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Understanding the Rice Value Chain in Pakistan:

Defining the Way Forward for Rice Fortification

August 2022

"**Understanding the Rice Value Chain in Pakistan: Defining the Way Forward for Rice Fortification**" was supported by the Regional Bureau for Asia and the Pacific in 2022 and developed by ValueNotes Strategic Intelligence Pvt. Ltd.

We would like to acknowledge and thank the World Food Programme Country Offices in Cambodia, Indonesia, Pakistan, Philippines and Sri Lanka as well as the private sector and government stakeholders who participated in the study for their contributions, availability and sharing of information and data.

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Executive Summary

Pakistan with a population of 220 million (2020), is one of the largest South-Asian countries and grapples with the persistent problem of micronutrient deficiencies (MNDs). Although Pakistan is primarily a wheat-consuming country, rice is the second most widely consumed cereal in the country. The per capita consumption of rice has seen a steady increase from 14/kg to 17/kg between 2015 and 2021. The country contributes approximately 8 percent of total global rice trade. The domestic as well as the export market for fortified rice is untapped and presents a potential business opportunity for rice millers and exporters involved in both domestic and international rice trade.

Pakistan is at the pre-engagement stage of rice fortification, i.e., there is no government or private sector engagement in rice fortification at present. Based on discussions with the government stakeholders, it was evident that they are interested in scaling up rice fortification processes in the country, and are aware of the health benefits of consuming fortified rice. A summary of key inputs received during these discussions are as follows:

1. The absence of food safety standards for fortified rice poses a hindrance.
2. Creating consumer acceptance for fortified rice is difficult, especially in rural regions, where creating awareness will pose as a barrier. Demand creation for fortified rice from the government and/or WFP is essential.
3. Millers are hesitant in investing in rice fortification due to no demand in the market. Thus, NFA must create an initial landscape study to understand the feasibility of rice fortification. WFP can provide support for the pilot study of rice fortification. They could help in the installation of machinery at millers' premises. They could offer technical support to these millers.
4. It is essential to have local availability of FRK and fortificant premix to keep the cost of production minimal.

In discussions with millers, two issues were highlighted are: 1) the need to create demand, and 2) likely profits they might expect. A summary of important inputs received during these discussions is as follows:

1. It is uncertain whether there is a need for fortified rice. Rice is a natural product which should not be tampered with.
2. Most millers were not aware of the production techniques involved as well as the raw materials and machinery used. There is a lack of knowledge about various costs involved and the possible channels to procure inputs.
3. Consumer demand for fortified rice may be negligible if its price is higher than regular rice. They would be hesitant to buy it given their lack of knowledge about fortification.

4. The Government must create sufficient initial demand for fortified rice to feed the malnourished sections of the population. WFP could procure fortified rice (from Pakistan) for their relief activities in other countries.

5. TDAP should provide subsidies, trade relaxation schemes, Free Trade agreements, etc. to reduce duties and costs if importation of inputs and machinery is being considered.

The table below provides a summary of the barriers to rice fortification scale-up and their corresponding recommendations.

Given the reluctance of the private sector to invest without support from the government, commercialization of fortified rice will take time, and needs several other things to fall in place first. There is room for optimism as Pakistan's domestic rice industry is quite well-developed. To create demand in the market, a campaign to generate awareness about the benefits of consuming fortified rice among the population is essential. Appropriate advocacy could bring a change, given the government's positive actions regarding the fortification of other foods, and the desire to reduce the incidence of MNDs.

SN	Barriers	Recommendations
1	Relatively low priority for rice fortification among relevant government entities	**Advocacy with government decision-makers** Conduct meetings with the government entities to showcase the potential of rice fortification in tackling MNDs in Pakistan and prioritize budgetary provisions for the pilot study
2	Lack of awareness of the health benefits of rice fortification among rice millers	**Business model - return on investment** Develop and share a technical report for millers, which highlights health benefits, technical know-how of rice fortification processes, costs involved and investment returns
3	Limited awareness among millers about the production techniques, costs involved, and suppliers of raw materials and machinery required for rice fortification	**Advocacy with millers** Conduct periodic workshops and individual meetings with the leading rice millers to educate them about rice fortification, its health and economic benefits and the technical processes involved
4	Low return on investment perceived in fortified rice production due to lack of consumer demand and awareness on various production costs	**Pilot modelling** Conduct a pilot test programme (local evidence study) for rice fortification with a few millers through the inclusion of fortified rice in the 'Ehsaas Langar' scheme
5	Lack of a regulatory environment for fortified rice and FRK	**Development of a regulatory environment** Advocate with PSQCA to develop standards for fortified rice and FRK Provide technical assistance to PSQCA and provincial food authorities to support the development and implementation of a QA/QC system for rice fortification
6	Lack of awareness amongst the population about fortified rice and its benefits	**Demand creation** To create market demand for fortified rice, invite tenders from millers to procure fortified rice for government programmes and WFP's humanitarian activities **Awareness creation campaigns** Campaign to generate awareness about the benefits of consuming fortified rice among the population

Introduction

Background

South Asian countries are weighed down by the triple burden of malnutrition — high stunting and wasting rates, growing incidence of obesity, and widespread MNDs (1). Pakistan, one of the largest South Asian countries, had a population of 220 million in 2020 (23). The country grapples with persistent problems of MNDs. Anemia, vitamin A, vitamin D, zinc and iodine deficiencies disproportionately affect women and children. These MNDs engender poor growth, cognitive impairments, and increased risk of morbidity and mortality (1).

In 2016, more than 50 percent of children (6-59 months) and 40 percent of women of reproductive age (WRA) were anaemic (3) (4). Based on the World Health Organization's (WHO) cut-off values for public health significance, anemia emerged as a 'severe' public health problem among children and women, with over 40 percent prevalence (5). The National Nutrition Survey (2018) indicated that anemia due to iron deficiency affected approximately 29 percent of children under 5 and 18 percent of WRA. Anemia also affected one in two adolescent girls aged 10-19 years. Vitamin D emerged as a massive problem affecting 60 percent of children and 80 percent of WRA (6). Vitamin-A deficiency (VAD) affected 50 percent of children and 27 percent of WRA. About 20 percent of children and WRA were zinc deficient (7).

The food consumption patterns of the Pakistani population revealed that the diet of both poor and non-poor households predominantly consists of energy dense foods with minimal diversity. In an average week, wheat alone contributes 46-52 percent to the total daily caloric intake. Other items include oils (13-14 percent), dairy (10-13 percent), sugars (10 percent), and meat (2-3 percent). The consumption of salt and sugars are far above WHO's recommended nutrient intake and dietary recommendations, whereas the consumption of vegetables, fruits, milk and milk products, meat and meat products is considerably lower (8).

Food diversification and intake of a balanced diet are the best ways to tackle MNDs. However, its adoption is difficult due to inadequate calorie intake and lack of affordability. This calls for large-scale nutrition intervention programmes. The Government of Pakistan is implementing multiple strategies, such as supplementation, fortification, and diet diversification for its different population groups. The existing interventions predominantly target children under 5 and pregnant women. School-age children (5-9 years), adolescents (10-19 years), lactating women and WRA are relatively neglected age-groups in nutrition programming (9).

Among the basket of interventions being implemented to address MNDs, large scale food fortification (LSFF) initiatives can play a crucial role in addressing MNDs by reducing the cost of healthy diets and complementing the gaps in supplementation programmes. The Government of Pakistan's current food fortification initiatives focus primarily on salt and wheat flour. Pakistan approved national standards on fortified wheat flour and mandatory legislation on salt iodization (10). With support from development partners, the Government

of Pakistan has made fortified wheat flour available in the commercial market to target MNDs in the general population in two districts. To tackle vitamin A and D deficiencies under pure food laws, fortification of oil/ghee is mandatory. However, as quality control remains a challenge, food authorities have now prioritized monitoring and compliance.

Although Pakistan is primarily a wheat-consuming country, rice is the second most widely-consumed staple and is increasingly seen as a potential fortification vehicle. The rice consumption per capita is 17 kg per year. The country produces a sizeable amount of rice with a total production of 7.4 million metric tons (MT) in 2021 and about 45 percent of total rice production is consumed locally (11). About 4.2 million MT were exported to Afghanistan, China, Kenya, Mozambique and United Arab Emirates, among others. Pakistan contributes 8 percent to the total global rice trade (12).

To explore the prospects of rice fortification, WFP conducted a feasibility study in 2020 on rice fortification in Pakistan that examined the challenges and opportunities in initiating rice fortification in the country (13). Pakistan is currently in the pre-engagement stage of introducing fortified rice, and there is a need for generating greater awareness on rice fortification as a strategy to address MNDs amongst the government and private sector stakeholders (14).

For more than a decade, the United Nations World Food Programme (WFP) has worked with governments, the private sector and technical partners across countries in Asia and the Pacific (Pakistan, India, Bangladesh, Nepal, Sri Lanka, Myanmar, Cambodia, Indonesia, Laos, Timor-Leste, Bhutan, and the Philippines) to make rice more nutritious through post-harvest fortification. Primarily, WFP provides technical assistance on policy and regulatory frameworks, advocacy, analysis and evidence generation, programming, and consumer awareness.

To introduce rice fortification in a sustainable manner that also enables scale-up, the Government of Pakistan, with support from WFP, needs to ensure that fortified rice is widely available and accessible through two main platforms, namely the social safety net programmes and commercial retail channels. These platforms can reach a wider population that are nutritionally vulnerable and in urgent need of micronutrient interventions. The analysis of the rice value chain will help identify key opportunities and challenges in engaging with stakeholders, to make fortified rice available at scale.

Objectives of the Study

The study 'Understanding the Rice Value Chain in Pakistan: Defining the Way Forward for Rice Fortification' aims to understand the potential of rice fortification in the country.

The overall objectives of this study are as follows:

1. Undertake a detailed landscape analysis to identify and map key players across the rice value chain in Pakistan; and
2. Identify and analyse the demand and supply challenges across the rice value chain in Pakistan and explore opportunities to introduce fortified rice through commercial channels and government social safety nets.

Specific objectives – Landscape analysis

- Identify, map and document key players across the rice value chain that include rice milling industry; blending and extrusion equipment manufacturers; fortified rice kernel (FRK) manufacturers and suppliers of vitamins and minerals/multi-micronutrient premixes; private food safety and quality testing laboratories; and retail organizations (including cooperatives, where these exist) in Pakistan.
- Map all rice value chain players that follow good manufacturing practices and adhere to the national/international food safety and quality standards for processed foods.
- Study and illustrate the rice value chain and identify value chain engagement points/opportunities for potential rice fortification programme support.
- Document the demand and supply challenges faced by key players across the rice value chain (infrastructural, capital availability, regulatory, supply chain, import/export regulations/policy, taxation, policy and political environment) and identify opportunities to introduce and scale up fortified rice through commercial channels and government social safety nets.
- Map the supply chain and trading (incl. cost mark-ups along the chain) of rice.
- Study and recommend potential options for strengthening the supply side for scaling up rice fortification through commercial channels at the regional level including the feasibility of a regional hub of suppliers to cater to the fortified rice demand of the region and beyond.
- Collect and document information on opportunities and challenges for a range of rice fortification options.

- Review and hold consultations with relevant government and private sector stakeholders to identify potential private sector players to introduce fortified rice through commercial channels and government social safety nets.
- Based on the consultation and analysis of the private sector players, identify select private sector players in each country for potential partnership with WFP.
- Identify key factors that could enable and contribute to the scale-up of fortified rice through commercial markets and government social safety nets.

WFP has engaged with ValueNotes Strategic Intelligence, India to conduct this study.

Research Methodology

A structured research process for this study is described below:

1. **Project Setup and Plan**
   - Project kick-off and discussions with WFP stakeholders to better understand context, objectives and expectations
   - Knowledge sharing by WFP based on prior research and experience in rice fortification initiatives in various countries
   - Preparation of project plan

2. **Secondary Research and Primary Research Design**
   - WFP conducted intensive desk research on several topics, including:
     - Nutrition deficiencies in Pakistan's population
     - Past experience in food fortification
     - The rice industry in Pakistan; size, exports, domestic consumption, etc.
     - The supply chain for rice in Pakistan
     - Key stakeholders in the supply chain, from a fortification perspective
     - Status of rice fortification initiatives and barriers to adoption and scale-up
   - Sources used include:
     - Available literature comprising research papers, development partners' reports, and project reports from previous pilots such as those from GAIN, WFP, PATH, OXFAM, etc.
     - Reports and statistics such as those from the government of Pakistan, USDA, FAO, etc.
     - A complete list of publications references is provided in the bibliography
   - The initial secondary research helped identify information gaps as well as key stakeholders that could provide valuable inputs.
   - For each type of respondent, whether industry stakeholders or government/regulatory bodies, a discussion guide was developed.
   - During this process, the ValueNotes team had several discussions with WFP stakeholders to fine tune the list of likely respondents and relevant discussion points.

3. **Primary Research**
   - The list of entities and the respondents were identified by an iterative process.
     - The reports and available literature used in secondary research helped identify important stakeholders in the Government as well as the rice industry in Pakistan.
     - The websites of multiple millers were utilized to find important details such as their milling capacity, their production levels, etc. Accordingly, the millers were classified based on their production capacities.
     - After the development of a list of relevant stakeholders, WFP proceeded to find the names of the relevant people in these organizations through additional desk research.
     - Then, WFP had detailed discussions with the stakeholders. To ensure diversity and representation of view, stakeholders from the Government as well as the private sector were contacted.
     - Additionally, a few experts were referred by respondents of the initial interviews were consulted.
     - More clarity was sought with stakeholders.
     - The discussions helped:
       - » Identify and analyze the gaps in the understanding of the industry, ecosystem, and level of fragmentation existing in the industry;
       - » Attain on-the-ground inputs from stakeholders on barriers to large-scale rice fortification; and
       - » Understand the constraints of different stakeholders, and possible future actions that might help reduce or remove some of the barriers.

   A list of respondents is provided in below table.

4. **Analysis and Report Writing**
   - All inputs mentioned above were collated, analysed and distilled to create this report.
   - The analysis and report were discussed with the WFP team (including the Country Office in Pakistan), and their feedback was incorporated

Type of entity	Name of entities	Designation
Large rice millers and exporters	Chappal Rice Mills	Director
	Garibsons Rice Mill	Director
	KK Rice Mill	Business Development Manager
	Awan Food Industries	Owner
Traders and wholesalers	AAK Enterprises	Owner
FRK suppliers	DSM	Business Development: Rice Fortification
Rice associations	Rice Exporters Association of Pakistan (REAP)	Senior Vice Chairman
Government entities	National Fortification Alliance (NFA)	National Coordinator
	Pakistan Standards and Quality Control Authority (PSQCA)	Director
Research and academia	National Institute of Food Science and Technology (NIFSAT)	Associate Professor
Social sector	Global Alliance for Improved Nutrition (GAIN)	Senior Advisor

Report Structure

The report is divided into seven chapters as described below:

Chapter	Title	Details
1	Nutrition Profile of Pakistan	The first chapter focuses on the diet composition, the current undernourishment levels and the MNDs in the Pakistani population. *Helps understand the scale of the problem, and the need and urgency for improving nutrition inputs in Pakistan.*
2	Food Fortification in Pakistan	This chapter gives background on the existing food fortification programmes in Pakistan. It also assesses past experiences in fortification, difficulties faced while scaling up, and success stories of food fortification (if any). *Provides an understanding of institutional experience, and lessons learnt from earlier initiatives with other food items.*
3	Overview of the Rice Ecosystem in Pakistan	The third chapter elaborates on the rice industry details (historical trend of production, consumption, export/import, production clusters, millers' capacities, rice varieties in demand, etc.). *This data helps us better understand the size and scale of the rice ecosystem in Pakistan, and its implications for rice fortification scale-up.*
4	Rice Supply Chain	This section details the existing rice supply chain in the country. *Provides an initial understanding of the key stakeholders who need to be involved in rice fortification initiatives.*
5	Key Stakeholders in Rice Fortification	This chapter provides further details of critical stakeholders and their respective roles. *Helps to understand which government entities, regulatory bodies, and non-government and private players, are important to scale up rice fortification in Pakistan.*
6	Barriers in Scaling up Rice Fortification	This chapter focuses on the barriers faced by various stakeholders, when scaling up rice fortification efforts. *It helps to give a clear picture of the bottlenecks in scaling up rice fortification in Pakistan. This is crucial for suggesting remedial measures or effective solutions.*
7	Recommendations for Scaling up Rice Fortification	The last chapter synthesizes the findings from earlier chapters and suggests specific recommendations to address or mitigate the barriers to scale-up. It also identifies the key stakeholders that need to be brought on board to address different issues. *It provides a detailed roadmap for the successful implementation of scaling up rice fortification in a measured and comprehensive manner.*
8	Annexes	Supplementary information and relevant statistics This section provides essential information to support the analyses throughout the report, including: - Wheat Flour Fortification Status - Key Seasons for Production and Harvest - Rice Mills - Rice Exports by Country - Varieties of Rice Produced - Key Rice Brands operating in Pakistan - Role of Different Ewntities in the Rice Supply Chain - Cost Mark-up of Rice across the Rice Value Chain - Role of Development Partners in Fortification - Ehsaas Programme

1. Nutrition Profile of Pakistan

Food consumption patterns in Pakistan indicate that the diet of both poor and non-poor households entail energy dense foods with minimal diversity. Wheat forms the primary staple which makes up about half of total daily caloric intake, followed by oil, dairy, sugar, and meat. The majority of the population consume refined cereals and hydrogenated and un-hydrogenated oil. The consumption of salt and sugar is far above the recommended nutrient intake and dietary recommendations set by the World Health Organization, while that of vegetables, fruits, milk and milk products, meat and meat products is much lower (8).

Correspondingly, the National Nutrition Surveys indicate a widespread prevalence of MNDs in the Pakistani population. To understand how fortification of food items (particularly rice) can aid in meeting the dietary guidelines for better nutrition, it is crucial to examine the MNDs situation in the country and their effects.

1.1 Micronutrient Deficiencies

The Pakistani population faces high levels of stunting, wasting and micronutrient malnutrition. The widespread prevalence of MNDs resulted in the following effects amongst the most vulnerable groups in Pakistan:

- Anemia was highly prevalent in WRA (15–49 years) at 52 percent, in pregnant women at 51 percent, and amongst children at 59 percent. It is categorized as a 'severe' public health problem as per WHO estimates.
- The prevalence of stunting was 40.2 percent, and of severe stunting, with the highest stunting levels (46.6 percent) amongst children aged 18–23 months
- 17.7 percent of children suffered from wasting, with a higher percentage in the rural population (18.6 percent) compared to the urban population (16.2 percent)
- During the period (2015 to 2019), the prevalence of undernourishment increased marginally to 12.9 percent from 12.8 percent **(2)**

According to the 2018 National Nutritional Survey in Pakistan, iron, vitamin D, vitamin A, and zinc are the crucial MNDs present among women, children, and adolescents (15).

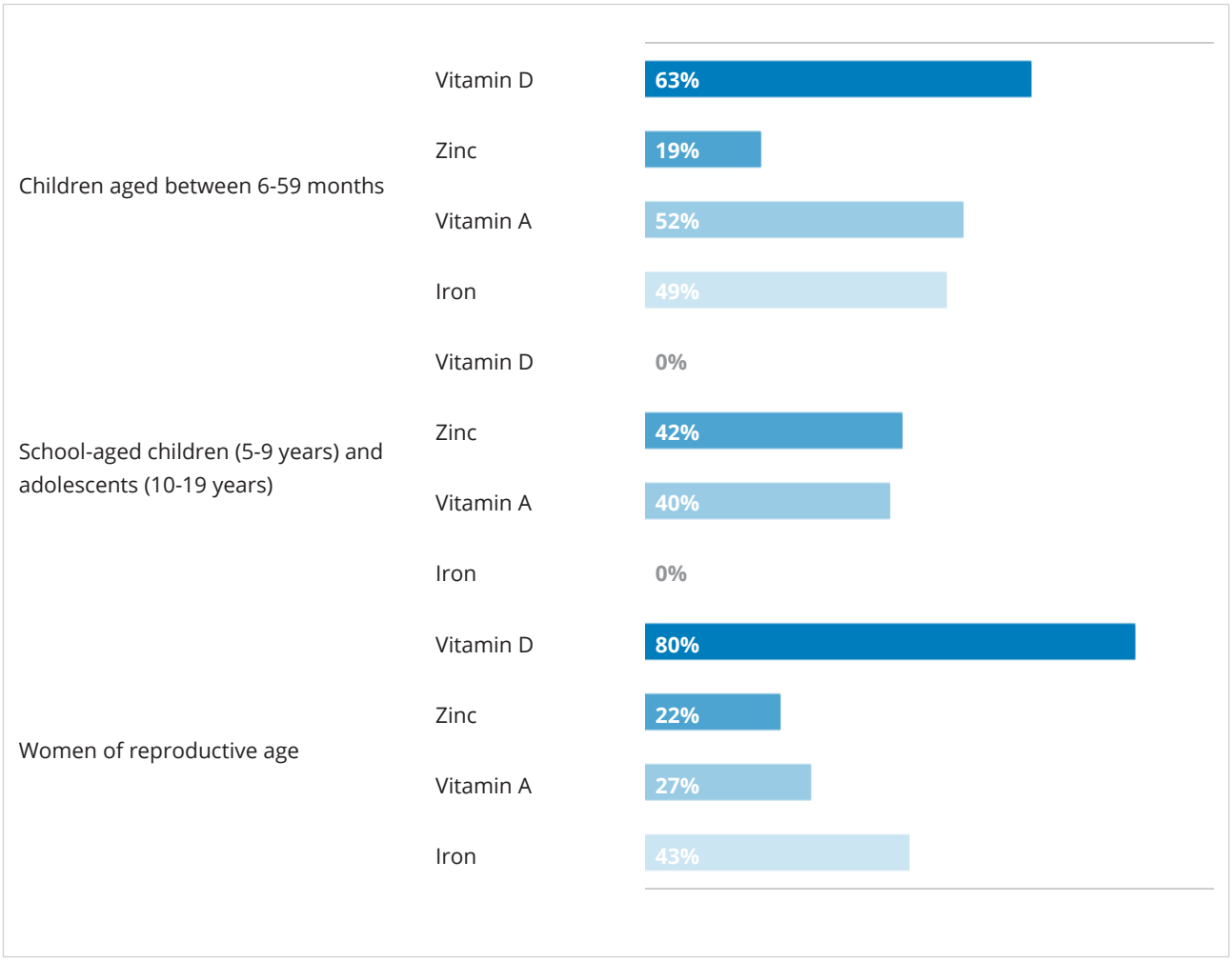
The Government of Pakistan is implementing multiple strategies such as supplementation, fortification and diet diversification amongst its different population groups. The existing interventions essentially focus on children under 5 and pregnant women. School-age children (5-9 years), adolescents (10-19 years), lactating women, and WRA are relatively neglected cohorts in nutrition programming (9).

Current food fortification initiatives focus primarily on salt iodization and wheat flour fortification. As part of its fortification initiative, Pakistan approved national standards on fortified wheat flour and mandatory legislation on salt iodization.

Adding to that, rice is seen as a potential fortification vehicle in Pakistan as rice is the second most-consumed staple after wheat (11).

A more detailed review of current food fortification initiatives is presented in the next chapter.

Figure 1: MNDs (%) among the vulnerable population groups in Pakistan



2. Food Fortification in Pakistan

One of the largest food fortification programmes was implemented in 2016 by the Food Fortification Programme (FFP), Mott McDonald, Nutrition International, and the UK's Department for International Development (DFID) [now Foreign, Commonwealth & Development Office (FCDO)] (16). FFP is a comprehensive food fortification initiative in the country with a focus on promoting the fortification of edible oil/ghee and milled wheat flour (17).

Legislation –

The Pakistan Standards Quality and Control Authority (PSQCA) is responsible for setting the national standards for fortification. Provincial Food Authorities (for instance, Punjab Food Authority, Sindh Food Authority, etc.) are responsible for monitoring and enforcement of the safety and compliance to those national standards (18) (19). Table 1 below elaborates on the presence of legislation on different fortified food items.

As illustrated above, fortification of other foods like wheat, edible oil and salt have received greater institutional attention so far, compared to rice. Given the experience with other food items, regulatory support is essential to scale up rice fortification efforts.

Wheat flour fortification –

Wheat flour is fortified by adding iron, folic acid, zinc, and vitamin B12 as the key micronutrients.

- At the provincial level, a successful sustainable flour fortification programme is being run by the Government of Azad Jammu & Kashmir (AJ&K) since 2013 with major support from WFP. To ensure an uninterrupted supply of premix, a revolving fund is generated under the consortium led by the Food Department of AJ&K (24).
- At the national level, 992 out of ~1200 flour mills are registered with FFP. However, a mere 13 percent of the flour produced by them by these mills is fortified (17). This is attributable to the lack of a formal supply chain of premix, delay in mandatory legislation for wheat flour fortification, and the unorganized nature of the wheat flour milling industry.

In addition to large-scale fortification, a unique programme of fortification of the whole-wheat flour milled by small-scale mills (chakkis) which caters to the 70 percent of the population consuming wheat flour from chakkis, has changed the dynamics of fortification approaches adopted over a couple of decades ago in Pakistan.

Table 1: Presence of provincial legislation of fortified foods in Pakistan

			Provincial Legislation			
Food Item	Mandatory Legislation	Year	Punjab	Sindh	Khyber Pakhtunkhwa	Balochistan
Salt	✓	-	✓	✓	✓	✓
Edible oil/ ghee	✓	1965	✓	✓	✓	✓
Wheat flour	×	-	In progress	✓	✓	✓
Rice	×	-	×	×	×	×

Under the lead of National Fortification Alliance (NFA), the Ministry of Health, in close coordination with the Food and Health department with a relatively low investment, made a significant impact on health through the chakki fortification. Currently, the programme operates in five districts. Thus, a national scale-up is deemed necessary to achieve targeted results[1].

Edible oil/ghee fortification –

Edible oil/ghee fortification was mandated in 1965 with the addition of vitamin A and D. Since then, oil refineries have significantly scaled up the production volumes. At present, 136 oil refineries are fortifying about 96 percent of the edible oil/ghee produced under FFP (17). Oil fortification does not require any additional machinery, making the fortification process more acceptable to oil suppliers.

The success of edible oil/ghee can be attributed to the coordination amongst key stakeholders by Global Alliance for Improved Nutrition (GAIN), proper enforcement and monitoring activities by provincial food authorities, and an easy fortification process.

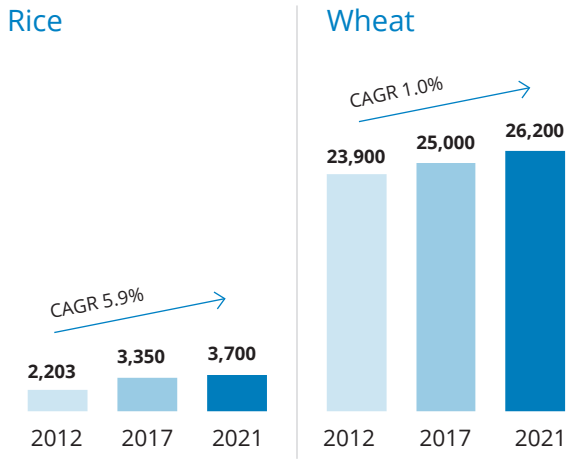
Fortification of these items alone is insufficient to improve the overall micronutrient intake of Pakistani people. The inclusion of rice as a fortification vehicle would be an important step to increase coverage of fortified staples and enhance nutrient intake, given its status as the second most consumed staple by the people of Pakistan.

2.1 Consumption of Key Cereals in Pakistan

Dietary diversity and consumption of micronutrient rich foods through food fortification are important to address MNDs. To improve the diet of the population, NFA, WFP, and the provincial authorities in Pakistan are planning to introduce fortification of other cereals, primarily rice, as now it is becoming a part of staple food in most households.

The consumption of rice in Pakistan is 13-14 percent compared to that of wheat. However, in the last nine years, rice consumption has grown at a faster rate (5.9 percent) compared to wheat (1 percent) (11). Likewise, in certain geographical belts, rice is preferred over wheat as staple food.

Figure 2: Consumption of key cereals in Pakistan ('000 MT)



Note: CAGR stands for Compound Annual Growth Rate over a given period. Source: USDA, Index Mundi

As illustrated above, rice is considered as a suitable option for fortification in view of increasing consumption levels, as an emerging staple cereal in Pakistan.

1 *Wheat Flour Fortification Status*

2.2 Rice Fortification Status in Pakistan

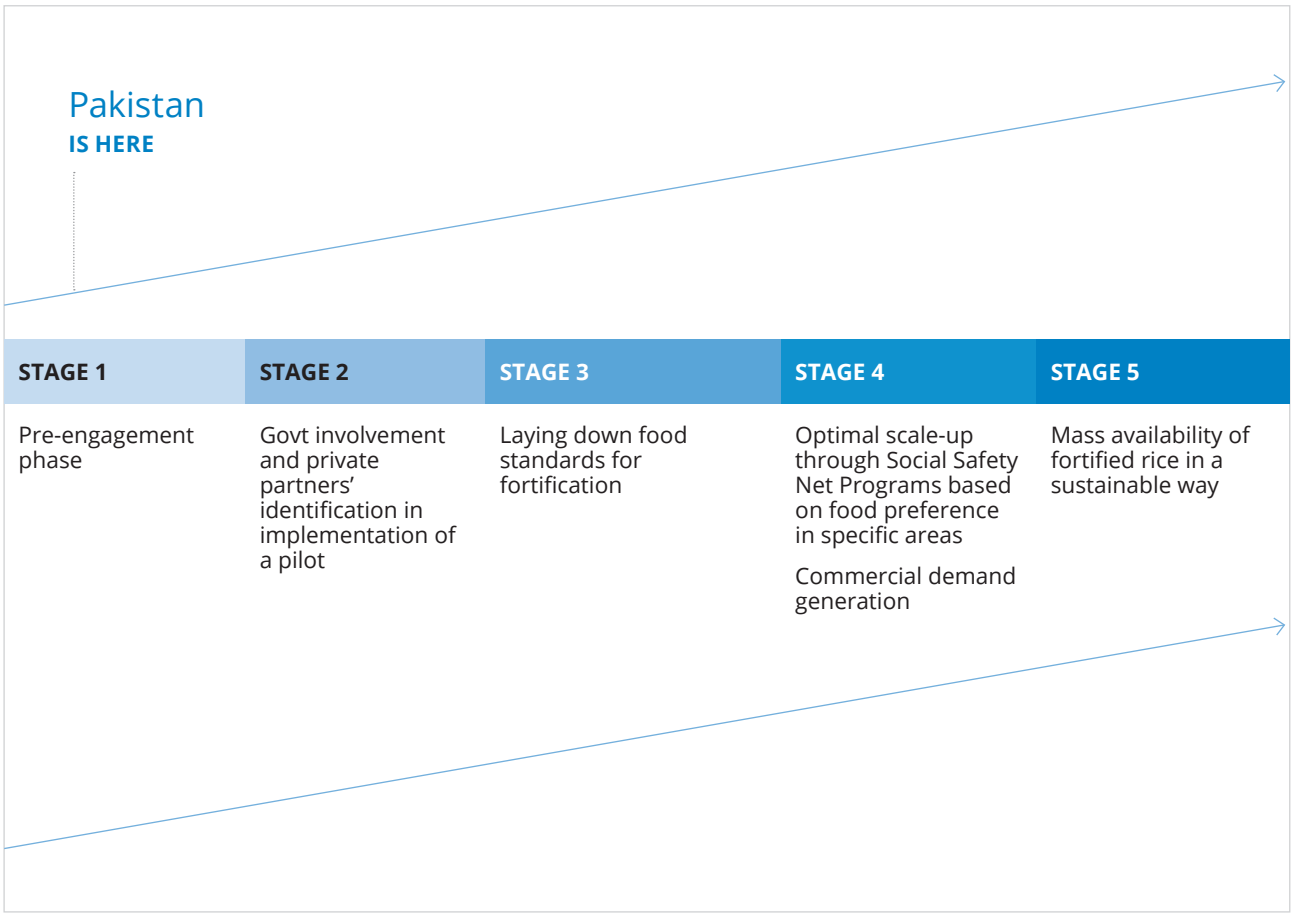
Currently, there is limited awareness about fortification amongst stakeholders in the rice trade and industry in Pakistan. Consequently, domestic demand for fortified rice has not been generated.

Pakistan exported 4.2 million MT rice in 2020-2021, 47 percent of the domestic rice production (12). However, the export market for fortified rice has not been explored due to a lack of demand from the export market and legal requirement on fortification for exporting rice to other countries.

As depicted in figure 3, Pakistan is at the pre-engagement stage of rice fortification, i.e., there is no government or private sector engagement in rice fortification (14). While the Government is interested in using fortification initiatives to address nutrient gaps in the population, this has not led to significant action for promoting rice fortification.

To enable mass fortification of rice in Pakistan, it is crucial to thoroughly understand the rice industry, processing capacity, roles of the various stakeholders, and the existing supply chain and barriers. The next chapter delves into the size and scale of rice production, consumption and exports in Pakistan.

Figure 3: Pakistan in the fortification scale up



3. Overview of the Rice Ecosystem in Pakistan

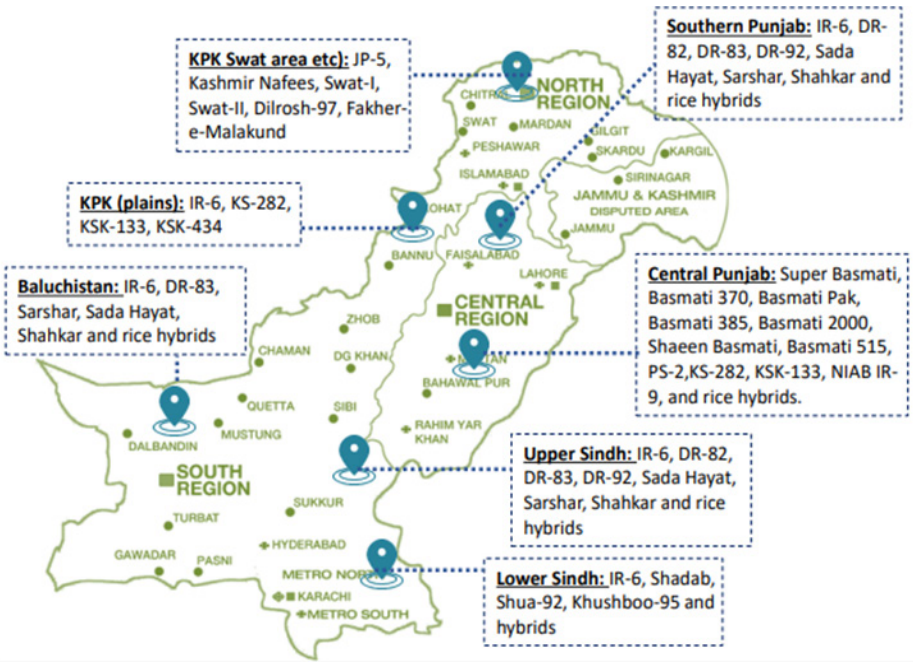
This section elaborates on rice production and consumption data, industry structure (rice mills), and the market segmentation of rice as per distribution channels.

3.1 Rice Producing Clusters

Punjab and Sindh are the two major rice-producing regions in Pakistan accounting for nearly 90 percent of the total production. Other rice-producing provinces in Pakistan include Balochistan and Khyber Pakhtunkhwa (20).

Punjab is the largest rice producing state in the country . The Kalar tract, between Ravi and Chenab rivers, is well-known for its basmati rice, while Sindh is famous for the cultivation of non-basmati rice, particularly IRRI-6, IRRI-9 and D-98 varieties (20). Therefore, rice millers operating in both Punjab and Sindh will be critical in developing the fortified rice supply chain.

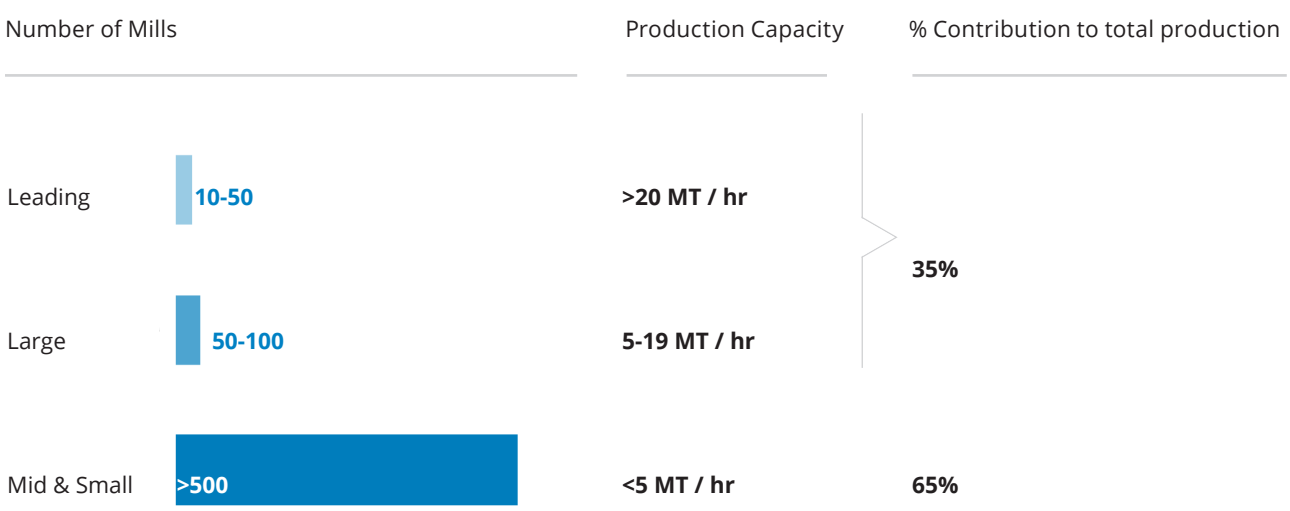
Figure 4: Rice producing clusters and rice varieties in Pakistan



3.2 Classification of Rice Mills

Rice mills are the most critical link in the supply chain for rice fortification. There are about 576 rice mills operating in Pakistan. They can be classified as leading, large, mid, and small-scale mills based on their tonnage capacity per hour (see figure 5 below).

Figure 5: Classification of rice mills by production capacity



61 of these mills have a production capacity greater than five MT per hour. They contribute about 35 percent of rice production. These mills are most likely to have sufficient financial resources to become part of the fortified rice supply chain, with support from the Government and development partners.

Leading and large millers have the capacity to invest in rice fortification. However, due to a lack of clarity on the available market for fortified rice, there is a low level of willingness to invest (see details in section 6.3). At present, they expect a guaranteed demand from the Government to consider venturing into rice fortification.

Overall, 91 percent of millers are based in Punjab (48 percent) and Sindh (43 percent). Thus, the focus of producing fortified rice must be in these regions, especially when 100 percent of leading and large mills are based in these two provinces .

3.3 Domestic Rice Production, Imports, and Exports

Rice Production –

In 2017-2021, the milled rice production in Pakistan increased to 8.9 million mt, with an average yield of 3.8 mt/ha on 3,335 ha area under rice cultivation. Rice imports in Pakistan have remained negligible throughout the same period.

In 2021, 67 percent of the total paddy production (13.3 million mt) was milled during rice processing.

The efficiency of the processes consistently improved over the years, indicating less wastage. Production increased as more land was cultivated, and there was a rise in the production of hybrid long grain non-basmati varieties (11).

Imports –

In 2020, the country imported less than 1 percent of the rice consumed.

Exports –

About 53 percent of the total rice produced in Pakistan is consumed in the domestic market while the rest is exported (4.2 million mt in 2021) (11) (12).

Rice exports comprise 20 percent of the basmati variety, with the rest being non-basmati variants (12).

Pakistan mainly exports to African and Asian countries, which accounts for 85 percent of the total exports. As illustrated in the table below, the top three Asian importing countries are Afghanistan, China and UAE, while Kenya, Mozambique and the United Republic of Tanzania are the main importers from Africa.

Rice exporters can play a crucial role in developing the export market for fortified rice. The export market for fortified rice is untapped and presents a potential for rice exporters as well as millers. This presents opportunities for economies of scale and supply fortified rice in the domestic market with reasonable prices.

Simultaneously, from 2015 to 2021, per capita consumption of rice increased from 14 kg to 17 kg. Potential distribution channels for selling fortified rice to consumers can be inferred by understanding rice market segments in the subsequent section.

Figure 6: Share of milled rice out of total paddy production ('000 MT) (2017-2021)

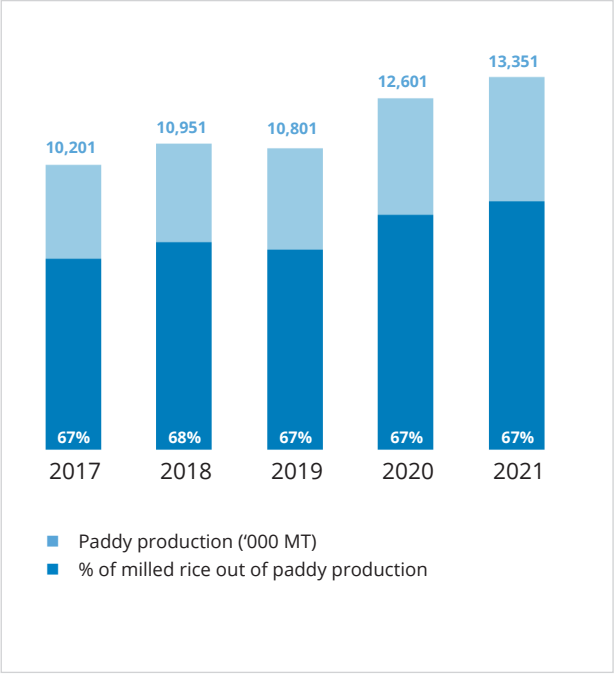


Figure 7: Milled rice production and exports ('000 MT) in Pakistan (2017-2021)

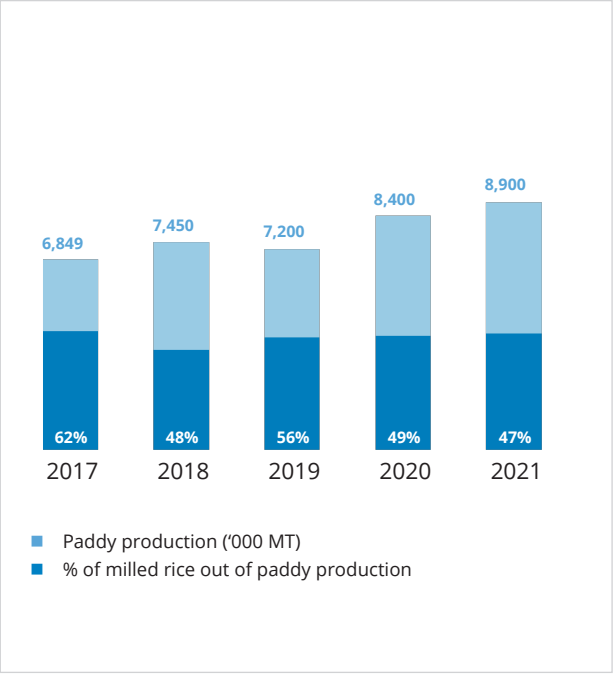


Table 2: Rice Exports by Country - Pakistan (2020 - 2021)

Country	Region	Exported quantity (mt)	% of imports out of total
Kenya	Africa	484,451	12%
China	Asia	376,557	9%
United Arab Emirates	Asia	286,392	7%
Mozambique	Africa	235,213	6%
Afghanistan	Asia	223,158	5%
Saudi Arabia	Asia	156,102	4%
United Republic of Tanzania	Africa	155,490	4%
Malaysia	Asia	131,978	3%
United Kingdom	Europe	125,989	3%
Indonesia	Asia	116,525	3%
Others	Misc.	1,870,603	45%
Total		4,162,458	100%

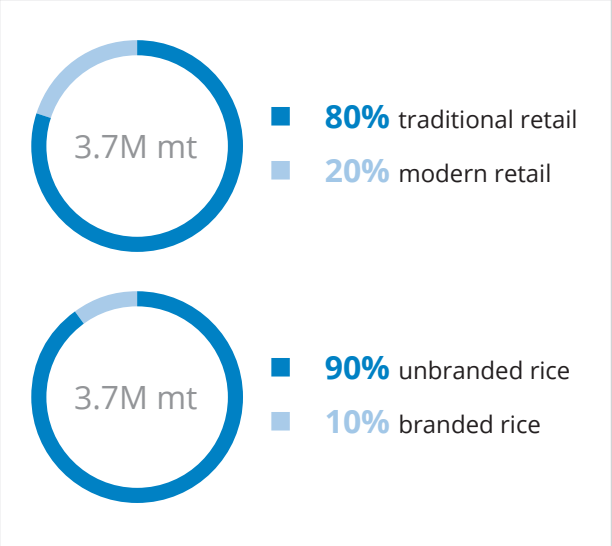
3.4 Rice Market Segmentation

In Pakistan, people primarily buy rice from local grocery stores, departmental stores and local marketplaces such as Joriya Bazar, etc. Traditional retail in the domestic market forms the dominant retail channel. There is a low number of brand-conscious customers , as illustrated by the 10 percent share of branded rice sold, in Figure 8.

Initially, fortified rice can be produced as a premium product at higher prices than regular rice, which would be bought by high-income earning segment of the population. However, it would be imperative that fortified rice reaches a wider population through sufficient marketing, state support and the development of a proper supply chain.

The next section explores the supply chain of rice in the country, including key stakeholders and potential of developing the fortified rice supply chain.

Figure 7: Channel share and branded rice share in domestic consumption (2021)

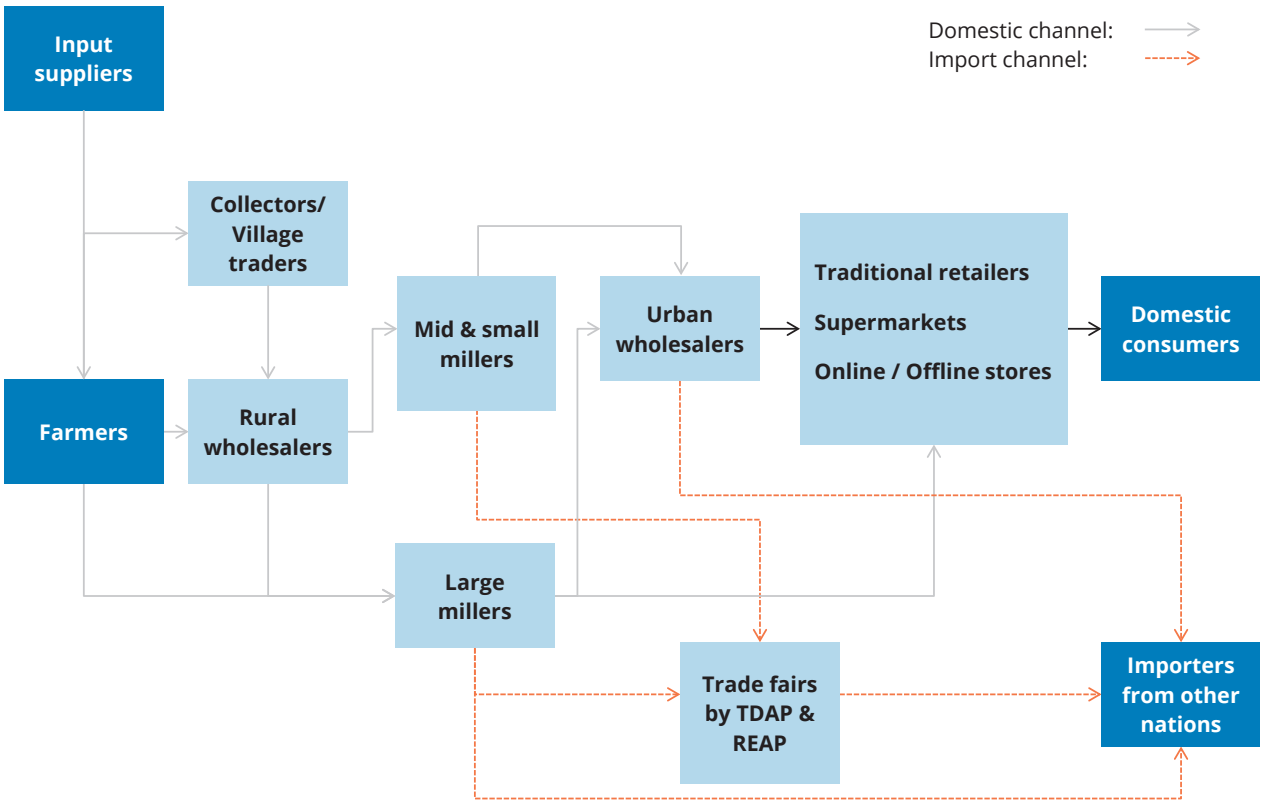


4. Rice Supply Chain

The domestic rice value chain in Pakistan is dominated by millers, collectors and retailers[6, 7] (21) (22). The rice value chain is depicted in Figure 9 below.

Currently, a fortified rice supply chain does not exist in Pakistan. There are no domestic suppliers of FRK and machinery i.e., blenders and extruders. Initially, FRK and machinery need to be imported from other countries.

To develop a sustainable ecosystem for rice fortification, a robust domestic supply chain for fortified rice should be developed with the involvement of stakeholders, whose roles are discussed in detail in the subsequent section.



6. Role of Different Entities in the Rice Supply Chain
7. Cost Mark-up of Rice across the Rice Value Chain

5. Key Stakeholders in Rice Fortification

There are multiple stakeholders crucial in the fortified rice supply chain in Pakistan:

1. Fortified rice manufacturers
2. Government entities/ministries/regulators
3. Other stakeholders (machinery and raw material suppliers, rice associations, etc.)

5.1 Fortified rice manufacturers

Millers are the most important participants in the supply chain. They either procure FRK from suppliers in the import/domestic market or produce FRK on their own using extrusion machinery. Installation of blending machinery at their rice mills is a prerequisite to blend FRK with normal milled rice. Millers are also responsible for packaging the product with certified labels, logos and nutritional information.

5.2 Government Entities

The scale-up of rice fortification will require efficient coordination amongst multiple government entities, across production, standardization, regulation, sale and distribution of fortified rice.

The role of such entities is mentioned in the table below:

Table 3: Government entities involved in scaling up rice fortification in Pakistan

Key Player	Role
Pakistan Standards Quality and Control Authority (PSQCA)	- National standardization body responsible for the enforcement of food standards and inspection and testing of fortified food items - Products certified by the PSQCA are issued the Pakistan Standards label. - PSQCA has developed standards for fortified flour and edible oil. They will also be involved in the development of national standards for fortified rice in the country by providing regulatory and technical support.
National Fortification Alliance	- Under the Ministry of Health, NFA is responsible for the coordination of fortification standards, policies, and programmes at the national level. - Develops legislative instrument and strengthens systems for regulation and monitoring of fortification
Provincial Food Authorities	- Includes food authorities in Punjab, Sindh, and Khyber Pakhtunkhwa (KPK) - Monitors and regulates the fortification of food items - Issues licenses to food operators - Organizes training programs in food safety and standards
Provincial Food Departments in each province	- Involved in monitoring the quality of wheat flour, managing the government procurement and storage of wheat grain and distribution to industrial flour millers via a quota system
Provincial Health Department in each province	- Enforcement of the pure food laws - Appointment of food inspectors - Collection of food samples for laboratory analysis
Pakistan Council of Scientific and Industrial Research (PSCIR)	- Laboratory of PSQCA - Inspects and analyses samples for compliance with standards - Compliance for national standards is voluntary, but those cited in legislation are compulsory
National Institute of Food Science and Technology (NIFSAT), University of Agriculture	- Resolves issues related to foodstuff purity by the hazard analysis and critical control points (HACCP) approach to food safety and other national standards - This institute has been involved in many national-level food fortification programmes. - NIFSAT offered to provide expertise in developing standards for FRK and fortified rice for the required micronutrients and offer their laboratory support for the rice fortification initiative.
Nutrition Division, National Institute of Health	- Operates as 'WHO focal point' for food safety, 'Federal Public Analyst Lab' for food quality and 'Reference Laboratory' for fortified wheat analysis - With respect to wheat flour fortification, the Reference Laboratory is involved in analysing iron and folic acid content in wheat flour samples
Rice Technology Lab, Rice Research Institute, Kala Shah Kaku	- Responsible for rice grain quality analysis. - Specializes in cultivation, breeding, quality assessment, storage, and processing of rice varieties

5.3 Other Stakeholders

Rice fortification through the process of extrusion requires FRK, blending- and extrusion machinery (if FRK is produced by the miller themselves) . Additionally, the role of rice associations as well as technical partners is imperative in scaling up rice fortification. The roles and availability of such stakeholders in Pakistan are discussed in detail in the table below.

The next section provides analysis of the barriers to large-scale fortification, and how these affect different types of stakeholders.

Table 4: Other stakeholders in rice fortification in Pakistan

Key Player	Role
FRK suppliers	- FRK suppliers provide FRK directly to millers, or the respective government bodies for distribution amongst millers at little or no costs - Currently, there is no supply of FRK in Pakistan - Some international suppliers of FRK are DSM, BASF, etc.
Blending machine suppliers	- Supply blending machines to millers - Involve supplying countries such as China, Germany, etc.
Extrusion machine suppliers	- The extrusion process of rice fortification requires machinery to produce FRK - In Pakistan, the NIFSAT and the Nuclear Institute for Food & Agriculture (NIFA) have the technical capacity to design and fabricate pilot-scale extruders for use in rice fortification but currently extruders are only used for lab-scale experiments - Some of the international companies supplying machinery are BUHLER, Satake, etc.
Retailers	- Retailers are involved in the selling of fortified rice in the market to the consumers - Retail chains include traditional grocery stores, modern supermarkets, rice mills' stores, online websites, etc.
Development / Technical Partners[1]	- WFP, PATH, and other potential development partners are essential in advising stakeholders in the Government of Pakistan to initiate the rice fortification programme - WFP's role is essential in coordinating with potential partners such as the Bill & Melinda Gates Foundation (BMGF), USAID, UK-FCDO, South Asia Food and Nutrition Security Initiative (SAFANSI), etc. to implement the rice fortification.

6. Discussion and Analyses

6.1 Stakeholder Discussion - Summary of Findings

Pakistan is one of the major rice producing countries in the world, contributing eight percent to the global rice trade. During 2021, the total rice production was 8.9 million MT, at a growth rate of six percent over the preceding year (11). More than 50 percent of the total rice production is consumed locally, while the rest is exported (4.2 million mt in 2020) (12).

Increasing production and consumption levels of rice and its status as the second most consumed staple after wheat indicates the potential of rice as a fortification vehicle. The benefits of fortification can reach the majority of the population.

As explained in chapter 1, detailed discussions were held with key decision makers in the government and relevant stakeholders in the rice value chain. Takeaways from these discussions are summarized below:

Discussion with government entities –

It was evident that the government stakeholders are interested in scaling up rice fortification processes in the country, and are aware of the health benefits of consuming fortified rice.

A summary of key inputs received during these discussions are as follows:

Table 5: Summary of discussion with government entities

Discussion themes	Entity	Details
Fortification of food items	NFA	• Currently, fortified food items such as wheat flour (particularly chakki fortification), edible oil/ ghee and salt, face challenges in enforcement; thus, a lack of enforcement may become a hindrance in rice fortification.
	PSQCA	• The challenges in developing a sustainable supply chain mechanism for wheat flour (chakki) fortification (elaborated in section 2) are impeding the scale-up of wheat fortification.
Necessity of food safety standards	PSQCA	• The lack of standards and compliance for fortified food items such as wheat flour, edible oil/ghee and salt have implications in rice fortification efforts.
Millers' hesitancy in investment in rice fortification	PSQCA, NFA	• Millers are hesitant to invest in rice fortification due to no market demand.
Creating consumer acceptance for fortified rice	PSQCA	• Creating consumer acceptance for fortified rice is difficult, especially in rural regions, where creating awareness will pose as a barrier.
Need of a pilot study	PSQCA	• NFA must create an initial landscape study to understand the feasibility of rice fortification.
Local availability of FRK and fortificant premix	NIFSAT, NFA	• It is essential to have local availability of FRK and fortificant premix to keep the cost of production minimal. • FRK can be imported for the pilot study for rice fortification. • The domestic production of FRK should be encouraged in the longer run. This could help manufacturers to explore the export market for FRK.
Demand creation by government/ WFP	NFA, PSQCA, NIFSAT	• Demand creation for fortified rice from the Government and/or WFP is essential.
Awareness creation	NFA, PSQCA, NIFSAT	• Awareness creation campaigns by the Government and WFP are necessary to make consumers aware of the benefits of consuming fortified rice.
WFP support required	NFA	• WFP can provide support for the pilot study of rice fortification, including the installation of machinery at millers' premises and continued, technical support to the millers.
Others	NFA	• Millers such as Matco are willing to invest in rice fortification.

Discussion with millers –

The stakeholders in the rice value chain, particularly millers, were aware of wheat and edible oil/ghee fortification to a certain extent. However, most were largely unaware of rice fortification and its health and economic benefits. During our discussions, two issues were highlighted by all of them: 1) the need to create demand and 2) likely profits they might expect. They showed hesitation to invest as they were not aware of any of the key financial variables, required production techniques, the raw materials and machinery used, overall cost, and expected profitability.

A summary of important inputs received during these discussions is as follows:

Table 6: Summary of discussion with millers

Discussion points	Details
Health benefits of fortified rice	- It is uncertain whether there is a need for fortified rice. Rice is a natural product which should not be tampered with.
Lack of knowledge about production techniques	- Most millers were not aware of the production techniques involved as well as the raw materials and machinery used. There were questions around how the micronutrients can stay intact after the rice is washed. A miller also asked whether the colour of the FRK can be matched with regular rice. Such doubts make it clear that there is a significant lack of awareness fortified rice.
Lack of knowledge about costs	- It is crucial to understand the various costs involved and the possible channels to procure inputs.
Target audience and pricing	- Less than 20 percent of the population buys rice from supermarkets. Thus, selling fortified rice in supermarkets or modern markets will not help reach the target population. - Consumer demand for fortified rice may be negligible if its price is higher than regular rice. - Consumers would be hesitant to buy fortified rice given their lack of knowledge about fortification. Consumers may think it is a harmful product with foreign items added to it. A miller suggested using terms such as 'vitamin enriched' instead of 'fortified'.
Creation of demand by the government/WFP	- The Government must create sufficient initial demand for fortified rice to feed the malnourished sections of the population. - WFP could procure fortified rice (from Pakistan) for their relief activities in other countries.
Exploring the export market	- Export markets such as Middle East (Dubai, Qatar, Saudi Arabia), America and the UK, may accept fortified rice as a value-added product. These countries usually import basmati variety of rice, which is expensive and premium. REAP may help in the identification of countries which require fortified rice.
Need for awareness programmes	- There is a need for educational awareness campaigns by the government to inform consumers about fortified rice and its health benefits.
Tax benefits	- TDAP should provide subsidies, trade relaxation schemes, Free Trade agreements, etc. to reduce duties and costs for millers if importation of FRK and blending machinery is being considered. - Federal Board of Revenue, in partnership with the Government and WFP, can propose tax exemptions for millers investing in rice fortification.

Discussion with other stakeholders –

Consultations were held with a rice export association, an FRK supplier and a development partner. The highlights of the discussions are provided below.

The successful implementation of rice fortification requires a coordinated effort amongst key stakeholders in the supply chain and a clear understanding of the barriers faced by them. The subsequent section uses inputs from all the earlier sections, as well as inputs from the primary research (including interviews with stakeholders) to elaborate on the major barriers in scaling up rice fortification in Pakistan.

Table 7: Summary of discussion with other stakeholders

Discussion themes	Entity	Details
Rice consumption and market	REAP, GAIN	- Rice consumption is emerging as a staple food in the country. - The Pakistani population mostly purchases unbranded rice from local markets such as 'Joriya Bazaar', grocery stores, etc. Roughly 5-6 percent of the population purchases branded rice.
Export market	REAP	- Mostly, mechanized farming techniques are used by large exporters at REAP (particularly in Punjab). - Exporters at REAP have not received any inquiries for fortified rice from importing countries yet. - The acceptance of fortified rice may be higher in the markets of US and UK, presenting an opportunity for Pakistani rice exporters.
Local availability of FRK and fortificant premix	GAIN	- The development of a sustainable supply chain mechanism for the availability of premix in the domestic market is essential.
Profit motive of millers	GAIN	- Earning profits is the primary objective of millers, for investing in rice fortification
Need for food safety standards	GAIN	- Developing standards for fortified rice and FRK is essential to ensure consistency in the fortified rice supplied in the market. - Umbrella legislation for fortification of food items such as salt, oil/ghee, wheat flour and rice, can be adopted in the future. The legislation should be monitored and implemented in all provinces.
Need for a pilot study	REAP	- A comprehensive research study must be undertaken by the Government in rice fortification, with WFP's support.
Need for awareness programmes	REAP, GAIN	- Conduct awareness programmes for fortified rice through the Government and WFP initiative - WFP must explore consumer's preferences for fortified rice
Benefits to millers	GAIN	- Tax exemptions must be considered for millers interested in investing in fortification - Fortification equipment (blending machinery) must be provided free of charge to the millers interested in rice fortification
Creation of demand by the government/WFP	GAIN, International FRK supplier	- There is an utmost need for government support in creation of demand for fortified rice to encourage private millers to invest in rice fortification

6.2 Barriers to Scaling up Rice Fortification

Barrier 1

Relatively low priority for rice fortification among relevant government entities

While the Government is keen to address nutrient deficiencies, the level of attention to rice fortification is inadequate. Government departments such as NFA, regulatory authorities such as PSQCA and provincial food authorities that have been instrumental in scaling up fortification of other foods, do not prioritize the fortification of rice.

One of the reasons is that these authorities are not sufficiently convinced about the positive impact of consuming fortified rice and its potential in tackling MNDs in the population. This entails lack of institutional support to rice fortification, as opposed to that of wheat, salt, and edible oil. It is important to change these perceptions and kindle the interest of government agencies to help make an impact on large-scale rice fortification, and improve the nutrition of the population.

Barrier 2

Lack of awareness of the health benefits of rice fortification among rice millers

The vast majority of rice millers in Pakistan are not aware of rice fortification and its health benefits. They are unaware about how it can help improve the nutrition of the population.

Barrier 3

Limited awareness among millers about the production techniques, costs involved, and suppliers of raw materials and machinery required for rice fortification

Most of the millers are unaware of the technical processes involved in rice fortification. They are also not aware of the required raw materials such as premixes / FRK or their likely costs and the machinery (blending/ extrusion) needed for rice fortification.

Given the limited awareness about the production process, there is a lack of knowledge about the costs of various inputs and the appropriate channels to purchase them. Addressing such knowledge gaps is an essential step in establishing a sustainable and efficient supply chain for fortified rice in Pakistan. This will require coordinated efforts from international agencies such as WFP, donors, government entities and stakeholders in the rice industry.

Barrier 4

Low return on investment perceived in fortified rice production due to lack of consumer demand and awareness on various production costs

Given the limited knowledge of production processes as discussed earlier, millers are unable to assess the quantum of investment needed, and the likely returns. Most prominent millers believed that the required investment in machinery as well as increased costs would be substantial, even though they were unable to quantify this.

Added to this, the lack of demand and the absence of government support make them very reluctant to make investments in rice fortification.

It is important to educate millers on likely costs and investments, as this will provide a framework for them to seriously evaluate the option.

Barrier 5

Lack of a regulatory environment for fortified rice and FRK

The absence of a regulatory environment and well-defined standards is another significant structural impediment. Without standardization, it will be extremely difficult to ensure consistency and quality across fortified rice supplied by various millers in the market. Food products must be safe for human consumption, and without standards and compliance, it will not be possible to guarantee safety.

Hence, the regulatory body, PSQCA needs to establish and lay down the food safety standards for producing and distributing fortified rice and FRK in Pakistan. Provincial food authorities, in coordination with PSQCA, must also develop a monitoring and enforcement environment in the country. This would ensure compliance to the food safety standards.

Barrier 6

Lack of awareness amongst the population about fortified rice and its benefits

There is negligible awareness about fortified rice and its benefits among the general population in Pakistan. Adding to that, the price premium for fortified rice is perceived to be 30 percent over regular rice. Consumers are unlikely to pay this premium. Creating large-scale consumer awareness about the positive health impact of consuming fortified rice is essential to generate market demand.

The impediments mentioned above need to be addressed by a series of interventions and coordination amongst different entities across the value chain. In the next chapter, various recommendations to accelerate the scaling up of rice fortification are highlighted.

6.3 Commercialization by private sector

In conversations with private sector stakeholders, it was clear that the vast majority of the millers and other players were not willing to invest in rice fortification without any clarity on the available market.

The stakeholders require basic understanding of the return on their investment. At the moment, these players do not believe that the commercial sale of fortified rice would generate any profits. Hence, financial support or guaranteed take-off of fortified rice through Government-led procurement programs is required to provide initial economies of scale to manufacturers.

The prospects of consumer-driven market demand are also not encouraging due to the price differential between fortified and non-fortified rice as well as negative perceptions about the taste and/or colour of fortified rice.

Essentially, our research indicates that commercialization (by private sector) at this stage does not seem viable. In the next chapter, recommendations to accelerate the scale-up of rice fortification are highlighted.

7. Recommendations for Scaling Up Rice Fortification

Pakistan is at the pre-engagement stage where there is no apparent government interest in rice fortification yet (discussed in section 2.2). Appropriate advocacy could bring a change, given the Government's positive actions regarding fortification of other foods and desire to reduce the incidence of MNDs.

A successful scale-up would require coordinated efforts from all stakeholders along several parameters - continuing advocacy and awareness building, business model development, development of standards and a regulatory framework, and demand creation.

Any ambitious programme such as this will need to be implemented in a phased manner. The rational sequence of steps for a successful implementation of the rice fortification programme could be as follows:

1. Pilot modelling;
2. Demand creation;
3. Programme expansion;
4. Sustainable supply chain mechanisms; and
5. Transfer of the fortification costs to the consumers.

A comprehensive approach is required with the coordination of key decision makers within the Government and the industry leaders in the rice value chain.

The recommendations below provide a detailed roadmap to successful scale-up, including commercialization as well as subsidized distribution of fortified rice under social safety nets.

1 **Advocacy with government decision-makers**
Conduct meetings with the government entities to showcase the potential of rice fortification in tackling MNDs in Pakistan and prioritize budgetary provisions for the pilot study

2 **Business model - return on investment**
Develop and share a technical report for millers, which highlights health benefits, technical know-how of rice fortification processes, costs involved and investment returns.

3 **Advocacy with millers**
Conduct periodic workshops and individual meetings with the leading rice millers to educate them about rice fortification, its health and economic benefits and the technical processes involved

4 **Pilot modelling**
Conduct a pilot test programme (local evidence study) for rice fortification with a few millers through the inclusion of fortified rice in the 'Ehsaas Langar' scheme

5 **Development of a regulatory environment**
Advocate with PSQCA to develop standards for fortified rice and FRK

Provide technical assistance to PSQCA and provincial food authorities to support the development and implementation of a QA/QC system for rice fortification

6 **Demand creation**
To create market demand for fortified rice, invite tenders from millers to procure fortified rice for government programmes and WFP's humanitarian activities

7 **Awareness creation campaigns**
Campaign to generate awareness about the benefits of consuming fortified rice among the population

Recommendation 1: Advocacy with government decision-makers

Conduct meetings with the government entities to showcase the potential of rice fortification in tackling MNDs in Pakistan and prioritize budgetary provisions for the pilot study

Indicative timeline: short term (on-going process)

To scale up rice fortification, active participation of government entities is essential. Hence, sustained advocacy with government departments and regulatory authorities is indispensable. WFP can conduct meetings with decision makers in the Government such as NFA, PSQCA, and provincial food authorities to disseminate information about the potential benefits of rice fortification.

NFA is the leading authority in monitoring food fortification in Pakistan. The engagement of provincial food authorities is required for adequate regulation of the quality of fortified rice in the market once a national standard has been approved by PSQCA.

Given their lack of prior interest in rice fortification and insufficient conviction about the positive impact on the population's nutrition, advocacy would be essential to demonstrate the significant potential for rice fortification in tackling MNDs. This will help spark interest and engagement of key government stakeholders on fortification efforts.

Additionally, it is imperative that these government entities are nudged towards sourcing funds for the rice fortification initiative.

Recommendation 2: Business model - return on investment

Develop and share a technical report for millers, which highlights health benefits, technical know-how of rice fortification processes, costs involved and investment returns.

Indicative timeline: short term (ideally to be done within a year)

Millers and rice associations are largely unaware of the concept of rice fortification and its health benefits. They are unaware of the technical know-how of rice fortification processes, costs involved and economic returns in selling fortified rice. WFP, in collaboration with NFA, could develop a technical report and share it with the millers to inform them about these aspects in detail.

Indicative contents of the document:

i. Health benefits of rice fortification

ii. Different processes of rice fortification and the most feasible technology

iii. Raw materials and machinery required

iv. Process innovation in FRK and machinery through case studies in other countries

v. Costs involved –
   - Cost of importing FRK
   - Cost of blending machinery
   - Cost of FRK for local production (includes the cost of extrusion machinery)
   - Any other associated costs

vi. Investment needed and expected returns under different scenarios –
   - Whether FRK is imported or produced locally
   - Whether blending machinery is imported or produced locally
   - Whether extrusion machinery is imported or produced locally
   - Whether subsidies are provided by the Government for importing FRK or machinery

vii. Financial viability in producing fortified rice – expected return on investment

viii. Case studies of successful rice fortification projects across other countries through existing WFP reports

Having a technical report ready will go a long way in enabling appropriate advocacy efforts with stakeholders.

Recommendation 3: Advocacy with millers

Conduct periodic workshops and individual meetings with the leading rice millers to educate them about rice fortification, its health and economic benefits and the technical processes involved

Indicative timeline: short term (ongoing process – once

the technical document is prepared)

Given the lack of awareness among millers about the health and economic benefits of rice fortification, NFA and WFP can conduct workshops and meetings with individual rice millers to inform them about rice fortification in detail. The technical report (recommendation 2) can be leveraged to disseminate the necessary information. Such workshops and meetings would help with signing on a few millers (ideally, amongst the larger millers in Pakistan) for pilot testing the programme for rice fortification.

These workshops/meetings can include discussions on:

i. Health benefits of consuming fortified rice

ii. Guidance on financial viability of producing fortified rice

iii. Success stories of rice fortification in other countries through existing case studies of WFP

iv. Technical processes involved in rice fortification

v. Gaining commitment from 4-5 significant millers for a pilot testing programme for rice fortification

vi. Details of the pilot testing programme as mentioned in recommendation 4.

NFA must ensure that there is continuous engagement (not one-time meetings or workshops) with those millers to help them at all stages of production and resolve any queries.

Recommendation 4: Pilot modelling

Conduct a pilot test programme (local evidence study) for rice fortification with a few millers through the inclusion of fortified rice in the 'Ehsaas Langar' scheme

Indicative timeline: medium term (ideally to be started after the budget is approved)

Given the absence of a local rice fortification ecosystem and the resulting hesitancy and scepticism surrounding rice fortification, it is essential to implement one or more pilot programmes. This will help establish the health benefits, enable better understanding of costs and financing implications, and kick-start the creation of a supply chain for raw materials and machinery. This can generate conviction amongst millers for a large-scale initiative in rice fortification.

2.1 Design of the pilot study

The pilot test programme will essentially consist of a local evidence study that would help in generating practical knowledge and experience among millers about the production processes involved in rice fortification. It will also provide local evidence of the health benefits of rice fortification to a variety of stakeholders.

The pilot programmes should focus on the following aspects:

i. The programme should target key areas of undernourishment – stunting, wasting, anemia or other nutritional deficiencies. The composition of FRK must be decided based on the prevalence of such MNDs in consultation with the Ministry of Health.

ii. The pilot test must be planned for at least an 8-12-month period to understand the health impact of consuming fortified rice.

iii. The fortified rice produced by the mills must be distributed amongst the sample population. The health benefits of consuming fortified rice must be examined by testing laboratories.

iv. Testing laboratories, such as PCSIR and the research laboratory of NIFSAT, can contribute to testing samples of fortified rice produced during the pilot stage. The tests should convey the lab nutrient analysis by testing laboratories and the health impact of consuming fortified rice in the sample population. The results would be crucial inputs to PSQCA, enabling them to demonstrate the most appropriate standards for fortified rice.

2.2 Sampling for the study

The sample population of the pilot testing programme should ideally target a vulnerable population group. This should be decided by NFA based on discussions with the Ministry of Health.

One of the social safety nets which can include the distribution of fortified rice as part of the pilot testing programme is the 'Ehsaas Langar' scheme (poverty alleviation). Under this scheme, the Poverty Alleviation and Social Safety Division (under the Ministry of Social Protection and Poverty Alleviation Coordination) organizes free meals for labourers in Pakistan. NFA can advocate with this body to consider the inclusion of fortified rice distribution in the 'Ehsaas Langar' scheme .

This step would help with the distribution of fortified rice through daily meals consumed by beneficiaries of

'Ehsaas Langar'. This population group will effectively be the sample population of the pilot testing programme. Their health and nutrition status can be studied before and during the testing phase to quantify the health impact of adding fortified rice to their normal diets.

Additionally, the Government will be able to generate initial demand for fortified rice which will help interested millers in the pilot programme to make some initial investment commitments.

2.3 Technical support for the study

The millers selected for the pilot will require substantial support. This entails installing of blending machinery, information about procurement of raw materials and the production process. It will also require a technical support team that provides not only knowledge, but guidance throughout the whole process.

Organizations such as NFA can collaborate with NIFSAT to provide this technical support. They will also be able to build on and impart knowledge of process innovation in rice fortification in other countries. For instance, in Indonesia, the control feeder equipment in the rice processing machinery is modified to perform the functions of blending machinery. This helped in reducing the investment cost in machinery for millers. Similar examples of process innovation can be explored by businesses and NIFSAT while implementing the pilot testing programme in Pakistan.

TDAP can provide subsidies, trade relaxation schemes, free trade agreements, etc. to reduce the export duties and costs for millers for importation of FRK and blending machinery.

2.4 Funding for the study

Development partners such as Bill & Melinda Gates Foundation (BMGF), USAID, UK-FCDO, South Asia Food and Nutrition Security Initiative (SAFANSI), etc. could be approached by development agency(ies)/businesses for the pilot test programme. These funds will be used for supply of FRK and blending machinery to the millers, installation of blending machinery in their mills' premises, as well as training and support.

2.5 Dissemination of results of the pilot study

Under the leadership of NFA, stakeholders should collaborate to support the development of an awareness and advocacy plan. Workshops and periodic meetings are recommended to disseminate the results of the programme to various stakeholders, and enable their optimal engagement:

- To help **NFA and other government entities** better understand the nutritional benefits of fortifying rice and decide the way forward concerning rice fortification implementation
- To help **PSQCA** to map nutritional needs to the benefits of fortified rice and decide the way forward for setting standards for fortified rice
- To help the **pilot phase millers** understand production processes and costs, and connect with suppliers of FRK and blending machinery
- To help the **prospective millers** understand the potential of producing fortified rice, given the successful implementation of the pilot testing programme.

Additionally, millers should be incentivized with tax benefits and/or subsidies to buy raw materials and machinery. An alliance under NFA could be developed to involve banks such as the State Bank of Pakistan to explore cheaper funding options to millers for installing machinery.

Recommendation 5: Development of a regulatory environment

Effectively, rice fortification could be voluntary initially and, in the long run, made mandatory as with other food fortification initiatives. One of the first steps would be the development of standards for fortified rice and FRK, followed by the implementation of a quality assurance and quality control (QA/QC) system for rice fortification. Without standards and compliance, there are likely to be a variety of differing products leading to quality issues, and this will negatively impact the expected health benefits. Also, without standardization, consumers will not have the required trust in fortified rice products.

Without standards, millers might not feel secure about investing in production of fortified rice. For instance, if standards are developed at a later stage, then millers might face the risk of producing fortified rice below the appropriate national standards. Thus, it is imperative that standards are developed at an early stage. The creation of standards is a vital infrastructural enabler, without which promoting rice fortification becomes much more difficult.

5.1 Advocate with PSQCA to develop standards for fortified rice and FRK

Indicative timeline: medium to long term (to be done in parallel with pilot modelling)

To avoid any inconsistency in the quality of fortified rice and the micronutrients to be added to the FRK, it is essential to develop comprehensive food safety standards. WFP and NFA should advocate PSQCA to set standards for fortified rice, building on the international guidelines set by WFP.

The results of the pilot phase about the nutritional impact of consuming fortified rice released by testing laboratories, such as PCSIR and the research laboratory of NIFSAT, must be discussed in detail with PSQCA. This would help them align the micronutrients to be added to the premix of FRK with the health status of the population.

5.2 Provide technical assistance to PSQCA and provincial food authorities to support the development and implementation of a QA/QC system for rice fortification

Indicative timeline: medium to long term (to be done in parallel with pilot modelling)

WFP, in partnership with NFA, can provide technical assistance to support the regulatory authorities in the effective integration of a quality assurance and quality

control (QA/QC) plan for rice fortification. This would help in monitoring the quality of fortified rice, and, in the long run, to monitor FRK production, if FRK were to be produced locally.

As mentioned earlier, standardization and compliance are essential to scaling up rice fortification, and this means intensive and sustained support from institutions like WFP and NFA.

Recommendation 6: Demand creation

To create market demand for fortified rice, invite tenders from millers to procure fortified rice for government programmes and WFP's humanitarian activities

Indicative timeline: >1.5 years (ideally to be started after pilot study)

In the final analysis, without creating institutional and/or consumer demand, millers will have no incentive to invest in rice fortification. This requires interventions in both institutional procurement as well as creating consumer demand, especially from the more affluent population at the initial stage.

Without government support, millers will be hesitant to invest in the production of fortified rice. Similar to the experience in other countries, bulk purchases of fortified rice by the Government can provide a significant boost to demand. The Government can procure fortified rice for social assistance programmes and emergency response, as well as existing nutrition-related initiatives. Commitments from the Government to purchase fortified rice in bulk, ideally at subsidized rates would go a long way to generate initial demand and incentivize the millers to make the required initial investment. This bulk demand could enable millers to plan for higher capacities, which will provide economies of scale.

The case study of rice fortification scale-up in Bangladesh and India sheds some light on the efforts of the government in those countries:

Bangladesh:
CASE STUDY

The Government of Bangladesh has integrated the distribution of fortified rice through national social safety net programmes. This has helped the private sector manufacturing companies to get a sustainable market for FRK. The scale-up of domestic production of FRK can be attributed to the unrelenting support of WFP, Nutrition International (NI), Global Alliance for Improved Nutrition (GAIN), and other partners (26) (27).

Initially, FRK was being imported at higher costs; however, with technical support from WFP, three local privately-funded FRK facilities were set up in 2019. This resulted in significant cost reduction. In fact, these facilities have reached an annual production capacity of more than 1,500 mt of FRK. Now, there are 8 FRK producers in the country (26).

WFP is also providing technical assistance to the Government in establishing a FRK factory (production capacity of 200 kg per hour) and a laboratory facility for kernel testing (26). More than 50 blending units (rice mills) are operational in Bangladesh.

From these cases, it is evident that Government efforts are essential to efficiently scale up the rice fortification.

Simultaneously, the export market can be explored with WFP's support. WFP can explore procuring fortified rice from millers for its humanitarian activities in other underdeveloped regions such as Africa. WFP could also help the Government of Pakistan to coordinate with the governments of other rice importing countries to create demand.

One of the millers suggested that export markets such as Middle East (Dubai, Qatar, Saudi Arabia), America and the UK, may accept fortified rice as a value-added product. These countries usually import basmati variety of rice, which is expensive and premium. Such markets can be explored by WFP and the concerned government entities.

India:
CASE STUDY

In August 2021, the Indian Prime Minister announced the distribution of fortified rice throughout the Public Distribution System and other government schemes in all States and Union Territories by 2024 in a phased manner (28).

In 2022, Food Corporation of India (FCI) in multiple states announced the procurement of fortified rice from private millers. For instance, the procurement of 260,000 mt of fortified rice from private millers was announced in the state of Telangana as a part of 'PM Poshan' (Mid-day meal programme).

The rice would be distributed in pre-primary education centres and would be expanded to include distribution of fortified rice amongst schoolchildren. The Indian Food Ministry advocated with the relevant entities to provide financial assistance to rice millers for installing blending machinery. Currently, 600 out of the 900 major rice mills in the state have installed the required equipment.

To ensure that the millers are provided with FRK, multiple state governments invited tenders from manufacturing companies. The tender requirements were:

Availability of extrusion machinery to produce FRK

Ability to transport the FRK to the designated rice millers for a definite period, as instructed in the tender (29) (30) (31).

Such efforts of the Government have led to a significant increase in the availability of FRK suppliers in the country. As of May 2020 (before the government announcement), there were 13 FRK suppliers (32), which increased to 157 across multiple states by April 2022 (33).

Recommendation 7: Awareness creation campaigns

Campaign to generate awareness about the benefits of consuming fortified rice among the population

Indicative timeline: >2 years (on- going process)

Once the Government is able to generate some level of awareness among consumers about fortified rice through its distribution programmes, it would be essential for the relevant entities to invest in mass-awareness campaigns.

The Ministry of Health and Ministry of Poverty Alleviation and Social Safety can partner with state-owned broadcasters (like PTV) and other media channels to run advertisements about the benefits of consuming fortified rice. This could generate initial traction for fortified rice among consumers, especially those that are more health conscious and willing to pay a premium.

Along with television, innovative digital outreach could complement these efforts and help reach a certain digitally active and younger cohort of the population at lower costs. Apart from Government funding, aid agencies and corporate social responsibility (CSR) funds can substantially enhance this effort.

As described above, the key success factors in scaling up rice fortification in Pakistan include a nudge from the Government by creating initial demand; the belief that rice fortification is beneficial amongst all stakeholders; establishment of a viable business model for millers; and a sustained campaign to build awareness amongst consumers.

Given Pakistan's well-developed domestic rice industry, there is room for optimism. However, this will need effective coordination amongst stakeholders and a long-term commitment. In the long run, a combination of Government support and rising acceptance by the public will help create a sustainable ecosystem that will help to significantly reduce MNDs in Pakistan.

Conclusion:

POTENTIAL ROADMAP TO COMMERCIALIZATION

The scale-up of rice fortification would require immense efforts from the Government, along with WFP, development partners and donor agencies. The success will depend on continued advocacy and awareness-building, business model development, restructuring of the mandatory fortification legislation and implementing a regulatory framework, and demand creation.

Given the hesitancy of the private sector to invest in rice fortification without support from the Government, commercialization of fortified rice will take time. However, based on the recommendations above (in section 7), a possible roadmap to commercialization of fortified rice could be illustrated as follows:

Invite tenders from millers to create initial demand for fortified rice through government social protection programmes.

Provide financial support (in the form of cheaper and/or subsidized loans from banks, funding from government and/or WFP, grants, etc.) to encourage millers to invest in capacity for blending.

Initially, a few large millers that have indicated interest or those that might show interest after understanding business and technical aspects will initiate fortified rice production and supply it to the government programmes.

As millers would have already invested, they could consider selling additional fortified rice in the open market. They could create a nutritious rice brand (niche premium product) and sell it at slightly higher prices.

As awareness spreads gradually (as mentioned in recommendation 9), along with the efforts of and private millers' marketing teams), more millers would be willing to participate in the market.

As the supply of the product increases, costs will also reduce. The final price of fortified rice would become more affordable to customers and would not be only limited to the premium customers who were initially targeted.

Annex:

WHEAT FLOUR FORTIFICATION STATUS

Overview – The fortification of wheat flour started in 2007 by adding iron, folic acid, zinc, and vitamin B12 as key micronutrients. Networks such as GAIN, DFID (now FCDO), Nutrition International, WFP and Scaling Up Nutrition are the key stakeholders involved in increasing wheat flour fortification in Pakistan through funding and coordination among key stakeholders.

Raw materials and machinery – The machinery (micro-feeders), imported from China and Russia, were installed free of charge in most flour mills by GAIN and the provincial food authorities. Iron and folic acid premix were provided free to the miller. However, the latter now needs to be imported as there is no domestic supply. In chakki fortification and AJK large-scale fortification, micro-feeders are local as per international standards in terms of accuracy and precision. Similarly, the qualitative testing and toolkits are locally developed, working efficiently.

Challenges – Most millers stopped producing fortified wheat flour when GAIN's supply of premixes was exhausted. The lack of a formal supply chain of premix is a major hindrance in wheat flour fortification. Additionally, low demand for fortified wheat flour and the lack of mandatory legislation are hampering the development of the fortification programme. Currently, 992 out of ~1200 flour mills are registered with FFP. However, a mere ~13 percent of the flour produced by them is fortified.

Success stories –

- The large-scale fortification in AJ&K is self-sustainable and 100 percent of production is fortified in all 11 districts with technical assistance (TA) from WFP.
- The chakki fortification gives a huge opportunity to change the dynamics of the fortification approach in Pakistan, but the scale-up at the national level needs consistent determination and advocacy with relevant departments for investment.

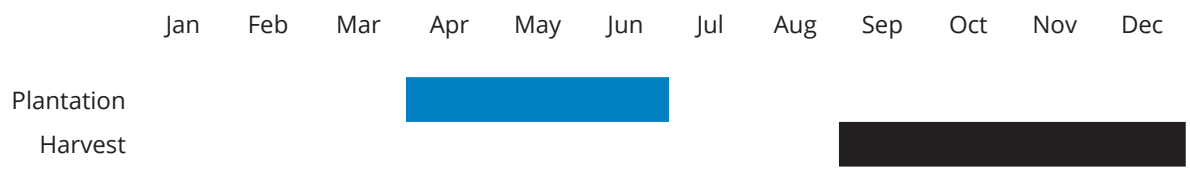
Annex:

KEY SEASONS FOR PRODUCTION AND HARVEST

The plantation and harvest seasons are similar across the major rice-producing regions in Pakistan. Rice is planted in the “Kharif” season and harvested in September-December each year. The non-basmati- and basmati varieties are harvested in September and November, respectively.

The main raw material for producing fortified rice i.e., premixes in the form of fortified rice kernels (FRK) needs to be supplied before the harvest commences as it has to be blended with the regular rice. July to September is essential for suppliers of FRK.

Table 8: Plantation and harvest seasons of rice in Pakistan



Annex:

RICE MILLS

Table 9: Classification of rice mills by capacity

Type of mills	Criteria	Number of mills	% share of total mils	% share of production
Leading	> 20 mt/hour	25	4.3%	35%
Large	5-19 mt/hour	36	6.3%	
Mid and Small	< 5 mt/hour	515	89.4%	65%
Total		**576**	**100%**	

Source: REAP, ValueNotes Analysis

Table 10: Classification of rice mills by regions

Region	Leading	Large	Mid and Small	Total	% share
Punjab	14	26	236	276	48%
Sindh	11	10	227	248	43%
KPK	0	0	8	8	1%
Balochistan	0	0	44	44	8%
Total	**25**	**36**	**515**	**576**	**100%**

Source: REAP, ValueNotes Analysis

Annex:

VARIETIES OF RICE PRODUCED

Varieties of Rice Produced

Rice varieties in Pakistan are classified under two categories: Basmati and Non-basmati

Table 11: Rice varieties in Pakistan – growing region and average price (PKR/kg)

Variety Name	Sub-variety	Average Price (PKR/kg)	Region	Details
Super Basmati	Basmati	190	Punjab	- Long grain rice, famous for its aroma and delicate/ nuanced flavor - Particularly popular in Karachi and Lahore
Basmati 385	Basmati	108	Punjab	- Long, dry grain, traditional variety of rice grown from the mid-June to end-June
Kainat 1121	Basmati	174	Punjab	- Very popular variety in the domestic market due to its long grain length (8.5-9 mm) and less cooking time - Its parboiled/sella version is used in catering - Exported to Afghanistan and Iran
Basmati D-98 / Pk-198	Basmati	118	Sindh	- Extra-long length, rich pearl white colour and highly aromatic grain
Basmati 370 (in Kalar tract)	Basmati	140	Punjab	- High yielding variety developed and released by Rice Research Station at Kala Shah Kaku
Super Basmati (Sindhi)	Basmati	-	Sindh	- More popular as a brown rice variety in Europe and Middle East export market
IRRI 6	Non-basmati	68	Sindh and Punjab	- Long grain and wider width than IRRI 09 long grain rice - Mostly sold in China, Africa, Sri Lanka and Malaysia - Somalia and Saudi Arabia prefer its parboiled/sella version
IRRI 9	Non-basmati	80	Sindh and Punjab	- White long grain rice, popular due to its colour, length and cheaper price
PK 386	Non-basmati	94	Punjab	- Non- sticky rice made up of thin kernels without aroma; longer grain length compared to other Non-Basmati varieties
KS 282	Non-basmati	-	Sindh	- Long grain white rice

Annex:

KEY RICE BRANDS OPERATING IN PAKISTAN

Table 12: **Key brands operating in Pakistan**

Key brand	Rice mill/company
Mughal	Garibsons Rice Mill
Falak	Matco Foods
Reem	Reem Rice Mill
Pioneer	Al-Wahab Rice Mills
Lasani	Lasani Foods
Safeena	Amir Rice Traders
Moti Dana	Al-Asad Rice Mills
Guard	Guard Rice
White Pearl	White Pearl Rice Mills
Ideal	HAS Rice Mills

Annex:

ROLE OF DIFFERENT ENTITIES IN THE RICE SUPPLY CHAIN

Table 13: Supply chain participants and their role

SN	Key players	Step involved in
1	Input Suppliers	Supply of inputs such as seeds, fertilizers, and pesticides to farmers
2	Farmers	Production of paddy and selling it to wholesalers through the following channels: - Via the Mandi (wholesale market). - Marginal farmers sell their produce to village traders or collectors who then sell it in the Mandi. - Some large farmers (typically with > 25 acres of holdings) sell paddy rice in bulk to large millers.
3	Collectors/Village Traders	Buy rice from farmers and perform the husk removal (primary processing) of rice before selling it in the rural wholesale market
4	Rural wholesalers	Purchase rice in bulk and supply to the processing industries, exporters, and mills
5	Mid-sized & small rice millers	Mid and small rice mills (milling capacity of less than 5MT/hour) obtain paddy rice from rural wholesalers/ traders and sell the milled rice in the domestic and export market through urban wholesalers and retail chains.
6	Large rice millers	Large rice millers (milling capacity greater than 20MT/hour) process milled rice and sell it in the domestic market through urban wholesalers. Some of these millers also sell processed rice under their own brand name. For instance, 'Mughal' by Garibsons. Most of these mills export rice either through wholesalers or on their own.
7	Urban wholesalers	The rice produced is transported to consumers in both the domestic and export market through urban wholesalers who either export it to other countries or act as commission agents to transport rice to retail outlets.
8	Retail outlets	At the retail level, rice is sold either in the open bags at traditional grocery stores or in modern supermarkets. Some large rice mills sell branded rice through their own stores.
9	Rice Associations and Trade Authorities	Exporter's associations such as Rice Exporters Association of Pakistan (REAP) bring growers, millers, and traders on one platform. They educate stakeholders and organize various trade fairs for rice mills/ exporters to facilitate access to buyers. Similarly, trade authorities such as the Trade Development Authority of Pakistan (TDAP) assist rice exporters by organizing trade fairs and international expos for facilitating access to potential markets.
10	Domestic Consumer	Consumers can buy rice from multiple channels such as traditional grocery stores, e-commerce websites, and retail stores of major brands in Pakistan, supermarkets, etc.
11	Importers from other nations	Importers include the government of other countries, individual consumers accessing e-commerce websites, etc. buying rice from Pakistan.

Annex:

COST MARK-UP OF RICE ACROSS THE RICE VALUE CHAIN

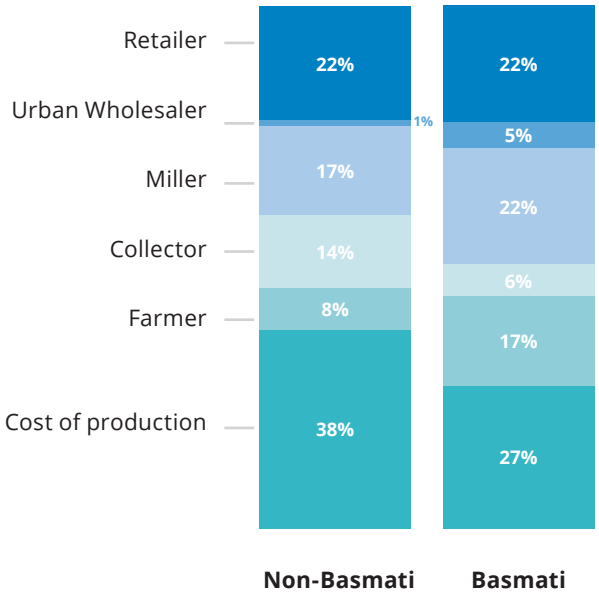
Basmati has lower yields on average, yet the farmers' cost of production for basmati (27 percent) is lower than non-basmati (38 percent). Farmers generate higher income in Basmati (17 percent of the total value) than non-basmati (8 percent) because its price is ~2.5 times higher.

Collectors have a large influence and negotiation power compared to urban wholesalers in the case of non-basmati variety as wholesalers sell this rice variety as a cheap product; hence earning profits on volume rather than value.

In the case of basmati, collectors face strong competition from millers who buy ~20 percent of volumes directly, and from urban wholesalers who sell basmati as a quality product with higher margins.

Retailers' share appears to be the same in both varieties; however, they earn a higher value in the case of basmati. Millers earn more on basmati because of its higher profit margin.

Figure 11: Cost mark-up for basmati and non-basmati variety



Annex:

TECHNOLOGIES FOR RICE FORTIFICATION

Rice can be fortified using multiple technologies, such as dusting, coating, cold extrusion, warm extrusion and hot extrusion. This report focuses on rice fortification through extrusion.

Extrusion is a fortification technique in which FRK is added to the polished rice in ratios ranging from 1:50 to 1:200. Applying the extrusion process for rice fortification can be of two types – cold extrusion and hot extrusion.

Cold Extrusion: The process, also called "shape forming", uses no additional heat except that generated during the mechanical processing of the rice dough. The product temperature during the entire processing operation remains below the melting temperature of the rice starch (30–40 °C), and hence gelatinization of the starch does not take place.

Hot Extrusion: In this process, additional heat energy is applied normally through steam heated barrel jackets and the melting temperature of starch is exceeded (80–110 °C). The dough containing micronutrient premix in the required concentration and other optional additives are pressed through the extruder tube where steam and water are added. The pasta shaped extrudate is cut into rice size pieces at the exit and the wet FRK is subsequently dried. The process results in fully or partially pre-cooked simulated rice kernels that have similar appearance to normal polished rice (25).

Annex:

ROLE OF DEVELOPMENT PARTNERS IN FORTIFICATION

Table 14: Role of Development Partners in Fortification

Authority	Role
World Food Programme (WFP)	- Supports government-led efforts to improve food and nutrition security and address malnutrition - Works with the Government of Pakistan to build capacity at national and provincial levels to develop multi-sectoral policies and strategies fully aligned with the Scaling-Up Nutrition (SUN) approach, partner on research initiatives in the areas of food security
Food Fortification Programme (FFP)	- Food Fortification Programme, a five-year fortification initiative, is funded by UK Aid from the Foreign, Commonwealth & Development Office, managed by Mott MacDonald and Nutrition International.
Global Alliance for Improved Nutrition (GAIN)	- GAIN has been working in Pakistan since 2007, with an initial focus on large-Scale Food Fortification. - Under GAIN, the SUN Business Network (SBN) is the private sector branch of the SUN Movement and aims to support businesses in growing the role they play in improving nutrition.

Annex:

EHSAAS PROGRAMME

Established under the Division of Poverty Alleviation and Social Safety in 2019, Ehsaas is about the creation of a 'welfare state' to create precision safety nets; promoting financial inclusion and access to digital services; and supporting economic empowerment of women.

Under Ehsaas, the scheme 'Ehsaas Langars' is meant to serve meals to the poorest and most vulnerable populations, especially daily wage laborers. It is a public-private partnership, in collaboration wiath Saylani Welfare International Trust (SWIT) to open 112 Langars across major metropolitan areas in Pakistan. The first Langar was opened in Islamabad on 7 October 2019, where 600-800 people were provided free meals. Since then, many Langars were opened across Punjab, KP, Sindh, Balochistan, Islamabad, and GB. Areas where Langars are being established include bus stands, industrial areas, railway stations, and places where labourers tend to congregate. The Government offers logistics support in establishing Langars and sets safety and quality standards for the meals served.

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Annex: Acronyms

AJ&K	Azad Jammu & Kashmir
BMGF	Bill & Melinda Gates Foundation
CAGR	Compound Annual Growth Rate
DFID	Department for International Development (now FCDO - Foreign, Commonwealth & Development Office)
FAO	Food and Agriculture Organization
FFP	Food Fortification Program
FRK	Fortified Rice Kernels
GAIN	Global Alliance for Improved Nutrition
HACCP	Hazard Analysis Critical Control Points
IRRI	International Rice Research Institute
KPK	Khyber Pakhtunkhwa
LSFF	Large Scale Food Fortification
MT	Metric tons
MND	Micronutrients Deficiency
NFA	National Fortification Alliance
NIFA	Nuclear Institute for Food and Agriculture
NIFSAT	National Institute of Food Science and Technology
OXFAM	Oxford Committee for Famine Relief

PACRA	Pakistan Credit Rating Agency Limited
PATH	Program for Appropriate Technology in Health
PKR	Pakistani rupee
PCSIR	Pakistan Council of Scientific and Industrial Research
PSQCA	Pakistan Standards and Quality Control Authority
PTV	Pakistan Television Corporation
REAP	Rice Exporters Association of Pakistan
SAFANSI	South Asia Food and Nutrition Security Initiative
SBN	SUN Business Network
SUN	Scaling Up Nutrition
SWIT	Saylani Welfare International Trust
TDAP	Trade Development Authority of Pakistan
USDA	U.S. Department of Agriculture
VAD	Vitamin-A deficiency
WFP	World Food Programme
WHO	World Health Organization
WRA	Women of reproductive age

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World Food Programme
Regional Bureau for the Asia Pacific