



View Point

Assessing food value chain pathways, linkages and impacts for better nutrition of vulnerable groups



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ABSTRACT

This article offers insights into assessing the effectiveness of post farm-gate agri-food value chains at improving the nutrition intake of vulnerable groups. It develops a conceptual framework integrating the value chain concepts with agriculture and nutrition, and identifies key outcomes and requirements for value chains to be successful at delivering substantive and sustained consumption of nutrient-dense foods by poor households. Other frameworks linking value chains with nutrition have been published, but this article provides the analytical lens to assess post-farm-gate value chains.

To achieve improvements in the intake of nutritious foods by the target populations food must be: safe to eat on a sustained basis; nutrient dense at the point of consumption; and consumed in adequate amounts on a sustained basis. This shifts the focus to the role of public actions and policy in terms of shaping the functioning of food value chains.

By assessing the limits of what business can and cannot contribute in a given market context, policy-makers and other relevant stakeholders will be more capable of creating an appropriate institutional environment that shapes how value chains operate for the benefit of vulnerable target groups, designing and implementing effective policies and strategies with respect to the role and use of market-based interventions.

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1. Introduction: undernutrition and agri-food sector objectives

Malnutrition¹ is a central and persistent challenge for global development. Lack of sufficient nutrition among children below two years of age and in pregnant women has irreversible generational health and developmental consequences for individuals and society. Therapeutic approaches to treating undernutrition are immensely important within humanitarian programmes. They involve interventions such as complementary and supplementary feeding, and distribution of fortified foods with micronutrients miss-

ing from diets, such as iodine (for example in salt), iron (for example in supplements for adolescent girls) and vitamin A (for example in cooking oil).

In addition to targeting health and other areas related to undernutrition, a key priority is also the transformation of the agriculture and food sector. While patterns of crop and livestock production are widely expected to affect nutrition and the health of vulnerable groups, the evidence base for a positive impact, albeit growing, is still limited and sometimes inconclusive. This article will focus on food-based approaches to delivering high quality foods to nutritionally vulnerable populations. There is a growing consensus that a key priority to address undernutrition is the transformation of the agriculture and food systems.² Goal 2 from the Sustainable Development Goals (SDGs), zero hunger calls 'to end hunger, achieve food security and improved nutrition and promote sustainable agriculture'. Agribusiness might be assumed also to be one means of implementation and revitalisation of Goal 17,

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¹ Malnutrition refers to undernutrition and overnutrition. Undernutrition encompasses acute malnutrition (that occurs after a sharp reduction of food, implying substantial weight loss or hunger); or chronic malnutrition, (long periods of inadequate intake of food or basic micronutrients), with irreversible effects and usually harder to identify ('hidden hunger'). Overnutrition refers to a range of diseases stemming from over-consumption of calories and fats. All these forms of inflict severe damages on human health, wellbeing and economic productivity (UNICEF 2012). This article, however, focuses specifically on chronic micronutrient deficiencies (hereafter referred to simply as undernutrition).

² While the other initiatives mentioned are also critical (access to health care, clean water and sanitation, and women's empowerment) this article focuses on food-based approaches.

'the global partnership for sustainable development'. By designing a framework to assess the effectiveness of post-farm gate value chains, we hope to help shed light on an important question, to what extent can we expect the private sector to deliver on public sector nutritional objectives, and what are the public and private actions and pathways for impact on undernutrition.

2. Tackling undernutrition

The economic consequences of undernutrition in terms of costs to the global economy because of the human capital losses are estimated on USD3.5 trillion per year (Hoddinott, 2013). An estimated two billion people suffer micronutrient deficiencies and almost 800 million people are affected by hunger, most of whom live in low-income countries and are strongly affected by poverty (Allen et al., 2016). The human consequences are real but incalculable.

Eliminating global undernutrition by 2030 faces huge challenges (IFPRI, 2016). This reflects in part the complexity of factors involved besides food-insufficiency, such as poor quality water, sanitation and hygiene, inadequate caring practices, and disease (UNICEF, undated; Black et al., 2008). Initiatives targeting these aspects are critical, particularly access to health care, clean water and sanitation, and women's empowerment.

Nearly half of the undernourished population of the world live in South Asia. Food insecurity remains high, with around 23% of the population not having access to adequate calorie intake. Yet agriculture is the main source of livelihoods, employing 60% of the total workforce. The phenomenon of rapid rates of national economic growth and persistent poverty and hunger in countries such as India, where agriculture – essentially food production – is a major economic sector, is a glaring illustration of the complexity of the relationship between agriculture, economic development and well-being. Agricultural growth has been shown to reduce levels of hunger (Hoddinott et al., 2013), reflecting the strong association with calorie intake; institutional developments such as contract farming have been found to reduce food insecurity among participating households, either through income effects or through productive spillovers from commercial to subsistence crops (Bellemare and Novak, 2016); but evidence for the link from agricultural growth to increasing dietary diversity and intake of micronutrients is considerably weaker, especially in South Asia (Headey, 2012: 14–15). With respect to South Asia, but as a caveat which is likely to apply more widely, Pandey et al. (2016: 39) conclude that:

"linkages between agriculture and nutrition are complex and require multi-sectoral and multi-dimensional approaches to tackle the malnutrition problem in this region."

For this reason, it is widely recognised that efforts to reduce nutrition by boosting agricultural productivity should be accompanied by a wider focus on making food systems nutrition-sensitive, and also with complementary initiatives specifically targeting increased consumption of nutritious foods (Ruel et al., 2013).

There is a consensus that food-based approaches can also address undernutrition through the transformation of agriculture and food systems (Dangour et al., 2012; Poole et al., 2016b). Globally, much of the emphasis on efforts to integrate better agriculture and nutrition have focused on farm households. Examples include the promotion of kitchen/home gardens (Le Cuziat and Mattinen, 2011; Girard et al., 2012a; Masset et al., 2012b) and the production for on-farm consumption of bio-fortified crops (for example, orange-fleshed sweet potato) (Bouis et al., 2011; Le Cuziat and Mattinen, 2011; Girard et al., 2012a; Masset et al., 2012b). Live-stock projects to improve nutrition outcomes also have potential

to increase animal-source foods (Leroy and Frongillo, 2007; Rawlins et al., 2014; Hoddinott et al., 2015; Jodlowski et al., 2016).

There is no assurance that nutritious home produce will be consumed by vulnerable women and children, or in sufficient quantities to effect improvements in nutrition and health. A number of recent reviews have found that diverse agricultural interventions have increased food production, but did not necessarily improve nutrition. Moreover, impact pathways were not always through direct effects on diets but often indirectly through sales and income effects (Berti et al., 2004; Leroy and Frongillo, 2007; Girard et al., 2012b; Masset et al., 2012a). Agricultural produce of higher nutritional quality may be sold and substituted in the diet by poorer foodstuffs bought with cash. Increased incomes may also be diverted towards non-food consumption. In Afghanistan, Levitt et al. (2010) argued that the actual linkages from agriculture to nutrition are weak, and may fail to leverage the potential for agriculture through its diverse direct and indirect impact pathways to improve nutrition and health of vulnerable groups.

Such research increasingly points beyond agricultural production to the role of markets in linking agriculture and nutrition as a source of nutritious foods, even among rural people (Hoddinott et al., 2015; Flores-Martinez et al., 2016). For example, the share of purchased food in total food consumption currently constitutes around 70–80% of the food consumed in middle income countries such as Indonesia or Vietnam (Reardon, 2015). Moreover, poor households tend to consume low-cost sources of food calories, typically cereals and starchy tubers (Bouis et al., 2011), which lack micronutrient density, as often foods that are rich in micronutrients (fruit and vegetables, dairy products, meat, poultry and fish) are inaccessible to the poor due to lack of physical availability and/or high prices (Miller and Welch, 2013). Even as poor people in developing countries become less poor, the phenomenon of 'nutrition transition' means that diets change but do not necessarily improve in nutritional quality (Drewnowski and Popkin, 1997; Popkin, 2001).

Reviews of the different pathways for agri-food value chain interventions in Bangladesh, India and Pakistan show the challenges faced in distributing their products to undernourished consumers. The success of such interventions relies heavily on well-functioning markets and distribution systems, and on consumer awareness of the value of nutrition, which is often lacking (Humphrey and Zuberi, 2015; Zuberi et al., 2016; Parasar and Bhavani, 2016; Islam et al., forthcoming).

A number of authors have offered frameworks to enable policy-makers to understand the market pathways linking agriculture with nutrition, and the conditions for these to work effectively from supply and demand perspectives (Hawkes et al., 2012a; Trail et al., 2014; Gelli et al., 2015; Kanter et al., 2015; Allen et al., 2016). This has led to an increase emphasis by development agencies, governments and others on the benefits of involving the private sector in strategies to increase food production and consumption and tackle undernutrition. It is therefore crucial to consider food markets as a key determinant of access to and availability of food, and understand what realistically can be expected of private enterprise in delivering public nutrition objectives.

This article explores ways to assess the potential and effectiveness of the private sector to bring about substantive and sustained consumption of nutrient-rich foods³ by nutritionally vulnerable target groups. Unlike other frameworks, it focuses on the actors engaged on agri-food value chains and markets post-farm gate in

³ Nutrient-rich foods are those high in micronutrients that, if consumed in adequate quantities (notwithstanding health, WASH and other conditions) are likely to improve the nutritional status of individuals who are undernourished in respect of micronutrients.

terms of the availability, affordability, acceptability and consumption of nutritious foods. The ultimate aim is to identify the most effective strategies for ensuring that nutritious foods are eaten by the poor on a sustained basis.

3. Pathways, linkages and impacts for better nutrition of vulnerable groups

3.1. The role of business for nutrition

Hawkes et al. (2012b) have argued that there has been a ‘paradigm shift’ in agri-food policies from state intervention to market globalisation. This change has failed to ensure the primacy of health and nutrition in food consumption and dietary choices over business interests of ‘food consuming industries’. Gomez and Ricketts (2013) in turn point out how transformations in the different types of food chains in response to the evolving policy and business environment have different implications for different population groups. Hawkes et al. (2012b) suggest that among the implications for food policies is the need to identify points in the supply chain that could be leveraged to create healthier food environments. Popkin (2014) notes that many of the modern shifts in food systems and their consequences for nutrition are under researched (e.g. transformations of foods available in urban and rural markets). The commentary calls for further understanding of the food retail sector shifts and the impacts it will have on health and nutrition. In addition, Hawkes et al. (2012a) conclude that for policies to be effective in promoting nutrient-rich foods these must take into account not only how food is produced, but also how it is processed, distributed and marketed along the value chain.

In addition, development agencies, governments and others together increasingly focus on the benefits of involving the private sector in strategies not only to increase food production but tackle consumption and undernutrition. Two recent papers in the *Lancet* (Gillespie et al., 2013; Ruel et al., 2013) highlight the potential role of the private sector in efforts to combat undernutrition, outlining key analytical points to maximise impact:

1. understand the bottlenecks that the private sector could help overcome;
2. incentivise positive roles and the development of business models that support them;
3. regulate ongoing activities for potential risks to nutrition, with strong monitoring processes;
4. be transparent about the role of the private sector in the policy process and any potential conflicts of interest; and
5. independently evaluate public–private partnership activities and make the data and analyses publicly available.

They also point to the lack of empirical analysis so far of the contributions the private sector can make to reduced undernutrition (Gillespie et al., 2013: 7):

‘... although the private sector is now even more important in the national nutrition system, too few independent and rigorous evaluations have been done of the effectiveness of involvement of the commercial sector in nutrition.’

Agri-food businesses can variously be large or small, formal or informal, public or private, national or international. The World Bank recognises that ‘well-functioning agricultural markets and agribusinesses that are inclusive and efficient – and that optimize the sustainable production and distribution of food – are essential for a food-secure future for all’ (World Bank Group, 2016: vii). It emphasises the enabling environment for agribusiness:

‘well-designed laws and regulations – supported by strong institutions and efficient administrative procedures – are necessary for agriculture to prosper’ (World Bank Group, 2016: xi).

An enabling environment is not enough: constraints through regulation and taxation are necessary but not sufficient conditions to ensure the delivery of high-nutrient quality foodstuffs to poorly nourished populations. There needs to be an alignment between business and public sector objectives. Key findings of the IFPRI Global Nutrition Report 2015 identified the role of business as having both positive and negative impacts on nutrition, calling for more critical assessments of engagements with the private sector, and more understanding of how policy-makers might shape these relationships to deliver the intended outcomes (IFPRI, 2015). A common model is public-private partnerships (PPPs). Nevertheless, a recent review of the evidence base for PPPs in nutrition by Hoddinott et al. (2015) found few assessments on which to base a judgement about realistic expectations of the private sector. They acknowledged that relationships are often characterised by lack of trust, and also that there is a need for incentives – profitable opportunities – for private firms to engage.

PPPs are only one way in which the private sector contributes to the nutrition agenda. Agri-food firms affect nutritional outcomes whether or not there is any agreement with the public sector. Taking public advantage of the potential for private food systems innovation and financing requires transparency in discussing, even reconciling, objectives, and in monitoring and evaluation. Rather than PPPs, it is mostly the invisible hand of autonomous economic activity that delivers foodstuffs to the majority of the world’s population, where the incentive structure for the firm is profit-driven. Hence conflicts of interest between public and private sectors are likely. The power of civil society and advocacy organisations to shape firm activities is evident in some circumstances, while in others there must be regulatory approaches. This calls for an assessment of the role of other actors in the system, including government, businesses already participating in the value chain, and any other public or private institutions, rules and social norms within which transactions take place.

3.2. Agri-food value chain interventions

The value chain concept offers an analytical approach to explore agriculture-nutrition market linkages, to assess the potential contribution of the private sector towards public nutrition objectives and to identify incentives, bottlenecks and constraints in production and consumption (Poole, 2013). On the other hand, ‘value chain interventions’ are development activities directed at segments of a value chain, or along its entire length, to achieve particular economic or social objectives. They depend on analysis of particular products or sets of products, and involve the application of investments or innovations to these value chains, typically focusing on business processes (Zuberi et al., 2016).

Many agricultural development initiatives take the form of a value chain intervention through making upstream investments in primary production. A recent LANSAN Working Paper on agricultural and nutrition policies in Afghanistan highlights the approach of the World Bank and of the programmes of international donors such as DFID and USAID which aim upstream interventions at the objectives of income generation and employment without considering the consumption dimension (Poole et al., 2016a). In the particular context of Afghanistan, value chain investments specifically promote licit agriculture in order to combat poppy production, falling short of considering the nutritional interests of vulnerable groups of food consumers. This shifts the focus from agricultural production to the role of businesses in the delivery of nutrient-dense foods through to undernourished consumers.

3.3. Agri-food value chain research approaches

Value chain research approaches explore the links created between firms through the production process, focusing the analysis on the opportunities and challenges that they entail. Programmes like Agriculture for Nutrition and Health (A4NH) are designed to fill the existing gap between agricultural development and its unfulfilled health and nutritional benefits. Tackling the Agriculture Disconnect in India (TANDI) has been focusing efforts on assessing the links between value chains, agriculture and nutrition (Gelli et al., 2015). Gelli et al. (2015) have developed a 'value chain for nutrition' framework to evaluate nutrition interventions acting through three pathways: (1) increasing the consumption of nutritious foods; (2) reducing costs, increasing supply and generating greater economic returns to value chain actors; and (3) increasing nutritional value-addition in the chain transactions through enhancing chain efficiency, increasing food availability, quality, and affordability. Other value chain-based frameworks have been developed for linking agriculture to nutrition (Gomez and Ricketts, 2013; Kanter et al., 2015), focusing on pre-farm gate activities such as enhancing production of nutrient-rich foods, and not on identifying and resolving key market challenges (Humphrey and Robinson, 2015). Further research is needed to fill the gaps on pathways linking value chain activities post-production to the nutrition of vulnerable consumers, and the conditions for these to work effectively from a supply and demand perspective (Allen et al., 2016).

We advocate here a research approach that focuses on one dimension of the challenge, which is the distribution-consumption link, by exploring the incentive structures within which private sector food firms operate and understanding the potential of the private sector to deliver public nutritional objectives. To be precise, we are concerned with understanding the effectiveness of interventions at enhancing the performance of food markets in terms of the availability, affordability, acceptability and consumption of nutritious foods by the poor, with particular emphasis on infants and women of child-bearing age. Key elements are the **value chain pathways** from agribusiness to the delivery of nutrient-rich foods through markets, the nature of **the linkages** between value chain actors essential to deliver the required nutrient-rich foods to target households, and the **key requirements** for effective value chains.

The food policy implications do not cover the entire value chain from research and development, through primary production to consumption, but address distribution and delivery of nutritious foods to vulnerable population groups.

4. Impact pathways through the food chain environment

The potential pathways to deliver good quality nutrient-dense foods to low-income and undernourished people are multiple. Applying a pathways approach to integrate better agriculture and nutrition has proven to be a useful analytical lens, as it recognises the need to examine all stages of the chain, from production through to consumption; the links between agriculture, food systems and nutrition; as well as the potential key areas for policy-makers to influence. Other researchers have used this approach (Hawkes et al., 2012b:12; Trail et al., 2014:1; Kanter et al., 2015:773) to assess linkages between food, agriculture and nutrition, with a predominant linear focus on the farm to food consumption direction, characterising the relationships as moving from agriculture towards nutrition, missing often the distribution-consumption link, and the circular directionality of these pathways. It will be equally valid for an agriculture-nutrition approach to start from the consumer nutritional deficiencies perspectives and from there work backwards on the value chain.

The model in Fig. 1 illustrates linkages between the different levels in the food chain environment from nutrient requirements, through product demand and supply, new product development, firm strategy, the industry or market environment and the distribution systems, and consumption of nutritious foods by vulnerable population groups. Product flows are depicted cyclically to emphasise demand for and delivery of nutritious foods to consumers. Intervention points can be conceived throughout the chain.

Primary agricultural supply in many situations is the source of most foodstuffs. Interventions by the public sector, NGOs and agribusiness firms can influence on-farm production, for example through providing information, inputs and incentives to farmers. However, consistent with the purpose of this paper, attention is focused less on agricultural value chain interventions and more on the post-farm gate environment.

There are different potential pathways, suggesting ways in which post-farm gate value chain interventions can contribute to enhanced nutrition among the poor. These food value chains may be short and simple or long and complex, and involving public and private sector enterprises, small and large firms, and social protection programmes as well as commercial value chains.

One pathway is by **enhancing access to, and consumption of, foods that are naturally rich in micronutrients**, such that overall dietary diversity increases. These include fresh foods, such as fruit and vegetables, meat, fish, dairy products, and pulses. Despite the fact that value chains are evolving in developing countries, and the emergence of industrial-scale food manufacturers and supermarkets, naturally-rich foods that are important sources of micronutrients continue to be accessed primarily through traditional value chains (Gomez and Ricketts, 2013; Guarin, 2013). However, such fresh foods in particular are generally lacking in the diets of low-income households (Ruel et al., 2013). A recent systematic review has highlighted the successes and remaining production and marketing challenges, inter alia, in introducing orange-fleshed sweet potato in Mozambique during a 15 year period (Jenkins et al., 2015). Nutrition education policy has the intention to increase intakes of such nutrient dense foods by vulnerable groups, but effecting behaviour change in terms of purchasing and consumption preferences is a long-term process and problematic.

A second route through which increases in the supply and consumption of nutrient-dense foods can be achieved is in the **production and distribution of foods with increased nutritional value** (Chen et al., 2013). Investment incentives can serve to influence the new product research and development environment for food fortification. Information and increasing awareness may also create market conditions for the development, purely commercially, or through public-private partnerships, of products or nutraceuticals enhanced with vitamins and minerals aimed at particular population groups, such as the Grameen Danone Shokti Doi yoghurt for children in Bangladesh. Specific nutrients can be added, or nutrients lost on processing and storage can be restored. This strategy focuses on a single food, the micronutrient content of which is sufficient to increase markedly the intake of the target population and to address a specific nutritional deficiency. In some cases, this strategy is targeted at the population as a whole, and in others to meet the needs of a particular subgroup, for example, pregnant women, children or those with severe acute malnutrition.

Both biofortification and industrial fortification tend to be employed at the population level to enhance the nutrient intake of all consumers. However, if efforts are not targeted to specific sectors of the population, they may not reach the most needy, as these population groups may make different food choices, or access food through informal markets (Maestre et al., 2014; Robinson and Humphrey, 2015).

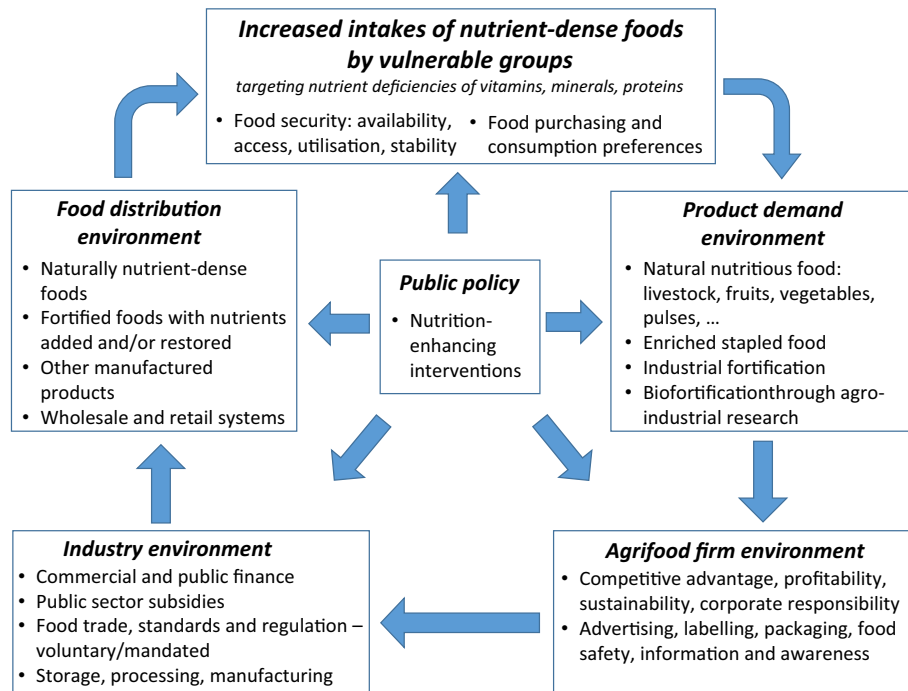


Fig. 1. Agri-food pathways and policy linkages for improved nutrition.

A third strategy is the **direct enhancement** of food chains through innovations or systems improvements, often involving both private and public sectors. Direct provision of infrastructure can improve storage, logistics and communications, reducing food losses and business costs. Removal of burdensome barriers to local and regional trade can reduce both direct production costs and transaction costs for agribusinesses such as agro-dealers and transport firms. Financial, informational and technical or technocratic innovations are commonly held to be the instruments for overcoming institutional and market coordination failures. These can involve novel contractual interlinkages between value chain partners often covering input supplies, technical, managerial and financial services, and product marketing.

Fourthly, **food distribution** programmes are a means of promoting access by the poor to more nutritious foods and/or targeting particular groups, such as those with severe malnutrition. Food distribution programmes tend to be funded by governments or humanitarian and development agencies. Various forms of public distribution systems are seen in Bangladesh, India and Pakistan that make (fortified and unfortified) staples available to the poor at subsidised prices. Similar but more targeted initiatives include school feeding programmes and supplementary nutrition under the Integrated Child Development Services in India. Distribution systems, often involving both public and private sector actors, are employed to target populations suffering acute malnutrition, as in the case of RUTFs.

The complexity of market institutions in many developing countries requires a deep understanding of the political and social conditions in which business takes place, in addition to technical production and consumption issues, before interventions can be designed. For example, Minoia et al. (2014) showed how improving the performance of the onion market within Afghanistan and externally with Pakistan is not just a technical matter that can be reduced to policies, plans and technical interventions. Similarly, the report by Poole et al. (2016a) found evidence from multiple sources that a lack of storage infrastructure in Afghanistan created a seasonal export-import market for domestically produced toma-

atoes between Afghanistan and Pakistan, but that the underlying determinant of agribusiness between Nangarhar and Peshawar is governance by an 'agrimafia'. Such social and political factors condition market functions, value addition and the distribution of benefits among value chain actors.

Country reviews completed in India, Pakistan and Bangladesh show that interventions promoting naturally nutrient-dense foods and foods of enhanced nutritional value struggle to ensure that the product is affordable and accessible. In addition, consumers need to have a certain level of nutritional awareness to prioritise purchasing such foods. The diversity of these supply, distribution, marketing, and consumption challenges necessitates the involvement of multiple sectors in order to overcome them (Humphrey and Zuberi, 2015; Zuberi et al., 2016; Parasar and Bhavani, 2016; Islam et al., forthcoming).

4.1. Requirements for impact

There are key outcomes needed to bring about improvements in the micronutrient intake of vulnerable populations. Then there is a series of requirements for the value chain to operate successfully, from a consumer and a supplier perspective, to deliver the desired nutritional outcomes (Henson and Humphrey, 2015). Thus:

- **Outcome 1 – Food must be safe to eat:** The target food has to be safe at the point of delivery to the target population. Unsafe food may have harmful effects that offset any nutritional benefits from consumption. Microbiological contaminants are associated with diarrheal diseases, which can inhibit nutrient absorption. Such food-borne hazards can be naturally-occurring in foods and/or be introduced by contamination or adulteration: agrochemical abuse in farming can cause high levels of residues; urban air pollution can contribute to toxic levels of heavy metals in otherwise 'healthy' foods (Poole et al., 2002). Furthermore, hazards can develop along the value chain during processing, storage, distribution and/or preparation.

- **Outcome 2 – Food must be nutrient-dense at the point of consumption:** The target food must be a significant source of the micronutrients in which consumers are deficient at the point it is delivered to the consumer and given the amount that they can reasonably be expected to consume on a sustained basis. There is potential for loss of nutrients along the value chains during processing, storage, distribution and/or preparation due to spoilage, adulteration, inappropriate handling or preparation methods.
- **Outcome 3 – Food must be consumed in adequate amounts on a sustained basis to bring about the desired nutritional outcomes:** The target food has to be actually consumed by those that need it and in sufficient quantities over time to meet their nutritional needs on an ongoing basis. In turn, this requires that the food reaches the consumer; this will not necessarily be households but rather target individuals within households.

Where specific population groups are targeted, reference intakes vary with age, gender and activity levels and must be considered with caution. The patterns of intra-household behaviour and cultural norms for food distribution must be taken into account also: food availability and food preferences do not automatically convert into food purchases if there is not intra-household consensus on diets, nor do purchases necessarily lead to desirable intra-household food preparation practices or distribution among household members. Here, the role of women becomes critical as they are often both producers of food and primary household food providers and carers of children.

Achieving these three outcomes on a sustained basis is dependent on, and can be seen as, the result of meeting two sets of requirements simultaneously. First, the **consumption side** – the households in which the target population group resides must choose to eat the target food. Second, the **supply-side** – there must be aligned interests for actors, private and public, along the value chain to produce, process and distribute the food (Henson and Humphrey, 2015).

4.2. Consumer choice

Taking Hawkes and Ruel (2011) as the starting point, a series of five requirements can be defined for the food to be purchased and consumed in target households. Conversely, these can be seen as the first set of constraints or obstacles to be overcome for a food-based intervention to be effective at bringing about sustained consumption of nutrient-dense foods. The fundamental question is, what is the extent to which targeted vulnerable groups consume the nutrient-dense food? Public health and nutrition survey data, disaggregated by gender, will be the basis for assessing impact:

- **Requirement 1 – Nutrition Awareness:** Consumers (and/or household purchasers of food) must be aware of the benefits of improved nutrition for themselves and/or members of their household. Furthermore, they must be aware of the nutritional benefits of a more diverse diet and/or the nutritional benefits of greater consumption of nutrient-dense foods. If they are unaware, they will not value foods on the basis of their nutrient-density or diet diversity. Nutrition education is an activity transcending value chain actors. Data for this element of assessment will come from quantitative surveys on drivers of food choice, for example, qualitative assessment through focus groups and informal interviews at household level and household distribution of roles and responsibilities by gender.
- **Requirement 2 – Signalling:** Consumers must be able to distinguish foods that are nutrient-dense from those that are not. The nutrient content of food is typically a 'credence characteristic'; it cannot be identified by the consumer and/or purchaser even

post-consumption. This can undermine the willingness to purchase nutrient-dense foods (especially if they cost more), but also to create the opportunity for counterfeits and fraudulent claims to emerge in the market. The ability of food suppliers to signal 'quality' is of particular importance in the case of foods with increased nutrient content (for example, those that have been fortified) and are indistinguishable visually and in terms of flavour and texture by consumers and/or purchasers (Poole et al., 2007). Reliable mechanisms can be implemented to signal nutritional value, although, for example, the promotion of trusted brands or use of private certification systems are expensive strategies. Assessment of signalling will come from market observation, and studies of willingness to pay. Information from key value chain actors can be used to triangulate consumer data.

- **Requirement 3 – Availability:** Nutrient dense foods must be physically available through home production and/or market sources. Purchasers of the food must be able to procure the food in locations that are physically and socially acceptable. Ideally, this will be where they habitually shop, or at least in locations which are sufficiently easy to access, for example, where they work, live or shop for other goods or services, such that the additional costs of shopping for food are minimised. This suggests a focus of interventions on communications and logistics infrastructure in markets frequented by the poor. Food availability should be assessed through distribution information at market level and also directly from consumer data.
- **Requirement 4 – Affordability:** Prices are the fundamental determinant of buying practices: consumers must be economically able and willing to buy the food. On the one hand, they must have sufficient disposable income to purchase foods that are more nutrient-dense, which typically cost more than less nutritious staples. On the other, they must be willing to pay for foods that are more nutritious, which can be impeded by low nutritional and health awareness overall, and also by the inability to distinguish foods on the basis of their nutritional value. Furthermore, meeting other food choice requirements, for example signalling and availability, can add costs such that nutrient-dense foods are rendered less affordable. Incentives on farmgate prices have mixed impacts on affordability (Miller and Coble, 2007; Hawkes et al., 2012a). However, social payments to poor consumers can reduce the cost-price gap, increasing affordability. Seasonality is an important factor affecting affordability of many foodstuffs: ensuring stability in physical supplies is translated into affordability through the price mechanism, and is enhanced by efficient processing, storage and distribution systems which minimise losses. Willingness to pay and market surveys giving costs and margins are appropriate for assessing affordability.
- **Requirement 5 – Acceptability:** aside from their nutritional value, they must be acceptable to consumers on the basis of their physical appearance, ease of preparation and social and cultural norms, given prevailing tastes, consumption patterns, preparation practices. While differences in these other characteristics can help in distinguishing nutrient-dense foods from less nutritious alternatives, they can also raise significant problems with acceptability. Thus, willingness to pay will tend to be diminished if consumers and/or purchasers are required to trade-off enhanced nutritional value for different (and less acceptable) taste or more lengthy preparation. These characteristics will be assessed through household-level studies.

4.3. Alignment of interests between actors

Critical to an understanding of the functioning of agri-food value chains, in general and for nutrient-dense foods in particular,

is their role in the creation and capture of 'value' and its distribution among the actors along the chain. While Requirements 1 to 5 have an important role to play in this regard, how value chains are organised and how the different actors along the chain interact is also important. Indeed, certain basic requirements have to be met for the chain to function well, regardless of how it is structured; these same requirements apply for short chains serving local markets and long ones moving food to urban areas, to value chains that are highly fragmented, and to informal chains as well as those with a high degree of vertical coordination.

There are challenging but achievable data requirements for workable indicators. Assessing performance and value against business requirements is always problematic because of issues of competitiveness, confidentiality and difficulties of achieving cooperation from agribusiness firms. The attractiveness to firms of a particular market sector, as well as, distribution effects along the value chain can be estimated from the industry dynamics: data such as firm entry and exit, numbers of products and new product development, advertising propensity and publically available data from individual firms can provide good indications of the potential value. Coordination and governance issues may be tackled through collective sector stakeholder meetings as well as through individual key informants. Businesses may be willing to impart some information on costs and risks in addition to data obtainable through market observation. Policy-makers, trade bodies and civil society organisations will provide opportunities to triangulate other data sources. In the case of private-public partnerships, publically available data should complement participant data sources. In the case externally funded projects, donors and implementing organisations will be key information sources.

Firstly, for businesses, the levels and flows of costs and returns have to be sufficiently attractive in the context of the associated risks and uncertainties. There are a further five inter-related business requirements as follows.

- **Requirement 6 - Capturing value:** The challenges of creating and capturing value in agri-food value chains are made particularly complex by the characteristics of the nutrients themselves, and most notably their credence nature. With the exception of therapeutic foods used for the treatment of acute malnutrition, the positive effects of nutrient-dense foods are not evident in the short term nor even easily attributable to the food consumed over time. Mechanisms are needed for actors along the value chain to be able to capture a sufficient share of the value they create through their own contributions to the production, processing, storage and/or distribution of nutrient-dense foods. Food choice surveys can help identify if the firms are capturing value and why.
- **Requirement 7 – Distribution of incentives along the value chain**
- Having created the value associated with nutrient-dense foods, it is necessary that this is distributed to actors along the chain so as to incentivise their individual contributions to meeting Requirements 1 to 5. This recognises the interdependency of the functioning of the value chain as a system to the actions of each individual actor, whether involved in production, processing, storage and/or distribution. Economic power is the common determinant of distribution of benefits, and may serve as a disincentive without an adequate institutional or policy environment. Price-cost margins are an indication of value distribution.
- **Requirement 8 – Value chain coordination and governance:** actors at each level of the value chain need to capture sufficient value so as to incentivise the actions they are required to undertake. That is, ensuring all actors capture some value or have incentives. In many cases, the actions of actors along the chain require efficient coordination, as in sharing of information,

alignment of business strategies and implementation of joint promotional activities. Thus, the chain as a whole may not function well in meeting Requirements 1 to 5 simply because one actor fails to undertake a particular action, or this action is undertaken in a manner or at a time that is incompatible with the actions of other actors in the chain. Value chain mapping with the stakeholders will help identify key functional bottlenecks along the value chain.

- **Requirement 9 – Managing, costs, risk and uncertainty:** There can be significant costs, and related risk and uncertainty, associated with efforts to develop, commercialize and supply nutrient-dense foods, especially in the context of the challenges associated with markets serving the poor. Mechanisms are needed to reduce and/or offset these costs and the level of risk and uncertainty, and to share these equitably among actors along the value chains. There is a key role for public policy and for engagement between businesses and the public sector in achieving this.
- **Requirement 10 – An appropriate institutional environment:** businesses do not function in a vacuum, and the informal and formal institutions which influence transaction costs and define the business environment shapes the production and delivery of nutrient dense foods to consumers. Through the legal framework, the public sector state shapes market competition and provision of finance for agribusiness investment, provision of information and marketing, food standards and regulation, management of business risks and insurance. Both under- and over-regulation can increase transaction costs and risk to the extent that all value is eroded, and business fails. Civil society can play a major role in awareness raising and advocacy that influences both business and policy-makers. [The World Bank's \(2016\)](#) work on enabling agribusiness provides a wide range of appropriate indicators.

5. Implications

The role of value chain-based interventions in promoting the consumption of nutrient-dense foods by those with micronutrient deficiencies is to bring about changes in the way markets are operating, such that the requirements outlined above are met. For different products, chains and nutritional demands, each of these ten requirements will have a different priority. Nevertheless, assessing the value chain as a system will allow stakeholders to identify key areas for intervention, from better coordination, to improved targeting of certain products or nutritional awareness campaigns. There are two clear strategies for this goal:

1. To promote initiatives along the pathways identified in Section 4, such that some problematic requirements are avoided altogether.
2. To reduce or offset the costs, risks and uncertainties faced by businesses engaged in markets for nutrient-dense foods directed at the poor.

With respect to the first strategy, the extent to which the requirements impact upon businesses engaged in markets for nutrient-dense foods varies considerably across the pathways. For example, mandatory fortification avoids many of the acceptability, availability and affordability challenges associated with foods with increased nutritional value, such that many consumers are even unaware that the food has been fortified. However, even if food fortification is mandatory, poor households may access their food via informal markets or multiple small-scale millers, as its more accessible and lower cost. These small businesses often cannot comply with the legislation and consumers may suffer from poor food safety or nutritional quality ([Humphrey and Robinson, 2015](#)).

Recent literature on value chains and nutrition exemplifies how these challenges are interrelated, hence the need for taking a value chain or systems perspective. For example, studies carried out in three African countries (Ghana, Nigeria and Tanzania) identified a complex set of interrelated challenges that tend to undermine value chain viability, especially in rural areas (Anim-Somuah et al., 2013; Maestre et al., 2014; Nwuneli et al., 2014). One of the key problems driving undernutrition lies in the limits faced by people living in poverty – most of whom live in rural areas (Alkire et al., 2014; Olinto et al., 2013) – in accessing affordable safe and nutritious food, as mentioned above. While such foods are available in most countries, they are often under-consumed by poor people (Anim-Somuah et al., 2013; Temu et al., 2014); households that are extremely marginalised may fail to access sufficient food (calories) for some or all of the year or the food they access may be low quality or unsafe (Hawkes and Ruel, 2011).

Other challenges relate to the difficulty in applying value chain approaches outside of single food commodities distributed through formal food markets (Hawkes and Ruel, 2011), as poor households often access their food from the informal sector. Henson et al. (2013) also emphasise that good nutrition depends on a high-quality diet, rather than an increase in one nutrient-rich food. Furthermore, household dynamics on resource allocation, time-use and decision-making are also often ignored, even though they are key to improving household nutrition intake.

Meeting the challenges associated with markets for nutrient-dense foods directed at the poor may require innovations in many aspects of the product, such as how it is produced, processed, stored and distributed, and the market system. For example, utilising small and informal distributors may require extensive distribution systems and that the product be shelf-stable. Similarly, as nutrients are 'invisible', businesses may need to find ways to convince consumers that claims about their products are true and to distinguish their products from inferior or fraudulent copies. This emphasises that efforts to overcome these inter-related challenges may require that attention be given to all aspects of the product and actions along the entire length of the value chain, as well as the market system where they operate.

Many interventions will necessarily focus on ways in which the costs, prices, risk and uncertainties faced by businesses can be reduced or offset. The increasing models of contractual interlinkages between value-chain actors, including collective enterprises are another type of mechanism for aligning value chain incentives. Other examples include public nutrition awareness campaigns (whether having a general nutrition focus or being directed at particular nutrient-dense foods), incentives through grants, credit or subsidies for innovative businesses, investment in public distribution infrastructure, and forms of advanced market commitment. Acute gaps in availability and affordability of nutrient-dense foods can be reduced through humanitarian food distribution interventions. High costs and prices which cause chronic situations of low availability and affordability and hence demand for nutrient-dense foods among the poorest can be addressed by subsidized public distribution through institutions such as schools and clinics, and by direct cash transfers.

An important implication of the discussion above is that expectations that the private sector will deliver on public nutrition objectives need to be tempered by the reality that most firms within food value chains – even most socially responsible firms – are businesses whose first intention is to create and distribute profits to owners. Thus, a significant public sector role in the market system will be needed in the form of food distribution, public investment, public services, subsidies, taxation, standards and regulation.

6. Conclusions

Building effective linkages between food value chains and nutrition requires initiatives on multiple fronts. To improve how agri-food value chains deliver nutrient-rich foods and contribute to reducing nutritional deficiencies amongst larger undernourished and low-income households, there must be a comprehensive understanding of how these work and what are the roles that both public and private actors play in making them work more effectively.

This conceptual framework has informed a series of ten case studies in South Asia to identify the challenges and successful strategies in agri-food value chains. It will directly inform public policies towards the better functioning of markets for nutrient-rich foods. It can also be of interest to international organisations and donors to design and target future interventions, and for private sector organisations to better understand consumer decision making behaviour, design and market their products better or identify incentives to collaborate with the public sector or invest in this area. Mobilising food businesses to support efforts to reduce undernutrition has been proven to be challenging. By looking at the limits of what business can and cannot achieve in a given market environment, actors will be more capable of creating an appropriate institutional environment that shapes how these value chains operate for the benefit of vulnerable target groups.

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References

- Allen, S., de Brauw, A., Gelli, A., 2016. Harnessing Value Chains to Improve Food Systems International Food Policy Research Institute. 2016 Global Food Policy Report: 49–55 Washington, DC, International Food Policy Research Institute (Chapter 6).
- Alkire, S., Chatterjee, M., Conconi, A., Seth, S., Vaz, A., 2014. Global Multidimensional Poverty Index, 2014.
- Anim-Somuah, H., Henson, S.J., Humphrey, J., Robinson, E., 2013. Mapping Value Chains for Nutrient-Dense Foods in Ghana. Institute of Development Studies, Brighton.
- Bellemare, M.F., Novak, L., 2016. Contract farming and food security. *Advance Access published July 28*.
- Berti, P.R., Krasevec, J., FitzGerald, S., 2004. A review of the effectiveness of agriculture interventions in improving nutrition outcomes. *Public Health Nutr.* 7 (05), 599–609.
- Black, R.E., Allen, L.H., Bhutta, Z.A., Caulfield, L.E., De Onis, M., Ezzi, M., Mathers, C., Rivera, J., Maternal and Child Undernutrition Study Group, 2008. Maternal and child undernutrition: global and regional exposures and health consequences'. *The Lancet* 371 (9608), 243–260.
- Bouis, H.E., Hotz, C., McClafferty, B., Meenakshi, J.V.P., Pfeiffer, W.H., 2011. Biofortification: A New Tool to Reduce Micronutrient Malnutrition. *Food Nutr. Bull.* 32, 231–240.
- Chen, C., Crawford, P., Dary, O., Drewnowski, A., Namusoke, H., Schneeman, B., Townsend, M., 2013. Building Effective Nutrition Policy Demands a Strong Evidence Base. FAO, Rome.
- Dangour, A.D., Green, R., Häsler, B., Rushton, J., Shankar, B., Waage, J., 2012. Linking agriculture and health in low-and middle-income countries: an interdisciplinary research agenda. *Proc. Nutr. Soc.* 71, 222–228.
- Drewnowski, A., Popkin, B.M., 1997. The nutrition transition: new trends in the global diet. *Nutr. Rev.* 55, 31–43.

- Flores-Martinez, A., Zanello, G., Shankar, B., Poole, N., 2016. Reducing anemia prevalence in Afghanistan: socioeconomic correlates and the particular role of agricultural assets. *PLoS ONE* 11 (6), e0156878.
- Gelli, A., Hawkes, C., Donovan, J., Harris, J., Allen, S., de Brauw, A., Henson, S., Johnson, N., Garrett, J., Ryckembusch, D., 2015. Value Chains and Nutrition: A Framework to Support the Identification, Design, and Evaluation of Interventions. IFPRI Discussion Paper 01413. Washington DC, International Food Policy Research Institute. <http://a4nh.cgiar.org/files/2012/07/Value_chains_and_nutrition_A_framework_to_support_the_identification_design_and_evaluation_of_interventions.pdf> (Retrieved 1 November 2016).
- Gillespie, S., Haddad, L., Mannar, V., Menon, P., Nisbett, N. Maternal and Child Nutrition Study Group, 2013. The politics of reducing malnutrition: building commitment and accelerating progress 382, 552–569.
- Girard, A.W., Self, J.L., McAuliffe, C., Olude, O., 2012a. The effects of household food production strategies on the health and nutrition outcomes of women and young children: a systematic review. *Paediatr. Perinat. Epidemiol.* 26 (Suppl 1), 205–222.
- Girard, A.W., Self, J.L., McAuliffe, C., Olude, O., 2012b. The effects of household food production strategies on the health and nutrition outcomes of women and young children. *Paediatr. Perinat. Epidemiol.* 26 (s1), 205–222.
- Gomez, M., Ricketts, K., 2013. Food value chain transformations in developing countries. *Food Policy* 42, 139–150.
- Guarin, A., 2013. The value of domestic supply chains: producers, wholesalers and urban consumers in Colombia. *Develop. Policy Rev.* 31 (5), 511–530.
- Hawkes, C., Ruel, M.T., 2011. Value chains for nutrition. In: Paper 4 Prepared For the IFPRI 2020 International Conference "Leveraging Agriculture for Improving Nutrition and Health". New Delhi, India.
- Hawkes, C., Friel, S., Lobstein, T., Lang, T., 2012a. Linking agricultural policies with obesity and noncommunicable diseases: a new perspective for a globalising world. *Food Policy* 37, 343–353.
- Hawkes, C., Turner, R., Waage, J., 2012b. Current and Planned Research on Agriculture for Improved Nutrition: A Mapping and a Gap Analysis. Report for DFID. London and Aberdeen, Leverhulme Centre for Integrative Research on Agriculture and Health and Centre for Sustainable International Development. <http://r4d.dfid.gov.uk/pdf/outputs/misc_susag/lcirah_mapping_and_gap_analysis_21aug12.pdf> (Retrieved 1 November 2016).
- Headey, D., 2012. Turning Economic Growth into Nutrition-Sensitive Growth. In: Fan, S., Pandya-Lorch R. (Eds.), *Reshaping Agriculture for Nutrition and Health*, IFPRI, Washington DC, pp. 39–46. <<http://www.ifpri.org/publication/reshaping-agriculture-nutrition-and-health>> (Retrieved 1 November 2016).
- Henson, S., Humphrey, J., McClafferty, B., 2013. Nutritious Agriculture by Design: A Tool for Program Planning. The Global Alliance for Improved Nutrition and Institute of Development Studies, Washington DC in Brighton.
- Henson, S., Humphrey, J., 2015. Review of Agri-Food Value Chain Interventions: Assessing the Effectiveness of Agri-Food Value Chain Interventions Aimed at Enhancing Consumption of Nutritious Food by the Poor: Conceptual Framework. LANSAs Working Paper Number (4). <<http://lansasouthasia.org/content/assessing-effectiveness-agri-food-value-chain-interventions-aimed-enhancing-consumption>> (Retrieved 1 November 2016).
- Hoddinott, J., 2013. The economic cost of malnutrition. In: Eggersdorfer, M., Kraemer, K., Ruel, M.T., Van Meringen, M., Biesalski, H.K., Bloem, M., Chen, J., Lateef, A., Mannar, V. (Eds.), *The Road to Good Nutrition: A Global Perspective*. Basel, Switzerland, Karger, pp. 64–73 (Ch. 5).
- Hoddinott, J., Rosegrant, M., Torero, M., 2013. Investments to reduce hunger and undernutrition. In: Lomborg, B. (Ed.), *Copenhagen Consensus 2012*. Cambridge University Press, Cambridge.
- Hoddinott, J., Gillespie, S., Yosef, S., 2015. Public-Private Partnerships and the Reduction of Undernutrition in Developing Countries IFPRI Discussion Paper 01487. International Food Policy Research Institute, Washington DC.
- Humphrey, J., Robinson, E., 2015. Markets for Nutrient-rich Foods: Policy Synthesis from Three Country Studies IDS Evidence Report 161. Institute of Development Studies, Brighton.
- Humphrey, J., Zuberi, S., 2015. Markets for Nutrition. LANSAs Policy Brief: 2. <<http://opendocs.ids.ac.uk/opendocs/handle/123456789/12157>> (Retrieved 1 November 2016).
- International Food Policy Research Institute (IFPRI), 2015. Strengthening Accountability for Business in Nutrition, pp. 97–106. Global Nutrition Report 2015: Actions and Accountability to Advance Nutrition and Sustainable Development. Washington, DC, International Food Policy Research Institute (IFPRI) (Ch. 8).
- International Food Policy Research Institute (IFPRI), 2016. Global Nutrition Report 2016: From Promise to Impact: Ending Malnutrition by 2030. International Food Policy Research Institute (IFPRI), Washington, DC.
- Islam, S., Ul-Kabir, A., Chakraborty, B., Hossain, M., forthcoming. Review of Agri-Food Chain Interventions Aimed at Enhancing Consumption of Nutritious Food by the Poor: Bangladesh. LANSAs Working Paper.
- Jenkins, M., Byker Shanks, C., Houghtaling, B., 2015. Orange-fleshed sweet potato: successes and remaining challenges of the introduction of a nutritionally superior staple crop in Mozambique. *Food Nutr. Bull.* 36 (3), 327–353.
- Jodowski, M., Winter-Nelson, A., Baylis, K., Goldsmith, P.D., 2016. Milk in the data: food security impacts from a livestock field experiment in Zambia. *World Dev.* 77, 99–114.
- Kanter, R., Walls, H.L., Tak, M., Roberts, F., Waage, J., 2015. A conceptual framework for understanding the impacts of agriculture and food system policies on nutrition and health. *Food Secur.* 7 (4), 767–777.
- Le Cuziat, G., Mattinen, H., 2011. Maximising the Nutritional Impact of Food Security and Livelihood Interventions: A Manual for Field Workers, New York: ACF International. <<http://www.actionagainsthunger.org/publication/2011/07/maximising-nutritional-impact-food-security-and-livelihoods-interventions-manual>> (Retrieved 1 November 2016).
- Leroy, J.L., Frongillo, E.A., 2007. Can interventions to promote animal production ameliorate undernutrition? *J. Nutr.* 137, 2311–2316.
- Levitt, E., Kostermans, K., Laviolette, L., Mbuya, N., 2010. Malnutrition in Afghanistan: Scale, Scope, Causes, and Potential Response. World Bank, Washington DC.
- Maestre, M., Robinson, E., Humphrey, J., Henson, S., 2014. The Role of Business in Providing Nutrient-Rich Foods for the Poor: A Case Study in Tanzania IDS Evidence Report 52. Institute of Development Studies, Brighton.
- Masset, E., Haddad, L., Cornelius, A., Isaza-Castro, J., 2012a. Effectiveness of agricultural interventions that aim to improve nutritional status of children: systematic review. *Br. Med. J.* 344, d8222.
- Masset, E., Haddad, L., Cornelius, A., Isaza-Castro, J., 2012b. Effectiveness of agricultural interventions that aim to improve nutritional status of children: systematic review. *Br. Med. J.* 344, d8222.
- Minoia, A., Mumtaz, W., Pain, A., 2014. The Social Life of the Onion: The Informal Regulation of the Onion Market in Nangarhar, Afghanistan Working Paper 26. SLRC, Kabul and London.
- Miller, J.C., Coble, K.H., 2007. Cheap food policy: fact or rhetoric? *Food Policy* 32 (1), 98–111.
- Miller, D.D., Welch, R.M., 2013. Food system strategies for preventing micronutrient malnutrition. *Food Policy* 42, 115–128.
- Nwuneli, N., Robinson, E., Humphrey, J., Henson, S., 2014. The Role of Businesses in Providing Nutrient-Rich Foods for the Poor: Two Case Studies in Nigeria IDS Evidence Report 64. Institute of Development Studies, Brighton.
- Olinto, P., Beegle, K., Sobrado, C., Uematsu, H., 2013. The state of the poor: where are the poor, where is extreme poverty harder to end, and what is the current profile of the world's poor? *Econ. Prem.* 125 (2).
- Pandey, V.L., Mahendra Dev, P., Jayachandran, U., 2016. Impact of agricultural interventions on the nutritional status in South Asia: a review. *Food Policy* 62 (2016), 28–40.
- Parasar, R., Bhavani, R.V., 2016. Review of Agri-Food Value Chain Interventions Aimed at Enhancing Consumption of Nutritious Food by the Poor: India. LANSAs Working Paper (8). <<http://www.lansasouthasia.org/lansa-publications>> (Retrieved 1 November 2016).
- Poole, N.D., Marshall, F., Bhupal, D.S., 2002. Air pollution effects and initiatives to improve food quality assurance in India. *Quart. J. Int. Agric.* 41 (4), 363–385.
- Poole, N.D., Martínez-Carrasco Martínez, L., Vidal Giménez, F., 2007. Quality perceptions under evolving information conditions: implications for diet. Health and consumer satisfaction. *Food Policy* 32 (2), 175–188.
- Poole, N.D., 2013. Value chain perspectives and literature: a review. *Food Chain* 3 (3), 199–211.
- Poole, N., Echavez, C., Rowland, D., 2016a. Stakeholder Perceptions of Agriculture and Nutrition Policies and Practice: Evidence From Afghanistan. LANSAs Working Paper (9). <<http://www.lansasouthasia.org/lansa-publications>> (Retrieved 1 November 2016).
- Poole, N., Audia, C., Kaboret, B., Kent, R., 2016b. Tree products, food security and livelihoods: a household study of Burkina Faso. *Environ. Conserv.* 43 (4), 359–367.
- Popkin, B.M., 2001. The nutrition transition and obesity in the developing world. *J. Nutr.* 131 (3), 871S–873S.
- Popkin, B.M., 2014. Nutrition, agriculture and the global food system in low and middle income countries. *Food Policy* 47, 91–96.
- Rawlins, R., Pimkina, S., Barrett, C.B., Pedersen, S., Wydyck, B., 2014. Got milk? The impact of Heifer International's livestock donation programs in Rwanda on nutritional outcomes. *Food Policy* 44, 202–213.
- Reardon, T., 2015. The hidden middle: the quiet revolution in the midstream of agri-food value chains in developing countries. *Oxford Rev. Econ. Policy* 31 (1), 45–63.
- Robinson, E., Humphrey, J., 2015. Better Nutrition for the Poor through Informal Markets IDS Policy Briefing 89. Institute of Development Studies, Brighton.
- Ruel, M.T., Alderman, H. The Maternal and Child Nutrition Study Group, 2013. Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition? *The Lancet* 382 (9891), 536–551.
- Temu, A., Waized, B., Ndyetabula, D., Robinson, E., Humphrey, J., Henson, S., 2014. Mapping Value Chains for Nutrient-Dense Foods in Tanzania IDS Evidence Report; 76. Institute of Development Studies, Brighton.
- Trail, B., Mazzochi, M., Shankar, B., Hallam, D., 2014. Importance of government policies and other influences in transforming global diets. *Nutr. Rev.* 72 (9), 591–604.
- UNICEF (undated). Multi-sectoral Approaches to Nutrition. <http://www.unicef.org/eaprio/Brief_Nutrition_Overview.pdf> (Retrieved 1 November 2016).
- World Bank Group, 2016. Enabling the Business of Agriculture 2016: Comparing Regulatory Good Practices. Washington DC, World Bank. <<http://eba.worldbank.org/~media/WBG/AgriBusiness/Documents/Reports/2016/EBA16-Full-Report.pdf>> (Retrieved 1 November 2016).
- Zuberi, S., Mehmood, R., Gazdar, H., 2016. Review of Agri-Food Value Chain Interventions Aimed at Enhancing Consumption of Nutritious Food by the Poor: Pakistan. LANSAs Working Paper (7). <<http://www.lansasouthasia.org/lansa-publications>> (Retrieved 1 November 2016).