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# Review of Agri-Food Value Chain Interventions Aimed at Enhancing Consumption of Nutritious Food by the Poor: Pakistan

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## **About this paper**

The LANSA Review of Agri-Food Value Chain Interventions papers have been produced to provide context for LANSA's work. It should be noted these are living / evolving papers, not intended for publication or citation at this time.

## **About LANSA**

Leveraging Agriculture for Nutrition in South Asia (LANSA) is an international research partnership. LANSA is finding out how agriculture and agri-food systems can be better designed to advance nutrition. LANSA is focused on policies, interventions and strategies that can improve the nutritional status of women and children in South Asia. LANSA is funded by UK aid from the UK government. The views expressed do not necessarily reflect the UK Government's official policies. For more information see [www.lansasouthasia.org](http://www.lansasouthasia.org)

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## Acronyms

CMAM	Community Based Management of Acute Malnutrition
FATA	Federally Administered Tribal Areas
GAIN	Global Alliance for Improved Nutrition
IDS	Institute of Development Studies
INGO	International Non-Government Organisation
LANSA	Leveraging Agriculture for Nutrition in South Asia
MI	Micronutrient Initiative
NGO	Non-Government Organisation
PARC	Pakistan Agriculture Research Council
PSQCA	Pakistan Standards and Quality Control Authority
RUTF	Ready-to-Use Therapeutic Food
SNP	School Nutrition Programme
USC	Utility Store Corporation
WFP	World Food Programme

# 1 Introduction

How can agriculture play a more effective role in improving nutrition in countries with a high burden of hidden hunger and where an increasing proportion of the poor sources its food from the market? There is a need to understand how linkages between the farm and the consumer can be made to work for nutrition goals. This review paper examines the case of Pakistan, which has a relatively productive agricultural sector but which has experienced high and persistent rates of undernutrition. A promising analytical and research perspective in this regard is the concept of value chains, which highlights the multiple ways in which producers and consumers are linked through a variety of processes, interactions and stakeholders. Moreover, value chain-based approaches have been popular development interventions in agricultural and food systems.

In Pakistan, 44 per cent of children under the age of five are stunted while 15 per cent are wasted and 32 per cent are underweight (NNS 2011). According to World Health Organization classifications, Pakistan falls in the “very high” range for severity of malnutrition for all three figures (de Onis and Blössner 1997). The incidence of micronutrient deficiency is also alarmingly high with half of the population of children under 5 suffering from anaemia and vitamin A deficiency, while 39 per cent are deficient in zinc (NNS 2011). Micronutrient deficiency has worsened over a ten-year period for children under five and non-pregnant mothers on all counts, aside from iodine deficiency (NNS 2011).

The fact that dietary intake is a key bottleneck in improving nutrition can be seen from the data on Infant and Young Child Feeding (IYCF) or complementary feeding between the ages of 6 to 24 months. This is regarded as a critical period for the introduction of nutrient-rich foods (including fortified foods, naturally nutrient-dense foods and manufactured complementary feeds) into the diet. Pakistan has large deficits compared with prescribed IYCF standards (Table 1). Over 6 per cent of the 6-23-month-olds did not consume any form of milk, and only 22.2 per cent consumed more than four food groups in 24 hours preceding the survey. Under two-thirds had the minimum required number of meals in that period, and only 15 per cent had a diet which complied with three or more IYCF practices. Fewer than half of the 6-23-month-olds had a vitamin A-rich food, and around a third had food that was rich in iron.

**Table 1: IYCF practices of 6-23-month-olds, by category**

	Child or household category	Per cent complying with prescribed IYCF practice				Per cent who consume foods	
		Breast milk, milk, or milk product	4+ food groups <sup>1</sup>	Minimum meal frequency	With 3+ IYCF practices <sup>2</sup>	Rich in vitamin A	Rich in iron
Sex	Male	93.6	24.2	61.5	14.9	45.6	35.2
	Female	93.6	20.1	63.9	14.7	43.3	33.9
Urban or rural	Urban	95.1	30.5	70.6	20.2	52.5	46.0
	Rural	92.9	18.6	59.2	12.4	41.0	29.5
Wealth quintile	Poorest	91.8	11.9	57.0	8.6	32.6	19.5
	Richest	95.7	38.7	77.4	26.0	60.6	56.2
All		93.6	22.2	62.7	14.8	44.5	34.6

<sup>1</sup> Food groups: a. infant formula, milk other than breast milk, cheese or yogurt or other milk products; b. foods made from grains, roots and tubers, including porridge and fortified baby food from grains; c. vitamin A-rich fruits and vegetables (and red palm oil); d. other fruits and vegetables; e. eggs, f. meat, poultry, fish and shellfish (and organ meats); g. legumes and nuts.

<sup>2</sup> Non-breastfed children age 6-23 months are considered to be fed with a minimum standard of 3 infant and young child feeding practices if they receive other milk or milk products at least twice a day, receive the minimum meal frequency, and receive solid or semi-solid foods from at least 4 food groups not included the milk or milk products food group.

Source: Demographic and Health Survey 2012-13, Tables 11.6 and 11.7

For agriculture to be more effective in improving nutrition through dietary intake, markets must play a role. While approximately 45 per cent of the labour force is involved in the sector, over three-quarters of the households are net buyers of wheat or wheat flour, the main staple food (World Bank 2010, based on 2005-6 PSLM). Many agricultural households depend on market purchases for some part of their food consumption because of the specialisation in the agricultural economy. There is a core of the poorest that, besides the market, also rely on various non-market interactions with other households through social networks, patronage ties and charity. But those who provide food assistance from their own stocks to food-insecure relatives are themselves likely to be sourcing food from the market (Gazdar 2015).

The present review forms part of the larger value chains component within LANSA, which aims to understand how agri-food value chains that deliver nutritious food to households beyond the farm gate can be improved so that substantive and sustained consumption of

nutrient-dense foods by the poor in post-farm-gate households is achieved. The overall research uses an adapted value chain and nutrition conceptual framework developed by Henson and Humphrey (2016), and will include a number of case studies, in different countries, of initiatives that seek to develop agriculture nutrition value chains and increase the accessibility of poor people to nutrient-rich foods.

This review will identify existing and potential cases of agri-food value chain interventions in Pakistan that might play a role in improving nutrition outcomes through the delivery of nutrient-dense foods to undernourished consumers; however, it will not comment on the impact of these interventions as this requires further inquiry. It will focus on post-farm gate value chains and the channels through which food moves from farms to markets and on to households. It will inform the selection of the cases that will then be taken up for more detailed empirical study to analyse the advantages, drawbacks and constraints of various approaches, and to come up with ways in which the nutrition impact of agri-food value chain interventions might be optimised. This analysis will be presented in forthcoming case studies. The selection of cases will pay particular attention to those value chains which are particularly relevant for IYCF. In the selection of case studies, this review does not aim to determine whether one agri-food value chain approach is better suited to nutritional improvements than another.

Section 2 introduces the concept of value chains, the classification of various value chain interventions used throughout this paper, and the framework that the research follows. Section 3 describes the methodology of the review. The findings of the review are presented in Section 4, and are further analysed thematically in Section 5. The findings of the review and their analysis are then used in Section 6 to identify specific value chain interventions for detailed case study. Section 7 offers conclusions based on the review and topics for further investigation in the case studies.

## 2 Concepts

### 2.1 Value chains

Pathways which trace the linkage between agriculture and nutrition point to two sets of contributions which agriculture can make to improve nutrition (Gillespie et al. 2012; Hawkes and Ruel 2006). First, increased agricultural productivity is known to have led to higher levels of consumption through the greater availability of nutritious foods. Second, higher incomes for farm households increase their ability to acquire food and non-food inputs needed for improved nutrition.

The conditions underlying these pathways, however, are known to be changing. It can no longer be assumed, if it ever could, that higher levels of output of nutritious foods will effortlessly translate into improved diets for the undernourished. It is increasingly recognised, for example, that the majority of the poor derive some or all of their food not through self-production but through markets (Henson et al. 2013).

Other indirect agriculture-nutrition impact pathways can be identified: agricultural incomes can also be used for non-food expenditures that enhance healthy household living conditions; increasing female participation in production and income benefits can enhance women's health, status and household caring practices. And at an aggregate level, increased agricultural output can lower market food prices for poor consumers.

It is not self-evident if or how agricultural innovation will automatically lead to greater availability and higher consumption of nutritious foods among the poor. As Hawkes and Ruel (2011: 2) argue:

If the agricultural sector is to play a more effective role in improving nutrition by increasing the access, acceptability, and quality of diets, there needs to be a greater focus on what happens between production and consumption (including in producer households). This new focus will require the engagement of not only the agriculture sector, but also the other sectors involved, and approaches are needed to help overcome inter-sectoral barriers, which create disincentives to closer cooperation. One way of addressing these issues is through the adoption of 'value-chain' concepts.

The value chain, according to Hawkes and Ruel (2011: 3) is 'a supply chain in which value is added to the product as it moves through the chain. It is described by the series of activities and actors along the supply chain, and what and where value is added in the chain for and by these activities and actors.' The concept of a "value chain" recognises interdependencies between the activities and actors involved in bringing a product from production through to consumption. Although there is often an overlap between them, it can be helpful to distinguish between the use of value chains as an analytical perspective on the one hand, and the design and execution of value chain-based interventions on the other.

## 2.2 Analytical perspective versus intervention

Virtually, any set of economic activities can be usefully studied using a value-chain perspective. Tracing the transition and transformation of a product across a variety of processes of value creation, through the actions of, and interactions between, multiple actors, has proven to be a source of insight into otherwise complex systems of production and delivery. The value chain concept is sufficiently flexible to accommodate market

transactions, non-market transfers and exchanges, and the movement of a product within and across economic entities. It allows for a graphic mapping of nodal points and transitions, and is particularly advantageous in identifying incentives, bottlenecks and constraints — economic, technological, organisational, and behavioural — in production and consumption. The concept can help an understanding of modern systems of production and marketing, traditional and informal arrangements, as well as combinations of the two.

The standard economic toolkit is well equipped for dealing with instantaneous transactions and exchanges, as well as system-wide equilibrium and disequilibrium. Goods and services might be exchanged through a variety of market- and non-market-based institutions. The main focus of the standard economic approach is on prices and quantities of instant exchanges as well as economy-wide levels of price and output. The economic toolkit can also deal with processes within organisations such as firms. The value chain perspective has the advantage of linking together processes which might straddle various markets, non-market arrangements, and interactions within a firm as well as across firms, into a coherent sequence.<sup>1</sup>

Applying the value chain approach to the study of a particular product can highlight what happens across various institutional settings, even across jurisdictions, from the point of start to a finishing point. In the case of a physical good, the starting point might be a raw material while the end point might be a retail outlet. Seeing the entire sequence as one can help to identify specific processes where efforts might be directed to obtain changes that are considered desirable. The change in question might be increased income for some segments of the value chain, more effective consumer protection, higher overall output, or lower prices.

Value chain interventions are activities directed at segments of a value chain, or along its entire length, to achieve particular economic or social objectives. Value chain interventions clearly depend on value chain analysis of particular products or sets of products, and involve the application of investments or innovations to these value chains. While the value chain perspective can be applied very widely across production and delivery interactions and systems, value chain interventions typically focus on business processes. This distinction is important from the point of view of the present review because of the need here to understand, on the one hand, existing formal and informal value chains which link agriculture

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<sup>1</sup> Seeing things in a linear sequence is, incidentally, also a limitation of the value chain perspective. It is useful when dealing with well-defined and relatively simple products where the production and delivery processes are sequentially arranged. The value chain perspective may not be particularly helpful in understanding complex products (say, those which bundle goods and services), how new products emerge, and situations where value addition might not be sequential (for example through changes in information and expectations).

with nutrition (i.e. applying a value chain perspective), and, on the other hand, to learn lessons from existing agri-food value chain interventions.

This paper aims to fill an evidence gap in Pakistan by reviewing existing and past agri-food value chain interventions and their possible impacts on nutrition. Interventions which are selected for in-depth case study will then be examined using a value chain analytical perspective to draw implications for intervention design and policy.

### 2.3 Framing value chain interventions

For agri-food value chain interventions to have a positive impact on nutrition, Henson and Humphrey (2016) identify a number of requirements that cover a range of issues from consumer awareness, demand, purchasing power and sustainability. Does the intervention address the awareness among consumers of the nutritional benefits of particular products? Since nutrient content is not a visible characteristic of food, is there effective signalling to inform consumers? Do poor undernourished households need to have easy access to markets where nutrient-rich foods are sold, and can they actually afford nutrient-dense foods? Does the intervention address possible constraints related to social and cultural norms, tastes, consumption patterns, preparation practices and the time available to the caregiver? Gender is a particularly important dimension in this regard, both with respect to the division of care work (which implicates food choices and preparation) on the one hand, and economic agency, on the other. If, as found in the case of Pakistan (see, for example, Balagamwala et al. 2015), there are restrictive gendered norms regarding women's access to markets, the demand side of value chain interventions needs to be attentive to the possible dissonance between those within the household who will prepare the food and those who will actually purchase it.

Going from the side of the consumer to that of the producer, Henson and Humphrey (2016) identify a number of conditions that need to be met if the value chain intervention is to be sustainable. Are there mechanisms for actors along the value chains 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? Relatedly, are actors along the chain sufficiently incentivised to produce affordable and acceptable nutrient-dense foods? Is there efficient coordination and governance of the chain to ensure that all actors are performing their required tasks in the prescribed manner? Are there measures in place to deal with risk and uncertainty?

The review of interventions builds on the Henson and Humphrey (2016) framework to focus on demand creation and targeting on the consumption side, sustainability on the supply

side, and regulation which straddles demand and supply. There are two prior criteria for analysing agri-food interventions in this review: first, whether, or to what extent, they have explicit nutrition-related goals, and second, whether, or to what extent, they have agricultural linkages.

## 2.4 Classification of interventions

The range of ways that nutrient-rich foods can mitigate micronutrient deficiencies within households is diverse. Table 2 classifies the types of nutrient-dense foods that this review is concerned with and the types of value chain interventions that are commonly seen within each category of nutrient-dense food. This classification borrows from nutrition literature and provides a framework for understanding the specific challenges and benefits involved in following a particular type of intervention for a certain type of food.

**Table 2 Types of nutrient-dense foods – and types of value chain interventions (generic)**

Types of nutrient-dense foods		Types of value chain interventions	
		Market-based delivery	Public distribution
		Common challenges	
<b>Naturally nutrient-dense</b>	Animal-based (e.g., meat, poultry, milk, etc.)	Supply chain, regulatory action — health and safety, standards	Delivery, supply chain, subsidy, regulatory action — health and safety, standards
	Plant-based (e.g., fruits and vegetables)	Supply chain, regulatory action — health and safety	Delivery, supply chain, regulatory action — health and safety
<b>Foods of increased nutritional value</b>	Fortified	Marketing, subsidy, regulatory action — standards, mandate	Delivery, subsidy, retail, regulatory action — standards, mandate
	Fortified staples (e.g., iron-fortified wheat flour)		
	Fortified prepared foods (e.g., weaning foods, snack foods, etc.)		
	Biofortified (e.g., wheat, rice, etc.)	Marketing, subsidy, regulatory action — standards, mandate	Delivery, subsidy, retail, regulatory action — standards, mandate

## 2.4.1 Types of nutrient-dense foods

### *Naturally nutrient-dense foods*

One of the leading ways of increasing nutritional intake is to enhance access to, and consumption of, foods that are naturally rich in micronutrients. These include animal-based foods such as meat, fish and dairy products and plant-based foods, such as fruits and vegetables, pulses. Foods such as fruits and vegetables, milk and meat are important sources of micronutrients, but these foods are commonly lacking in the diets of low-income households (Ruel et al. 2013). The big challenge for strategies aimed at increasing dietary diversity is the need to ensure that such foods are available and affordable to those that most need them. There may be considerable competition for nutrient-rich foods and poor local consumers frequently lack the resources to buy them in sufficient quantities, as they are not affordable or are not accessible if they are sent on to more distant markets.

### *Foods of increased nutritional value*

Given that foods that are naturally rich in micronutrients are expensive, one strategy for delivering nutrition is to add micronutrients to food products. There are various ways in which this can be done. First, nutrients can be added to staple products. The most prevalent strategy in this area is food fortification, and, in particular, mandatory fortification of staple products such as wheat flour, cooking oils and salt. This strategy has the advantage of building on existing widely acceptable products distributed through well-established value chains. Fortified products have the potential to reach some of the most nutritionally-deficient populations, but maintaining consistent levels of fortification and keeping prices below other non-fortified substitutes are some of the barriers this approach faces.

Food fortification can also be carried out on a voluntary basis: this process is typically business driven and is based on marketing differentiated products. For this approach to be successful, it is important for consumers of fortified food brands to be convinced about the nutritional benefits of the products and to have confidence in their claims. Many of these products are targeted towards specific consumer groups such as children or women. There are also a wide variety of foods that are specially formulated and prepared to meet particular nutritional needs. Examples include complementary foods for infants and Ready-to-use Therapeutic Foods (RUTFs) directed at those who have severe acute malnutrition.

A second route to enhancing the nutritional value of staples is biofortification; this involves breeding plants so that they naturally synthesise micronutrients or their precursors (Hotz and McClafferty 2007). Examples include golden rice and quality protein maize and wheat. Where biofortified and unfortified products are, in practice, more or less indistinguishable, it may be difficult to create efficient markets.

## 2.4.2 Types of value chain interventions

### *Market-based delivery*

These types of interventions are led by public as well as private sector actors interested in promoting the market-based supply and consumption of certain types of nutrient-rich foods. Generally, these initiatives will involve private sector actors working towards improving the supply of nutrient-rich foods as part of their business strategy.

The main challenges related to the enhanced access of naturally nutrient-dense foods are around improving the supply and quality of the food and better linking of producers to the market. Therefore, intervention activities involve strengthening the supply chain. For foods of increased nutritional value, these interventions focus on addressing marketing and signalling strategies to ensure that consumers are aware of the nutritional benefits of the products and can differentiate them from similar products in the market.

Public actors will directly influence these interventions by supporting or blocking them through related policies. Regulatory actions for naturally nutrient-dense foods will be related to health and safety standards as these foods are perishable. With regard to dairy products, there are also government standards to be adhered to. Regulatory action interventions ensure that fortification standards are set for foods of increased nutritional value. This involves identifying the micronutrients that products should be fortified with and to what level, especially for staples and biofortified products. Also, regulation will be needed to ensure products are complying with the fortification standards. For these two types of foods, regulatory action can involve setting the mandate for fortification, which is determining if it is obligatory and who is under obligation to follow fortification standards. Mandate and standard setting is not typically required for fortified prepared foods, apart from ensuring that advertising claims are accurate. Public sector interventions may also involve providing a subsidy for these foods.

### *Public distribution*

A second category of intervention is public distribution when the government itself is involved in the delivery of nutrient-dense foods to the consumer. This type of intervention acts as a form of subsidy and focuses on promoting access by the poor to more nutritious foods and/or targeting particular population segments - for example, those with severe acute malnutrition or those thought to be vulnerable to malnutrition. The emphasis on targeting consumption through distribution may be combined with value chain initiatives to promote, for instance, local sourcing of products. This is seen particularly with interventions involving naturally nutrient-dense foods which work to strengthen linkages along the supply chain while providing a subsidy and focusing on delivery.

Various public initiatives across the region make nutrient-dense foods, especially fortified staples, available to the poor at subsidised prices. Similar but more targeted initiatives include school feeding programmes. Distribution systems, often involving both the public and private sector actors, may be particularly effective in targeting populations known to face particular nutritional problems, as well as a means of reaching populations for whom distribution costs are a disincentive to buy the foods. At the same time, hybrid public-private models also exist (for example, local resellers working in particular communities) and these may help to defray the costs of public distribution.

Public distribution interventions can have an element of regulation comparable to interventions for the market-based delivery of nutrient-rich foods. Government involvement along the value chain can act on health and safety of naturally nutrient-dense foods and also on standards. For foods of increased nutritional value, there is more of a focus on standards and mandate.

### 3 Review Methodology

The review was compiled primarily through searches of publicly available documents. Initial keyword searches were conducted using terms relating to 'value chains' and 'Pakistan'. Those interventions were excluded that did not concern local agriculture. Targeted internet searches were conducted on specific organisations that are known to undertake value chain interventions. Where relevant, organisations were contacted and asked to share programme documents and impact and evaluation documents to supplement publicly available information.

A defined set of inclusion criteria was applied to select from among the population of identified interventions. These were: first, whether the intervention's primary aim was to increase consumption of nutrient-dense food in target populations beyond the farm gate and, if not, whether the intervention could still be expected to increase the supply of nutrient-dense food to such populations; second, whether the focal food reached target population groups through value chains involving the private, public and/or not-for-profit sectors; and third, whether the intervention was beyond the 'proof of concept' or experimental phase.

This process yielded few interventions that had specific nutrition objectives or that were focused on the end consumer, but instead resulted in the identification of numerous donor-driven value chain interventions that aimed to improve the livelihoods of producers. These results highlight the premise that the value chain approach has traditionally been used as a

development tool to improve rural livelihoods rather than as a means to connect agriculture to improving nutrition outcomes.

Therefore, searches were then refined to include specific types of nutrient-dense foods that this review is concerned with (see Table 2). Keyword searches were carried out on 'biofortification', 'fortified foods', 'meat', 'poultry', 'dairy development', 'weaning foods', as well as 'school feeding programmes', 'government food programmes' (Table 3). Once specific food products were identified within the category of fortified foods, general internet searches were conducted into companies that were involved in the manufacturing and selling of the products. These searches were supplemented by personal communication with manufacturers and processors requesting additional information and confirming publicly available information.

This material was augmented by information from interviews conducted with 21 key stakeholders in the agriculture and nutrition policy sector. Stakeholders working in the federal and provincial governments and in local and international NGOs were asked to provide details of any value chain interventions that they were aware of that worked to improve the nutrition of the poor in the country.

The inventory of value chain-based interventions does not claim to be comprehensive in that it does not present a complete list of every value-chain intervention in Pakistan. Rather, in compiling these reviews, the aim has been to identify a representative cross-section over a specific period of time (in 2013 and 2014) of interventions indicative of the main approaches and/or focal foods, and that highlight instances of innovation.

**Table 3 Details of keywords**

<b>Primary</b>	<b>Secondary</b>							
<b>Agriculture</b>	Crop	Development	Interventions	Products				
<b>Biofortification</b>	Products							
<b>Dairy</b>	Development							
<b>Food</b>	Companies	Government programmes	Nutrient-dense	Post-farm gate	Processed	School feeding	Staples	Weaning
<b>Fortified</b>	Biscuits	Milk	Oil	Products				
<b>Horticulture</b>	Interventions							
<b>Nutrition</b>	Adolescent girls	Child						
<b>Poultry</b>	Chicken	Farming						
<b>Value Chain</b>	Agri-food	Chicken	Interventions	Meat	Vegetables			

## 4 Findings

The methodology outlined above yielded a total of 24 interventions representing a range of value chain activities with the potential to bring nutrient-dense foods to poor consumers (Table 4). Most of the value chain interventions found in our review were for the market-based delivery of nutrient-rich foods — only four could be classified as public distribution programmes. This is not surprising, given the close association of the value chain concept with business processes, as value chains have been traditionally used to track the transformation and associated transaction of various products. In this section, we organise the finding of our review in accordance with the framework proposed in Section 2. The Annexure to this paper presents an overview of each intervention included.

**Table 4 Identified agri-food value chain interventions**

Types of nutrient-dense foods		Types of value chain interventions	
		Market-based delivery	Public distribution
<b>Naturally nutrient-dense</b>	Animal-based (e.g. meat, poultry, milk, etc.)	7 dairy 2 poultry 2 meat	1 school feeding
	Plant-based (e.g. fruits and vegetables)	1 fresh fruits and vegetables	
<b>Foods of increased nutritional value</b>	Fortified	1 oil 2 cereals 2 milk 1 complementary food 1 biscuit	1 RUTF 2 school feeding
	Fortified staples (eg. iron-fortified wheat flour)		
	Fortified prepared foods (eg. weaning foods, snack foods, etc.)		
	Biofortified (e.g. wheat, rice, etc.)	1 biofortified wheat	

## 4.1 Promotion of nutrient-rich food initiatives

The dairy sector accounted for the highest number (seven) of value chain interventions in Pakistan. Non-dairy, naturally nutrient-dense foods such as poultry, meat, and fruits and vegetables had five interventions. There were eight value chain interventions in foods of increased nutritional value, all save one in fortified foods.

### 4.1.1 Naturally nutrient-dense foods: Dairy

Dairy products, particularly milk, form an important part of the diet in Pakistan. Milk is one of the few nutrient-dense foods that is widely consumed across income classes, either by itself or in other preparations such as milky tea. Livestock rearing is an important sub-sector within agriculture and accounts for a high share of value added in the sector. Consumers have historically accessed milk either from their own farm animals, through reciprocal exchange, or through traditional value chains around unprocessed fresh milk sold at specialised shops and through delivery agents. This began to change in the 1980s with the introduction of locally-produced UHT milk in the market. Most of the dairy value chain interventions covered in the present review relate to the production of processed (UHT) milk.

Nearly all of the dairy interventions are implemented in Punjab and Sindh and involve activities such as establishing village milk collection centres, providing cooling tanks, strengthening livestock extension services, as also technical and enterprise training for farmers. The Dairy Hub is a typical intervention in this regard. It started as a joint project in 2009 between the packaging firm Tetra Pak and three established private food companies (Engro, Haleeb, and Nestlé Pakistan). The project claims to bring safe, hygienic and easily accessible milk to consumers. It aimed to develop the dairy sector through improving the production and collection of milk, with the idea that better quality and increased quantity of milk supply will lead to higher demand of Tetra Pak's aseptic packaging.

The intervention worked to create dairy hubs, usually including 20 villages located within a 15-20 km radius, 800-1,000 farmers and a total of up to 10,000 cows/buffaloes. The hubs established village milk collection (VMC) points as well as laboratories for testing milk, and farmers were registered to sell their milk at their local VMC and receive bonuses for good quality. The hubs and VMCs hired people from the local community; two dairy hubs have been established which employ only women. The programme provided milk machines to farmers and field services, and collaborated with the University of Veterinary and Animal Science (UVAS) and the livestock and dairy development departments of the government for technical support. Dairy hubs work to integrate various actors along the value chain and create linkages between producers, suppliers and packagers of milk.

Engro, a large food company, has had a dairy hub since 2009. An assessment of the hub showed a positive impact on milk production and collection. Milk collection increased from 400 litres to 8,500 litres per day within one year and animal health improved, as animals were vaccinated against various diseases and de-wormed. While the Dairy Hub project is a commercial collaboration between private sector companies, two of its participants, Engro and Haleeb, are also involved in two other value chain interventions that have received donor funding. The projects support established business processes of these companies but emphasise social policy goals such as increasing the income of women dairy farmers.

#### 4.1.2 Naturally nutrient-dense foods: Meat, poultry, and others

Of the five non-dairy interventions relating to naturally nutrient-dense foods, two (Save the Calf and Fruit and Vegetable Development Project) were focused on providing technical assistance to farmers to improve productivity. Another two involved providing inputs (egg-producing chicks) to rural beneficiaries, particularly women, as women are responsible for tending to poultry. One of the five (Lahore Meat Processing Complex) involved the setting up of a more complex value chain linking producers and consumers. The first four projects (those providing technical assistance or inputs) were aimed primarily at improving

livelihoods of farmers, with the additional benefit of increasing the supply of nutrient-dense foods in local and national markets. The more complex value chain was aimed at improving the supply of higher quality meat to urban consumers.

### *Fortified foods*

Commercially available fortified foods in the review include wheat, edible oil, milk, complementary food and biscuits. The products represent a selection of foods whose main inputs are sourced from the Pakistani agriculture sector and are either marketed directly to poor consumers or are sold in packaging that allow them to be affordable to populations from lower income brackets.

In Pakistan, there is a range of commercially available fortified edible oil products. Fortification of edible oil/ghee with vitamin A was mandated by the West Pakistan Pure Food Rules of 1965 and this provision has been retained in the Pure Food Rules in all provinces (Gaffey et al. 2014). The Utility Store Corporation (USC), a government-owned organisation which works to sell food items to poor segments of society at prices lower than market rates, sells its own oil, which is sourced from various manufacturers, packaged and USC branded and then distributed through USC retail outlets. This fortified product is specifically targeted towards populations from lower income groups and therefore has been included in the review.

Two previous wheat flour fortification interventions have been included in the review. Both explicitly aimed to improve iron deficiency in women and girls. One operated in an earthquake-affected region in the country while the other was a national project which retailed its wheat flour through USC at the same price as non-fortified wheat flour to ensure that the product was accessible to all segments of society.

Both these projects were led by INGOs — namely, Micronutrient Initiative (MI) and Global Alliance for Improved Nutrition (GAIN), respectively — but are no longer operational. The national project was initiated in July 2005 by GAIN along with technical assistance from the Micronutrient Initiative and in partnership with the nutrition wing in the Ministry of Health. With commitment from the flour mill industry, GAIN trained mill staff and laboratory technicians on fortification, provided the premix, created quality assurance /quality control manuals and management information systems, and began to fortify wheat flour with iron and folic acid (B9).

The project was envisioned to have two phases: the first which started in July 2005 was completed in 2010, while the second phase of the project aimed to start in May 2010 and was expected to end in April 2013. This project aimed to increase fortified wheat flour

consumption and to reduce iron deficiency and anaemia, in women from 25.5 per cent to 20 per cent and in children under five from 36 per cent to 28 per cent.

To increase the accessibility and affordability of wheat flour for all segments of society, the Ministry of Health signed an MoU with the Utility Store Corporation, whereby iron-fortified wheat flour was sold to consumers at the same price as regular flour in Islamabad, Lahore, Karachi and Peshawar. GAIN also launched a social marketing campaign and developed a fortified wheat flour logo to help consumers with product differentiation.

By the end of the first phase of the project, more than 12.7 million people had access to fortified wheat flour and 125 flour mills were equipped for fortification and workers were trained. The standards for fortified wheat flour were approved by the Pakistan Standards and Quality Control Authority (PSQCA), but the project did not enter its second phase as mandatory fortification legislation was not passed by the national government. GAIN's project ended as they were supplying free pre-mix with the understanding that mandatory fortification legislation would be implemented, but this did not happen and millers were not incentivised to pay for the pre-mix as sufficient demand had not been created for the fortified wheat flour (Technical Resource Facility 2012). Currently there are still efforts underway to push for mandatory fortification of wheat flour (Gaffey et al. 2014).

Since October 2013, GAIN has renewed its efforts to fortify wheat and has worked with the Punjab provincial government on issues of legislation, capacity development and quality control. This shift of focus to a province is part of wider constitutional changes in Pakistan with the provincial tier of government being entrusted with greater responsibilities in the area of nutrition and health.

In addition to mandatory food fortification in Pakistan, there is also an established and expanding market for locally-produced fortified foods in which major food companies (some of which are active in the dairy value chains) are the main players. Nestlé fortified products are important in this regard and have been included in the review. Questions have been raised about the social and environmental ethics of Nestlé's supply (Martindale 2013) and specifically there has been controversy over Nestlé's promotion of its own breast milk substitutes in Pakistan (Balch 2014). Given the company's large presence and range of fortified products in the country, it is important to retain their interventions in this review. Nestlé sells fortified powdered milk under a range of different labels in Pakistan such as Nido Fortified and Nestlé Bunyad, both of which are targeted towards children. Nestlé also sells Cerelac infant cereal for children between the ages of six months to three years of age. All three products are sold in sachets at less than 25 rupees each (US \$0.23). Nestlé generally

targets marketing activities of its products in smaller towns to ensure their easy accessibility and visibility.

Haleeb foods, a local company, sold iron-fortified dairy liquid in tetra packaging at 20 rupees for 250 ml. Their brand GroAur, which loosely translates into 'grow more', was promoted as addressing the nutritional needs of children, but is currently not on the market since the Punjab Food Authority took action against the brand. Dairy liquids have reduced fat and therefore by PSQCA standards cannot be classified as milk. They are sold at a price lower than UHT milk and loose milk, and are marketed to those segments of the population that may not be able to afford UHT milk. GroAur was the first brand within the dairy liquid category that sold a fortified product. Fortification interventions in the dairy sector are linked to improving the supply and access of the naturally fortified product, rather than artificially fortifying it, as discussed above.

Furthermore, Tiger biscuits were introduced in the market by Continental Biscuits Limited, a local company that has a joint venture with Kraft. Marketing activities for Tiger biscuits have specifically targeted school children. While Tiger is marketed as a nutritious biscuit, the company introduced Tiger Max which offered greater nutritional value. Tiger Max was sold in larger packs at 15 rupees for 57 g compared to Tiger which retails at 30g for five rupees. Tiger Max was taken off the market as consumers were not willing to pay more for the fortified biscuit.

In Pakistan, biofortification is still a relatively new intervention. HarvestPlus along with the National Agriculture Research Council in Pakistan have begun biofortifying wheat with zinc; however the project is still in its test phase. The wheat variety aims to be released for cultivation for the 2015-16 *rabi* (winter) crop.

## 4.2 Public Distribution

While value chain interventions are conventionally thought to work on business processes, this review also includes public sector systems for the distribution of nutritious foods to the poor. Unlike some other countries in the region (notably India) where the public sector plays an active role in food distribution, its role in Pakistan has been limited. The government implemented a wide-scale school feeding programme, Tawana Pakistan, which was designed to improve the nutritional status of primary school girls aged 5-12 years and was implemented in rural areas of 29 of the poorest districts of Pakistan. The programme ran between 2002 and 2005, and through community participation, provided students with freshly cooked mid-day meals made from locally available food items.

The World Food Programme (WFP) has run a number of school feeding programmes to address undernutrition and improve school enrolment, especially of girls. Programmes have typically provided staples to school children as take-home rations, including edible oil, wheat flour, dates and complementary cereal, in addition to providing high energy biscuits onsite. WFP is a key actor involved in food distribution in Pakistan; the organisation generally operates in emergency response situations or emergency-affected areas. One of its interventions is part of Community Based Management of Acute Malnutrition (CMAM), through which a locally-produced, nutrient-dense chickpea-based Ready-to-Use Therapeutic Food (RUTF) is distributed to suit the nutritional needs of moderately malnourished children. WFP also produces and distributes a similar product which is given to prevent malnutrition. The United States Department of Agriculture funded a school feeding programme in the district of Ghotki in Sindh, called the School Nutrition Programme (SNP). It was implemented by Land O'Lakes International Development, which is a division of Land O'Lakes Inc., a large agri-food company in the United States. The programme aimed to improve the nutrition, and to increase the attendance, of children in primary schools in the district, by providing school-going children and teachers in the district with 200 ml of fortified UHT milk and a 40 g pack of fortified biscuits five days a week. Prior to the project, 20 per cent of girls were enrolled in primary schools in Ghotki; the region faces chronic food insecurity and high rates of undernutrition among children. During the six years of the programme, SNP fed more than 202,000 children and 4,000 teachers in over 2,000 primary schools.

An assessment found that beneficiary children grew an average of five inches and gained more than 13 pounds in the last two years of the programme. It was found that the intervention helped reduce endemic stunting and wasting. The success of SNP led the government to replicate this programme and continue to feed 115,000 girls in six districts after the programme ended.

Aside from school feeding, the programme also trained 300 people working in 10 milk processing plants on a range of quality processing standards and provided in-depth guidance to 500 small dairy farmers and producers on good farm management practices and obtaining quality milk from their livestock. SNP also coordinated with the government to provide children with de-worming tablets and incorporated a number of complementary efforts to improve regular attendance by providing benches, school bags, stationery and sports equipment to students. In addition, the intervention included a community awareness component on the environment and the importance of recycling, as well as a component on awareness about personal hygiene, health and sanitation. The programme saw school enrolment increase 118 per cent and attendance increase 45 to 90 per cent.

The processed products that SNP and WFP distributed were specially manufactured for their respective programmes and were not intended for sale on the open market, thus distinguishing them from the differentiated business-driven fortified products.

## 5 Analysis

The Henson and Humphrey (2016) framework for analysing agri-food interventions highlights a number of questions on the consumer side: awareness, signalling, availability, affordability and acceptability. For the agri-food interventions we have reviewed in Pakistan, these consumer side concerns relate to demand creation (awareness, availability, signalling and acceptability) and targeting (affordability and availability). Supply side issues relate to sustainability (capturing value, incentives, and risk and uncertainty). Regulation straddles the consumer and supply sides (signalling and coordination and governance). In addition to these sets of questions, there are two additional aspects which were used to analyse the findings: first, whether or to what extent nutrition improvement was an objective of the intervention, and second, whether or to what extent the intervention had strong agriculture-nutrition linkages. Table 5 provides a summary of the various types of interventions by the extent to which they addressed nutrition goals, agricultural linkages, targeting, demand creation, regulation and sustainability.

Many of the value chain interventions in Pakistan do not focus on the consumer end of the chain. Half of the interventions do not have specific nutrition objectives and most do not measure nutrition outcomes. Many of the business-driven initiatives, excluding fortification of staples that have a nutrition focus tend to target higher-income consumers, while interventions involving food distribution target those that are in need of food assistance. The fortified foods initiatives have to manage issues of demand creation for their products and are also strongly affected by regulation. It is striking that neither public distribution efforts nor interventions for the market-based delivery of nutrient-dense foods pay any particular attention to the gendered nature of market access and care work within the household.

The linkages with agriculture of these interventions vary, with naturally nutrient-dense interventions having a stronger connection than fortified products. Sustainability of interventions is an uncertainty with the donor-driven ones as they have a programme life-span; while government-led initiatives have to deal with willingness and capacity. The following sub-sections provide a more detailed analysis of these issues as they relate to interventions included in the review.

**Table 5 Analysis of intervention type by key issue addressed**

	Nutrition goals	Agricultural linkages	Targeting	Demand creation	Regulation	Sustainability
Promotion of nutrient-rich food initiatives — dairy	No	Yes	No	Yes	Yes	Yes (private sector led)
Promotion of nutrient-rich food initiatives — meat, poultry and others	No	Yes	No	Yes	Yes	Yes (private sector led)
Promotion of nutrient-rich food initiatives — fortified foods	Yes	Weak	Yes	Yes	Yes	No
Promotion of nutrient-rich food initiatives — mandatory fortified foods	Yes	Weak	No	No	Yes	Yes
Food distribution	Yes	Yes/Weak	Yes	No	Yes	No

## 5.1 Nutrition improvement as objective

Half of the interventions included in the review do not have specific nutrition objectives, while all interventions involving foods of increased nutritional value and public distribution have improving nutrition as a goal. Of those that target nutrition, even fewer measure the effect of their interventions on nutrition outcomes.

None of the interventions that involve naturally nutrient-dense foods have specific post-farm gate nutrition objectives, but these are often viewed as an outcome of the intervention, targeting the suppliers or a secondary objective. Among these interventions, three do mention nutritional improvement as an objective but view it as a by-product of other activities and not as a focal element of the intervention. None of these interventions measure the impact of their activities on nutrition. Tetra Pak’s dairy hub intervention aims to integrate

the value chain to improve livelihoods while also boosting nutrition outcomes, and the Pakistan Agriculture Research Council (PARC) poultry intervention in the federally administered tribal areas (FATA) expects that it will help mitigate protein deficiency by improving the supply of eggs and chicken in the rural markets, while the backyard poultry intervention also states that it will improve the health status of women through improved poultry production.

Interventions involving foods of increased nutritional value on the other hand are inherently focused on improving the nutrition of consumers, as they have micronutrients added to them, typically at the processing stage or the production stage of the value chain. The business-driven fortified interventions included in the review that are led and funded by the private sector all have improved nutrition of a target population as their objective. However, none have publicly available assessments of the impact of their products on the nutritional outcomes of their target population. Conducting such assessments can be costly, time consuming and would realistically be beneficial to private sector companies only if their consumers had a certain level of nutrition awareness, whereby publically sharing positive assessment outcomes would result in increased sales.

Large private sector companies such as Nestlé which enjoy scale economies can afford to have all their products go through a nutrition profiling system and therefore products such as Nido Fortified and Nido Bunyad can claim to target the specific nutritional needs of a particular age bracket of children. However, ethical concerns over Nestlé's supply chain and marketing activities have called into question their commitment to improving nutrition through the sale and consumption of their products versus their interest in profit (Baloch 2015).

The school feeding programmes included in the review were among the very few interventions which had improving nutrition (as well as school attendance) as a stated objective.

## 5.2 Agricultural linkages

Of the 24 agri-food value chain interventions, some have strong links to agriculture but weak nutrition linkages, such as the naturally nutrient-dense interventions, while others have strong nutrition focus but weak agricultural linkages, such as the food fortification interventions. By this we mean that naturally nutrient-dense interventions commonly intervene at the agriculture stage of the chain while fortification occurs at the processing stage, which is removed from agricultural practice. Activities along one part of the chain cannot be understood, of course, in isolation from other parts and activities along the chain,

initiatives such as mandatory fortification, will have a bearing on production and motivate actors along the chain in different ways. The contrast between interventions in naturally nutrient-dense foods and food fortification with respect to their respective agricultural linkages shows that thus far there are no salient models of interventions which focus *both* on income generation among poor producers *and* directly on the consumption of nutrient-dense foods.

### 5.3 Targeting

Nutrient-dense foods, whether naturally nutrient-dense or foods with enhanced nutritional value, tend to be among the more expensive foods in the market. Value chain interventions among the business-driven interventions that aim to deliver nutrient-dense foods through the market and therefore target low-income undernourished consumers can pose challenges which food distribution programmes are able to overcome.

Promotion of nutrient-rich market interventions that are concerned with naturally nutrient-dense foods generally use innovation along the value chain and capacity building to achieve the overall objective of improving the agriculture sector while also improving the livelihoods of producers. They therefore do not focus on targeting the supply of food to specific segments of the population, and some of the products these interventions are concerned with are likely to exclude low income consumers. The main product of the dairy value chains, for example, is UHT milk which sells at a higher price than unprocessed milk. In a similar manner, the poultry and meat interventions that work to increase the supply in the market are focused on promoting products which many low income consumers cannot afford to consume on a sustained basis, and are therefore not able to realise the nutritional value of these products.

Fortified packaged foods included in the review are designed to address the nutrition of children and are marketed towards them or their mothers. These private sector-led initiatives face challenges in aligning their business interests with those of improving nutrition among low-income consumers. Foods of additional nutrient value tend to be more expensive as they have undergone an additional processing stage, as is seen with Nestlé's products and Tiger Max.

To tackle this challenge, companies involved in the dairy sector such as Haleeb Foods have started producing dairy drinks, which have less milk solids than real milk, but as a result can be sold at a price below loose milk in tetra pak packaging, sealing it from contaminants. GroAur is one such product which is fortified with iron, and is sold to lower income households; it however faces other regulatory challenges.

Fortified staples are consumed by a wide segment of the population and are more likely to be consumed by women and girls within the household as opposed to other more expensive foods that typically would first go to the males in the family. Therefore, the two wheat flour fortification initiatives explicitly aim to reduce iron deficiency in women and children, with MI's interventions specifically stating that they aim to improve maternal health, though it was not apparent that they targeted marketing activities to these groups. With regard to targeting low-income populations, the process of fortification increases the cost of wheat flour and to ensure that low-income populations consume the nutritionally-enhanced product, either a subsidy needs to be introduced or consumers need to be convinced of the benefit and bear the additional cost.

By contrast, public distribution interventions such as school feeding programmes are seen to function as social safety nets as they essentially transfer the value of the food provided to the children or to the household. These programmes have, by their design, an element of targeting, which is a general feature of social protection programmes. Since the point of delivery of school feeding programmes is the government school, its beneficiaries are children from relatively low income households.

## 5.4 Demand creation

For initiatives that promote nutrient-dense markets to be successful at selling fortified products to lower income consumers, their interests need to align with consumer needs. To expect consumers to pay an additional sum for fortified products, they need to have a certain level of nutritional awareness about the benefits of the product. This is reflected by the case of Tiger Max, which was taken off the market as consumers were not willing to pay more for the fortified product. Tiger Max further highlights that marketing a nutritious product at a price that those in most need of the fortification can afford and signalling its value to consumers is integral to its success. Therefore products such as Nestlé's often target higher SECs as certain levels of nutritional awareness exists among those segments of the population. Further, business-driven naturally nutrient-dense interventions, such as those involving UHT milk, have only been able to capture a small percentage of the milk market as they are not able to compete with the relatively low prices of loose (unprocessed) milk.

Mandatory fortification addresses issues of demand that arise as a result of low consumer awareness around nutrition, as well as targeting and processing costs. In the absence of mandatory fortification, INGO-driven wheat flour fortification initiatives adopted other strategies to address these same issues, such as running awareness campaigns and providing free pre-mix. But even with these strategies, these interventions had to deal with concerns around private sector commitment and costs, capability and capacity of both internal and

external quality control and the enforcement and monitoring of quality and safety standards — factors which eventually have a bearing on demand.

Food distribution initiatives do not need to create demand, but can work to influence food preferences and eating patterns over a long period of time.

## 5.5 Regulation

Regulation is an important aspect of most of the value chain interventions included in the review. For naturally nutrient-dense foods, especially milk, there are certain quality and safety standards that the product has to meet before it can be sold on the open market. For dairy liquids, regulation has resulted in the Punjab Food Authority removing GroAur and other similar products from shelves as they believe these dairy drinks are being advertised as milk. On the other hand, private sector actors say there is a need to lobby the government to create special standards for dairy drinks. Further analysis needs to be done to determine whether dairy drinks, both fortified and non-fortified, are actually nutritious products that should target lower income populations on the basis of their nutritional value and as a replacement for milk. In other provinces across the country such regulatory bodies are not active or in existence.

With regard to fortification of staples, literature suggests that there are inadequate regulatory monitoring systems which deal with compliance, quality control and licensing (Pakistan Ministry of Health 2005 and Pakistan Planning Commission 2012) and, in fact, analysis of oil/ghee samples has revealed a wide variety of fortificants of low quality (Bhutta 2003). With respect to USC oil, different oil/ghee manufacturing companies across the country manufacture and package the oil according to the requirements of USC; two of these manufacturers were contacted and through personal communication they confirmed that USC edible oil is fortified with vitamins A and D according to the stipulations of the Pakistan Standards and Quality Control Authority (PSQCA).

Specifically for wheat flour fortification, previous successful programmes have operated on a small scale but the success of a national level intervention will hinge on ensuring that there is state willingness, that regulation is set across the provinces, and that implementation occurs properly. A scoping study of food fortification in Pakistan found that current barriers to effective fortification of food staples include a lack of mandatory legislation laws, limitations of food inspectors in terms of quantity and capacity, and the absence of standardised protocols for inspection and collection of food samples (Gaffey et al. 2014). Laboratories also have limited capacity to test samples for micronutrient content, monitoring and enforcement procedures lack coordination and clarity on institutional roles, and there are erratic penalties

for non-compliance; in some cases fines are less than the costs associated with fortification (ibid.).

## 5.6 Sustainability

There are contrasting patterns with respect to the sustainability of various agri-food value chain interventions in Pakistan. Those private sector-initiated interventions which promote nutrient-rich markets proved themselves to be sustainable through the market mechanism. The story of dairy value chains emerging along the marketing strategy of a packaging manufacturer is a case in point. As described in Section 4, these interventions have been successful in creating further demand and capturing increasing market share for their product in innovative ways, by receiving funding to increase the incomes of producers and at the same time supporting their established business processes. By contrast, the sustainability of government-led interventions — whether business-driven or public distribution programmes — depends on institutional strength and political commitment. The national Tawana school feeding programme, for example, underwent changes in design and was ultimately closed down prematurely. While some evaluations found the programme to have had a positive impact, allegations that there were breaches in governance processes marred the public image of the intervention and led to an erosion of political support for it. Other interventions which have been donor/INGO driven have also not been sustained beyond their project lifespans. An example of this is the school feeding programme, SNP, funded by the United States Department of Agriculture, which despite being successful in achieving improved nutrition outcomes ended as the programme drew to a close. The sustainability of government or donor-led interventions for market-based delivery, such as those in food fortification, depends also on continued political commitment both for the provision of subsidy as well as for the enactment and enforcement of regulation.

## 6. Selection of case studies

The foregoing review (particularly Section 5) has identified themes and issues which will need to be addressed in order to enhance the contribution of agriculture to nutrition improvement through value chain interventions in Pakistan. This understanding needs to be deepened further with a more detailed examination of foods where value chain interventions might play a particularly promising role. Our Pillar 2.2 work in LANSAs proposes to engage with selected existing or proposed value chain interventions through in-depth mixed methods case studies in order to both highlight problems in design and implementation in those cases, and also to draw out broader policy lessons for future value chain interventions in general.

Our review above has shown that while some value chain interventions have nutrition as an explicit objective, others are primarily concerned with increasing household incomes and treat nutrition as a secondary goal. In the selection of case studies, therefore, it will be important to pay attention to those interventions which give primacy to nutrition, or to those interventions which have the potential for improving the consumption of nutrient-dense foods by the priority population. We propose to focus on Infant and Young Child Feeding (IYCF) as a high priority concern within nutrition.

Actual complementary feeding practices for 6-23-month-olds show that non-breastfeeding children had greater recourse to infant formula and non-breast milk, but had similar patterns of consumption otherwise (Table 6). The most prevalent foods given to infants and young children were grain-based preparations that normally do not include nutrient-dense foods. The second most prevalent food in both groups was 'other milk' — including fresh unprocessed milk or various forms of processed milk from dairy animals. Fortified baby foods which might be a reliable source of nutrients were consumed by only 15 per cent of the 6-23-month-olds.

**Table 6: Children aged 6-23 months consuming complementary food — breastfeeding and non-breastfeeding children**

	Breastfeeding children	Non-breastfeeding children
Infant formula	3.6	12.9
Other milk	41.4	72.7
Fortified baby foods	15.5	14.6
Food made from grains	69.7	79.8
Vitamin A-rich fruit/vegetables	18.8	20.6
Meat, fish, poultry	16.2	22.9
Eggs	23.9	27.8

*Source: Demographic and Health Survey 2012-13, Table 11.5*

A better understanding of value chains in grains (specifically wheat), milk and fortified baby foods can help to identify the types of interventions and policies which can lead to improvements in the consumption of nutrient-dense foods by those that most need it. To elaborate, grains, because these dominate complementary foods (70 per cent for breastfed infants and 80 per cent for non-breastfed infants between the ages of 6-23 months), and there are existing and proposed programmes for enhancing their nutrient density; milk, because it is the main nutrient-dense food in the diets of infant and young children (41 per

cent for breastfed infants and 73 per cent for non-breastfed infants between the ages of 6-23 months); and fortified baby foods, because there is a well-established value for these in the private sector, and there are potential lessons to be learnt from a public policy perspective. Using value chains as an analytical tool not only helps uncover how market-based approaches to delivering food can be strengthened but may also highlight where subsidies, social protection programmes or other types of related policies and government practices (e.g., food and safety regulation) may be required.

The case studies will focus on demand-side factors that affect the consumption of nutrient-dense foods and supply-side factors that determine the effectiveness of various business models with regard to delivering nutrient-dense IYC foods to poor households.

Preliminary investigation based on a review of literature and selected key informant interviews on the three agri-food value chains have helped identify more specific research questions for each case study. A brief description of the agri-food value chain and the related research questions is provided below.

The three case studies will address a number of generic research questions driven by the agri-food system framework outlined by Henson and Humphrey (2016). These include:

- To what extent are these agri-food value chains successful in bringing about increased and sustained consumption of nutrient-dense foods by IYC in Pakistan?
- What are the most prominent challenges faced in the effective implementation of agri-food value chains?
- Which types of agri-food value chains offer the greatest prospects to achieve substantive and sustained consumption of nutrient-dense foods by low income IYC at scale?
- What are the implications for policy makers?
- How well do these interventions work in the context of fragility --- that is, weak willingness and/or capacity of government to support such initiatives and/or to promote increased consumption of nutrient-dense foods by the poor?
- In what ways are gender considerations critical to the functioning and/or success of the interventions, and to what extent have these been considered in the design and/or implementation of the interventions?
- To what degree and what forms of innovation along the agri-food system are critical to the success of the interventions?

### *Naturally nutrient-dense foods: Milk*

Within Pakistan, the livestock sector accounts for 55.4 per cent of agriculture, which is the single largest sector. Livestock contributed 11.9 per cent of national GDP during 2012-13 (Pakistan Ministry of Finance 2015), making it an important part of the economy. Within livestock, milk production has a significant role to play as Pakistan is the fourth largest milk producer in the world (FAOSTAT 2015).

Milk is available in numerous forms in the market in the country, with varying nutritional quality. In addition, the way it is prepared and consumed can have a significant bearing on how safe and nutritious it is. Milk can be powdered, packaged UHT form and fresh. Fresh milk from cows, buffaloes as well as goats is consumed. Fresh milk is often sold in open containers in raw unpasteurised form. This method of selling milk allows for adulteration; typically milk is mixed with water. UHT milk is processed and sealed, so it is considered safer to drink, but is significantly more expensive and is often thought of being less nutritious as it not fresh.

This case study will seek to understand the opportunities to distribute safe and low cost milk to the poor, by specifically studying whether efforts to promote pasteurised packaged milk leads to increased consumption of safe milk for low income households. It will examine whether certain business models better serve low income households and how best to mitigate possible adverse effects of each of these models.

### *Fortified staples: Wheat flour*

According to the 2010 Agricultural Census of Pakistan, farms devoted 42 per cent of their total crop area to wheat. In Pakistan, wheat is the main staple food, and therefore the government has an interest in ensuring adequate supply of the product across the country and is involved in price setting, procurement, storage, and milling of wheat. As a result, wheat flour fortification is viewed as a promising initiative to help improve nutritional outcomes, but close co-operation with the government and millers is necessary for such an initiative to be successful.

This case study will examine historical wheat flour fortification interventions as well as proposed programmes to specifically study the sustainability of such interventions, and understand issues relating to regulation (design and implementation), scaling-up (adoption of wheat fortification by large and small millers), signalling and targeting.

### *Manufactured: Fortified baby cereal*

This case study will examine various local agri-food value chain business models for fortified baby cereals, examining them for their effectiveness in reaching low-income IYC households. One of the largest actors in this sector is Nestlé. It manufactures a complementary fortified

cereal called Cerelac, which is enriched with iron, vitamins A & D, iodine and probiotics.. The cereal is targeted towards children between the ages of 6 to 24 months. It is typically consumed by higher SECs<sup>2</sup> (A to C), but is also sold in single serving (25 g) sachets for 13 to 18 rupees which are consumed by SEC D. Cerelac is marketed as a convenient complementary feeding solution that meets the nutritional requirements of IYC.

Nestlé procures the wheat, acquires the premix for fortification, processes and packages the commodity. It then markets the product to doctors and mothers. Nestlé adopts market-based strategies, which include product placement to increase the consumption of the product in small towns and promote the cereal to healthcare professionals.

The government is an important actor in terms of being a regulator. Specifically, the Pakistan Standards and Quality Control Authority (PSQA) formulates, promotes and supports compliance with national standard specifications in various industrial and service areas, including agriculture and food.

This case study has some elements which are common to the first two. Like the dairy value chain study, it provides an opportunity to examine a market-driven initiative and the potential for the resulting product to have wider outreach among the target population. The product in question is also likely, like fortified wheat, to be subject to the application of policy-driven standards and mandates.

## 7 Conclusion

This review has compiled 24 agri-food value chain interventions which aim to increase the consumption of nutrient-dense foods or increase their supply to post-farm gate poor populations. This paper provides a descriptive overview of the actors and activities involved in these interventions, and an analysis of the characteristics and challenges of the various agri-food value chain approaches, with the objective of providing insight into the potential of food-based value chain approaches in tackling undernutrition. The review sets out the basis for an empirical analysis which will examine the ability of three of these interventions to address undernutrition. The rationale for the selection of these three case studies and a broad overview of them has also been set out. Further analysis on how the selected agri-food value chain interventions may influence nutritional outcomes will be provided in the forthcoming case studies.

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<sup>2</sup> SECs refer to social economic categories, and is a marketing classification system used to group consumers.

From the interventions included in this review, the following has been noted:

*The value chain approach is still largely being utilised as a tool to improve livelihoods in Pakistan, with some examples of interventions connecting this approach to pre-farm gate consumption.*

Interventions involving naturally nutrient-dense foods generally focus on the producer and not on the post-farm gate consumer, although they also work to increase the supply of these foods. Naturally nutrient-dense agri-food value chains in this review include numerous dairy interventions which involve a range of actors from donors to the government to the private sector. Most are focused on improving the supply and quality of dairy products; however, there is scope for these interventions to incorporate objectives around post-farm gate consumption by poor populations, including low-income, rural, non-farm, landless and urban households.

*Agri-food value chain interventions which have a focus on providing nutrient-dense foods to poor consumers could have a greater focus on distribution and utilising those channels through which the poor access food.*

Interventions typically do not work with informal food industries, which are the value chains that the poor are more likely to engage with. This is an area that would benefit from a focus on food safety and nutritional quality, though with this being said, if food products are placed in local *kirana* stores there is a higher chance of the poor consuming them. In addition, food distribution programmes aim to ensure that they reach poor consumers, although the majority of these interventions are project based and involve international actors, affecting their long term sustainability.

*Fortified staples have a strong potential to address undernutrition among target populations, but require the right processes and policy in place.*

The wheat flour fortification interventions included in the review specifically aim to improve the nutrition of women and girls, though these require coordination and monitoring along the value chain to be successful. The regulatory framework still needs to be built up and monitoring and enforcement need to be strengthened; however, some of these issues can be resolved through investment in the process (Gaffey et al. 2014). In addition, such activities do not yet cover *chakkis* (micro-mills) where a significant percentage of wheat in the country is milled. Biofortification of wheat in Pakistan may bypass some of these issues but it is still in its nascent stages and the success of the interventions is yet to be determined.

*Private sector-led interventions need to devise strategies to market and sell their fortified products to consumers in lower income groups.*

Fortified non-staple foods included in the review are private sector-led interventions. These products are marketed to a range of segments of the population and are only affordable to lower income brackets when they are sold in their smallest packaging. Brands like GroAur that do not target the highest socio-economic category but advertise to nutrition-conscious mothers are selling a product that cannot be classified as milk. Tiger Max was sold at a higher price than its non-fortified counterpart, perhaps reflecting additional costs associated with fortification as well as segments where demand for such products actually lie.

*The design of agri-food interventions needs to pay attention to gendered norms of care and market access.*

Market-based delivery as well as public distribution systems will be more effective in ensuring the consumption of nutrient-dense foods if their design incorporates the effects of gendered norms within the household about decision-making regarding care as well as food acquisition.

These conclusions will refine the analytical lens for the upcoming case study work to help determine what the potential is of the selected agri-food value chain interventions to deliver nutrient-dense foods to low income populations through IYCF. The desk-based review will provide the foundation for the empirical case study work and serve as a guide to the agri-food value chain intervention landscape in Pakistan.

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## Annexure: Summary of agri-food chain interventions

### Business-driven: Naturally nutrient-dense — Dairy

Intervention	Aim	Primary beneficiaries	Description / key activities	Expected outcome
<b>Dairy Hub: A Community Dairy Development Programme</b> (2009- ) Tetra Pak and Engro, Nestlé Pakistan, Haleeb	To develop the dairy sector so that better quality and quantity of milk supply will lead to higher demand of Tetra Pak's packaging	Smallholder, local dairy farmers	Hubs set up to include 20 villages in a 15-20 km radius, covering 800-1,000 farmers and 10,000 cows. Register farmers, test milk, provide chilling machines, and establish VMCs	Safe, hygienic and easily accessible milk brought to consumers through cooperation with dairy processes and better economies of scale
<b>Dairy Project</b> (July 2011- July 2014) USAID and DRDF, PVTG and UVAS	To improve the production of dairy products and increase dairy farmers' income	Dairy farmers and livestock technicians, including women	Capacity building, extension services and awareness campaigns	Improvement in the livelihoods of those working in the dairy sector and also increase in the supply of dairy products to the market
<b>Establishment of Milk Processing Plants in Districts Layyah and Sialkot</b> (2006-2011) Extension Services, L&DD, Government of	To increase the quantity and quality of milk production	Farmers, processors and consumers	Creation of farmers' organisations in 1,000 villages, establishing milk centres, chilling centres and milk powder plants	Improvement in incomes by increasing quantity and quality of milk

<b>Intervention</b>	<b>Aim</b>	<b>Primary beneficiaries</b>	<b>Description / key activities</b>	<b>Expected outcome</b>
Punjab				
<b>Haleeb Value Chain Project (HVCP)</b> (2008-) CIDA, MEDA and Haleeb Foods	To increase the incomes of 6,000 women dairy farmers	Women dairy farmers	Capacity building of women farmers to improve milk productivity and quality, as well as improve market linkages. Women were also provided with equipment and collection centre facilities	Economic empowerment of women in the dairy sector
<b>Model Farm and Farm Cooling Tanks (FCTs) Programmes</b> (2006- ) PDDC and partners from private sector	To increase the supply of safe and affordable milk beyond the farm gate	Farmers, processors and consumers	Facilitation of linkages between farmers, processors and consumers. Augmentation of milk production by improving farm management, milk collection and marketing	An increase in the supply of milk will result in more affordable milk for all segments of society, especially the poor
<b>Plan Milk Value Chain Project (PMV CP), Vehari</b> (2010) Plan Pakistan and EU	To reduce poverty among dairy farmers by improving milk productivity of animals	Small livestock farmers	Establishment of milk collection centres, engagement in social mobilisation, provision of feed, fodder and veterinary services and running the family nutrition	Mitigation of the effects of increases in food prices and achievement of household food security

Intervention	Aim	Primary beneficiaries	Description / key activities	Expected outcome
			programme	
<b>Women Empowerment through Livestock Development (WELD)</b> (2011-2013) USAID, MEDA and Engro Foundation	To improve 15,000 dairy farmers' incomes by 50%	Milk producers, predominately women	Creation of a cadre of female livestock extension workers and female village milk collectors to provide training and services at milk producers' doorsteps. Support the establishment of small village-level businesses. Engro provided 60 chillers and agreed to buy milk suppliers' product at competitive rates	Increase in the post-farm gate consumption of dairy products due to improvement in production and quality

#### Business-driven: Naturally nutrient-dense — Non-Dairy

Intervention	Aim	Primary Beneficiaries	Description / Key Activities	Expected Outcome
<b>Lahore Meat Processing Complex</b> Punjab Agriculture and Meat Company	To improve meat processing efficiency and trigger quality meat production through backward integration	General population	Establishment of backward linkages with certified farms, provision of mechanical processing facilities, storage, value addition of allied products and quality	Improvement in the supply of safe and healthy meat beyond the farm gate

			compliance	
<p><b>Save the Calf</b> (2010 ) PAMCO owned by the Government of Punjab</p>	<p>To decrease the number of calves that are slaughtered at an early age and to ensure international quality standards of meat</p>	<p>Farmers and meat industry</p>	<p>Provision of technical support, animal health facilities, e-tagging and cash incentives to farmers in order to ensure the survival of male calves until a suitable slaughtering time</p>	<p>Increase in the supply of disease-free meat in the commercial sector</p>
<p><b>Backyard Poultry Breeding and Culture</b> (2009- ) PARC</p>	<p>To achieve poverty alleviation and empowerment of women rural farmers</p>	<p>Rural women</p>	<p>Provision of 15,000 of highly productive chicks to rural women poultry farmers</p>	<p>Increase in the supply of meat and eggs in the rural market and improvement of living standards and health status of rural women</p>
<p><b>High Egg Producing Rural Chicken Livelihood Improvement &amp; Poverty Alleviation in FATA</b> PARC</p>	<p>To address worsening protein deficiency in remote rural areas</p>	<p>Poor residents of FATA</p>	<p>Provision of high egg producing chicks in exchange with old low producing birds at no extra cost</p>	<p>Better egg and chicken production, generation of employment, women's empowerment and uplift in the village economy</p>

<b>Fruit and Vegetable Development Project (FVDP)</b> (2005-2013) ACIAR, Government of Pakistan with international and local organizations	To increase the production of quality fruits and vegetables in order to ensure sustainable supply in market	Community involved in fruit and vegetables cultivation	Farmer education through Farmer Field School (FFS) to ensure value addition along chain, reduction in post-harvest losses, integrated pest management development of market linkages of producers and processors	Poverty alleviation of farmers through diversification of high value fruits and vegetables
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#### Food Distribution Programme: Naturally nutrient-dense

<b>Intervention</b>	<b>Aim</b>	<b>Primary Beneficiaries</b>	<b>Description / Key Activities</b>	<b>Expected Outcome</b>
<b>Tawana Pakistan</b> (2002-2005) Government of Pakistan and NGOs	To improve nutritional status of girls and increase enrolment and nutrition awareness in 29 of the poorest districts in the country	Primary school girls aged 5-12 years	Girls were provided with freshly prepared, locally sourced, nutritious midday meals at school. School committees were formed which included mothers, community members teachers and students who were responsible for planning and preparing the	Improved nutritional outcomes of girls who received the intervention

			meals. Training sessions on nutrition awareness were also conducted in the community	
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### Business-driven: Food fortification

Intervention	Aim	Primary Beneficiaries	Description / Key Activities	Expected Outcome
<b>Commercial Wheat Flour Fortification Project</b> (2007- ) MI in partnership with WFP, implemented with flour millers and health workers	To fortify wheat flour with iron to improve maternal health and reduce iron deficiency in women and girls	Population of earthquake-affected areas of Khyber Pakhtunkhwa	Fortification of wheat flour, worked with the Mill Association to spread information about the importance of fortification. Educated and assisted millers to procure pre-mix and install microfeeders. Trained staff and ensure quality control. Worked with health workers to spread awareness about the product	Benefit about half a million people
<b>Pakistan Wheat Flour Fortification Project</b> (2005-2010) Funded by GAIN and implemented by	To fortify wheat flour with iron to reduce anaemia in women from 25.5% to 20%	45% of the population, with specific focus on women and children	125 flour mills equipped and workers trained, GAIN provided pre-mix, PSQCA approved	Access by more than 12.7 million people

Ministry of Health, flour millers and USC	and in children under five from 36% to 28%	under the age of five	standards for fortified wheat flour, social marketing campaign was launched; a MoU was signed with USC and fortified wheat flour was sold at the same price as regular wheat flour	
<b>Utility Vegetable Cooking Oil</b> Utility Store Corporation (USC)	To sell cooking oil fortified with vitamins A and D at a price lower than market	General population	Own branded fortified cooking oil retailed at a lower price than oil found in the market	Increase in the consumption of fortified cooking oil
<b>Cerelac</b> Nestlé Pakistan	To sell baby cereal to children	Children between the ages of 6 months - 3 years of age	Cerelac is targeted to a variety of age groups and is sold at lower prices in sachets. Awareness campaigns targeted to health care professionals	Address the nutritional needs of children
<b>GroAur Dairy Drink</b> Haleeb Foods Ltd.	To sell iron fortified dairy drink to children	General population, specifically targeting children	Iron-fortified dairy drink, GroAur, sold in smaller sizes, especially targeted towards mothers who are concerned about their children's nutritional	Fulfil iron-nutritional needs of children

			wellbeing	
<p><b>Nido Fortified Milk</b> Nido Bunyad (2009) Nido Fortified Nestlé Pakistan</p>	<p>To sell fortified milk powder to children</p>	<p>Children between the ages of 1-12 years</p>	<p>Fortified milk powder that meets the nutritional requirements of particular age groups of children, Nido is available in sachets at lower prices for the lower income groups. Marketing activities take place in smaller towns</p>	<p>Address the nutritional needs of children</p>
<p><b>Tiger Biscuits</b> <i>Tiger: 1993</i> <i>Tiger Max: 2012</i> Continental Biscuits Ltd.</p>	<p>To focus on improving nutrition</p>	<p>General population, specifically targeting children</p>	<p>Tiger is of milk and wheat. Tiger Max contains additional vitamins and minerals. Sold in various packages to target different income groups. Marketing campaign targets school children, emphasizing the importance of energy</p>	<p>Provide energy and nutrition to children</p>

### Business-driven: Biofortification

Intervention	Aim	Primary Beneficiaries	Description / Key Activities	Expected Outcome
Zinc Wheat (2010-2018) HarvestPlus and NARC Pakistan	To develop zinc biofortified wheat seed with the objective of addressing zinc deficiency in the country	General population	Plant breeding for wheat biofortified variety with high zinc.	Expected that after 10 years wheat will be consumed by 100 million people in country – the seed variety provides 20% more zinc than other commonly grown varieties

### Food Distribution Programmes: Fortified

Intervention	Aim	Primary Beneficiaries	Description / Key Activities	Expected Outcome
<b>RUTFs – Wawa</b> Mum, Acha Mum Since 2009 WFP CMAM	To improve nutrition of children moderately or acutely malnourished, in emergency response situations	Children between the ages of 6 to 59 months in emergency response situations	WFP contracts manufacturers in emergency-affected regions to locally manufacture chickpea based RUTF. Then distributes and transports the product. The product wraps a day's worth of vitamins and nutrients into a single 50g pack	Reduce malnutrition in emergency-struck areas
<b>Pakistan School Feeding</b>	To increase school enrolment	Primary school-going	School children were provided	Save lives, avert hunger and

<p><b>Programme</b> Various Programmes (2006-2010) WFP and other local and international partners</p>	<p>through on-site feeding and take-home rations, improve nutrition and health status of children and pregnant and lactating women</p>	<p>children in conflict and disaster-affected areas</p>	<p>high energy biscuits in school and with take-home rations including fortified edible oil, fortified wheat flour, dates and blended food, depending on the programme. Each programme also involved community nutrition programmes</p>	<p>reduce malnutrition among vulnerable populations</p>
<p><b>School Nutrition Programme (SNP)</b> (2003-2009) USDA, Land O'Lakes and Government of Sindh</p>	<p>To improve nutrition and attendance of children in primary schools in the district Ghotki</p>	<p>Primary school children</p>	<p>Provided teachers and children with fortified milk and biscuits. Trained more than 4,000 teachers and school supervisors on the handling, storage safety and quality assessments of milk</p>	<p>Assessments found that the intervention helped reduce stunting and wasting as well as improving school enrolment and attendance</p>