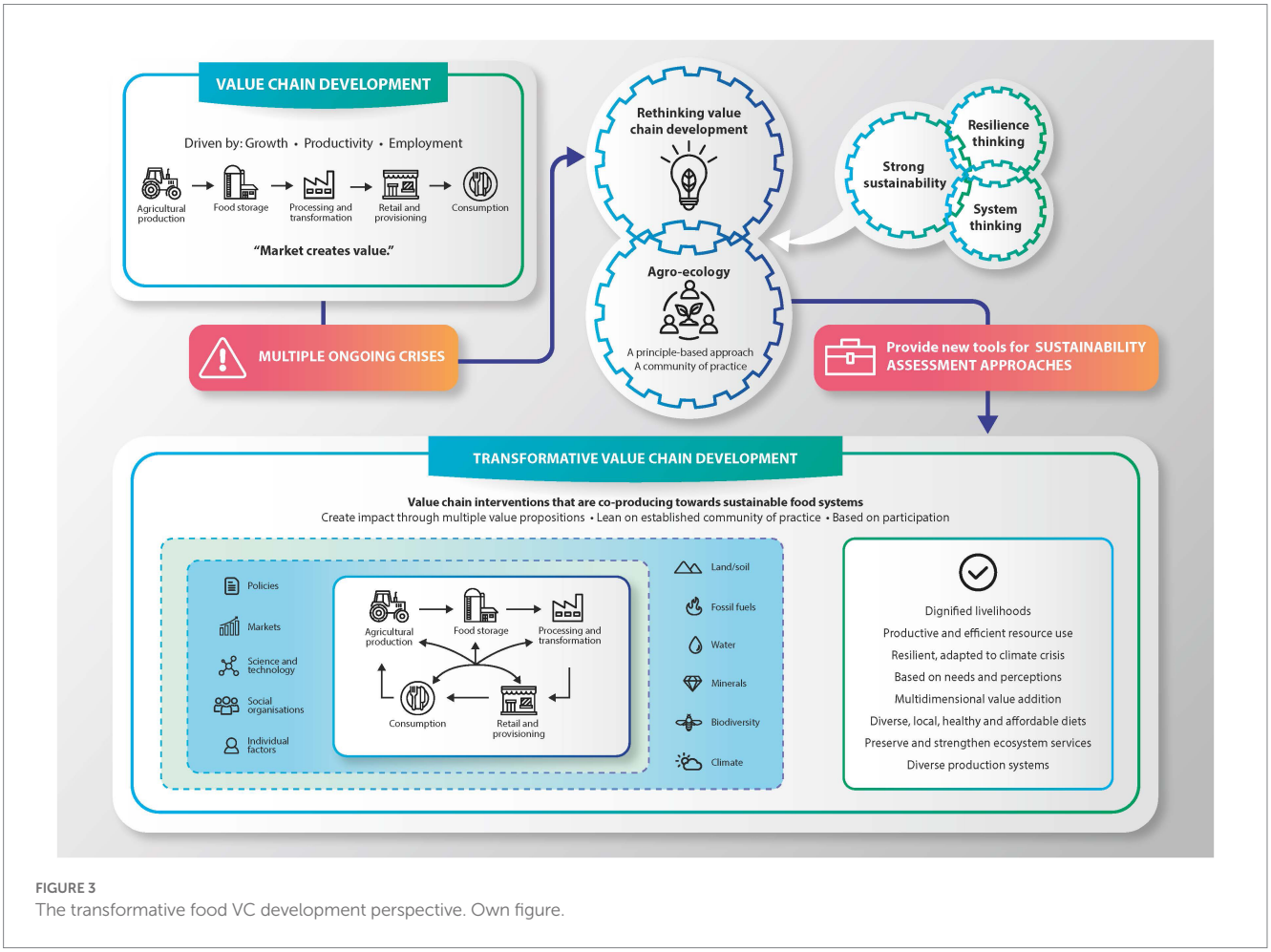

FIGURE 3
The transformative food VC development perspective. Own figure.

that are believed to do no harm or even regenerate the capacity of the food system to fulfill food system purposes.

4.2. A principle-based approach for making decisions along transformative pathways

Principles-based food system interventions and approaches for decision-making and evaluation are different from goals-driven projects and their evaluations (Patton, 2021). For example, principles-based project evaluation differs from traditional development project evaluation in that it can only evaluate the success or failure of processes of implementing principles, the outcomes directly associated with those principles, and the impact of innovative approaches to principles adaptation (Patton, 2021). Food system transformation is an open-ended continuous process of trial and error along which complexity and system dynamics pose limits to decision making following indicator-based monitoring and evaluation. Increasing VC stakeholders' chances of successfully embarking on transformative trajectories calls for an approach that informs initial decision making on food VC interventions and guides learning for actors who find themselves trapped in complicated trade-offs and feedback loops. In such a learning context, we caution against providing an extensive list of indicators (for the many reviews of assessment of sustainability dimensions, see, for example Lien et al., 2007; Janker et al., 2019; Franco Granovel et al., 2021; also Fraser et al., 2006; Reed et al., 2006; Coteur et al., 2018; Lairez et al., 2020; Belanche et al., 2021), but rather a limited set of clear and applicable principles derived from best practice and contextualized scientific facts (Schneemann and Vredeveld, 2015).

The implementation of a principles-based approach marks an important difference between traditional VC intervention concepts and interventions following the TVCD perspective. Deciding on a transformative VC intervention means introducing change at a certain entry point on a previously-agreed-upon set of principles. The application of simple principles is meant to ensure that a VC-level intervention does no harm and helps project stakeholders evaluate progress and create productivity and resilience.

A good example of a principle-based food system intervention that is heuristic in nature is the implementation of agroecological principles. Being in line with transformative capacity thinking, agroecology's practices demand the strong involvement of local actors in the co-creation of necessarily context-specific knowledge. Similarly, agroecological principles are based on strong sustainability assumptions and are based on knowledge about the preservation and integrity of ecological systems with full respect for planetary boundaries (FAO, 2018; HLPE, 2019). On the social dimension, co-creation and co-sharing of knowledge, a modified knowledge and information management system, and support to farmers as sustainable managers of natural resources offer the opportunity for social change that is induced and conducted by self-organized communities (Altieri, 2015). Involving farmers and their knowledge-generating role at the beginning of change processes means inviting their expertise in farming practices and decision making in the field and along the VC, as well as emphasizing the importance of intergenerational and gendered knowledge about land and resource use. The example of agroecology shows how 13 principles can underpin a theory for transformation of the food system and may guide intervention processes at different levels of the overall transformation starting at the farm and grassroots level and integrating all levels of society (FAO, 2018; Gliessman et al., 2019; HLPE, 2019). Applying agroecological principles to food VC interventions shows how food VC interventions may play important roles in all five levels of transformation. The agroecological principles provide guidance in the selection process for transformative VCs as well as for monitoring the implementation and impact of principles.

Strong sustainability, transformative capacity and system thinking coupled with a principles-based approach are important and interlinked elements in the trajectory of future food VC interventions, the Transformative Value Chain Approach *TVCA*. Agroecology as a set of principles backed by various sets of good practices may provide a set of guidelines relevant to the selection, design, and monitoring of future transformative VC interventions. The principles are derived from community of practice that has long been established despite the lack of clear definitions (Wezel et al., 2020). For the TVCA approach, agroecology offers a set of existing and agreed upon principles and elements, which draw pathway for transforming food systems. Concretely, the 13 principles and the 10 elements of agroecology have already been used to inform tools and methods for the appraisal and the evaluation of the sustainability of food value chains (Droppelmann et al., 2022; Enssle et al., 2022). This is particularly important as it informs decision makers and practitioners about the righteousness of the intervention, while keeping fundamental boundaries untouched. Those boundaries (or go's and no-go's) guiding the design and implementation of the future food value chain are derived from and inspired by the agroecological principles and elements can make sure that transformative value chains must promote social and ecological wellbeing in a way that:

- Promotes dignified livelihoods also including for marginalized and resource-poor groups.
- Promotes productive and efficient resource use.
- Are resilient, adapted to climate crisis.
- Based on needs and perceptions.
- Recognize multidimensional value addition.
- Promote diverse, local, healthy and affordable diets.
- Preserve and strengthen ecosystem services.
- Promote production system diversity.
- Embedded in a food system analysis.

In addition to embedding strong sustainability, transformative capacity at the same time, agroecology has the benefit of being a community of practice, whereby various actors from science, practice and political and social movements can co-learn, co-research, and co-produce towards sustainable food systems. Following this logic, the TFVC development perspective:

- is the result of contextualized analysis of sustainability problems in the relevant part of food systems and the analysis of the potential of VC interventions;
- is based on strong sustainability conceptualization that neither compromises nor trades off the social and environmental spheres;
- considers the particularities of potential markets for products produced in line with agroecological principles;

- supports socio-ecological innovations and practices for value addition along the VC that reflect an understanding of value that incorporates multidimensional values defined in a given context and not solely by end-consumers; and
- promotes instruments for activating the creative potential of all food VC actors to manage risks and increase their well-being based on cooperation and collective action; and pursues "real development collaboration" in interventions by fostering the co-creation of knowledge and active participation of stakeholders in the design, principles management, and assessment of project activities.

5. Conclusion

Food value chains are an integral part of a food system and remain central in the work of development agencies when it comes to food security, social justice and environmental sustainability (see, e.g., FAO, 2018; AGRA and UNDP, 2020; Barrett et al., 2020; IPES-Food, 2020). Despite their popularity among donors, the value chains interventions are nowadays at a crossroad. The multiple ongoing crisis have ultimately put a square emphasis on food as a nexus issue, urging to rethink the paradigms guiding the food value chains promotion.

We have argued that a change in paradigm may have consequences on three concepts: the food system thinking has its implications on the fact that the value chain interventions shall look beyond the linear concept of the "farm to fork" and integrate element of policy, society and the institutions surrounding the value chain. The strong sustainability concept is advocating for a beyond economic view in the value chain approach and for the necessity to trade-in sustainability goals instead of considering them as independent and conflictual. The new resilience thinking implies considering the actor's transformative capacity and their ability to shaping their own interpretation of sustainability.

Applying these conceptualizations to future value chain promotion deals with the challenging issue of how to go beyond relying on "cure-all" proposals for solving complex problems related to the transformation towards sustainability. Dealing with complex issues such as food systems transformation calls for a principle-based approach. Such an approach diverges from a how-to manual and rather takes a participatory and context-specific account of how future value chain promotion need to be designed and implemented, if they are to contribute to the transformation of food systems towards sustainability.

Finally, we explore existing transformative paradigms, such as agroecology, as it is an available and modular set of principles (and levels and elements) allowing to enough flexibility to deal with context specific issues while keeping the rigor of transformative imperatives and non-tradable sustainability outcomes.

The new perspective on VC interventions we proposed in this paper, labelled TVCD aims at building a bridge between the practice of food VC interventions and the findings of sustainability, resilience, and food system transformation research. TVCD interventions are based on a strong sustainability concept and are important entry points for development cooperation activities oriented towards the transformation of sustainable food systems. As drivers and showcases of change, they are the result of participatory problem solving through system thinking and may rely on the creation of multiple types of value that result from increased natural, social, or economic capital. TFVC interventions target both food system stakeholder capacities and process ownership as well as the natural and social capitals needed to produce, process, distribute, and consume food products.

In line with the findings of the High Level Panel of Experts on Food Security and Nutrition, we argue that for the transformation of the food system towards sustainability "a reconfiguration of knowledge systems is urgently needed, shifting towards a co-learning paradigm, bringing research and extension closer together and better linking international and national research and extension systems with local knowledge and farmer-to-farmer knowledge exchange" (HLPE, 2019, p. 116).

Data availability statement

The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author.

Author contributions

AM has provided the concept, literature research, and redactional work. MH has provided input into the concept, has contributed with some written sections. HH has reviewed the paper and provided guidance for the general argument and the discussion. All authors contributed to the article and approved the submitted version.

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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.

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