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A Value-Chain Perspective on Wheat Flour Fortification in Pakistan

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Abstract

Food fortification is a popular strategy for addressing ‘hidden hunger’, and staple foods are seen as promising if unproven vehicles for the delivery of essential micronutrients to the poor in developing countries. This paper examines wheat flour fortification with iron in Pakistan as a case of technocratic optimism in the face of institutional constraints. An evaluative framework based on the analysis of the entire value chain can provide a reality check on technocratic optimism. Poor people base their preferences for different types of flour on price as well as perceptions of nutritional value. Many of these flour types are not covered by fortification programmes. Fortification interventions meanwhile have attempted to leverage public-private partnerships in a segment of the wheat flour value chain which is beset with regulatory weaknesses. This paper illustrates why technical interventions should support, rather than ignore, a broader agenda of reforms in food policy.

I. Introduction

Pakistan has high rates of stunting and wasting among children, and high rates of iron deficiency among adult women and children alike. Cereals contribute around half the energy intake in Pakistan and wheat dominates all other cereals (Gazdar and Mysorewala 2016). The standard meal includes flat wheat flour bread or *roti* — cooked either on a hot plate as *chapati* (flat bread) or baked in a clay oven as *naan* (leavened bread) — as its main starchy component. Wheat flour has, therefore, been seen as a promising vehicle for addressing anaemia through iron fortification (Gaffey et al. 2014). The high prevalence of wheat flour consumption, which makes wheat a favourable vehicle for fortification, is, in fact, a sign of undernourishment — wheat flour is the cheapest source of energy. Even so, around two-fifths of the country’s population consumes less than 2,100 kcal per day (Balagamwala and Gazdar 2013). Hunger directly affects around a third of the households. A nationally-representative survey found that a tenth of the households had experienced severe hunger while another 20 per cent had experienced moderate hunger (National Nutrition Survey 2011).

The appeal of wheat flour fortification, evidence notwithstanding, is clear from the number of attempts at establishing fortification programmes (Zuberi et al. 2016). There have been at least seven wheat flour fortification interventions in Pakistan — two national and five regional — since 2005. Independent evaluations are not publicly available for any of these. The largest programme was the National Wheat Flour Fortification Programme (NWFFP) led by the Global Alliance for Improved Nutrition (GAIN) with technical support from Nutrition International (NI, formerly Micronutrient Initiative). NI has been involved in one way or other in all interventions since then (MI 2015). The United Nations’ World Food Programme (WFP) is another key participant. At the time when fieldwork for this case study was carried out, the only operational project was a WFP and NI one in the Azad Jammu and Kashmir (AJK) region. NI is also a technical partner in the consortium implementing an ambitious new national fortification programme supported by UKaid (DFIDb 2016).

All the interventions follow a similar model. They work with licensed private sector flour mills to create capacity for fortification, provide the pre-mix, conduct social marketing campaigns to increase

awareness about the benefits of consuming fortified flour, and lobby for the mandatory fortification of flour and for the setting up of systems of quality assurance. These are, in fact, common elements in food fortification programmes across developing countries. This paper proposes to study wheat flour fortification programmes as a case study of technocratic optimism in the face of stubborn institutional constraints. This study aims to throw light on wheat flour fortification in Pakistan through an agri-food value-chain perspective. It aims to highlight potential bottlenecks and knowledge gaps with respect to producer incentives and consumer behaviour in the delivery of nutrient-dense food to those who need it the most. The study examines wheat flour value chains and past food fortification interventions, and draws lessons for the design of fortification interventions as well as for broader reforms of food policy.

Existing and planned interventions for wheat flour fortification are implicitly optimistic about the achievement of sustainable nutrition improvements through partnerships between public policy and private business. A conceptual framework that is attentive to producer incentives and consumer behaviour makes explicit some of the conditions and requirements for success. This study is not an evaluation of current or past wheat flour fortification projects in Pakistan. Rather, it is an attempt at drawing lessons from those projects by training an agri-food lens on what are usually seen as narrowly-focused nutrition interventions. The case study bears relevance for countries where comparable models of intervention have been championed or implemented, and for a broader agenda of pro-nutrition food policy reform.

Section 2 sets out the framing of the case study and its methodology. Wheat flour value chains are described in Section 3 where issues for the design of wheat flour fortification interventions are also anticipated. Section 4 reports the observations from the fortification project in AJK. Case study findings are discussed in Section 5, and Section 6 concludes the paper and draws out broader lessons for nutrition interventions. Notes are found at the end of this paper.

2. Framing and Methodology

2.1 Technocratic optimism

‘Technocratic optimism’ — or the belief that there are viable technological solutions to structural problems — has been identified as a powerful driver of champions of technology-based interventions (May et al. 2003).ⁱ An insightful study of the process of the introduction of a new technology into health systems speaks of ‘ideation’ as a level in the discourse where “general notions about the definition and production of both a new technology and reliable knowledge about it are formed and circulated” (ibid.: 701). The processes and actions analysed by May et al. in the context of health systems could easily apply to the role of champions, such as the American Medical Association in the 1920s and 1930s (Bishai and Nalubola 2002), or The Lancet 2013 Nutrition Series (e.g., Bhutta et al. 2013), in the current discourse on food fortification. Positive but inconclusive evidence on the reduction in anaemia through food fortification (e.g., Gera et al. 2012; Das et al. 2013) have been deemed ‘reliable knowledge’ on which to base strong advocacy for an intervention for which there is no specific evidence — via wheat flour fortification in countries like Pakistan.ⁱⁱ

Moreover, as public-private partnership models have progressively replaced government or donor-administered programmes in developing countries (Danton-Hill 1998; Yach et al. 2010), food fortification champions such as GAIN have constructed persuasive narratives that link technocratic optimism with corporate power. The linear output-oriented approach of these narratives predisposes them towards ignoring broader issues and causes of hunger and malnutrition (Kaan and Liese 2010). A national-level fortification programme, after all, is more complex and involves coordinated actions by a range of players, than a tightly administered trial.ⁱⁱⁱ

2.2 Value-chain perspective

The resistance to evidence of particular models of wheat flour fortification interventions in Pakistan and elsewhere suggests a need for broader evaluative frameworks that can make explicit some of the structural, institutional and behavioural constraints which technocratic optimism overlooks. Although it emerged initially as a tool for business strategy, the value-chain perspective gained wider applicability for an understanding of how private business might contribute to public policy goals such as nutrition.^{iv} A value chain “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” (Hawkes and Ruel 2011: 3). First developed to trace the creation of value and its capture along international supply chains, the perspective has been used productively in the study of agri-food systems.^v This study draws upon the conceptual framework developed by Maestre et al. (2017) to aid the design and assessment of sustainable public-private interventions for improving the nutrition of vulnerable populations through the consumption of nutrient-dense foods.

The simple framework developed by Maestre et al. (ibid.) is useful for correcting biases such as technocratic optimism. Based on an extensive review of existing literature on agri-food value chains, their framework proposes a checklist of requirements which must be met with respect to producer incentives, consumer behaviour and coordination, for the success of an intervention:

- On the consumer side, the intervention must factor in awareness about the nutritional value of the food, and needs to ensure that the food is available, acceptable in terms of tastes and cultural norms, and affordable, for the target population.
- For the intervention to be successful, the private sector must respond to incentives and be able to capture value along the value chain, and public policy must play an effective role with respect to coordination and regulation.

This system-wide view of an intervention is particularly useful for bringing perspectives from agriculture and food policy to bear on nutrition interventions which tend to be driven by health programming. Therefore, the Maestre et al. (ibid.) framework has been used here to map elements of the wheat flour value chain in Pakistan — including producer incentives, consumer behaviour and regulatory governance — to place the generic model of the wheat flour fortification intervention in its broader institutional context. The acceptability or affordability of fortified flour, for example, needs to be gauged in relation to other comparable products, and the incentives of private sector millers to fortify flour need to be compared with their other options. This study probes whether and to what extent this intervention fulfills the requirements set out in Maestre et al. (ibid.), technocratic expectations notwithstanding.

2.3 Methodology

Three sources have been drawn on to trace the wheat flour value chain in Pakistan: Existing studies and reviews of the wheat sector and fortification projects; a representative sample survey of consumers in (wheat growing) rural areas of the Sindh province; qualitative fieldwork including interviews with stakeholders with interests along the value chain, including policymakers, project implementers, farmers, millers, wholesalers, retailers and consumers.^{vi} Community-level qualitative research was carried out to understand consumer behaviour and preferences, as well as producer incentives. In-depth household interviews were conducted to probe factors behind consumer (and producer) choices with respect to the acquisition, storage and use of wheat and wheat flour.

Three types of sites were purposively selected. First, rural communities in a wheat-growing region of the Sindh province were visited to understand both the producer-end of the value chain as well as consumption patterns in a setting where locally-produced wheat was in abundant supply. Second, low- to middle-income localities in the metropolis of Karachi were selected to gain insights into consumer behaviour in a market-dominated setting. Third, the idea was to observe a wheat flour fortification project at work. The only opportunity at the time of the fieldwork was in Azad Jammu and Kashmir which had an ongoing fortification programme. The aim was to interview informants in rural as well as urban areas in that region but it was not possible to visit rural sites due to security considerations.

The main respondents in these communities were mothers of young children: a married woman who had a child younger than a year qualified. These women and other individuals in their households, including their husbands, were interviewed about any interaction they had with the wheat value chain, as producers and consumers. Community-level resource persons helped to identify initial respondents in each site. These respondents then suggested other eligible individuals for in-depth interviews. Although all the survey sites were relatively low-income communities, care was taken to ensure that the respondents included the more marginalised individuals and households as well as the somewhat better-off ones.

3 Wheat Flour Value Chains

3.1 Grain to flour

Pakistan grows around 23 million mt of wheat annually and domestic output is sufficient, in most years, to satisfy consumer demand (Ministry of National Food Security and Research 2014-15). In the winter (rabi) season, wheat occupies around four-fifths (78 per cent) of the cropped area. Wheat is grown across the country, particularly in the irrigated plains of Punjab and Sindh which account for around nine-tenths of the total harvest (ibid.). While it is the main food crop everywhere, in a number of 'surplus' districts in central and southern Punjab and Sindh wheat is also an important cash crop (Dorosh and Salam 2008).

Pakistan's farm economy is almost entirely made up of private farmers, and there are four main channels to which the wheat crop is directed (ibid.). First, farmers retain part of the crop for self-consumption and for seed. Second, there are in-kind payments to various stakeholders, including

harvest labourers. Third, grain is sold at controlled prices to government agencies.^{vii} Fourth, part of the harvest is sold to private buyers — mostly grain traders and flour millers.

In the last ten years, government procurement accounted for around a quarter of total output. The procurement price is meant as an incentive for the bigger commercial farmers to sow wheat and to ensure grain availability in the country. The price is often set at a level that anticipates world market prices in order to prevent hoarding and illegal cross-border smuggling (Balagamwala and Gazdar 2013).^{viii} But most farmers are smallholders like Ahmed in a village in rural Sindh:

"We harvest around 35-40 maunds (40 kg) of wheat from an acre of land, depending on land quality and irrigation. We retain half the harvest for our own use and the rest of it we sell to private dealers in the city. The government rate is 3,250 rupees per 100 kg but you need to have good connections with officials to sell to the government. They don't buy from us. We sold our wheat soon after the harvest to private traders at a much lower rate of 2,700 rupees per 100 kg. The price goes up later in the year." (Ahmed, age 30, Naushero Feroze district).

The government occupies a strategic position in a sector otherwise dominated by the private sector. At harvest time, its procurement agencies — notably provincial food departments — purchase around a quarter of the crop at an officially-designated support price. Government stock is subsequently sold to private mills at subsidised prices. The government's involvement in the wheat economy is seen as the main plank of the country's food security policy, which revolves around ensuring domestic stocks of wheat and preventing shortages and price spirals in urban markets (Gazdar 2015).

There are no precise data about other uses of the crop but it is estimated that private traders and mills directly buy between 15 and 19 per cent of the harvest. Farmers are, therefore, thought to retain over 60 per cent of the harvest in the first instance. Only around half that amount is kept for self-consumption or seed. The rest is either used as in-kind payments (including to harvest labourers), or sold to private sector buyers.^{ix}

3.1.1 Alternative value chains: chakkis and mills

There are two alternate value chains for producing wheat flour: small-scale, traditional, community-level chakkis and large-scale flour mills spread across the country. Virtually all the grain which does not enter the market, such as that which is retained for self-consumption by farmers or is earned by labourers as in-kind payment, goes through a local chakki. For grain that customers bring for grinding, the chakki charges a small fee — 2 rupees per kg in rural areas and 4 rupees in Karachi.^x The chakki system is the predominant value chain in the wheat-growing rural areas of Punjab and Sindh, by which grain is crushed into whole wheat flour.^{xi} Chakkis are not limited to rural areas. They are common in cities too. Chakkis also buy grain from the market. This is particularly the case in urban areas where customers do not, typically, have their own grain stores.

The second method is processing through large-scale flour mills spread across the country. These mills acquire grain from two sources. Licensed mills are supplied grain from government stocks at subsidised prices, and they are also free to buy grain from the open market. Nearly all of the grain

procured by the government eventually ends up being processed in a licensed flour mill. Mills produce a range of varieties of flour, from 'regular' to 'fine' qualities. Among consumers there is a strong identification of regular flour with flour made from government-supplied grain, even though there is no restriction on millers using grain from private suppliers to produce regular flour. Industry key informants were of the view that mills are responsive to consumer preferences in terms of colour, taste and texture and these vary across regions and socio-economic groups. They believe that regular flour is regarded as an inferior product in some market segments in which there is a strong preference for 'fine' qualities.

Most of the licensed flour mills are thought to be represented in the Pakistan Flour Mills Association (PFMA). The PFMA website mentions a total of 915 mills operating across the country. Not all mills are registered with PFMA however, and different sources provide varying numbers. It has been noted that the reported output capacity of licensed mills in Pakistan far exceeds market requirements.^{xii} No data was found on the number of industrial-scale flour mills which are not licensed or are not members of PFMA.

The relationship between government agencies (primarily the provincial food department) and privately-owned licensed flour mills currently revolves around three parameters. One, mills are assigned quotas according to their processing capacities and their supply of government-procured grain is determined by this quota. Two, a mill is obliged to produce a requisite quantity of regular flour against the supply of grain.^{xiii} Three, the ex-mill price of regular flour, whether it is made from government-supplied grain or grain acquired from the market, is agreed between the government and the mills association.^{xiv} This price is set by taking into account processing costs and other margins which are negotiated between the millers and the government. Industry sources claim that while all atta is subject to the food department's price regulation, 'fine' qualities are actually *maida* (all-purpose flour) which has low bran content and is therefore exempt.

3.1.2 Seasons and regions

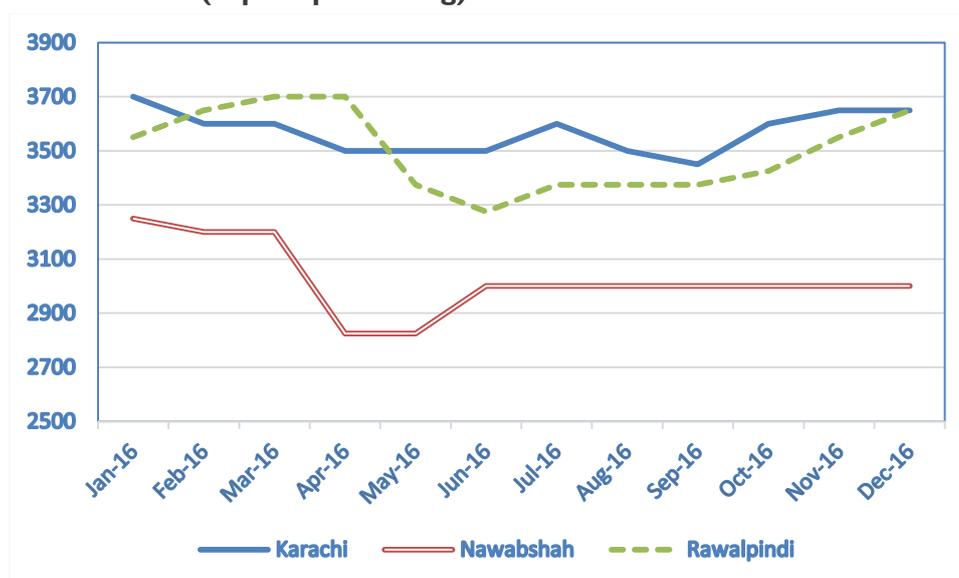
There is also a seasonal element in the operation of these various value chains.^{xv} In the wheat-growing areas, while the richer rural households (and some urban ones) have grain stores which last them the entire year, most rural households run out of their grain stocks several months before the new harvest. From around January, therefore, local chakkis mostly sell flour made from the grain that they themselves purchase. Some in the rural areas continue to grind grain for their customers but stop selling flour once their stocks run out in the late season.

The formal value chain around the larger flour mills also operates seasonally. While government procurement operations take place at harvest time (March to May), supplies from this stock begin only from around September and carry on till the next harvest. The government intervenes in the market at a time when privately-held post-harvest stocks have dwindled and there is an upward pressure on the price of flour. It is also reported, however, that many mills remain idle in the post-harvest period and only start operations when grain from the government stock is released.^{xvi}

Figure 1 shows the monthly price of wheat at three reporting stations of the Pakistan Bureau of Statistics' survey of markets and prices. Nawabshah (now Benazirabad) is in a wheat-growing area of Sindh and an important procurement centre for the government, Rawalpindi is in a wheat- deficit

region of Punjab with a high degree of dependence on government-supplied stocks of wheat, and the large metropolis of Karachi draws in supplies from the market. Wheat prices are lower throughout the year in the wheat-surplus region (Nawabshah) compared with the two wheat-deficit centres (Rawalpindi and Karachi). In the two regions where the government procurement and supply system dominates, there is a clear seasonal effect in grain prices with a significant downturn during the harvest season (March to May). In Karachi, where grain supply is dominated by the private sector, the seasonal effect is less marked.

Figure I: Wheat Price (rupees per 100 kg)



Source: Monthly Bulletin of Statistics, Pakistan Bureau of Statistics, issues from February 2016 to January 2017

3.1.3 Prices and efficiency

The wheat procurement and supply system has given rise to several types of inefficiencies. The subsidy to producers in the shape of relatively high procurement prices is mostly captured by the larger farmers, even if it does serve the function of encouraging domestic wheat output and preventing hoarding and smuggling (Gazdar and Mallah 2013).^{xvii} The government ends up with a virtual monopoly in the stock of wheat grain in wheat-deficit areas (besides Karachi). According to an FAO study (Prihodko and Zrilyi 2013), there is little incentive for the private sector to invest in storage capacity if the government is expected to subsidise the cost of holding stocks. Licensed private sector mills are then allocated quotas of subsidised grain from government stocks. The quotas are determined by mill size, and this accounts for over-investment or over-reporting of milling capacity (Dorosh and Salam 2008).

There are questions about the ability of government agencies to exercise effective control over the quantity of regular flour produced.^{xviii} It is, indeed, surprising that neither the government nor the flour mills association have reliable data on the output of the mills, or the relative contribution of government-supplied versus privately-traded grain in industrial-scale mills. The confusion surrounding the precise status of ‘fine’ flour, and whether or not it counts as atta, is another

example of the lack of transparency in the sector. ‘Fine’ flour is not subject to the price regulation that governs atta. Its average price in 2016 was anywhere between 7 to 47 per cent higher than the price of regular flour in the same market (**Table I**). This price differential suggests that there might be incentives for the mills to divert some of their allocation of subsidised grain towards maida production.

Table I: Prices of regular and ‘fine’ flour in various cities

	Price (rupees per kg) of Wheat Flour Varieties		Difference in Price (%)
	Regular	Fine	
Karachi	42.50	48.32	14
Nawabshah	39.39	46.09	17
Multan	37.13	39.54	7
Lahore	38.75	50.00	29
Rawalpindi	38.33	56.30	47

Source: Authors’ calculations based on Monthly Bulletin of Statistics, Pakistan Bureau of Statistics, issues from February 2016 to January 2017

Prikhodko and Zrilyi (2013) estimate that the issue price of wheat to flour mills includes a subsidy element of around 15 per cent. In urban areas where regular mill flour sells alongside unsubsidised whole wheat chakki flour, the latter was found to be 10 to 12 per cent dearer than the former. This is an informative comparison because it suggests that the value chain that produces chakki flour remains competitive despite the industrial scale and public subsidy enjoyed by the modern value chain.

3.1.4 Fortifiable wheat flour

International organisations recommend that wheat-flour fortification is appropriate in countries where a high proportion of the flour consumed is fortifiable — processed in industrial-scale milling facilities (WHO et al. 2009).^{xix} Previous and planned wheat- flour fortification interventions in Pakistan are, correspondingly, based on working with licensed formal sector flour mills. Moreover, fortification interventions in Pakistan seek to leverage existing public-private partnership between government (mostly provincial food departments) and licensed mills which are members of the Pakistan Flour Mills Association (PFMA). There are no precise data in Pakistan on fortifiable flour — or flour which is milled using industrial roller mills. There are questions also about the number of licensed flour mills and their production capacities (see **section 3.3.1** for a detailed discussion).

3.2 Wheat economy of households

3.2.1 Wheat-growing rural region

The sample survey of households in rural Sindh provided insights into consumption patterns in wheat-producing areas. Of the 939 households who reported using wheat flour roti as their main staple food, around two-thirds had some grain from the harvest — either from their crop, or as in-kind payment for work done. But only 18 per cent had sufficient grain to last them the whole year.

Others either bought grain to take to chakkis or bought flour. Nearly three-fifths of the wheat-consuming households in the sample (59 per cent) worried about not having enough food to eat. A third of the households reported that adults had gone to bed hungry at least once in the previous month, and in 19.3 per cent of the households, even children had slept hungry.

For the time that their own store of grain lasted, rural households did not purchase flour. They took their grain to the local chakki. In in-depth interviews in the wheat-growing region, the issue of quality came up in most conversations about different sources of flour. The experience of Raheela, whose family does not own land but receives grain for wages, was fairly typical:

"We get compensated with wheat grain for our labour. We use one maund (a unit of weight, equal to about 40 kg) every 5 or 6 days — we have a big family. When there is no work we end up buying 'sarkari' (government) flour from the local shop. The shop doesn't keep chakki flour. We prefer chakki flour — we don't like the consistency of milled flour. It feels like chewing gum and is sometimes white and at other times black, and causes stomach aches." (Raheela, age 27, Naushero Feroze District)

Although mills can produce atta using either government or privately-acquired grain, most respondents mill flour with the government system. Besides perceptions about quality in terms of freshness and adulteration, consumers in the wheat-growing area also expressed their preference for freshly-ground chakki flour referring to its nutritional value:

"There is 'strength' in the real (pure) grain, not in the factory-milled flour which is mixed with other stuff. We prefer getting and storing grain to flour, because we get it crushed as needed. We like fresh flour. Grain has its own vitamins, but loose flour is adulterated." (Hamid, age 40, Naushero Feroze District)

3.2.2 Urban areas

It was surprising to find a strong preference for chakki flour in both the Karachi fieldwork sites. In Azam Basti, along with factory-milled flour, a local chakki is also a main source of flour — and unlike communities in the wheat-growing areas, chakki flour is available all year round.

"My husband brings 5 kg of wheat flour which lasts a week. We make chapati. The shop is close by. Chakki flour is fresh and healthier. Flour from the mills is often stale." (Saima, age 36, Azam Basti, Karachi)

Bhittaiabad, by contrast, has stronger rural linkages, as many of its residents are recent rural-urban migrants. Residents bring grain from their villages to the city and use a local chakki much in the same way as their rural counterparts — that is, to grind their own grain.

"We buy wheat from our village in Sindh and bring it over by bus. My husband or some other family member who visits the village brings it with them. We bring 40 to 60 kg, and grind 25 kg at a time. This lasts us a month. We don't have our own land but our village has a lot of wheat, so my husband buys it at harvest time. The flour made from this wheat tastes good, and its roti has a nice colour. We don't buy milled flour. Our own wheat is better." (Huma, age 25, Bhittaiabad, Karachi)

Like their rural counterparts, many in Bhattaiabad are unable to stock enough grain to last them the whole year. They need to rely on alternatives. Some opt for milled flour because it is cheaper than that from the chakki. Interviews with other informants in Karachi, including shopkeepers, confirm the availability of various types of flour — chakki as well as different grades of milled flour.

In the city of Muzaffarabad in Azad Jammu Kashmir, there were no chakkis or chakki flour. This region does not have very much wheat cultivation and relies on milled flour. It is also a region where a wheat flour fortification initiative is currently active, with the claim that local mills (nearly all of which depend on government-supplied grain) are part of the programme. While most of the households that were interviewed bought industrially-milled flour, none were aware of the availability or benefits of fortified flour. The flour that the respondents bought was, almost without exception, sourced from mills located outside AJK. ‘Fine’ flour or maida is popular here and we were told that regular coarse flour, known in this area as ‘red flour’, is considered to be an inferior product and is consumed mostly by the urban poor and rural households.

“We usually buy small quantities of loose flour, not large sacks which are expensive. I don’t know about fortified flour. I know that there are different qualities of flour — like ‘red’ and fine. We don’t buy fine flour because it is more expensive. We don’t have any strong preference in terms of taste.” (Sajida, age 29, Muzaffarabad)

Some of the reasons for the unpopularity of mill atta here are similar to those in the wheat- growing region. It is suspected that red flour is made from poor quality grain and contains adulterants and impurities.

3.3 Issues highlighted for wheat flour fortification interventions

This review of the wheat flour value chain reveals a number of institutional issues that are pertinent to the viability and success of wheat flour fortification interventions.

3.3.1 Data gaps

First, there are significant gaps in the data on key aspects of the wheat economy. While the PFMA website reports a total of 915 mills across the country, other sources give divergent numbers.^{xx} The mills association publishes data on the aggregate milling capacity of its members but no data are available on their utilisation of grain or their output of atta or maida. Gaffey et al. (2014) assert — without citing a source — that around half of all households acquire their flour from the mills. A key informant from an INGO involved in a fortification programme was of the view that mills account for around 60 per cent of all flour consumed in the country. Other sources speculate that mills cater to the consumption needs of around 40 per cent of the population (Prihodko and Zrilyi 2013). There is no precise data on the number of chakkis either — estimates range from 6,000 (a key informant from an INGO), 7,925 (a representative of the Pakistan Flour Mills Association; Awan 2015) to 30,000 (Gaffey et al. 2014). There is also little independent information on the share of different flour products (for example, ‘regular’ and ‘fine’) in the output of the licensed mills.

3.3.2 Consumer constraints and choices

Second, factors which determine the availability and consumption of fortifiable flour in preference to its alternatives vary across income groups and regions. For many of the poorest, the most salient nutritional issue is the acquisition of sufficient amounts of flour or bread to stave off hunger. But even families, such as that of Raheela above, who opt for the cheapest alternative available have a clear preference for particular types of flour. Rural consumers in wheat-growing areas as well as urban migrants from those areas prefer freshly-ground chakki flour for its texture, taste and the perception of 'goodness'. In non-wheat growing areas and urban centres that have historically relied on milled flour (made from government-issued wheat), coarse flour is considered to be an inferior product and the more expensive fine flour (or maida) is associated with upward mobility.

Consumer choices and options for different types of products are driven by a range of considerations including tastes, perceptions about quality and nutritional value, price and availability, including seasonal availability. Consumers who have been exposed to milled flour for some time, either due to the non-availability of chakki flour or because of a price difference, incline towards that product. Others, particularly those with strong rural linkages, but not only those, prefer chakki flour.

The discussion of consumer choice and behaviour needs to be foregrounded in the scale of the undernutrition problem in Pakistan. While wheat flour might be a potential vehicle for introducing micronutrients, its primary role in the food economy of the poorest is still as a source of energy. Despite self-sufficiency in wheat production and the existence of a large government system for procuring, storing and issuing wheat, hunger continues to affect large segments of the population. This calls for a critical examination of the wheat flour value chain not only from the point of view of fortification but from a broader hunger and food security perspective.

3.3.3 Regulatory weaknesses

The observations above point to regulatory weaknesses in the wheat economy, particularly in the relationship between government and mills. The absence of precise data on key aspects of the value chain underlines the lack of transparency in the utilisation of the public subsidy. Negative consumer perceptions about mill atta point to inadequate incentives and sanctions to ensure quality. The system has introduced costly distortions, and is unable to pass on the benefit of subsidies and industrial scale to consumers. Wheat fortification interventions seek to leverage existing public-private partnerships in a segment of the wheat flour value chain which is beset with regulatory lapses.

4. Fortification programmes

4.1 Fieldwork findings in Azad Jammu and Kashmir

There are 11 licensed flour mills in AJK, and apart from two mills in Mirpur which have special permission to buy some grain privately from Punjab province, all of them rely exclusively on government-supplied grain. The mills are NI partners and, as such, have agreed to produce only fortified flour.^{xxi} Fortified flour is available only with licensed depots. Other shops do not stock it.

Most of the stores that were visited, however, stocked flour from mills located in Punjab or elsewhere. There was only one licensed depot across Muzaffarabad and fortified flour was not found in any other retail outlet. Some shops stocked a local brand which had the tagline ‘full of nutrition’ on the packaging, but there was no specific mention of fortification on the bag.^{xxii} According to millers and wholesalers, the rural poor end up buying the fortified flour not because they know it is fortified but because they are constrained to buy the cheaper ‘red’ flour which happens to be fortified.^{xxiii} Most of the private storekeepers who were interviewed had no idea about fortification, but recalled that after the earthquake in 2005 they received WFP-supplied flour in packaging which indicated that the flour contained iron.

At the one licensed depot that was found, the shopkeeper said he had little incentive to sell or keep fortified flour as it had a very small margin for him. He said that a 40 kg bag of flour — whether it was fortified or not — sold for 1,500 rupees. He bought fortified flour for 1,486 rupees, but could get non-fortified flour (from Punjab mills) for 1,360 rupees. The shopkeeper was of the opinion that the fortified flour was considered inferior by most urban consumers because of its darker colour. The licensed shopkeeper said that he received an advertising banner about fortified wheat when he first started stocking it, indicating its availability at his shop. That banner was damaged and had not been replaced. Consumers, including those living close to the licensed depot, were unaware of any fortification initiative.

4.2 Current fortification plans

A new national level plan for wheat flour fortification was initiated in 2016 with a grant from UKaid. This project is to be implemented by a consortium of organisations (including NI) in partnership with provincial and federal governments. The wheat flour fortification element of this project is similar in some ways to past initiatives. The project aims to work with licensed flour mills and PFMA to provide feeders, premix and training for flour fortification. The project is based on the premise that a high proportion of the wheat flour consumed in Pakistan is fortifiable but project documents are unable to specify the relative sizes of the mills and chakki value chains.

The main lesson from past projects which is reflected in the initial thinking about programme design is the need for prior attention to mandatory fortification in the provinces, and the setting up of quality checking and enforcement mechanisms on the ground.^{xxiv} Project design is premised on the view that when mills are properly equipped and their staff trained, the marginal cost of fortification will be relatively small. It is anticipated that the programme will be commercially viable once consumer demand and government regulations are established, as consumers will be willing to pay the small increment in cost due to fortification.^{xxv} The reported success of mandatory salt iodisation in Pakistan figures prominently as a model in this regard.^{xxvi}

5. Discussion

Technocratic optimism around the reduction in anaemia through wheat flour fortification is based on a number of assumptions about consumer behaviour, producer incentives and regulatory action that appear to be unrealistic. There are questions about whether, or to what extent, the simple checklist of pro-nutrition value chain actions and processes identified by Maestre et al. (2017) are met by the

generic design of flour fortification programmes that has shown resilience in Pakistan. A number of salient findings are apparent that can be helpful in drawing lessons for flour fortification going forward.

First, unlike wheat-producing regions of Pakistan, AJK does not have any significant number of chakkis. A high proportion of flour that is consumed in this region, therefore, is produced in industrial-scale mills and thus fortifiable. There is a high acceptance of milled flour and no strong preference in favour of chakki flour in AJK. This might be due to the fact that being a wheat-deficit area, consumers in this region have been exposed to milled wheat for a long period of time.

Second, within milled flour there were clear patterns and preferences. Consumers and key informants such as retailers were of the view that 'fine' flour is considered desirable and is associated with upward socio-economic mobility. By contrast, rural and poorer urban consumers buy 'red flour'. One of the factors driving the preference for more processed flour is similar to the reason behind the popularity of (the less processed) chakki flour in other areas. There is a perception that mills use low quality grain, and flour is adulterated with impurities which add bulk. The finer texture and lighter colour of refined flour is associated with the absence not just of bran, but of other impurities too. This issue of flour grading is important because millers believe that they are mandated to fortify only the 'red flour'. Locally-produced fine qualities are not fortified.

Third, the impact of the demand-creation campaign for the fortified product was not visible. Besides not being easily available, fortified flour was not seen as a distinct commodity with particular nutritional benefits. This can be a drawback if there are issues in the acceptance of flour with different visible attributes like colour and texture. The lack of demand for the fortified product creates incentives for millers, wholesalers and retailers to produce and stock non-fortified flour.

It might be argued that constraints to the successful implementation of the Micro-nutrient Initiative (MI) project — now known as NI — in AJK were partly related to the nature of the region itself. While the high level of reliance of AJK mills on government-supplied wheat from outside the region made AJK a good candidate for fortification, the fact that flour could be brought in easily from other non-fortification regions, such as Punjab, also made the uptake of fortified flour more challenging. It is possible that, like the GAIN-led project, the main obstacle to successful implementation lay with regulation and its effective enforcement. Questions remain, nevertheless, about the compatibility of private sector incentives and the acceptability of fortifiable flour.

Implications of the existence of alternative value chains from farm to consumer need to be understood better. There is lack of clarity about the prevalence of fortifiable flour. Not only is there ambiguity about the volume of flour produced by chakkis, there are questions about the number, capacity and operation of industrial mills. The qualitative research on the producer- and the consumer-end of the value chain shows that there are seasonal and regional dimensions to the prevalence of fortifiable flour. The availability of fortified flour to the target population is not simply an unresolved issue with respect to the relative size of the chakki value chain which is not subject to any of the fortification programmes. There are seasonal variations in the operation of industrial mills too across different parts of the country. Existing evidence on the acceptability of fortified flour (e.g., Mahmood et al. 2007) is based on the blind testing of specially-prepared batches of flour which

are identical except for the addition of fortificants. A more realistic comparison will include the range of products of different qualities that are actually available to consumers across seasons and locations. The impact of wheat flour fortification on outcomes such as growth and anaemia has been difficult to establish empirically even under conditions where there is high and consistent exposure to fortified flour (Hurrell et al. 2010). It is likely to be considerably harder to show in a population where a large segment does not consume fortified flour on a consistent basis. The prevalence of alternative value chains is likely to be a function of a combination of factors including incentives along the value chain and consumer preferences.

Project design is based on the premise that consumer behaviour can be made to change to suit the requirements of fortification. It is posited that there are no major constraints to the acceptance of fortified flour — none that social marketing cannot overcome. This is a key assumption which remains to be tested. The experience of the AJK project is not helpful in this regard because of the poor implementation of the consumer awareness campaign. This qualitative study on consumer attitudes suggests that there are reasons, some of them based on nutritional or food safety grounds, for the popularity of chakki over milled flour in some communities, and for ‘fine’ varieties of milled flour over the regular atta in others. But chakki flour is likely to remain outside the remit of a standard fortification intervention that focuses on industrial mills, and it is unclear if the ‘fine’ variety will be brought under mandatory regulation given its current regulatory exemption.

There is a question about whether, or to what extent, the measures incorporated in the design of the proposed project, such as partnering with the industry association, mandatory regulation, creating capacity for testing and quality control, and demand creation, can help to overcome bottlenecks in the wheat flour fortification value chain. The success of salt iodisation has been cited as a model for wheat flour fortification.^{xxvii} MI worked with private- sector salt processors, particularly the larger ones, provided equipment and training, subsidised the fortificant, and helped to set up mechanisms for testing and quality control.^{xxviii} It encouraged the formation of a Salt Processors’ Association in order to facilitate liaison with the producers. In the absence of national and provincial legislation, the programme relied on district-level enforcement of existing food quality rules to monitor the output of salt. There was also a consumer information component of the programme which mobilised various opinion-leaders and LHW (lady health workers). Some elements of the programme are comparable with the proposed wheat flour fortification project.

There are caveats, however, which need to be considered if lessons of the salt iodisation programme are to be applied to the wheat flour value chain. First, a large proportion of the population was already aware of the importance of consuming iodised salt several years prior to the MI initiative which began in 2005 (NNS 2011). Second, the technology for testing iodisation is relatively simple and portable, compared with wheat flour which requires laboratory testing. Third, unlike in the case of wheat flour, there do not appear to be multiple value chains driven by producer incentives and consumer preferences. Cooking salt is a relatively undifferentiated product for most consumers. Finally, salt iodisation was found to have been effective even though an independent review found it to have fallen short of prescribed standards in a number of regulatory areas (Masuood and Janjua 2013).

It is doubtful if a sub-optimally implemented wheat flour fortification programme could be expected to demonstrate comparable impact, since there are critical issues with respect to producer incentives and regulation. The AJK fieldwork reiterated regulatory weaknesses in the government-mills relationship as, perhaps, a basic institutional constraint which has ramifications not only for the quantity and outreach of fortifiable flour, but also on consumer perceptions about its quality. Mandatory fortification backed up by effective quality checking has been proposed as a solution to such problems (Gaffey et al. 2014). It is questionable, however, if a technical response is sufficient to turn things around in an entire segment of the industry that has evolved around the capture not of entrepreneurial rent (as envisaged in the value-chain perspective) but of public subsidy.

6. Conclusion

A value-chain perspective on the agri-food systems linking wheat production to consumption in Pakistan yields important insights for nutrition programming. Wheat is perhaps the most important food crop in the country, and being the main source of energy for large segments of the population, it occupies a central place in food security and nutrition policies. The government has a strategic position in the wheat flour value chain even though private sector stakeholders are responsible for virtually all of the wheat grown and processed in the country. The government's role in the procurement, storage and transportation of wheat makes it the leading market player that influences price, availability, and investments in the sector. Although the government also enjoys administrative and regulatory authority, its strategic position is largely due to the volume of its market intervention. The persistence of felt as well as hidden hunger suggests that the existing system has failed to ensure food security for the population, even if it does prevent shortages and price spirals in urban markets. The system has, however, spawned inefficiencies, regulatory failures and rent-capture. Nutrition interventions such as wheat flour fortification need to be part of a broader reform agenda that has food security at its central objective.

The effectiveness, efficiency and sustainability of the modern wheat flour value chain, which is dominated by government operations, has been called into question on a number of counts. Although the wheat procurement policy has been successful in ensuring national self-sufficiency of an essential food, it has not led to food security at the household or individual levels. There are concerns of adverse incentives with respect to milling capacity (or its reporting), and private sector investment in storage and transportation. The traditional value chain which supplies stone-ground whole wheat flour from smaller chakkis remains competitive, despite not being a recipient of government subsidies. A broader reform agenda that has food security at its central objective can lead to a politically- and fiscally-sustainable wheat value chain.

The consumer end of the wheat value chain sustains diverse types and grades of flour. Tastes, preferences, perceptions of quality and nutritional value, price and availability, are all factors that lead to the persistence of these diverse products. Given the importance of the wheat sector for food security, the absence of more precise data and analysis of the consumer end of the value chain is surprising. Pro-nutrition interventions in the wheat flour value chain will need a better understanding of consumer choices and constraints. Value-chain interventions that lead to or require changes in consumer behaviour need to be approached with caution, particularly if the

sustainability of the intervention is premised on government action in areas where implementation capacity and governance systems have found to be wanting.

Given the depth of the nutrition deficit in Pakistan, the delivery of essential nutrients through the fortification of a widely-consumed staple food will remain an attractive proposition. The scientific and technical aspects of intervention design need to be seen alongside a range of factors which shape consumer behaviour and producer incentives. Fortification interventions that are not attentive to institutional constraints that perpetuate inefficiencies along the value chain are not likely to deliver on their potential. Will engagement with these arrangements lead to an unwitting endorsement of regulatory weakness and rent-seeking opportunity, or can it be used as a lever for much needed reform?

Wheat flour fortification and other food fortification initiatives across the globe are sustained, in part, by technocratic optimism which needs to be corrected using other evaluative frameworks such as those offered by the value-chain perspective. The possibility of the involvement of the business sector through public-private partnerships tends to magnify this optimism by holding out the prospect of commercial viability and long-term sustainability. The core narrative is appealing, indeed, as it combines the apparent certainty of science with the logic of the market. This case study of wheat flour fortification interventions in Pakistan is a cautionary tale that highlights some costs of ignoring process for output. It calls for taking a step back and asking if existing public-private partnerships in the sector where the intervention is sought are ready for institutional reform.

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Notes

ⁱ Technocratic optimism has been shown to affect expert opinion and decision-making in a number of spheres (e.g. Clark et al 2016), and is thought to be stronger among specialised experts in a given field compared with individuals with broader areas of expertise (Tichy 2004).

ⁱⁱ In fact, as Bishai and Nalubola (2002) show, following the success of salt iodization in eliminating goitre in US mid-west in the 1920s, the championing of other forms of food fortification (notably that of wheat flour and bread with iron) was based on technocratic optimism rather than specific evidence of impact.

ⁱⁱⁱ Evidence of positive impact of flour fortification programmes is, understandably, even more ambivalent than that based on trials (Hurrell et al 2010; Pachon et al 2015).

^{iv} A brief account of how the value-chain perspective evolved with respect to nutrition is offered in Ansari et al (2018)

^v See, for example, Coles and Mitchell (2011), Devaux et al (2016), Gelli et al (2015), Harper et al (2015), Hawkes (2009), and Poole (2013).

^{vi} The Women's Work and Nutrition survey undertaken for LANSAs (Leveraging Agriculture and Nutrition in South Asia) in collaboration between the Collective for Social Science Research and the Leverhulme Center for Integrative Research on Agriculture included modules related to the consumption end of wheat flour.

^{vii} The government agencies responsible for procuring wheat are the provincial food departments who operate in their respective provinces, and the federal government's Pakistan Agricultural Storage and Supplies Corporation (PASSCO) which mostly conducts its operations in Punjab (Dorosh and Salam 2008; Prikhodko and Zryili 2013).

^{viii} Administrative measures such as prohibitions on the inter-district and inter-provincial movement of grain are also put in place at particular times to prevent hoarding and cross-border trade.

^{ix} These aggregate harvest shares are based on Dorosh and Salam (2008), who in turn, base their estimates on a survey of farmers in Punjab and Sindh in the late 1990s.

^x Authors' fieldwork.

^{xi} Key informant interview, sector expert, Islamabad.

^{xii} The PFMA website reports an installed capacity of 77,000 mt per day. If the mills operated for 300 days in a year they would process the entire annual wheat harvest of 23 million mt.

^{xiii} According an industry key informant, subsidised flour is sold only in 20 kg sacks while other flour can be sold in packets of various sizes. Furthermore, in some regions such as AJK, government-milled flour can be sold only through licensed dealers.

^{xiv} While the ex-mill price is regulated by the provincial food department, wholesale and retail price regulation comes within the domain of other market regulation authorities in most areas.

^{xv} Authors' fieldwork.

^{xvi} Key informants from milling industry; Dorosh and Salam (2008)

^{xvii} Government procurement agencies only buy wheat which is delivered to them in officially-supplied gunny sacks (bardana). Large producers who have political connections or are able to pay bribes corner the supply of bardana, hence ensuring that their harvest is bought at the higher prices paid by procurement agencies.

^{xviii} Our inferences from field observations support previous sector analysis such as Dorosh and Salam (2008).

^{xix} Designating industrially milled flour as 'fortifiable' is to do with the available fortification technologies rather than the milling process itself.

^{xx} Some of our key informants thought that there were 1,200 to 1,300 mills. Gaffey et al (2014) record 1,200 mills, and the logframe of DFID's (United Kingdom's Department for International Development, also UKAid) food fortification project in Pakistan (DFID 2016a) notes a total of 1202 licensed mills. A 2015 presentation by an expert associated with PFMA claims that there were 1,575 mills registered with the association (Awan 2015).

^{xxi} According to the programme director, the choice of AJK for the MI fortification project was partly motivated by the fact that the region has a high proportion of fortifiable wheat, and that there is greater government control over the supply of grain (Naqash 2015).

^{xxii} It was surprising, given the claim that all local mills relied exclusively on government-supplied grain, that this AJK mill produced flour other than the regular fortified variety.

^{xxiii} In the rural localities close to Muzaffarabad that were visited, retailers did not report stocking fortified 'red' flour. It was not possible to visit more remote rural areas due to security-related travel restrictions.

^{xxiv} Gaffey et al (2014) draw this lesson from the unpublished evaluation of an earlier national wheat flour fortification project.

^{xxv} The consumer demand component of the proposed project appears similar to the design of previous projects with reliance on social marketing campaigns and messaging through Lady Health Workers (LHWs) at the community level.

^{xxvi} See, for example, the scoping study for this project (Gaffey et al 2014).

^{xxvii} The two rounds of the National Nutrition Survey — 2001 and 2011 — indicated a decline in severe iodine deficiency among children, from 23 per cent to 2 per cent. While a salt iodisation programme had been in place since 1994, Masood and Janjua (2013) argue that the decline in iodine deficiency was due to an MI-supported 'revitalisation' of this programme in 2005.

^{xxviii} Masood and Janjua (2013) provide a detailed account of this programme.