VALUE CHAINS FOR NUTRITION IN SOUTH ASIA: WHO DELIVERS, HOW, AND TO WHOM?

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'Milk for Milk, Water for Water': Analysing Pakistan's Dairy Innovation[*]

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Abstract Interventions in agri-food value chains are thought to potentially make important contributions towards enhancing agriculture's role in nutrition. Some frameworks have begun to identify sets of requirements for pro-nutrition value chains. Pakistan's dairy sector has been the focus of a business-driven innovation which introduced ultra-high temperature (UHT)-treated milk in aseptic packaging. This was expected to relieve existing constraints in production and distribution, raise incomes for producers, and increase the supply of an affordable nutrient-dense food to consumers. While this innovation appeared to fulfil most requirements of a pro-nutrition value chain, it ultimately failed to act as a bridge between farmers and consumers. Instead, it led to the introduction of non-dairy products and imported raw materials. This case study shows that while existing frameworks take a relatively static view of whether an innovation prospectively fulfils certain requirements, businesses can quickly alter entire value chains in response to market conditions.

Keywords: value chains, dairy, Pakistan, agriculture, nutrition, markets, agribusiness, food systems, private sector, milk.

1 Introduction

This article presents the case study of a promising agri-food value chain innovation in a largely agricultural country with a high burden of undernutrition. The dairy sector in Pakistan attracted private business-driven innovations from the 1980s onwards, and particularly since the mid-2000s. We construct a case study of the sector using the emerging conceptual literature on agri-food value chains for nutrition. The case study has two main objectives. First, it aims to draw lessons on the potential for business-driven agri-food value chains interventions to improve nutrition in Pakistan and elsewhere. Second, it offers an opportunity for understanding the limitations of existing conceptual frameworks in prospectively identifying conditions and requirements for pro-nutrition value chains interventions.

1.1 Evolution of the value chains perspective

The value chains perspective began to be recognised in the 1980s as an internal business development tool that firms were using to strategically position themselves, under conditions of rapid technological and organisational change (Porter 1985). Companies became interested in identifying and advancing those elements of their business processes which would offer the greatest opportunities for value creation and appropriation. This perspective gained popularity in development studies in the 1990s through an influential paper by Kaplinsky (2000) who, in this strategic pursuit of entrepreneurial rent, identified a key characteristic of the emerging globalised economy.[1] What businesses were doing in developed countries had implications for developing countries as value chain management linked faraway producers and consumers through a series of closely coordinated inter-firm and intra-firm transactions. The prescriptive element in these earlier studies was limited to directing industrial policy towards those sectors and activities in developing countries which could be expected to accrue value. But policy interest was to extend further:

> Value chains approaches to development have been adopted by several developing agencies to encourage greater participation by poor people in modern value chains, including food value chains. These include agricultural value chain development projects, which tend to focus on some forms of 'upgrading' as a means of increasing returns to farmers (that is, changing their products, improving their processes, increasing the volume produced, changing their functions, or improving their coordination to capture more value) (Hawkes and Ruel 2011: 74).

The value chains concept had made a long journey from being named as an element of business strategy to an avenue of development investment for market-driven poverty reduction. Having come this far, could value chains interventions be used for addressing nutrition, particularly undernutrition (Hawkes and Ruel 2011)? A number of possible answers were forthcoming. Maestre, Poole and Henson (2017) reviewed these and summarised the requirements for pro-nutrition value chains interventions. On the consumer side, the product in question needed to be nutritious and safe, there needed to be clear signalling of its nutritional value, and the intervention simultaneously needed to ensure that the product was available, affordable and acceptable to the poor. On the production, distribution and supply side it was important to know if, or to what extent, agents' incentives were aligned and if they were able to capture the value of their activity.

Pakistan's dairy sector offers a case of an innovation which appeared, prospectively, to fulfil most, if not all, of the requirements of pro-nutrition value chains outlined by Maestre *et al.* (2017) with respect to consumer choice as well as producer incentives. The introduction of modern milk-processing using ultra-high temperature (UHT)-treated technology was anticipated in various sector reviews to be a promising

route to overcoming bottlenecks in the expansion of production, supply and consumption of a popular and nutrient-dense food item (Anjum *et al.* 1989; Burki, Khan and Bari 2004; Fakhar and Walker 2006; Staal, Pratt and Jabbar 2008; Zia, Mahmood and Ali 2011; Younas 2013; Burki and Khan 2016). We propose to examine the value chain innovation by placing it in the context of the broader post-farmgate system for the supply and distribution of milk, including existing (traditional) value chains which predated the innovation, which the innovation sought to replace. This comparative lens is a key element of our methodology for assessing the success or otherwise of the innovation.

1.2 Methods

This case study brings together evidence from a range of sources – secondary literature and data, key informant interviews, and qualitative research in relatively low-income communities – to examine whether or to what extent the value chain innovation in Pakistan's dairy sector lived up its promise. Key informant interviews were conducted with representatives of private businesses operating in the modern segment of the dairy value chain, farmers, milk traders and transporters, industry experts, and retailers of dairy products.[2] A rural region which was known (from industry sources and secondary material) as an area where a dairy company had established its milk procurement system was purposively selected to observe the modern value chain at the supply end. Further, household and key informant interviews were carried out by two of the authors in selected low-income urban and rural communities to understand consumer behaviour with respect to milk.[3,4]

1.3 Outline of the article

Section 2 provides a historical account of the introduction of the value chain innovation in Pakistan, in the context of sector reviews and analyses. Section 3 describes the operation of traditional and modern value chains for milk and in the dairy sector. A qualitative assessment of the business-driven modern value chain innovation is given in Section 4. The innovation consists of numerous actions along the value chain by multiple actors over time, and our assessment does not attempt to evaluate the impact of any of these; rather, the focus is on patterns and trends in the modern value chain and its comparison with the traditional value chain that it sought to replace. Conclusions in Section 5 draw lessons for the dairy sector in Pakistan, on the potential of business-driven innovations for nutrition improvement more generally, and on the strengths and limitations of emerging conceptual frameworks for assessing the nutritional impact of value chains interventions.

2 Dairy value chain innovation in Pakistan

Milk and other dairy products constitute an important part of the diet of adults and children alike in Pakistan, and livestock rearing is the largest source of value added within the agricultural sector. However, a series of sector analyses characterised the dairy situation in Pakistan as that of low productivity and high potential (Anjum *et al.* 1989; Burki *et al.* 2004; Fakhar and Walker 2006; Staal *et al.* 2008; Zia *et al.* 2011;

Younas 2013; Burki and Khan 2016). Small herds of low-yielding breeds, wide fluctuations in output due to the seasonal variation in availability of green fodder, and high levels of spoilage because of the absence of effective cold chains[5] were identified as the supply-side issues limiting growth. Weak regulatory enforcement meant that the milk that reached consumers was vulnerable to adulteration and poor hygiene.[6]

The introduction of a modern value chain for processed milk was seen as a significant innovation which could raise farmer incomes and improve the safety and availability of a widely consumed nutrient-dense food.[7] A positive narrative was constructed around the developmental, income-generating, poverty-alleviating, and empowering roles of this innovation.[8] The innovation, which was spearheaded by Packages Ltd – the Pakistan-based partner of the transnational packaging company Tetra Pak – was taken up by a number of other private businesses.[9]

The core element of the innovation was the sourcing of fresh milk from local suppliers, its treatment and processing, and the aseptic packaging of UHT milk for distribution and sale. Two brands (Milkpak and Haleeb) were introduced in the early 1980s – the former being a joint venture led by Tetra Pak's local partner, Packages Ltd.[10] UHT milk was promoted as a safe and nutritious alternative to the unprocessed raw milk that was widely available and consumed in rural and urban areas alike. The market attracted new entrants, and by the late 2000s several brands of UHT milk became available – nearly all of them using Tetra Pak packaging. Most of the other entrants were local firms, such as Engro Foods (with the UHT milk brand Olpers), looking for a share in what promised to be an expanding market. It has been argued that a 2007 livestock sector policy – spurred on, in part, by the optimism surrounding the modern dairy value chain – was an important turning point (Burki and Khan 2016).[11]

At around the same time, a number of supportive interventions were made at the supply end of the value chain.[12] The main stated aim of these interventions was to increase farmer incomes by addressing some of the weak links on the supply side of the dairy value chain. These interventions provided infrastructure and organisational inputs at the community level to connect farmers with the modern value chain. They installed cold chain facilities, trained and hired local staff, and offered veterinary services and trainings to farmers. The private sector played an important part in all of these projects. The Dairy Hub project, for example, was led by Tetra Pak Pakistan to help a number of milk-processing companies – all customers of Tetra Pak's packaging – to set up or improve their milk sourcing systems. For at least the Haleeb Value Chain Project and Women Empowerment Through Livestock Development, private businesses received funding from development agencies. We were unable to find independent evaluations of these interventions.

The modern value chain innovation in Pakistan's dairy sector was premised on realising the untapped potential of this sector by providing

a critical missing link between producers and consumers. Consumers would be offered a safe and hygienic, naturally nutrient-dense food in the place of unprocessed fresh milk, which was thought to be susceptible to spoilage and adulteration. This new product, namely UHT milk (in aseptic packages supplied by Tetra Pak), was highly portable and had a long shelf life. It was expected that, because of efficiency gains, UHT milk would eventually become cheaper than unprocessed milk due to economies of scale and would capture market share (Burki *et al.* 2004). Thus, an affordable, acceptable, nutritious food was to be made widely available to consumers in greater quantities. At the same time, the interventions at the supply end implied that all actors along the value chain would benefit and be able to capture some part of the value thus created. Most importantly, the fact that the innovation was driven by private business meant that producer incentives were well aligned for profitability and sustainability.

3 Traditional and modern value chains

Descriptions of the dairy sector in Pakistan have identified distinctive value chains – such as those rooted in rural or peri-urban areas and the one serving the metropolis of Karachi (Anjum *et al.* 1989; Burki *et al.* 2004). The traditional–modern dichotomy which 'recognizes the existence of a modern sector (e.g. large commercial farms, agribusinesses, multinational food manufacturers, and modern supermarkets), a traditional sector (e.g. smallholder farmers and traders, wet markets, and "mom and pop" stores) and the interaction between modern and traditional actors' (Gómez and Ricketts 2013: 139) is one way of framing the change envisaged through the introduction of the UHT innovation. The modern value chain led by agribusinesses was expected to take market share from the more traditional value chains dominated by smallholders and wet markets.

Though traditional value chains with small-scale operators have the advantage of supplying nutritious food at low prices, they are constrained by seasonal and other sources of variability in supply. A modern value chain is thought to potentially help overcome some of these constraints and ensure greater availability, particularly if it targets the 'bottom of the pyramid'[13] through traditional channels of marketing and distribution.[14] Our review of the UHT innovation is prefaced, therefore, by a description of other existing value chains in Pakistan from the point of view of context and comparison: what was the UHT innovation planning to displace or replace, and how did it actually perform in comparison with existing value chains?

3.1 Traditional rural value chain

Historically, keeping livestock for milk has been a mainstay of rural society in Pakistan. For example, in the Women's Work and Nutrition Survey of 1,000 households in rural Sindh (Mazhar, Balagamwala and Gazdar 2017), nearly all households reported consuming milk, but under two-fifths reported buying it. The rest relied entirely on their own cattle, or on free or reciprocal exchange with neighbours. Livestock is

usually the most valuable asset owned by the rural poor, many of whom do not own agricultural land. Women and children are responsible for grazing, collecting fodder, and cleaning the animals, which are generally kept within the homestead; and livestock work is seen as an extension of household chores rather than an economic activity (Balagamwala, Gazdar and Mallah 2015; Mazhar *et al.* 2017).

There were various customs around the disposal of milk (*ibid.*). Traditionally, many rural communities did not market milk. When a buffalo or cow is in season it is milked twice a day – once in the morning and then again in the evening. Morning milk was usually consumed by family members or churned into butter which was purified to prolong its shelf life. Any surplus from the evening milking would be shared with neighbours free of cost. It might be argued that these customs and the notion of 'surplus' milk are connected with the absence of storage and transportation facilities. Although rural livestock holders do sell milk, in our fieldwork villages we found that some free or reciprocal circulation of milk and buttermilk from the evening milking is still practised.

Rural and peri-urban areas supply most of the milk that is marketed in Pakistan. The main actors are the small-scale producers who hold anywhere from one to five animals. They supply fresh, unprocessed milk to a middleman (known in many areas as a *doodhi*), who in turn delivers it to retailers or directly to consumers. The *doodhi* has arguably played an important role in the commodification of milk. Their ability to deliver and supply highly perishable, fresh milk over long distances quickly and safely, converted milk into a tradable good. There is also a growing rural market for milk, particularly in the form of roadside tea cabins and restaurants, and these, too, rely on the *doodhi*.

Sector reviews cited above have identified a number of constraints in traditional rural value chains. It is thought that the absence of an established cold chain leads to a high rate of spoilage – estimated to be up to a fifth of the produce.[15] There is also seasonal fluctuation in the availability of milk – herds produce around twice as much milk in the winter 'flush' season than in the lean months of the summer (Anjum *et al.* 1989).[16] The availability of free or cheap green fodder in the winter months is attributed to seasonal variation. It is widely reported, but with little more than anecdotal evidence, that *doodhi*-supplied milk is adulterated with contaminated water as well as other unsafe additives. Adulteration is seen as being linked to the risk of spoilage and seasonal variations. It is suspected that *doodhis* use ice (made from unsafe water) to chill the milk in the summer, and then use various chemical agents to make the milk appear thick and creamy.

3.2 Modern value chain
According to industry informants, the main sources of milk for all milk-processing companies are the village milk collection centres (VMCCs) spread across rural areas of the two high-productivity agricultural provinces – Punjab and Sindh. The location and number

of VMCCs have tended to shift over time, and there have been cases where a company has abandoned operations in a region and handed over its collection infrastructure to another firm. One dairy company, which reportedly has an approximate 50 per cent share of the UHT milk market, claims to operate over 1,600 such collection centres, each with a milk storage and processing capacity of up to 500 litres.[17]

Companies base their decision to site a VMCC after surveying a village for its capacity to produce surplus milk.[18] Once a VMCC starts functioning it enrols local vendors and maintains a relationship with them. Typically, a VMCC can have between 50 and 80 active milk vendors on its register and pays them on a weekly basis. In our qualitative fieldwork, we found that the VMCC had difficulty maintaining a regular group of suppliers due to competition from the *doodhi* who offered higher prices for the produce. Companies claimed that their preferred suppliers are direct vendors, which provide around 2–4 litres daily. They also use local agents who collect milk from several farmers in their localities and who bring 30–40 litres a day. Finally, there are contractors and *doodhis* who can manage 100–200 litres daily. Some companies said that they rely exclusively on direct vendors, while others accept the use of intermediaries, particularly during the summer months when the supply of fresh milk is constrained. Rather than displacing *doodhis*, in many instances the VMCCs end up relying on them.

3.3 Beyond milk and dairy

From around 2007[19] onwards, UHT milk manufacturers began to introduce new, mostly non-dairy, products which have little or no nutritional value. The so-called 'tea creamers' are vegetable fat-based liquids that are designed to taste and look like milk when added to tea. These were joined by 'dairy liquids' in 2011, which have some added milk fat but cannot be marketed as milk or as a substitute for milk.[20] Tea creamers now account for 55 per cent of the sales volume of UHT milk manufacturers while dairy liquids make up another 7 per cent (Burki and Khan 2016; interviews with industry key informants[21]). These products, particularly tea creamers are the main sources of growth in the industry. They, like UHT milk, use aseptic packaging supplied by Tetra Pak, and are marketed along similar supply chains to those utilised for UHT milk. The liquid tea creamers innovation is viewed as a breakthrough in the industry, and was framed as an achievement by industry key informants in our interviews with them, even though the powdered variant has been in the market for a longer time. The companies have successfully created a product that has overcome cost constraints[22] associated with the UHT chain (Andrew 2012), and which simultaneously has the attributes of traditional fresh milk – such as richness of colour in tea-making, and sweetness. Some of these attributes are associated by consumers with good nutrition as they evoke the high fat and nutrient content of buffalo milk. Our industry key informants indicated they were aware of instances where the product was being utilised for drinking by children in low-income households, even though it is categorically harmful for children under five years of

age to consume it. It might be argued that the rapid growth in the sales of creamers is premised on subtly prodding consumers into believing they are using a nutritionally sound product.[23]

3.4 Distribution and retail of UHT products

UHT products are sold in all kinds of retail outlets, unlike fresh unprocessed milk which is sold either directly to consumers or through specialised dairy shops. But also, unlike fresh milk, UHT products are marketed intensively. Interviews with industry informants revealed that the companies have made concerted attempts at understanding consumer behaviour. They classified milk consumption not only by region and socioeconomic status of households, but also according to the use of milk. Insights such as the differential demand within the household for milk as a drink (mostly for children) and for 'tea-creaming' formed the basis of strategies which aim to address various market segments. UHT milk, which the companies like to call 'premium UHT' is mainly targeted at higher-income groups in urban areas. It is difficult to find these products on the shelves of retailers in low-income urban localities or in rural communities.[24] According to industry sources, tea creamers have been developed specifically to compete with unprocessed milk, which is significantly cheaper than UHT products, and are priced accordingly.

4 Assessment of the value chain innovation

For the business-driven value chain innovation to have lived up to its promise of acting as a bridge between producers and consumers, and for it to have had a positive impact on nutrition, a number of trends and patterns should have become apparent. Numerous frameworks and *ex ante* sector reviews (such as those cited in Sections 1 and 2) had helped to create a positive narrative around this innovation as a panacea to the problems of low productivity, seasonal fluctuations, and the supposedly poor quality of existing supply. According to the reviews, the modern value chain should have made a significant dent in the market shares of supposedly inefficient traditional value chains, both at the supply and consumer ends (Burki *et al.* 2004). The price of UHT milk should have decreased over time and become available and affordable to low-income consumers (*ibid.*). Consumers should have become willing to pay a premium for quality (and nutrition) over available alternatives. With these changes in place, we should then have been able to observe some of the bottlenecks and constraints associated with the traditional value chains – such as high rates of spoilage, seasonal fluctuations, and low yields – being addressed (Anjum *et al.* 1989; Burki *et al.* 2004; Fakhar and Walker 2006; Zia *et al.* 2011; Younas 2013).

Data on the total volume of milk that goes through the modern value chain, and changes within that over time, are patchy and based mostly on figures provided by the industry. Burki *et al.* (2004) reported that, in 2003, UHT milk accounted for around 1 per cent of the total volume of milk produced in the country. With the rapid expansion of the sector in the mid-2000s and the establishment of dairy hubs across the

country, Burki and Khan (2016) cited industry sources as claiming that 1.8 billion litres out of an annual output of around 40 billion litres of milk – or 4.5 per cent – were processed by the dairy companies, out of which 1.18 billion litres (under 3 per cent) were used specifically for UHT products.[25,26] Younas (2013) cited Afzal (2006), who reported that 4–5 per cent of the milk produced in the country was being processed by dairy companies, with around half of that in the form of boxed UHT milk. The rest of the milk channelled through the modern value chain was converted into other dairy products. We were told by our industry key informants that the market share of UHT products had risen to around 10 per cent but that over half of the volume was accounted for by non-dairy milk replacements such as tea creamers.[27]

There were indications that milk procurement through VMCCs had initially risen and then regressed. In a panel survey of dairy farmers, Burki and Khan (2016) found that the selling of milk to companies had declined since 2010. Our qualitative research in a VMCC community in rural Sindh revealed a reason for this: the dairy company paid far less to the farmers than the local *doodhi*, and the VMCC was active only in the winter flush season. The *ex ante* narrative of the modern value chain innovation expected seasonal fluctuations to even out as increased demand from UHT companies would have created incentives for farmers to use green fodder the year round. Instead, the companies themselves end up leveraging seasonal differences in the availability of raw milk (Hasan 2017). In fact, sector reviews failed to account for structural factors behind the continued subsistence characteristics of the dairy economy. Seasonality in milk output is not necessarily an investment bottleneck. It is driven in large measure by the reliance on farming by-products which, in turn, is made possible by the existence of unpaid family labour of women and children. The scale of this subsistence-like activity can be gauged from the fact that while livestock accounts for over half of value added in agriculture, fodder cultivation takes up only around a tenth of the gross cropped area (MNFSR 2016).

There are concerns, moreover, that dairy companies started relying on imports of dried milk in order to produce pasteurised milk. The volume and value of milk product imports witnessed a fivefold increase between 2007 and 2015 – the period when a number of new UHT milk and non-dairy milk replacement products came on the scene.[28] These trends are clearly in the opposite trajectory of the expected benefits to local milk output of the value chain innovation.

Despite the lower price paid to farmers compared to the *doodhi*, the retail price of UHT milk (or the so-called 'premium product') is higher than that of fresh unprocessed milk in most cities. In Karachi, at the time of our survey, fresh milk sold for PKR85 per litre compared with PKR110 per litre being charged for UHT milk. The gap was wider still in smaller towns and rural areas where UHT milk was not stocked by retailers due to its high price.

With the marketing insight that over two thirds of milk consumption in the country is for preparing tea, companies came up with a product which is creamy, a little sweet, and gives a rich colour to the tea when cooked. Our qualitative fieldwork findings about consumer preferences suggest that companies have been successful in deciphering some of the factors associated with the popularity of buffalo milk in Pakistan. In our interviews with consumers in rural and urban sites alike, we were told that buffalo milk is considered to be a nutrient-dense product and its sweet taste and creamy consistency is read as a signal of its goodness. Dairy companies have been able to reproduce that signal without the original ingredients at a low price.

Some three decades down the line, hopes and expectations vested in the growth of modern value chains in the dairy sector in Pakistan appear to have been largely unmet. It was thought that processed milk would revolutionise demand as well as supply by expanding the market for a safer product than unpasteurised fresh milk, which had a notorious reputation for adulteration and dilution. Our case study of the modern value chain in the dairy sector – the supply side, as well as its consumer end – has shown that the main dairy product (packed UHT milk) struggles to compete with its traditional alternative.[29]

Where the modern value chain has innovated and competed profitably with unpasteurised fresh milk in terms of price and consumer preferences, it has engineered a product that is less nutritious and uses less raw milk than the products that already existed. Creamers and the so-called 'dairy liquids' are mostly non-dairy products of little nutritional value, and with weak or non-existent linkages with local agriculture. Modern value chain dairy companies have done what they are good at doing – understanding the market and responding to it.

Our case study of Pakistan's dairy sector suggests that a simplistic traditional–modern dichotomy in value chains for nutrition is not only erroneous, but it is also misleading. While frameworks such as Gómez and Ricketts (2013) offer a more nuanced understanding of the relationship between the supposedly traditional and modern sectors, ground realities are more complex. The resilience of the *traditional* value chain in Pakistan is, in part, due to an optimal use of available resources, and the higher costs in the *modern* value chain may be due to the uncompetitive pricing of the packaging. The 'upgrading' of value chains (Hawkes and Ruel 2011), which is usually taken to entail the introduction of modern segments, needs a more rigorous comparison with existing value chains than has been the case in Pakistan.

Evaluative frameworks such as that of Maestre *et al.* (2017) can play an important role in guiding policymakers in this regard. By focusing on specific requirements with respect to consumption and production conditions, such frameworks can obviate the need for a prior classification of value chains. Our case study has revealed that while the dairy value chain innovation in Pakistan met, *ex ante*, the

requirements posited by Maestre *et al.* (2017) (see Section 1.1), it failed to live up to its promise. Instead of developing the local dairy sector, increasing the availability of milk and increasing farmer incomes, this innovation led to the marketing of mostly non-dairy products made with imported raw materials. Marketing-driven food companies moved quickly from the dairy value chain to non-dairy products in response to their analysis of where they could capture value. While the checklist of requirements offered by Maestre *et al.* (2017) is very useful in evaluating the nutrition impact of a value chain intervention at a given moment in time, it would be more useful to policymakers if it could also anticipate dynamic changes in value chains, given producer incentives and consumer behaviour.

5 Conclusions

What can we learn from the failure of what appeared to be a promising pro-nutrition business-led value chain innovation in Pakistan's dairy sector? A cynical view might be that the positive narrative around the UHT innovation was promoted, at least in part, by corporate interests that benefited from the expansion of their markets, regardless of any benefits in terms of addressing constraints and bottlenecks in existing value chains. While this view cannot be discounted altogether, there are still lessons to be drawn for the sector or for wider debates on business-driven nutrition improvement, and for the emerging analytical frameworks. After all, the question of how agriculture can play a more positive role for nutrition improvement is still with us, and livestock is the largest sub-sector within Pakistan's agriculture. Moreover, a traditional–modern dichotomy is widely used in the analysis of food value chains, often with the presumption of a productivity advantage of modern innovations.

A key lesson for Pakistan's dairy sector from this case study is that the identification of technical constraints to productivity improvement and market expansion needs to happen alongside institutional analysis. Sector reviews, embedded in a dichotomous traditional–modern framework, focused on supply chains as the locus for strategic intervention without recognising the effectiveness of the *doodhi*-managed traditional supply chain in delivering a perishable product at low cost. While these analyses understood capacity issues in smallholder production, they were not attentive to the actual organisation of the livestock economy at the household level which relies on unpaid work by women and children, particularly in the collection and processing of fodder from local farm by-products. Despite increasing commodification, the livestock sector retains important elements of a subsistence household economy, such as the concept of surplus milk.

There is merit in recovering some of the insights from earlier literature on the value chains perspective which focused not so much on prescriptions about value chains interventions, but on the policy implications of companies applying value chains analysis in their business strategies. Companies focused squarely on actions that offered

them the greatest opportunities for capturing value, and changed strategies in response to these opportunities. Rather than being wedded to particular value chains, they created new ones which offered them higher returns. The packaging company leveraged its near-monopoly status as the supplier of aseptic packaging to create new markets for its product. Milk-processing companies saw marketing as their niche and designed products and marketing campaigns to compete with the otherwise more-efficient traditional value chain. A value chain innovation that appeared, prospectively, to be pro-nutrition along with being pro-poor, was abandoned over time as businesses rapidly adapted to new marketing insights and homed in on a value chain devoid of the nutrition focus, but which has proved to be more robust in terms of overcoming business costs and constraints. Emerging conceptual frameworks such as those which identify necessary conditions for pro-nutrition value chains (e.g. Maestre *et al.* 2017) need to be extended to pay greater attention to the inherent dynamism of the private sector in creating a new value chain just as an existing one has been analysed.

Notes

* 'Milk for Milk, Water for Water' is a traditional saying in Pakistan and India to denote when each party is given its due share, or is getting to the true picture.

1 By then the business studies literature was already referring to the value chains concept as belonging to 'that old industrial model' (Normann and Ramírez 1993: 65).

2 Thirty key informant interviews were conducted between 30 September 2015 and 8 January 2016. These included several representatives from two local, private, large-scale dairy businesses.

3 The Naushehro Feroze District of Sindh has a high concentration of village milk collection centres (VMCCs) belonging to one of the leading UHT milk manufacturers. The district also had villages which did not have a VMCC. We also carried out fieldwork in the urban centres of Karachi and Muzaffarabad. We carried out five in-depth interviews at each of the sites. All in-depth interviews were carried out with mothers who had children aged between 6 and 24 months. This selected criterion was driven by our primary focus on understanding infant and young child feeding or complementary feeding of children in that age category. Focus group discussions were also conducted with separate groups of married women and men in each fieldwork site. We also conducted key informant interviews with local retailers.

4 According to project material that we saw when visiting the VMCC, a donor-supported intervention had been implemented in this community.

5 'Formal processors use a cold chain for bulking and transporting milk. Farm cooling tanks (FCTs), owned and operated by processors, are set up in villages. Milk from the FCTs is transported in refrigerated tanks to regional collection facilities for onward transfer to centralized processing units' (Zia *et al.* 2011: 19).

6   Similar issues have been identified in dairy sector reviews in other countries – see, for example, Millogo *et al*. (2008) for Burkina Faso and Omore *et al*. (2004) for Kenya, Ghana, and Bangladesh.

7   The term 'modern' is used here in contrast with 'traditional' food value chains which source fresh produce locally and supply it through wet markets at relatively low price (Gómez and Ricketts 2013). Wet markets can include large or small markets which sell fresh produce.

8   Evocative phrases such as 'rivers of milk' conveyed the optimism associated with this approach (Fakhar and Walker 2006). Such slogans were widely used by the Pakistan Dairy Development Company which was set up as an autonomous entity with a grant from the government's Small and Medium Enterprises Development Authority (SMEDA) (Mumtaz *et al*. 2011).

9   Packages Ltd was a joint venture of a Pakistani industrial group led by the entrepreneur Syed Babar Ali and Tetra Pak of Sweden.

10 Milkpak was launched in 1981 as a brand of Milkpak Ltd in which Packages Ltd was a major stakeholder. In 1982, Tetra Pak Pakistan was formed as a local subsidiary of the transnational Tetra Pak, and Packages Ltd was a key shareholder of this company. In 1988, the transnational company Nestlé acquired stakes in Milkpak, and then took over the company and the brand in 1992.

11 In 2009, Tetra Laval of Switzerland acquired Packages Ltd's shares in Tetra Pak Pakistan, thus creating some nominal distance between Tetra Pak and the Milkpak brand. This move also, arguably, facilitated the entry of rival brands in the UHT market. The connection between Tetra Pak and Nestlé Pakistan remained strong through Packages Ltd. The latter retained its stakes in Nestlé Pakistan, and also dominated the market in the raw material used for Tetra Pak packaging.

12 There have been seven value chains interventions in the dairy sector in the last decade. Four of these (Modern Farm and Farm Cooling Tanks Programme 2006; the Dairy Hub project 2007; Haleeb Value Chain Project 2008; and Women Empowerment Through Livestock Development, or the WELD project, 2011) were directly related to the UHT milk industry. See Zuberi, Mehmood and Gazdar (2016) for a detailed review of these interventions.

13 'Bottom of the pyramid' refers to a marketing term that identifies the poor as a potential market for commercial interests. Markets at the bottom of the economic pyramid 'are fundamentally new sources of growth [for multinationals]. And because these markets are in the earliest stages of economic development, growth can be extremely rapid' (Prahalad and Hammond 2002: 51).

14 Gómez and Ricketts (2013) classify the latter – i.e. modern sourcing and flexible marketing through existing markets and retailers – as a modern–traditional value chain which is regarded as a promising path to nutrition improvement.

15 It is difficult to find direct evidence of spoilage. Sector reviews base their estimates of the rate of spoilage on differences in aggregated national data on milk output and consumption reported officially.

16 The existence of seasonal variation is widely accepted and cited anecdotally. The basis for the claim that milk output varies by a factor of 100 per cent between seasons is based on a rare study of seasonality carried out in a 1980s study of herds in one region of the country (Anjum *et al*. 1989).

17 If all of these VMCCs operated to full capacity (two collections a day) throughout the year, they would dispatch 584 million litres of milk to processing plants annually, compared with Pakistan's estimated total milk output of 40 billion litres.

18 The modern value chain thus operates within a traditional context in which only surplus milk is brought to the market.

19 Engro's flagship tea creamer, Tarang, entered the market in 2007.

20 Engro was found to be in violation of the Competition Act 2010 (Pervaiz and Quddus 2016) and fined by the Competition Commission of Pakistan for marketing and misrepresenting their dairy drink, Omung, as an alternative and substitute for loose milk (Cornall 2017). Loose milk is fresh, unprocessed, unpasteurised milk supplied by the traditional value chains.

21 Conducted 30 September 2015–8 January 2016.

22 Vegetable fat costs PKR130 per kg, whereas the milk fat it replaces costs PKR250 per kg, according to Andrew (2012).

23 Some non-dairy products have names such as 'Nature', which evoke a natural produce. While industry key informants are careful to state that their marketing does not advertise these products as milk, they admit that most consumers are illiterate and unable to read the fine print on the packaging. Recently the Food Authority in the Punjab province of Pakistan issued requirements for companies to indicate that this product is not milk on 15 per cent of the packaging (DAWN 2017). At a meeting convened by a parliamentary committee on this matter, companies went on the record to state that such information on packaging would adversely affect their sales (Junaidi 2017).

24 Authors' fieldwork.

25 Burki and Khan assume total processed output to include 'UHT milk, milk powder, chilled and flavored milk' (2016: 61).

26 Our own back-of-the-envelope calculations based on the processing capacity of VMCCs suggest a far smaller ratio.

27 Industry informants speak of market share – that is, UHT milk as a proportion of all milk sales. They do not include milk that is self-consumed by farming households, which accounts for around half of all produce (Burki and Khan 2016).

28 Although UHT companies claim that they source their milk locally, in a debate on rising imports of dried milk products the federal commerce minister revealed that these were being used by the dairy industry to make pasteurised milk (Senate Secretariat 2016).

29 There have been similar experiences in other countries – see, for example, Leksmono *et al*. (2006) and Karanja (2003) on Kenya.

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