



Investing in rural people

Nutrition-sensitive value chains from a smallholder perspective

A framework for project design

by

Isabel de la Peña

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Aulo Gelli

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Abstract

It is now widely accepted that food systems play a key role in shaping diets. Given that food is not only produced but also stored, processed, distributed and marketed, the value chain approach offers great potential to unpack the complexity of food systems and identify entry points and pathways for strengthening impact on nutrition.

Knowledge and evidence on how value chains can contribute to nutrition, while remaining financially viable and inclusive of smallholder farmers, is, however, scarce. This paper addresses this knowledge gap by reviewing the literature on linkages between value chains and nutrition from a smallholder perspective, and presenting an analytical framework for the development of nutrition-sensitive value chains.

The review identified multiple interventions that can serve the goals of income generation and nutrition improvement of smallholders, while also contributing to environmental sustainability and gender empowerment. But trade-offs exist too. By applying a nutrition lens to the different stages of the value chain, challenges and opportunities across these dimensions can be identified to promote development of nutrition-sensitive value chains.

1 Introduction

Malnutrition in all its forms (undernutrition, micronutrient deficiency, overweight and obesity) represents the number one risk factor in the global burden of disease (Global Panel on Agriculture and Food Systems for Nutrition 2016). Malnutrition has far-reaching consequences, especially for children, affecting overall cognitive development, school performance, lifetime earnings and vulnerability to infectious and chronic diseases in adulthood. In economic terms, undernutrition has an impact on GDP, reducing it by 11 per cent on average (Global Panel on Agriculture and Food Systems for Nutrition 2016).

The 2014-2015 *Global Food Policy Report* states that the majority of the world's hungry and malnourished people live in middle-income countries (MICs) (IFPRI 2015). Moreover, most MICs are undergoing the nutrition transition, and face what has been characterized as the triple burden of malnutrition: undernutrition, micronutrient deficiencies and overnutrition (Popkin, Adair and Ng 2012). Despite high rates of economic growth, some of the biggest MICs still face an alarmingly high prevalence of malnutrition: India is home to more malnourished children than all of sub-Saharan Africa, one third of children in Indonesia are stunted (chronically undernourished), and the levels of overweight are above 50 per cent in Brazil and Mexico (IFPRI 2015; McClafferty and Zuckerman 2014).

A healthy diet is fundamental to preventing malnutrition in all its forms, and agriculture plays an essential and singular role in addressing nutrition problems. Policies and programmes can shape agriculture and food systems so that their contribution to improving nutrition is enhanced, largely by ensuring that acceptable, diverse and nutritious foods, adequate to meet the needs of people of all ages, are available and accessible at all times.

The food in a food system is not only produced, but also stored, processed, distributed and marketed. A variety of specific commodities make up the diversity of a food system. In this context, an inclusive value chain (VC) approach offers great potential to explain what happens between production and consumption, and can help to identify potential entry points, pathways and actions for having a positive impact on nutrition.

Governments and development partners often use a VC approach to identify bottlenecks and opportunities and determine how to develop VCs for the benefit of smallholder producers. This approach can be inclusive and comprehensive, showing how to take into account the enabling policy and regulatory environment as well as cross-cutting issues such as environment and gender.

In recent years, there has been increased interest specifically in leveraging the potential of VC development to improve nutrition (Fanzo et al. 2017; Maestre, Poole and Henson 2017; Gelli et al. 2015; Hawkes and Ruel 2011). A VC approach can help to unpack the complexity of food systems by focusing on a particular commodity and identifying opportunities for nutrition along a particular chain.

It is in this context that the concept of nutrition-sensitive value chains (NSVCs) has arisen in the development community, with the central question of: how can VC development for smallholders not only increase economic value and returns for smallholders, but also improve value relevant to nutrition?

NSVCs are particularly relevant to IFAD, given the focus on VC development in the current portfolio (more than 70 per cent of IFAD's investments include a VC component) and its commitment to nutrition (nearly half of IFAD's investments are already nutrition-sensitive, and IFAD has a target for at least 50 per cent to be nutrition-sensitive by 2021).

Development of NSVCs remains a nascent field, however, and the knowledge gap is ever more acute when it comes to IFAD's target group: smallholder farmers. With the support of the German Federal Ministry for Economic Cooperation and Development (BMZ), IFAD implemented a research project specifically to address this knowledge gap and generate evidence-based guidance to develop NSVCs for smallholders.

The principal purpose of this literature review was, thus, to provide the conceptual basis for development of a framework and approach for the design of NSVC projects that seek to improve diet quality and nutrition for project beneficiaries, particularly smallholders. The framework and proposed steps for project design that resulted from the literature review were then used to structure fieldwork in Nigeria and Indonesia to test the approach and, ultimately, provide evidence and experience-based guidance for NSVC project design. The findings have been reflected in the resulting manual: *Nutrition-sensitive value chains: A guide for project design* (de la Peña and Garrett 2018).

The NSVC analytical framework and the steps for project design build on the VC for nutrition approach developed by Gelli et al. (2015) and IFAD's own guidance for VC development (IFAD 2014a). As part of their joint work, the framework has also been adopted as a common approach by FAO, IFAD and WFP, along with IFPRI and Bioversity International, to guide their efforts in mainstreaming nutrition into VC projects (CFS 2016).

The characteristics of the NSVC framework that distinguish it from others are three. First, the framework takes the perspective of an agricultural producer, particularly a smallholder. While, as will be seen, the framework practically starts from a consumption perspective and includes concern for the consumer (to resolve nutrition problems), it considers how a VC project designed for producers might address their nutritional needs as well. Second, throughout development of the framework, the operational relevance of insights gained for project design, from both literature and the field, was considered. Third, the framework itself has been presented and consulted on at various expert and country forums (such as the Committee on World Food Security Plenary in 2016 [CFS 2016], United Nations Standing Committee on Nutrition event on Nutrition and Trade 2016, United Nations VC Development Expert Market Fair 2016, internal seminars at FAO and IFAD) and held up for further analysis in an online discussion (Global Forum on Food Security and Nutrition 2017). In sum, the framework has been validated technically as well as operationally, and we expect it can be useful for development organizations as well as governments that are interested in designing and implementing VC projects that also work to improve nutrition of project beneficiaries (producers) as well as other actors throughout the VC, including consumers.

In terms of methodology, the literature review itself followed a systematic and integrative approach that started with a search for relevant literature in specialized and generic databases (Google Scholar, Agriculture for Nutrition and Health repository, Harvest Plus Library) using the following search terms: "nutrition," "nutrient," "VC" and "supply chain". Additional literature was accessed through a snowball process, building on the references found in these key papers. The search was restricted to papers and articles published in English, in both academic and grey literature. The literature review was initiated in 2015 and updated in 2017, with the incorporation of selected additional studies published since 2015 following the same search methodology. The knowledge and experience of the authors and additional feedback gained through the various consultations resulted in some additional references. The review focused on literature that identified opportunities as well as challenges in developing VCs, especially for smallholders in middle-income and other developing countries. It also examined relevant frameworks, guides and tools, with special attention to those that sought to incorporate non-income considerations, such as nutrition, into the approach.

This paper is structured as follows: Section 2 provides an overview of the key concepts relating VCs to nutrition and the food system. Section 3 builds on this to develop the NSVC framework, distinguishing two key features: the three strategies that can be used to make a VC more nutrition-sensitive and the pathways of impact on nutrition for NSVC projects. Section 4 discusses the key challenges and opportunities for NSVC development at each stage of the VC, including potential entry points and actions.

2 Value chains and nutrition: basic concepts

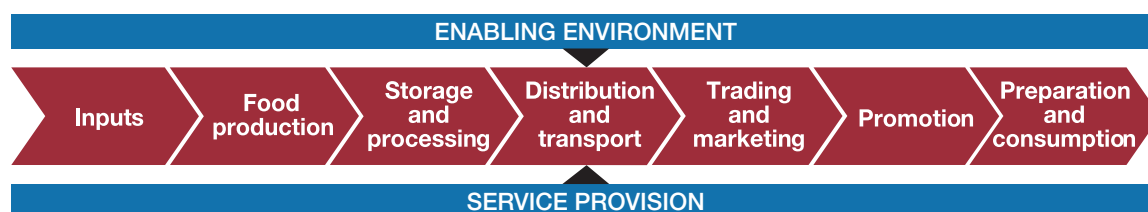
This section provides a brief overview of the main concepts related to VCs and nutrition, exploring the issues that are relevant to NSVC development.

2.1 Value chains

A basic definition of VCs would consider them as “the full range of activities which are required to bring a product or service from conception, through the different phases of production ... to final consumers, and final disposal after use” (Kaplinsky and Morris 2002, 4).

There are two core concepts involved in VCs: chain and value. The above-mentioned definition focuses on the concept of “chain,” referring to the linking of different phases that a commodity goes through from initial production to final consumption. However, in reality, VCs are a complex network of activities and linkages among different actors, and therefore the idea of “chain” should be considered as a metaphor for connectedness among them (Humphrey and Navas-Alemán 2010). The term “value” refers to the “value” that is generated along the chain as the commodity goes through the different phases (Altenburg 2007).

Figure 1 Stages and influencing factors in a food value chain



The expression “from farm to fork” is often used to describe food VCs, as they typically take the commodity from production to consumption (see Figure 1). Transformations in food systems have led to different types of food VCs in developing countries, ranging from traditional VCs (smallholder farmers selling to traders and local markets), to modern VCs (food manufacturers sourcing from commercial farmers and selling in supermarket outlets) to combinations of these two (multinationals selling through networks of traditional traders or sellers, or supermarkets sourcing from smallholders) (Gómez and Ricketts 2013). In all cases, a VC is commodity and even product specific. A specific VC also serves a specific market, which can be local, domestic or international.

For example, a fresh cassava VC might transform into a VC for cassava flour, both of which need to be considered separately but also both of which have implications for the actions and incomes of cassava producers and for the type of markets they serve. For example, fresh cassava may stay in the local market, whereas cassava flour may be sold to industrial processors.

The focus on how value changes during this process is what differentiates a VC analysis from a supply chain analysis. “Value” refers to both the value added to the product at each stage of the chain and the value captured by the different actors involved. In both cases it refers to economic value, although some advocate a broader conceptualization of the term “value,” including, as we will later argue for here, the inclusion of a concept of nutrition value (Gelli et al. 2015; FAO 2014a; Hawkes and Ruel 2011).

The VC approach has now been incorporated into development discourse as part of attention to market-led approaches to development. This approach is of interest to governments and development partners precisely because it puts the focus squarely on how to generate greater economic value for the VC actors, in a way that simple consideration of a “supply chain” does not. From a development and poverty reduction perspective, then, a VC approach presents an analytical framework through which to consider the elements of the chain as a whole. The approach allows a focus on the links and interactions between VC actors, and on how these interactions affect the poor. Additional analysis can then also note where there are constraints and opportunities for interventions that can help to develop the VC in order to generate greater income for smallholder producers.

From the perspective of smallholder farmers, there are several key features of the VC approach that explain the increasing uptake and interest among the development community. First, the emphasis of VC studies on the “*value added*” component has shown how just a small part of the final price (around 40 per cent in the case of coffee, for example) accrues to actors engaged in primary production, highlighting that primary gains are found in areas outside production (Kaplinsky and Fitter 2001; Kaplinsky 2000). This has led to one of the core ideas of the VC approach: in order to raise the incomes of the poor, we must look beyond the production stage and identify opportunities and constraints along the chain (Humphrey and Navas-Alemán 2010). However, not all VC interventions are concerned with smallholder farmers’ capture of a higher portion of the value added; some of them focus rather on strengthening the links between smallholder farmers and markets (VCs for particular commodities), as a way to increase not just income but also stability.

Another key element of the VC approach is shifting the focus on *competitiveness* from the firm level to the network level. Within VCs, the competitive advantage of firms relies on the chain as a whole rather than on the firm itself, so VC efficiency and coordination become crucial for all the actors involved (Altenburg 2007; Kaplinsky 2000). In this sense, improving VC performance may entail, for example, improving the flow of knowledge (e.g. customer requirements, production techniques) and resources (credit) and strengthening and improving linkages among the actors (e.g. building trust and long-term relationships), all of which can provide smallholder farmers with greater, more secure and more profitable access to markets and services (Humphrey and Navas-Alemán 2010).

Another key feature of the VC approach is the concept of *governance*, meaning the structures and relationships that affect how VC participants interact. An analysis of VC governance would examine how value, profitability and the ability to exert control (or power) are distributed along the chain among the different actors (Marketlinks 2018).

Lead firms within a VC are those that have the power to define and impose parameters and requirements on others in the chain (Gereffi, Humphrey and Sturgeon 2005). Lead firms have the advantage of access to the end customers, which allows them to capture most of the profit while farmers bear most of the risk (Bright and Seville 2010). Additionally, both public- and private-sector standards may determine how the production, transportation and transformation processes must be carried out (in the light of product and process standards, quantities, conditions of delivery, etc.) (Humphrey 2005).

The implications for smallholders, who are often dispersed and have resource and capacity constraints, are twofold. On the one hand, there is a need to overcome likely power asymmetries by promoting a more equitable sharing of costs, risks and information among VC actors – with, especially for smallholders, attention to engagement with potential buyers. This can be done by setting up, promoting and enforcing a fairer and more transparent set of terms to govern interactions. On the other hand, smallholder farmers may have additional needs in terms of access to services (training, credit, etc.) that will enable them to comply with the requirements established by the more influential actors in the chain (Bright and Seville 2010).

Summing up, VC interventions can benefit smallholder farmers both in terms of access to markets, which can offer higher and more stable income, and in terms of access to services. The primary focus lies, however, in increasing incomes, and VC interventions historically have not considered impacts on nutrition (Campbell 2013; Hawkes and Ruel 2011).

2.2 Nutrition

Global nutrition problems can currently be characterized as a triple burden: undernutrition (inadequate levels of food intake), micronutrient deficiencies (especially micronutrients of public health importance such as iron, zinc and vitamin A), and overweight and obesity (Popkin, Adair and Ng 2012). The consequences of malnutrition are well known. Worldwide, undernutrition causes more than 3 million child deaths per year. In addition, undernutrition has far-reaching consequences for overall cognitive and social development, with children and women being especially vulnerable (Black et al. 2013). Some 2 billion people are overweight or obese, which is associated with a range of non-communicable diseases such as diabetes and heart diseases (Development Initiatives 2017).

To address these nutrition problems, it must be understood that malnutrition has multiple drivers. The well-known conceptual framework of determinants of child nutrition developed by UNICEF (1990) identified immediate causes that affect nutritional status (food/nutrient intake, health status) mediated by maternal and childcare practices. Other underlying causes can also affect nutritional status, such as access to food and water, sanitation and health services. The framework can be extended to consider determinants of nutrition for all ages, where the mediator for food choices and care need not be the mother, but the individual as well.

Within this framework, we can distinguish two types of interventions (Ruel and Alderman 2013). One type is nutrition-specific interventions, which address the immediate causes of malnutrition and entail, for example, promotion of breastfeeding, dietary supplementation and treatment of severe acute malnutrition. The other type is nutrition-sensitive interventions, which incorporate specific nutrition goals and actions but address the underlying causes of malnutrition, for example agriculture and food security programmes, women's empowerment, and water, sanitation and hygiene. The kinds of actions considered here fall in the nutrition-sensitive category.

Some key concepts from the framework on determinants of malnutrition are particularly relevant to understand how markets and VCs can be leveraged towards nutritional goals (Hawkes and Ruel 2011). Factors affecting access to food (such as availability, affordability and acceptability) are of particular importance. Agriculture can make its contribution to improving nutrition by focusing on these food-related determinants and shaping the food system to ensure that diverse, nutritious foods are available, affordable and adequate to meet the dietary needs of people of all ages at all times. Development of NSVCs can play a large part in making sure that food systems provide access to the variety of foods that compose a healthy and balanced diet. Improving diet quality is, thus, at the centre of the contribution that VCs can make to improving nutrition.

Within the wider food system, the food environment can be defined as the interface that mediates one's food acquisition and consumption (Turner et al. 2017). In understanding the actions to take to shape VCs towards nutritional goals, it can be useful to unpack the different elements of the food environment and identify which actions occur outside the household and which ones inside it (Turner et al. 2017; Hawkes and Ruel 2011). For example, at the community or market level (i.e. exogenous elements of the food environment), there are issues of food availability (presence of a specific food in a specific location), nutritional quality (essentially the nutrient profile of food), and safety (presence of foods that have not been contaminated and are safe for human consumption). At household and individual levels (i.e. endogenous elements of the food environment), there are issues of affordability (whether or not purchasing power allows one to acquire foods in the market), accessibility (whether or not food can be acquired easily¹ in the market or accessed through other means, such as own production or transfer from others, including government programmes) and acceptability (whether or not foods are convenient and desirable to consumers).

All of these elements become crucial for development of NSVCs, particularly given their importance for dietary quality, even of agricultural producers themselves. Even though smallholders are involved in producing food (some of which can be consumed within the household), research shows that they also access food through the market. The share of purchased food in total food consumption by rural populations has risen and currently constitutes around 70-80 per cent of the food consumed in MICs such as Indonesia or Vietnam (Reardon 2015). The importance of food markets and food VCs to the diets and nutrition of smallholder farmers, especially in middle-income countries, is therefore crucial to consider. For these rural producers, the food market is a key determinant of their access to food and to high-quality diets, not only as a source of income but also as a source of a diversity of food.

1. Considering, for example, physical distance, time or modes of transport.

3 Nutrition-sensitive value chains: a framework for project design

3.1 Nutrition-sensitive value chains: framework and strategies

Within the nutrition-sensitive agriculture paradigm, there is increasing interest in broadening the focus on agricultural production by adopting a food system approach that looks at sustainable supply and demand of food in ways that contribute to improving nutrition. To improve nutritional outcomes, on the supply side, interventions need to take into account not only of the way foods are produced but also how they are processed, distributed, marketed and delivered to consumers (Hawkes et al. 2012). From the demand side, there is a need to understand what influences consumer demand and how, and to intervene accordingly (World Bank 2014; Hawkes and Ruel 2011).

As noted above, identifying specific actions to take within a food system to make it more nutritious can be facilitated by examining the VC – this series of actions from production to consumption – for a specific commodity. By analysing each of these actions with a nutrition lens, we can highlight relevant entry and leverage points along the chain. Appropriate policies, programmes and projects can then shape the VC for that commodity to better respond to nutrition problems. Supporting multiple VCs can help to create a more robust, nutritious food system by ensuring that a range of diverse, acceptable, nutritious foods are accessible and affordable year-round.

Key considerations of the nutrition-sensitive value chain framework

The framework for project design developed in this paper serves to identify the most appropriate commodities and the most effective actions to take to develop NSVC projects. It was developed with two major considerations in mind. First, the framework should lead to practical steps and interventions that a project aimed at designing NSVCs can take. Second, given that the primary beneficiaries of IFAD-funded projects are smallholder producers, the framework should be developed from their perspective, highlighting particular strategies, impact pathways and interventions that are relevant to them.

This innovative framework starts by turning the usual perspective of VC development on its head and beginning with an analysis of the nutrition problem in the target population, rather than simply considering the market demand and potential to generate income for the producers. The characterization of the nutrition problem specifically considers the excessive or insufficient consumption of key foods that compromise diet quality, pointing towards “dietary gaps” and towards the commodities that have the potential to address these gaps. By analysing the VCs of these selected nutritious commodities with a nutrition lens, one can identify the constraints in supply and demand of these foods as well as the specific actions to take to address these constraints (see Box 1).

Box 1 A framework for food VCs

Given that the NSVC framework aims to leverage the potential of VC interventions for nutrition outcomes, it is important to clarify that the approach here involves only food VCs. Non-food VC projects, such as coffee, cotton or spices, can still be adapted to be nutrition-sensitive agricultural investments (see FAO 2015). However, the NSVC framework here aims to make the VC itself nutrition-sensitive, alleviating constraints in supply or demand of specific foods in order to improve nutrition. The focus lies, thus, on food commodities, especially nutritious foods that can contribute to improvements in the diet quality of the target population.

Strategies for nutrition-sensitive value chain projects

Based on the identified constraints and opportunities in supply and demand, a project can pursue various strategies to make a VC more likely to improve nutrition, and therefore be “nutrition-sensitive”. These fall into three categories: strategies to *enhance supply* of nutritious foods, strategies to *add nutrition value* along the chain and strategies to *enhance demand* for nutritious foods.

- 1. Strategies to increase supply of nutritious foods.** The supply side covers interventions that affect inputs, production, storage and processing, distribution and transport, and trading and marketing. Strengthening the overall enabling environment and service provision makes sure that all parts of the chain function smoothly. A supply-side strategy aims primarily at getting more nutritious foods into the market, and these interventions largely follow what can be considered a “standard” VC development strategy.

For smallholders, changes in their usual business model (which may generally involve selling only raw produce at harvest time in local markets when prices are low and when they may have less bargaining power), along with increased connections, capacity, empowerment and information, could increase their incomes by making sure the needed inputs, services and information reach them. Value chain actor roundtables, training in planning and access to market information can improve coordination among VC actors and help to balance power relations and ensure transparent, enforceable agreements that benefit all. Key upgrading strategies along these lines include the following (IFAD 2014a):

- *Product and process upgrading* aims at “doing things better and bigger”. The goal of this type of upgrading is to improve smallholder capacity to increase supply. With such upgrading, producers can better meet market and VC requirements in terms of volume of production, quality, consistency and delivery. Product upgrading allows the introduction of new higher value products or improvements in product quality by, for example, providing access to better inputs or technical assistance. Process upgrading enhances efficiency during production processes by introducing new technologies, better organization to reduce production costs and dissemination of agricultural practices to improve productivity. These actions can increase the availability of nutritious foods, including biofortified or traditional nutrient-rich crops. Close attention to production can also address issues of seasonality and consistent availability.
- *Functional upgrading* encompasses interventions that move producers along the VC towards higher value added activities, with the objective of increasing the share of the final price captured by smallholders. Potential actions include provision of infrastructure, equipment or training in value added functions, such as processing, storage, manufacturing, packaging, grading and transportation.

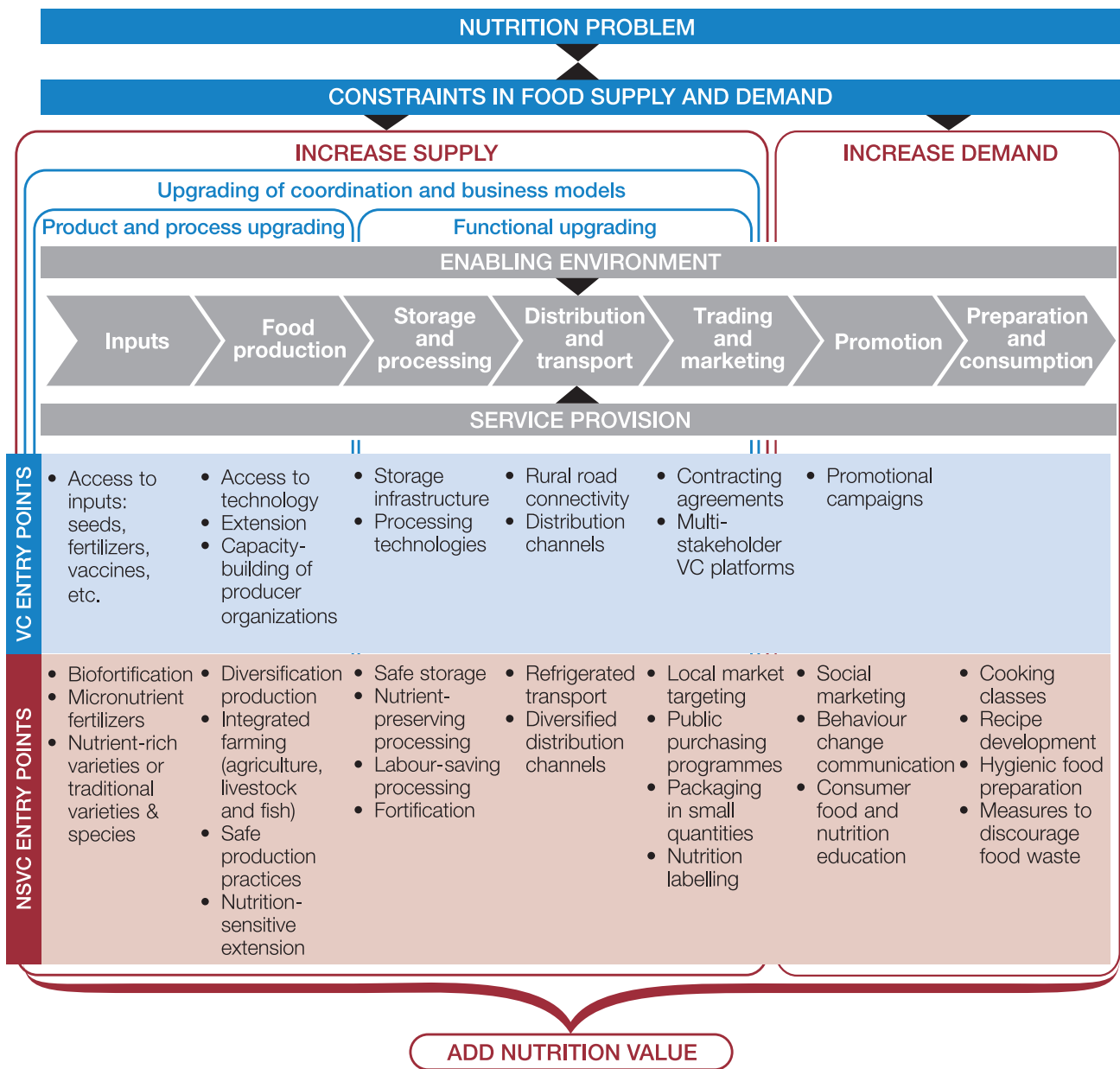
- *Upgrading of coordination and business models* looks for ways to make business relationships throughout the VC as mutually beneficial as possible. The underlying idea is that improving coordination and strengthening linkages among VC actors will improve not only smallholder participation in the VC but also the performance of the VC as a whole. Specific actions may imply formalizing (through contracts) horizontal relationships among actors in the same VC segment (e.g. linking farmers to cooperatives) or vertical relationships (e.g. contract schemes between farmers and processors/buyers). From a nutrition perspective, better linkages and coordination will increase the likelihood that actions to promote nutrition at one stage will actually have an impact once the food reaches the consumer, and will not have been undermined by failures at other stages in the VC.
2. **Strategies to add nutrition value along the chain.** Gelli et al. (2015) propose broadening the concept of value addition to incorporate value that is relevant for nutrition. This includes considerations of nutritional value as well as food safety, and food loss and waste. For instance, food loss is understood as a reduction in quantity or quality of food. This can be related to declines in nutritional value, food safety or economic value (especially in the case of waste) (FAO 2014a). Such declines clearly affect the availability, affordability or acceptability of nutritious foods.

These aspects of “nutrition value” are essential to making VCs and food systems nutrition-sensitive, so they are key elements of the NSVC approach. Actions to add nutrition value to existing products can include biofortification, nutrient-preserving storage and transport, and nutrition signalling and labelling. These actions emerge from applying a nutrition lens to standard VC interventions and from seeking to shape actions so they are more likely to improve nutrition. For example, more robust input markets can strengthen access to higher quality seeds (a standard recommendation), while a nutrition lens would suggest that such seeds be for more nutrient-dense biofortified or local crops (e.g. vitamin-A cassava rather than just typical cassava, or fonio instead of rice).

Importantly, these “complementary” or “enhancing” actions can take place on either the supply side or the demand side. For example, food must be nutritious and safe at the point of consumption; hence, food safety issues can be addressed at whatever stage of the VC they appear, whether, say, during production in the field (e.g. when aflatoxin contamination could occur) or during food preparation at home.

3. **Strategies to increase demand for nutritious foods.** If a lack of demand for nutritious foods is the main constraint to getting nutritious foods into the market and into diets, actions can focus on creating market demand. VC development projects generally do not focus on stimulating demand; hence, the type of actions that this strategy will promote are specific NSVC actions. When applying a nutrition lens to analysing demand, one must consider how affordability, availability and acceptability affect consumption and, consequently, demand. The actions included in this type of strategy will focus on the end-consumer and, therefore, on actions in the downstream stages of the chain, such as demand promotion (e.g. social marketing, behaviour change communication campaigns), and preparation and consumption (e.g. cooking classes). Additionally, demand for nutritious foods can also be created through accessing alternative markets, such as institutional markets (e.g. public purchasing programmes, school feeding).

Figure 2 The nutrition-sensitive value chain framework: strategies and examples of entry points



There are multiple interconnections and interdependencies among these three strategies. Therefore, NSVC development may entail a combination of strategies and actions in order to fully respond to the challenges that contribute to the nutrition problem. A discussion of the possible combinations is explored further below in the analysis of the impact pathways.

Figure 2 illustrates the framework and shows how these three strategies relate to the nutrition problem, stages of the VC and potential interventions. Additionally, Figure 2 maps how standard VC strategies and actions (in blue) are integrated and contribute to the NSVC strategy (in purple).

Summing up, VCs are a core element of the food system, which encompasses not only the supply and demand sides of a VC but also a range of drivers that influence the behaviour of all VC actors, including consumers. In this context, the NSVC framework aims to unpack the complexity of food systems by looking at the individual VCs of different foods, and identifying entry points for investment at each stage of these chains. In order to make a significant contribution to dietary diversity, the overall NSVC intervention strategy will need to adopt a food systems approach and intervene in a range of VCs. However, by using a framework that looks at one VC at a time, the identification of investment opportunities for a project is simplified, along with the identification of the roles and motivations of different VC actors.

This framework can be operationalized for project design through four specific steps (carried out through background studies or diagnostics), which allow for identification of suitable NSVC intervention options:²

- **Step 1. Nutrition situation analysis:** to identify the nutrition problem of the target population, and particularly the gaps in the diets.
- **Step 2. Commodity selection:** to identify the commodities (types of foods) that can address the nutrition problem, while also responding to market demand and ensuring income generation for smallholders.
- **Step 3. Nutrition-sensitive VC analysis:** to identify the constraints in supply and demand of these commodities as they relate to the nutrition problem. In the same way that standard VC development strategies respond to the constraints and opportunities identified through a VC analysis, the strategies that NSVC interventions will adopt are determined by the NSVC analysis. This analysis differs from a standard VC analysis in that it specifically analyses dimensions that are relevant to nutrition, such as food safety, food loss, nutrition value or barriers to consumption from smallholders.
- **Step 4. Identification of intervention options:** based on the constraints identified, a range of intervention options can be identified for the project to invest in.

2. Detailed guidance on each of these four steps is available from de la Peña and Garrett 2018.

3.2 Impact pathways and the contribution of nutrition-sensitive value chains to nutrition

NSVCs' contribution to addressing nutrition problems is related to the food-based determinants of malnutrition, and more specifically to the availability of and access to food and improvements in diet quality, which are key to preventing all types of malnutrition. Improving diet quality may entail filling in specific nutrient gaps in the diets, or intervening in a range of commodities that provide beneficiaries with access to a diverse and high-quality diet (Gelli et al. 2015).

A key limitation that arises when considering impact on diet quality based on VC development is the fact that VCs are generally commodity specific, whereas diet quality depends on a variety of foods. However, IFAD's VC projects often include a range of commodities, offering potential for improving overall diets. In addition, projects usually cover a fairly large geographic area, so, with different communities developing VCs for different commodities, there is the possibility of strengthening local and regional food systems and promoting a variety of foods in the markets across the project area.

Another relevant aspect of an NSVC project's contribution to nutrition is that impact can be achieved for both producer and non-producer households, rather than producer households alone. VC projects usually focus simply on producer households and the income that can be generated for them. This framework, however, starts with the nutrition problem, and so forces project designers to consider how to take actions to improve the nutrition of consumer households as well. Actions to make affordable, nutritious foods more available and to increase demand will have a knock-on effect for all consumers, not just the producer beneficiaries. As a result, NSVC development can shape the entire food system in ways that broadly increase access to nutritious foods. This approach has the potential to benefit a wider range of consumers by strengthening the food system to make nutritious foods more available, affordable and acceptable.

We need to be clear, however, on how such strategies and such a project will work to improve the diets and nutrition of the beneficiary households. While there is still limited evidence on the exact direct or indirect impact of interventions shaping NSVCs on nutrition (Gelli et al. 2015), the pathways through which agricultural interventions improve nutrition have been widely analysed and discussed (Dorward 2013; Henson, Humphrey and McClafferty 2013; Dangour et al. 2012; Hawkes et al. 2012; Hawkes, Turner and Waage 2012; Arimond et al. 2011; Fan and Brzeska 2011; Gillespie and Kadiyala 2011; World Bank 2007; Bonnard 2001).

Synthesizing and simplifying the different approaches, we identify three impact pathways for improving the nutrition of those involved in NSVC projects and two key mediators of impact:

Impact pathways

- **Own production.** Project households will increase the production of nutritious foods and can consume these foods from their own production.
- **Income.** The project will increase the incomes of beneficiaries, and households can use the income to increase purchases of nutritious food and improve household diets.
- **Market.** The project will increase the consistent availability and affordability of nutritious foods in the market, with greater efficiency in production, processing and transport, leading to greater diversity and lower cost of foods in the market.

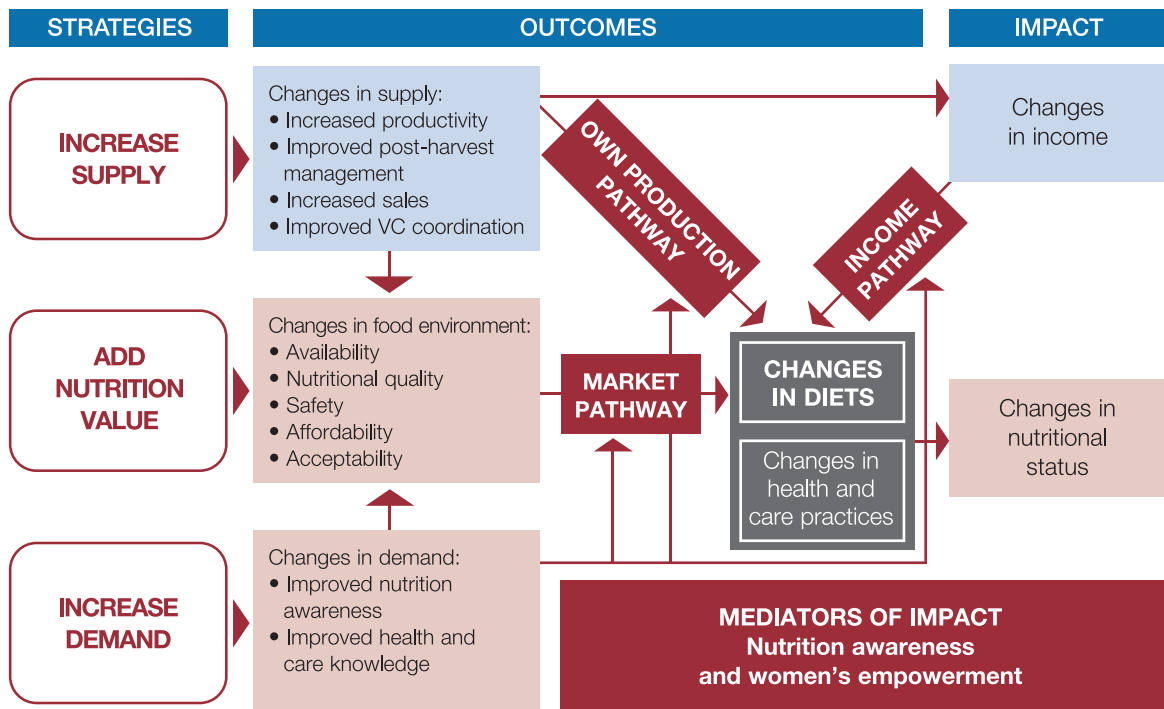
Mediators of impact

- **Women's empowerment and nutrition awareness.** These are essential dimensions cutting across all three impact pathways.

In Figure 3, we consider how the three different strategies to create NSVCs covered in the previous section will work to improve nutrition, graphically representing each of the impact pathways. As mentioned above, the main contribution of NSVCs to nutrition will occur through improvements in diet quality through increased consumption of nutritious and safe foods, both on farm (by producer households) and off farm (by consumers within the broader food system in which the VC operates).

The three impact pathways described all support changes in consumption of nutritious foods, and are achieved through combinations of the different NSVC strategies. Below, we describe the three impact pathways and the two key mediators of impact in more detail, as well as the main target groups for each pathway.

Figure 3 Impact pathways of nutrition-sensitive value chain projects from a smallholder perspective



1. Income pathway

The activities included in the typical VC development project (“increase supply” strategy) promote changes in quantity and quality of production, changes in post-harvest practices, changes in access to markets or changes in VC coordination, with the goal of achieving an increase in sales and profits that will lead to increased income.

This increase in income may feed back into dietary improvements at the household level, but this does not happen automatically, and there is a wide array of sociocultural factors that may keep the improvement in economic status from translating into improvements in diets and nutritional status. Increases in income are more likely to result in nutritional improvements when the incremental income is controlled by women, the stream of income is regular or frequent, the income is in kind (food) and the intervention includes behaviour change or nutrition awareness activities (Bonnard 2001). Therefore, the two key mediators of impact (women’s empowerment, and nutrition awareness) are essential. In this sense, the activities included in the increase supply strategy must be complemented with specific actions that stimulate consumption of nutritious foods among smallholders in order for the income pathway to have nutritional impact.

Target group. The income pathway’s target group is composed of stakeholders whose incomes are expected to rise as a result of a VC project. This includes smallholder producers, but also other groups that may benefit from a VC project, such as micro-, small and medium-sized enterprises acting as processors or individuals who can take advantage of employment opportunities generated along the chain. Moreover, women constitute a key target group of this pathway, since income controlled by women has a higher chance of leading to improvements in household nutrition.

2. Own-production pathway

The consumption of nutritious foods by producer households out of their own production can be considered the most direct pathway to achieving changes in consumption. Standard VC development activities (increase supply strategy) may entail changes in quantity and quality of production that lead to increased availability of food for these producer households. Strategies to add nutrition value can also contribute to improving food safety and nutrient retention on farm (i.e. at input and production stages of the VC), providing producers with more nutritious and safe foods that can be consumed at the household level. However, as with the income pathway, it is important to note that this pathway does not happen automatically. Specific actions to stimulate consumption, such as nutrition awareness and behaviour change campaigns, cooking classes or incentives to save a portion of the nutritious foods for household consumption, are needed to ensure that improvements in production lead to improvements in diets.

Target group. The own-production pathway’s main target group is producer households that benefit from increased consumption thanks to greater on-farm availability of nutritious foods.

3. Market pathway

Developing NSVCs can also catalyse changes in the food environment, resulting in improved access to food in the market. To explore the market pathway, it is useful to disaggregate different elements of the food environment:

- **Availability.** Developing an NSVC can affect food availability through changes in production (e.g. increases in productivity), changes in processing (e.g. greater shelf life), changes in distribution (e.g. improvements in rural infrastructure) or changes in market access (e.g. development of local markets closer to low-income consumers).
- **Affordability.** VC development can affect food prices by lowering costs through improvements in VC efficiency, productivity, packaging, processing and transport. Decreases in food loss and food waste can also lead to lower prices.
- **Acceptability.** Since NSVCs may incorporate activities such as behaviour change communication campaigns or nutrition education, acceptability of nutritious foods may be improved, leading to higher demand.
- **Nutritional quality and food safety.** Activities to reduce food and nutrient loss as well as ensure food safety along the chain will lead to improved safety and quality of the foods available in the market.

NSVC interventions have the potential to improve availability, affordability and acceptability of foods in the market, which can translate into increased consumption both on farm and off farm. Another way of achieving impact through the market pathway is through the exploration of new markets, such as institutional markets (e.g. public purchasing programmes, school meal programmes, food assistance programmes). An additional benefit of these markets is that they generally target nutritionally vulnerable populations, such as women or children.

Target group. The market pathway benefits producer households plus a wider set of consumers in the community who benefit from a food system under which good-quality and safe foods are more available, affordable and acceptable. In the case of institutional markets, vulnerable populations targeted by these programmes are also part of the target group.

Mediators of impact: women's empowerment and nutrition awareness

When conceptualizing the possible links between agriculture and nutrition and the specific pathways through which impact may occur, specific consideration is often given to women's empowerment and intra-household gender dynamics (Gelli et al. 2015; Arimond et al. 2011; Fan and Brzeska 2011; Gillespie and Kadiyala 2011; World Bank 2007). For NSVC interventions, women's empowerment is also a critical mediator of nutritional impact that crosses all three impact pathways. Women are a key target group for all impact pathways. Moreover, women are in a unique position at the nexus between agriculture (in their roles as producers or marketers) and nutrition (in their roles as the family member most often responsible for food consumption and preparation, as well as for childcare and feeding practices) (Kurz 2013).

Specific actions such as focusing on crops predominantly grown by women, generating income that is controlled by women, and improving women's access to services, markets, inputs or finance for VC development can improve impact on gender and nutrition (FAO 2015). However, VC development focused on women must take into consideration that there are also potential negative effects related to overburdening women and reducing the time dedicated to caregiving and feeding practices (FAO 2015; Gillespie and Kadiyala 2011).

It is essential to carefully balance these considerations when designing an NSVC development intervention, ensuring that there are no unintended effects, especially those relating to disempowerment or time burden (Celli et al. 2015).

Nutrition awareness is another crucial mediator of impact that cuts across all three impact pathways. Nutrition awareness refers to the knowledge and understanding of food and nutrition information (including dietary diversity, diet requirements for different age groups across the life cycle, as well as issues of hygiene and gender as they relate to nutrition) that, when adopted and put into practice, can lead to improvements in nutrition outcomes.

Adequate knowledge of and practices regarding nutrition must be in place to inform food choices and diets and turn changes in incomes and production into changes in consumption at the household level. Interventions to raise nutrition awareness are essential for NSVC development, since these actions are instrumental in stimulating demand for the nutritious and safe foods that compose a healthy diet. As discussed in the following section, raising nutrition awareness will entail investments in activities such as social marketing campaigns, social and behaviour change communication campaigns, food and nutrition education, and cooking demonstrations.

Women are a key target group for these nutrition awareness activities, given their responsibilities in addressing household nutrition, their role as caregivers, and the importance of their own health and nutritional status, especially when pregnant and lactating. However, in order to ensure the nutrition impact of NSVC development, it is important to raise nutrition awareness more broadly at the household level, targeting all individuals with decision-making power, including mothers-in-law as well as men.

4 Nutrition-sensitive value chains: entry points, challenges and opportunities for smallholders

The NSVC framework shows how to take nutrition into account in the design of a VC project. Figure 2 highlights specific strategies an NSVC project could adopt (increase supply, increase demand and add nutrition value), and provides examples of interventions to make a VC more nutrition-sensitive. In Figure 3, we link these strategies to the impact pathways for improving nutrition that are of particular relevance to smallholders, as both producers and consumers.

In this section, we discuss the entry points for nutrition at each stage of the VC, from inputs to consumption. We then turn to summarizing the main challenges and opportunities that are likely to arise when designing and implementing NSVC projects for smallholder farmers.

4.1 Nutrition-sensitive entry points and actions in the value chain

Based on the overall NSVC framework (Figure 2), there are multiple possible entry points for action throughout the VC. This section provides an overview of the nutrition-relevant issues that may arise at all stages of the VC, as well as the potential actions that can be promoted to address them, with a particular focus on smallholders. Complementarities and overlaps with gender and environment are also highlighted to promote a holistic and synergistic approach to NSVC development.

Inputs

A nutrition-sensitive food system starts with good-quality inputs that allow the production of nutrient-rich and safe products. However, one of the key challenges that smallholders face when being linked to agricultural VCs is their weak connection to input markets, which often translates into production costs higher than those of medium-sized or large farms. In addition, at the input stage of the VC, issues with regard to seeds or soil and water quality can negatively affect nutrition by affecting the nutrient value of the crops.

Smallholder farmers may face difficulties in accessing high-quality seed for nutrient-rich crops. The availability of nutrient-rich varieties has frequently been constrained by the fact that government policies and priorities have traditionally concentrated on staple crops, which may not be particularly rich in nutrients (Pingali 2015; McClafferty and Zuckerman 2014). A key entry point for NSVCs at input level is, therefore, the promotion of access to nutrient-rich crops, an initiative that can serve multiple purposes in terms of income, climate and gender. Pulses or fruit and vegetables, for instance, may not only have a high nutritional value but also provide scope for income enhancement and women's empowerment, given that these crops are generally controlled by women (FAO 2015; Henson, Humphrey and McClafferty 2013).

Conservation and production of traditional, but sometimes overlooked, crops or animals can sustain or add diversity and nutrient value to the local food system. They can also serve the multiple purposes of nutrition improvement, income generation, environmentally sustainable production and promotion of women's empowerment (FAO 2015; McClafferty and Zuckerman 2014). These traditional foods (highly nutritious fruit, vegetables, cereals, pulses, roots, breeds of animals and fish species) are sometimes neglected and underutilized in the push for higher production or standard VC development. Often women are more involved in their cultivation or collection; they often have higher nutrient values than crops that have been introduced from outside the community; and they may be more resilient to pests, climate change and related poor growing conditions. Some of these crops also grow in countercycle to the lean season and so are available when other crops are not (Padulosi, Roy and Rosado-May 2017).

An IFAD-funded project on neglected and underutilized species (NUS) in the Andean region provides a good example of this type of initiative. The project promoted commodities such as quinoa, amaranth, and cañihua while adopting a VC framework. The experience was successful in achieving conservation of Andean grains through the development and dissemination of improved high-quality seed varieties and the promotion of their use by a range of VC actors. Additionally, the project achieved increases in income for all VC actors throughout the chain while also increasing consumption of Andean grains among beneficiary communities and improving the working conditions of women involved in processing activities (Padulosi et al. 2014).

Biofortification is another increasingly important intervention. Biofortification aims to increase the bioabsorbable content of key micronutrients, such as iron, zinc and vitamin A, in staple and other food crops, such as potato, maize, cassava, beans, sorghum and millet. HarvestPlus, the leading organization working in this field, promotes conventional plant breeding to develop seeds that naturally fortify themselves and have a multiplier effect. It is regarded as a cost-effective strategy to prevent micronutrient deficiencies, especially for the rural poor who cannot afford a diverse diet and depend on local or own production (HarvestPlus 2010).

Another key input for nutritious food production is soil quality, which can be negatively affected by the use of fertilizers and pesticides. Declines in soil quality can reduce the nutrients available for seeds to absorb and, therefore, reduce the nutritional quality of the final product. Sustainable production techniques can preserve soil quality and will be explored in the next section. One alternative that is being promoted at the input level is the use of micronutrient fertilizers. These fortified inputs add micronutrients to the soil, improving the nutritional quality of the food produced in it (McClafferty and Zuckerman 2014).

Food safety risks may also arise at this point in the VC. Aflatoxin contamination, produced by a type of fungus, is one of the most common food safety risks, infecting peanuts, maize and other crops and posing serious threats to human health, including cancer and other chronic diseases as well as nutritional deficiencies and delays in cognitive development. Aflatoxin contamination, which can occur at several points of the VC, can be controlled at the input stage through application of products such as Aflasafe, a biological control product that can reduce contamination by up to 90 per cent (McClafferty and Zuckerman 2014).

Food production

With regard to food production, there are multiple entry points for nutrition-sensitive actions that can be included in product- and process-upgrading strategies and can respond to climate and environmental risks as well as concerns about gender equity. There are two broad categories of nutrition-sensitive issues at this stage of VC: *what to produce*, where smallholders face challenges related to the choice of commodity, specialization in one crop and seasonality; and *how to produce it*, where the key challenges for smallholders are related to their low capacity to meet market requirements and standards and to the potential risks of intensification of production.

Product: what to produce

One of the more complex issues that arises when developing NSVC interventions is the potential trade-off between the goals of increasing incomes of producers and improving nutrition of the target population.

As mentioned above, there are several nutritious foods that can balance both goals. Horticultural crops are highly recommended to improve micronutrient intake and dietary diversity, and they are also high-value crops with potential to increase incomes (FAO 2015; Henson, Humphrey and McClafferty 2013). Legumes combine high nutritional value with nitrogen fixation properties that improve soil fertility and increase yields (FAO 2015). Animal source foods (meat, milk and fish) have experienced a significant increase in demand and thus offer a profitable market that can be leveraged for income generation while contributing to dietary diversity (WorldFish Center 2011).

When incorporating a new nutrient-rich commodity, it is essential to consider how the production cycle will be affected in terms of inputs required, harvesting time, services, water consumption and labour. In this sense, some nutritious crops offer significant advantages. Indigenous crops such as African nightshade, vegetable amaranth and spider leaf combine short harvest times with climate-resilient properties (McClafferty and Zuckerman 2014). Biofortified orange-fleshed sweet potato, rich in provitamin A, is easy to cultivate, is less labour-intensive than other staples, propagates vegetatively and is drought tolerant once established, all of which can facilitate uptake by vulnerable smallholder farmers (Arimond et al. 2011).

Beyond crops, a small fish VC, for example, holds promise by serving the complementary goals of income generation for smallholders, gender equality, environmental protection and nutrition improvement. Some small fish, such as mola in Bangladesh, are especially rich in micronutrients and can be an important source of protein for low-income consumers, especially given that they are often more affordable than other animal source foods (Kawarazuka 2010). In addition, small-scale fishing methods can generate 1,200 per cent more employment than industrial methods (with 50 per cent of the workforce being women), and can use more environmentally friendly methods (less value captured from the ecosystem with lower fuel consumption as well) (Bjorndal, Child and Lem 2014).

The selection of these nutritious commodities can also contribute to gender equality. Given that production of food crops, especially fruits, vegetables and small animals, is generally controlled by women, focusing on these commodities can contribute to increasing women's empowerment and women's control over household income, both key factors in improving nutrition in the household.

However, it is important to carefully consider the impact of any changes introduced on women's time and labour requirements, in order to reduce potential negative effects on childcare and feeding practices (FAO 2015) and the woman's own health and status. For example, perverse effects may arise if the promoted crops begin to generate greater income (which a successful project would be expected to do). First, men may push in to take control and, second, such crops may exit the household diet, as they are increasingly put into the market. Both of these occurrences may have negative consequences for household diets and nutrition.

From a smallholder perspective, it is also important to consider the risks associated with specialization of production in one commodity when selecting commodities for production in an NSVC. Although specialization may be beneficial to achieve competitiveness within the VC, it can also place the household in a more vulnerable position with regard to external shocks, such as price volatility and environmental risks. Project design must balance diversification and specialization so that specialization does not actually increase risks to a household's production, income and even nutrition.

NSVC development for smallholders must also tackle the issue of seasonality (IFAD 2014b). Seasonality in food production causes variation in supply, when buyers would prefer continuous and timely supply all year round (Robinson, Nwuneli, et al. 2014; LeCuziat and Mattinen 2011), while also affecting food and income availability in the household. Addressing seasonality can be dealt with at both market and household levels. In terms of the market, addressing seasonality starts with understanding and mapping seasonal fluctuations and their impact on food prices and availability (Ladd 2013). Variations in availability can be dealt with in various ways: for example improving storage and processing to increase availability during slack periods, promoting diversified integrated production systems and taking seasonal fluctuations into account in contractual agreements with other VC actors (Bonnard 2001). At the household level, the promotion of diversified production systems can address the adverse effects of specialization and seasonality, while increasing the household's resilience (FAO 2015). Diversification of production can arise from use of integrated farming systems and complementary small-scale food production intended primarily for own consumption, for example the use of home gardens or raising of poultry and small ruminants. Furthermore, nutritional impact at the household level can be enhanced by jointly mapping harvest calendars with nutritional calendars to identify how diversification can contribute to overcoming seasonal nutritional deficiencies within the household (Jaenicke and Virchow 2013).

Process: how to produce it

In recent years, there has been an increase in product and process standards in agricultural VCs that determine how food production must be carried out (Humphrey 2005). The capacity of smallholders to meet these market requirements (in terms of volume, quality, frequency and consistency) can limit their sustainable incorporation into a VC. Moreover, more nutritious products often pose a higher risk in terms of food safety, and greater challenges in terms of nutrient retention (due to perishability of fruit and vegetables, food-borne diseases linked to livestock and fish production, etc.). Stricter production and processing standards apply when considering incorporation of these commodities into the market.

A key entry point, therefore, is to build smallholders' capacity to comply not only with general market requirements, but also with the specific market requirements associated with nutritious foods.

Product and process upgrading strategies in standard VC development generally involve the dissemination of agricultural practices and technologies to improve farmer compliance with market requirements in terms of quality, efficiency and consistency. These same activities can be made nutrition-sensitive by incorporating specific technical assistance and technology related to food safety and nutrient preservation. Extension agencies are often institutionally fairly weak. At the same time, they are the most logical country-level organization to use to build capacity, and there is increasing emphasis on the use of extension officers for the delivery of nutrition-relevant messages (for example promotion of nutritious foods, good agricultural practices, and safe and hygienic production), given their close contact with smallholder farmers (Fanzo 2015).

The environmental trade-offs associated with the intensification of production that certain VCs require are another concern at this stage of the VC. Increases in agricultural productivity may have a negative impact on agrobiodiversity and soil quality, and water supply and quality. Aside from the environmental consequences and the risks associated with depleting smallholders' natural capital, there are also consequences for nutrition. For example, reduction of agrobiodiversity on the farm is correlated with reduction of dietary diversity, and contamination of water and soil affects food nutrition quality and safety (FAO 2015; Jaenicke and Virchow 2013; Acharya et al. 2010). With regard to livestock and fish VCs, intensification of production can increase the risk of food-borne and other associated diseases. Unsafe handling of manure and unhygienic production practices can compromise food safety of dairy products. Uncontrolled aquaculture growth aimed at increasing fish production can affect the quantity and quality of water intended for human consumption and increase the risk of malaria from mosquitoes (FAO 2014a; USAID 2014; Hasler et al. 2013; WorldFish Center 2011).

Maintaining or improving the natural resource base of smallholders is a key principle in the promotion of nutrition-sensitive agriculture (Herforth and Dufour 2015). NSVC interventions must therefore take into account the potential negative effects of interventions and focus on techniques and technologies that improve compliance with market requirements while ensuring environmental sustainability.

Availability of water is another crucial input for both agriculture and nutrition. First, NSVCs must ensure that water is available in the quantity and quality required for safe crop and livestock production, without compromising water quality and availability for human consumption. Second, NSVCs must protect human health by promoting safe water management techniques that take into account not only the potential water contamination in surrounding communities (which can be a consequence of production intensification and use of pesticides and other agrochemicals), but also the additional health risks in terms of malaria, microbes and other vector- and water-borne diseases (FAO 2015; Ladd 2013; Muller et al. 2009).

Post-harvest management, storage and processing

Functional upgrading in VC development entails moving smallholder farmers up the VC towards more value added activities where they can capture a higher share of the final price. In recent years, there has been a proliferation of grass-roots and small and medium-sized enterprises (SMEs) undertaking post-harvest functions in the midstream segments of food VCs. Performing activities such as storage, milling, sorting, packaging and quality differentiation, these post-harvest SMEs have significant potential for incorporating the poorest smallholders into VCs by employing them in these activities.

However, if adequate capacities and facilities are not in place, post-harvest management can pose significant risks in terms of food loss, nutrient loss, and degradation and contamination. Therefore, building the capacity of smallholders and SMEs to ensure food safety and nutrition quality at this stage of the VC is crucial.

Controlling contamination, quality and food safety at post-harvest requires a coordinated effort at different points of the VC. Improving post-harvest practices can be promoted through traditional VC development strategies that improve coordination of VC stakeholders. Improving horizontal linkages by creating or strengthening farmer organizations can improve VC performance and provide a platform for improving post-harvest management. Farmer organizations are good channels for building capacity in food safety and quality assurance during production and post-harvest management, for supporting improvements in infrastructure (milk collection centres, warehouses, etc.) and for providing equipment for safe storage and handling (storage bags, low-cost cooling technologies, etc.) (McClafferty and Zuckerman 2014; Robinson, Nwuneli, et al. 2014; Save the Children 2012)(see Box 2).

Food safety and quality is an area where the private sector can serve as a potential partner for the NSVC project, given the importance of food safety for commercial purposes. The project can also adapt the nature of quality assurance mechanisms to the smallholder context. For example, vertical linkages among VC actors can be strengthened through contractual agreements between producers and processors, perhaps assured by a neutral third party. Such an arrangement can provide a long-term and stable relationship where actors can work out kinks and identify needed incentives to create smooth, efficient functioning of the VC, working together towards taking actions to promote nutrition and food safety (Robinson, Nwuneli, et al. 2014).

Box 2 Reducing aflatoxin contamination in the groundnut VC in Ghana

A good example of the need for VC coordination is the groundnut VC in Ghana, where aflatoxin contamination due to poor-quality storage facilities posed a significant food safety risk for the whole VC. Anim-somuah et al. (2013) showed that the only procedure to control aflatoxin contamination was sorting produce to remove contaminated groundnuts. Yet, in this case, unsafe groundnuts were simply diverted towards the poor, whereas uncontaminated products were targeted at the middle-income consumers or export markets, since the price charged to those groups could cover the cost of aflatoxin removal. In this case, a potential mitigating action would be to create a traceable supply chain that provides incentives to different VC actors to prevent contamination for all human consumption (including a premium price for safe supplies) and to identify non-food VCs (such as bioenergy) for contaminated production (Anim-somuah et al. 2013).

The choice of processing methods, also part of this stage of the VC, is crucial for nutrient preservation. The most desirable methods will enhance shelf life while maximizing retention and bioavailability of nutrients (FAO 2015; Mazur et al. 2011). In the case of small fish, 90 per cent of vitamin A can be destroyed through processing methods that involve intensive boiling and drying (Kawarazuka 2010). With regard to vegetables, reducing thermal treatment and improving the drying process can minimize nutrient loss (Weinberger and Pichop 2009).

Regarding secondary or industrial processing, a key issue affecting nutrition is the presence of ultraprocessed foods in modern VCs. Excessive consumption of these relatively inexpensive, calorie-dense processed foods can have significant negative implications for overnutrition (World Bank 2014; Gómez and Ricketts 2013).

A project can advocate limiting the use of harmful ingredients (such as added salt, sugar or fats) through government policies and regulations, such as the “Stop” label promoted in Chile for products with high sugar, salt or fat content, or the “soda tax” included in Mexico for sugar-sweetened beverages (Colchero et al. 2016). Another option to leverage industrial processing for nutritional goals is to develop healthy processed products of biofortified crops, such as “golden bread,” doughnuts and juice made out of orange-fleshed sweet potato (Arimond et al. 2011).

Another possible entry point for NSVCs at the processing stage is fortification, the process of adding micronutrients, such as zinc, iron, iodine or vitamins, to widely consumed foods, such as edible oil, milk or flour. Food fortification is a cost-effective strategy to address micronutrient undernutrition, while also improving health status, including reduction of diarrhoea and respiratory illnesses (World Bank 1994). Fortification is especially relevant in areas where there is limited access to non-staple foods that are needed for a more diverse diet (Jaenicke and Virchow 2013).

Food fortification has been made mandatory in some middle-income countries, such as India, where fortification of hydrogenated vegetable oil has been mandatory since 1953, or Nigeria, where the government has promoted mandatory fortification of widely consumed foods such as flour, salt and oil (McClafferty and Zuckerman 2014; Robinson, Akinyele et al. 2014). Mandatory fortification holds potential for overcoming some market constraints that arise further down the VC. For instance, fortifying widely consumed products avoids acceptability issues among the target population and can take advantage of distribution systems that are already in place. However, the experience in Nigeria shows that compliance can be low without adequate monitoring and enforcement. Products that are supposed to be fortified may not contain adequate levels of micronutrients (underdosing) or may not be fortified at all, especially in informal markets where the poor get their food (Robinson, Akinyele, et al. 2014). Where voluntary fortification is in place, questions may arise about whether products are actually fortified or not. In any case, for both mandatory and voluntary fortification, a key challenge will be to ensure that processors have the capacity (facilities, technology, knowledge, finance) to adequately fortify staple foods.

Distribution and transport

A common concern in projects that link smallholder farmers to VCs is inadequate rural infrastructure, which can make transport and distribution prohibitively expensive (IFAD 2014a). In NSVCs where poor smallholder farmers in remote areas are not just producers but also consumers, distribution can become an even more significant barrier to availability and affordability of food. Typical VC development investments aim to improve smallholders’ linkages with VC actors (traders, processors, etc.), as well as physical access to markets (road connectivity) and quality of facilities (market infrastructure) in order to improve distribution networks, increase efficiency, and reduce costs and losses (IFAD 2014a), and this can also help with provision of nutritious foods.

Some more specific nutrition-relevant actions can also be taken at this stage of the VC. Inadequate distribution and transportation can cause significant food and nutrient losses, for example. Fresh fish or milk can last 10 to 15 days if kept at optimum cold temperature (0° C), but only a few hours if kept at a warm ambient temperature of 30° C. In this sense, maintaining the cold chain through the use of refrigerated transport is especially important for certain animal source foods.

Aside from mechanized technologies such as refrigerated trucks and refrigerated marine containers, there are several low-cost and self-constructed cooling technologies that are affordable for smallholders to use (Kitinoja 2013).

Distribution can also be improved through “bottom of the pyramid” business models with strong distribution systems that can reach the poorest (often living in rural areas), or through partnerships with leading multinationals that leverage their wide-reaching distribution systems (Robinson, Nwuneli, et al. 2014). Gómez and Ricketts (2013) refer to these type of arrangements as “modern to traditional food VCs,” where national or multinational companies sell through traditional traders (see Box 3).

Box 3 Overcoming distribution and marketing challenges through “bottom of the pyramid” business models

An example of this sort of business model is Grameen Danone, a social enterprise created by Grameen Bank and Danone Group, which produces a fortified yoghurt called “Shokti,” with the goal of improving micronutrient deficiencies in poor rural areas of Bangladesh. This business model relies on a distribution system that works through saleswomen, the “Grameen Ladies,” in order to make the yoghurt available in remote areas. Even though the model was successful in reaching poor rural consumers, it was not financially sustainable. Grameen Danone started selling Shokti to middle- and high-income urban consumers to defray the cost of reaching low-income populations (a sort of cross-subsidy) (Agnew and Henson 2018). The combination of rural and urban distribution to poor and wealthy consumers can be a successful strategy to assist with financial viability.

Trade, marketing and promotion

The weak access of smallholders to markets is one of the key challenges that typical VC projects aim to address. However, when considering NSVCs, there is an additional challenge that it is not access to just any market that needs to be improved, but access to the markets where the target population purchases their food. In this respect, it is important to consider challenges associated with smallholders as both producers (supply side) and consumers (demand side).

From the *supply side*, smallholders and SMEs participating in the NSVC face two main challenges: achieving commercial viability and product differentiation while reaching low-income consumers.

With regard to commercial viability, the trade-off between income generation and nutrition impact is crucial. Although our approach aims to improve nutrition, producers and other VC actors will act only if their actions make business sense and turn a profit. The profitability of the NSVC might be greater if products are targeted to wealthy consumers. However, nutritional impact in our framework requires that NSVC target project beneficiaries, who will usually be low-income consumers, and thus target markets where these consumers purchase food.

Given that poor consumers generally purchase their food in traditional markets (mainly for reasons of price and locational convenience – and this is especially true in rural areas), development of NSVCs requires actions to improve access to and develop local markets, for both producers and consumers (Ayieko, Tschirley and Mathenge 2005). Local, generally informal, markets often suffer from shortcomings that make provision of nutritious food difficult. This includes infrastructure that is inadequate for storage, especially for perishable foods, and that exacerbates food safety risks.

At the same time, local markets may appeal to producers because they have less strict market requirements and they are closer to production areas, reducing environmental and economic costs associated with distribution. Robinson and Humphrey (2015) advocate strategies that build the capacity of informal businesses to supply more nutritious foods, capitalize on the flexibility of informal markets, and build on existing consumer knowledge and trust.

Another challenge to consider from a supply side perspective is differentiation between more and less nutritious products. In many cases, nutrition value can be invisible. For example, consumers (and even buyers in the VC) may not be able to distinguish a fortified from a non-fortified product, or an aflatoxin-free from a contaminated product. Consumers may have low nutrition awareness and simply not be aware of a particular product or its nutritional value. Nutrient content cannot be tasted and the positive effects will not be felt in the short term, so consumers cannot identify nutritional quality through consumption (Henson and Humphrey 2015).

Consequently, if nutrition awareness is raised and demand increases for purchased nutritious foods, consumers need to be confident they can differentiate products that are more nutrient-rich or safe from ones that are less so. Producers, marketers and consumers all need some sort of reliable signal of nutritional quality. Consumers will not be willing to pay a higher price for supposedly more nutritious foods unless they can somehow verify nutrition quality and be sure they are getting what they are paying for. One way to do this is to have specific characteristics that distinguish the products, such as *orange* biofortified maize or *yellow* biofortified cassava. Establishment of a strong brand image that allows consumers to associate assured nutritional quality with a specific brand is another option (Maestre et al. 2014; Robinson, Akinyele, et al. 2014). Initiatives can also establish mechanisms to control, verify and signal nutritional quality, such as use and promotion of food certification programmes that put labels on foods depending on certain requirements (Henson and Humphrey 2015).

From the *demand side*, in the context of development of VCs to improve nutrition, the targeted consumers, whether smallholders as consumers or other non-producer low-income consumers, face two significant challenges when accessing nutritious food in the market: availability and affordability.

In terms of availability, the above-mentioned strategy of provisioning local markets can contribute to tackling this issue. However, another relevant entry point is to explore alternative markets that can reach vulnerable consumers more directly: institutional markets. Public purchasing programmes, home-grown school meal programmes or other forms of food assistance can provide markets for smallholder production while also specifically targeting vulnerable target groups (women, children, poor households, etc.).

Linking smallholder farmers to institutional markets through long-term arrangements can also be a useful strategy for securing stable market demand. This then allows forward planning, the implementation of mechanisms to monitor and guarantee nutritional quality along the VC, and recuperation of investments needed for compliance. In addition, institutional markets can defray the costs of distribution, with the public sector (often a ministry) covering the cost of distribution to the target population while the other actors of the VC focus on improving production and post-harvest management (Robinson and Humphrey 2014). From a smallholder perspective, institutional markets can also be seen as a first step towards reaching private markets, giving producers the opportunity to build their capacity in terms of production and logistics before accessing a more competitive market.

Resolving the issue of affordability is crucial when considering smallholders and other low-income populations as consumers. For example, the main constraint to increased consumption of animal source products is the high price relative to other foods (Kurz 2013). Furthermore, complying with food safety standards or introducing nutrition labelling entails additional investments.

To justify the investment in nutrition value addition and achieve financial sustainability, premium prices may be required, and affordability may be further affected. If undertaken with the aim of preserving access to these foods for low-income consumers, VC upgrading strategies that aim to enhance supply (improving efficiency of the production process, creating producer organizations that can reduce transaction costs, developing bottom of the pyramid business models, etc.) can help to maintain or reduce consumer prices and overcome the affordability challenge.

Another way to tackle affordability is to package products in small quantities that are more affordable to low-income consumers (Henson, Humphrey and McClafferty 2013; Mazur et al. 2011). However, small or individual packages can potentially generate more waste, so it is important to envisage context-specific ways to reduce the potential environmental impact of this strategy. Locally developed innovations that improve affordability as well as availability of nutritious foods in the marketplace also exist (see Box 4).

Box 4 Improving access to animal source foods through innovations

In Kenya, in an initiative funded by the Global Alliance for Improved Nutrition (GAIN), a coin-operated machine provides small quantities of milk on demand to low-income populations who can use their own bottles or pitchers to transport the milk to the household (McClafferty and Zuckerman 2014). “Chicken Choice Shops” are another initiative funded by GAIN in Kenya. In these shops, less desirable chicken parts, which higher income consumers may reject, are marketed to poor consumers under safe conditions (McClafferty and Zuckerman 2014). The Chicken Choice Shops are not only a way to market low-cost safe poultry to poor consumers but also a way to recapture the value from food waste through a reverse channel that brings the product back into the food chain, which is one of the key components of the green food VC framework (FAO 2014b).

Promotion, preparation and consumption

Traditional VC development strategies can include interventions that cover the entire VC, but generally they are concerned with supply. In contrast, for NSVC development, shaping demand is crucial for all three impact pathways through which NSVCs achieve nutritional outcomes: the income pathway, the own-production pathway and the market pathway. Thus, development of NSVCs must also include activities that affect demand, particularly interventions that influence household consumption, purchasing and preparation behaviours.

A key constraint to increased demand for nutritious foods, and households’ willingness to pay, may be low nutrition awareness (Maestre et al. 2014; Mazur et al. 2011), especially among low-income consumers and smallholders who are the main targets of projects considered here. That is, those who make decisions about consumption and purchasing may not be aware of the importance of good nutrition to well-being, the importance of a nutritious diet in achieving good nutrition, and which foods are available and affordable to achieve such a diet. They may also face constraints in terms of distance, prices and income. Food and nutrition education and behaviour change communication campaigns are crucial actions to raise nutrition awareness and stimulate demand for nutrient-rich foods. Information can be incorporated in a range

of activities, such as health sector-based nutrition education, agriculture-based extension or community-based actions, including community cooking classes or meal programmes (see Box 5). Information can be provided not only about the components of a nutritious diet but also about what nutritious foods are currently available in the market and which foods provide the best nutrition at the most economical cost, as with the Mejor Compra programme in Peru (CENAN n.d.).

Another set of issues is related to food acceptability, which may take different forms. Some foods, even if nutritious, may not be acceptable because of cultural perceptions or social stigma. Long preparation time or significant energy use or factors related to consumption, including taste, smell or difficulties in digestion, can also affect consumer acceptability of a particular food (Robinson et al. 2014; Mazur et al. 2011).

For instance, less nutritious polished rice, available in inexpensive packages, may replace more nutritious millet, which can take hours for women to husk using traditional methods. In Nigeria, soy-based foods can take time to prepare, therefore consuming more fuel, and consumers, especially children, do not like the smell (Dhamankar, Valstar and Minneboo 2017). Taking into account acceptability issues in commodity selection and project design is the key to achieving higher consumption of nutritious foods. For this reason, when promoting new products or varieties, it is important to carry out taste-testing activities, promote the varieties that match local preferences, and develop behaviour change communication campaigns that address the issue of acceptability.

Another key activity to undertake as part of NSVC development is the use of social marketing campaigns. There is scope for collaboration and partnership with the private sector at this stage. The knowledge and power of persuasion of the private sector can be leveraged towards shifting consumers' preferences towards nutritious foods (McClafferty and Zuckerman 2014), particularly those for which smallholders have a comparative advantage.

Nutrition-relevant issues can also arise at the point of consumption. Inadequate storage, unhygienic preparation or cooking methods that reduce nutrient content hinder nutritional impacts. Simple actions such as washing the vegetables before chopping them, removing skins or adding them to cold water instead of directly to boiling water can reduce nutrient content (Weinberger and Pichop 2009). In the case of fish, micronutrients are concentrated in the bones, heads and viscera, so cleaning and cooking methods that throw away these parts as waste leave out a significant source of nutrients and significantly reduce nutrient intake (Kawarazuka 2010).

Cooking classes and demonstrations can promote preparation that is more likely to maintain nutrients and combinations of foods that are more likely to meet nutritional needs and enhance bioavailability. To encourage uptake, such training should reflect local preferences and encourage simple cooking practices that are hygienic and preserve nutrients (FAO 2015; LeCuziat and Mattinen 2011; Mazur et al. 2011). Within food-based approaches to nutrition, there are multiple examples of cooking demonstrations and recipe development initiatives aimed at increasing the quality and diversity of diets, particularly for women and children. Simple recipes incorporating small indigenous fish and other nutritious ingredients (a fish chutney for women and a complementary food for children aged 6 to 23 months) have had proven results in improving macro- and micronutrient intake in Bangladesh, with these simple processed products also holding potential for commercialization (Bogard et al. 2015). In addition, there are experiences that have improved consumption and hygiene through the provision of technology at the household level, such as fuel-efficient stoves that reduce fuel consumption (usually wood, which can have its own negative effects on health) and allow cooking more than once a day (McClafferty and Zuckerman 2014).

Box 5 Key features to consider when carrying out food and nutrition education activities and behaviour change communication

- **What needs to happen?** The focus should be on shaping purchasing decisions and consumption behaviours within the household. These actions should help the household to select and prepare the foods they need for a nutritious diet for all members of the household at all times (FAO 2015). Activities should provide information on dietary requirements of the household members (by age and sex) and what foods can help to meet these requirements. Education and behaviour change messages and delivery mechanisms must take into account the social and economic environment within which food decisions are made. Actions must take into account the capacities and resources of the household, especially in terms of how this affects the affordability of food, the household's ability to store, prepare and consume food in hygienic ways, and its capacity to receive, understand and act on messages. Actions must also consider the household's location and ways it accesses food, as well as knowledge, attitudes and behaviours within the household, the community or the society. Nutrition education and behaviour change communication should target both women and men in order to have the greatest impact on knowledge, attitudes and practices, and consequently on improving behaviours and ultimately diet quality. Awareness should be raised among all those who can affect the nutrition sensitivity of the VC, from the households directly affected by the nutrition problem, through others who can affect the nutrition-related actions to shape the chain, to those who can, ultimately, make decisions that result in large-scale change and affect the food system as a whole (Jaenicke and Virchow 2013).
- **How should education and behaviour change communication be developed?** Nutrition education and behaviour change communication activities should be developed from a participatory perspective that starts by listening and understanding household and individual behaviours, and recasts the role of the "expert" as a facilitator. Participatory interaction and adaptation of messages to the social and economic reality of the household and the individuals within it will improve the effectiveness of these actions in achieving long-term behaviour change (Arimond et al. 2011). Once the key issues are highlighted through this participatory process, activities should focus on conveying well-tailored, actionable nutrition messages through channels or mechanisms that are known to be effective, using language that will be readily understood (LeCuziat and Mattinen 2011).
- **How should education and behaviour change communication be delivered?** A range of dissemination channels for nutrition education and behaviour change communication are needed for effective outreach. Agriculture and home extension services, women's groups, farmer field schools, producer organizations, schools and mass media are all possibilities (FAO 2015; Arimond et al. 2011). Complementarities among efforts already dealing with agriculture, nutrition or gender should be explored. The Integrating Gender and Nutrition within Agricultural Extension Services (INGENAES) programme describes a variety of experiences and provides knowledge, tools and technical assistance to build more gender-responsive and nutrition-sensitive extension services (INGENAES 2018). Given the opportunity for outreach and the already close interaction between extension workers and rural households, food- and agriculture-related nutrition messages can be integrated into agricultural extension, including farmer field schools, even though care must be taken not to overburden extension workers or muddle messages.

4.2 Challenges and opportunities for developing nutrition-sensitive value chains from a smallholder perspective

In the development of NSVCs, there are a number of specific challenges as well as opportunities that are presented when smallholders are the main beneficiary group of the project. In our framework, the project must also take into account the fact that smallholders are targeted not only as producers, but also as consumers. In this respect, it should be emphasized that the framework is about designing an NSVC *project*, and not only an NSVC. That is, the approach is holistic in that it considers how the *project* can be designed to improve the nutrition of the project beneficiaries, in this case smallholder farmers.

Below we provide a summary of the trade-offs, challenges and opportunities when developing NSVCs for smallholders, which emerge from the discussion in section 4.1 and respond to this holistic and project-based perspective.

Trade-offs and challenges

NSVC projects face the same challenges as any project that aims to develop a VC incorporating poor smallholder farmers:

- Generally high production costs, due to weak connections to input markets and limited access to quality technical assistance, in particular for female smallholder farmers.
- High transaction costs in connecting with markets, getting price and related production information, and dealing with other market actors, due to the small size of the farms, location in remote communities with inadequate infrastructure, and weak producer power and organization.
- Low share of the final price, considering that:
 - primary economic rents are mainly in areas outside production and these small producers often do not have the knowledge, capacity or resources to undertake activities to capture more of the value added (Kaplinsky and Fitter 2001).
 - smallholders often have weak bargaining power and suffer from asymmetry in terms of information and power, which is exacerbated by the fact that they often have little storage capacity and so must sell at harvest time, when prices are lowest.
- Low capacity to meet strict market requirements in terms of volume, frequency, quality and consistency throughout the year.
- Increased livelihood risks associated with product or commodity specialization, as reduction in diversification can place smallholders in a vulnerable position when faced with price or climate shocks (IFAD 2014b).
- Unintended effects of VC development. For example, mechanization may increase efficiency but also generate unemployment, or VC development may increase local supply and then reduce local prices of the selected commodity.

As discussed in the previous section, when incorporating considerations of nutrition into a smallholder-focused VC project, we can highlight some additional, specific challenges. Below we summarize the key challenges that arise from considering smallholders as producers and as consumers, along with some associated potential solutions.

For smallholders as producers:

- **Trade-offs during commodity selection.** Smallholders may be wary of a trade-off between selecting commodities that generate income and ones that address the “nutrition problem”. Certain cash crops may be more profitable than the commodities needed to address the nutrition problem, and the price difference is certainly a driver when selecting commodities for VC development. However, many of the foods needed to address some of the most critical nutrition problems (micronutrient or protein deficiencies, for example) are high-value commodities for which, in many countries, demand is increasing (fruit and vegetables, livestock, fish). These commodities offer a profitable market that can simultaneously serve the goals of income generation and improving diet quality. Additionally, this trade-off can be addressed through diversification of production. Production systems can combine potentially more profitable commodities with more nutritious ones (thanks to intercropping or differences in the production calendar).
- **Trade-offs during market selection.** Producers may perceive greater profits if they target wealthy consumers in urban or even export markets. However, a typical NSVC project is concerned with improving the nutrition of the project’s target group: smallholder producers who are also low-income consumers. Nutritional impact, therefore, requires targeting low-income consumers and reaching the markets where these consumers actually purchase their food: local and traditional markets. One solution is not to see markets as either-or propositions but to take advantage of the opportunities each market offers. Modern outlets may offer a higher price and greater demand but require higher standards. Local markets will probably have less strict market requirements, a lower cost of distribution, and increased consumer knowledge and trust. Institutional markets, such as public purchasing programmes or school feeding programmes, may be particularly attractive if they are local and support can be given to connect these markets with local producers. They are also of interest because they often specifically focus on vulnerable populations, including school children, the elderly or low-income households.
- **Low capacity to meet market standards.** Smallholders may have trouble meeting food safety and quality standards, which are especially strict for nutritious foods such as milk, fish, meats, and fruit and vegetables. Strengthening vertical linkages among VC actors, through, for example, contractual agreements, is a potential way to address this constraint. Building long-term relationships allows these actors to work together to have a well-functioning VC, identify incentives for cooperation and put the required mechanisms in place to ensure compliance with agreed-upon responsibilities and standards. The private sector can be a good ally in this process, given often strong quality assurance mechanisms and linkages to broader markets.
- **Difficulties in nutrition signalling.** Food safety and nutrition value are frequently invisible and cannot be tasted, nor can the positive (or negative) effects be felt in the short run. This is an issue for consumers as well as for other VC actors along the chain, including producers, traders and processors. If iron-rich beans look the same as non-iron-rich ones, how will traders have the confidence to purchase, and perhaps pay a premium price for, the iron-rich ones? How will processors know that the product they purchase is not contaminated? As discussed in the section above on post-harvest management, storage and processing, a number of actions around food safety and quality can be taken, such as efforts to differentiate products, certification or nutrition labelling.

- **Additional burdens on women.** While it is essential to ensure women's equality and promote women's empowerment as part of NSVC development, the importance of their economic roles should not be overlooked. Women in rural households actively participate in production, trading and processing. Yet, when VCs for these commodities are developed, the time demands on women (for production or processing) may increase, putting their reproductive roles at risk, or, when the potential for income generation becomes clearer, men may encroach on production or marketing decisions and seek to take control of what income is generated. Adequately assessing opportunities for and risks to women's empowerment is, therefore, essential.

For smallholders as consumers:

- **Low affordability.** Nutritious foods, such as animal source foods, are generally more expensive than staples, and development of an effective NSVC project may require actions to address the trade-off between introduction of more nutritious foods in the market and the ability of households to buy them. Potential actions to address this issue are context and commodity specific, but they may include improving VC efficiency to reduce costs, or packaging products in small quantities that are sold at a more affordable price. Social marketing campaigns can also aim to increase willingness to pay for safe and nutritious foods.
- **Low availability.** The connections of smallholders to the markets will, of course, be a primary concern of any NSVC project. However, when a VC is more developed and the crop is seen as more viable for income generation, local markets may be bypassed in order to reach larger, less local markets, and local availability may be reduced. Focusing on improving ties to local markets and making local consumers and producers aware of the nutrition value of the commodities can contribute to tackling this issue.
- **Low acceptability and nutrition awareness.** Smallholders may not be willing to consume or pay for nutritious foods because of sociocultural factors (social stigma, taboos, taste and preferences) or lack of nutrition knowledge (food requirements for specific ages or sexes, feeding practices, food hygiene and preparation). Being aware of the nature of these constraints and incorporating actions that stimulate demand (social marketing, nutrition education, behaviour change communication campaigns, etc.) must be part of most, if not all, NSVC strategies. If not, simply increasing production will not result in greater consumption or improvements in diets.

Opportunities

Although there are challenges, there are also opportunities for smallholders in development of NSVCs.

- **Market potential.** The world is experiencing a dietary transition, from diets based on staples to more diverse diets with higher levels of animal proteins and vegetables. In spite of this, production trends still reflect a focus on staple crops that do not match the change in diets (Pingali 2015). Simultaneously, in many countries, and particularly in urbanizing areas, there is increased demand for and supply of processed foods, often with high levels of salt and added sugars. Nevertheless, in the face of such change, there is a growing demand for nutritious foods, such as fruit, vegetables, less common but nutritious cereal grains, and animal source foods (Bereuter, Glickman and Reardon 2016; Båge, Kanyima and Wredle 2014; McClafferty and Zuckerman 2014; WorldFish Center 2011). This growing demand is creating a profitable market that needs to be developed in order to sustainably meet rising demand for healthy foods, and it tends to be one where smallholders often have a comparative advantage, in terms of both production technologies and local knowledge about nutritious varieties.

- **Potential for institutional markets.** Given the increasing importance of nutrition worldwide, governments are searching for opportunities to contribute to nutrition through public programmes (for example schools, military, food assistance). Linking smallholder farmers with these institutional markets can therefore be another interesting opportunity, providing smallholders with a stable market for their nutritious produce. Given their policy priorities, governments are also often willing to work with smallholders and build their capacity to engage in these public purchasing programmes. Smallholders can later build on these experiences to access the private market.
- **Integration with gender, youth and environment.** It is now widely accepted that poverty is a dynamic, complex and multidimensional phenomenon. In line with the rise of this holistic consideration of poverty, the VC community has seen numerous initiatives calling for the incorporation of dimensions other than income in VC projects, such as gender, youth and environment. The joint consideration of nutrition, gender, youth and environment is aligned with IFAD's current approach to mainstreaming, which promotes a horizontal mainstreaming approach aimed at better integrating the work of these cross-cutting areas, rather than considering each one of them individually. Rather than seeing nutrition as a separate dimension, or an add-on, the mindset should change towards approaching VC development with a holistic perspective that takes these dimensions into account and permits a multifaceted approach. Complementarities and synergies between these dimensions need to be explored. This is a goal that runs through this paper, where areas of overlap have been highlighted to harness opportunities that achieve wins on all fronts.

5 Conclusion

NSVCs are a relatively new area of research and action, with increasing interest from governments and the development community. This paper addresses an existing knowledge gap about how, specifically, VCs can be shaped to increase incomes and improve diets and nutritional status, particularly of smallholders but also of other VC actors. It presents a review of the literature around VCs and nutrition, discusses the implications for smallholder farmers and other VC actors, and notes the key features of an analytical and action framework for the development of NSVCs. This includes strategies and impact pathways as well as key challenges and opportunities for VC development to address. The findings have special implications for the design and implementation of NSVCs for smallholders, a significant focus of the work of many governments in low- and middle-income countries and their development partners, especially donors and NGOs.

Being part of the nutrition-sensitive agriculture paradigm, the focus of NSVC development is on alleviating constraints on the supply and demand of specific foods in order to address a nutrition problem. This entails significant shifts from a typical VC project that focuses on improvements in the supply side of the chain in order to increase producers' incomes. Based on this review, and further supported through consultation and country experience, we argue that improving nutrition through VCs requires (i) identifying the nutrition problem in the target population, (ii) analysing not only the supply side but also the demand side of the VC in order to identify the constraints that are affecting consumption of nutritious foods by vulnerable populations, (iii) incorporating actions to stimulate demand when necessary and ensure profitability, and (iv) targeting not only producers but also consumers.

The review of the literature has shown that, despite this being a new field of knowledge, key areas of action are known that can serve to make VCs, and ultimately food systems, more likely to improve nutrition. These actions serve the dual goals of income generation and nutrition improvement, while also contributing to environmental sustainability and gender empowerment, when considering development of NSVCs from a smallholder perspective. Searching for these win-win opportunities will be crucial for the design and implementation of successful NSVC projects aimed also at improving the lives and nutrition of rural producers.

NOTE. The findings and concepts included in this paper, along with the analytical framework developed, have been used to guide field-testing on NSVC project design in Nigeria and Indonesia. The framework, along with the insights from the field experience, has informed the development of evidence-based guidance for design of NSVC projects. The resulting manual, *Nutrition-sensitive value chains: a guide for project design* (de la Peña and Garrett 2018), along with the reports from the studies carried out in Nigeria and Indonesia, is available at www.ifad.org.

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