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Understanding the Rice Value Chain in Indonesia:

Defining the Way Forward for Rice Fortification

December 2022



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Contact

WFP.Bangkok@wfp.org

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Executive Summary

Indonesia, with a population of 270 million (2020), is one of the largest economies in Southeast Asia and grapples with the persistent problem of micronutrient deficiencies (MNDs). Rice is the most widely consumed staple and is increasingly seen as an important fortification vehicle. The country is self-sufficient in rice production. The per capita consumption of rice is 128 kg per year. Given that almost the entire rice produced is consumed in the domestic market, fortification efforts can have a substantial impact.

To facilitate local production and improve the nutritional health of the population, the Government is putting immense efforts into the scale-up of rice, as elaborated below:

1. The rice fortification programme was initiated in Indonesia in 2009 by the Government of Indonesia (GOI) under its social safety net, RASKIN. Later under its rice fortification initiative, the GOI, along with the National Logistics Agency (BULOG), had distributed fortified rice among the beneficiaries of the staple food programme SEMBAKO in Kupang district.
2. In 2021, the GOI also invested in the promotion of bio-fortified rice with zinc. These NutriZinc seeds were harvested and redistributed to farmers who were part of government seed subsidy programmes.

Currently, the supply chain ecosystem for rice fortification is not developed. There are no food safety standards for fortified rice and fortified rice kernels (FRK) in Indonesia. Currently, rice is voluntarily fortified by a few government

enterprises. A few private players have forayed into fortified rice indicating that private millers do view it as an opportunity.

In order to understand the potential of rice fortification in improving the nutritional health of the population of Indonesia, detailed discussions were held with important stakeholders in the rice value chain. 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 is as follows:

1. The prices of fortified rice should be kept low as consumers are price sensitive.
2. It is imperative to develop national standards for fortified rice and FRK to ensure consistency in the products available in the market.
3. The Government must procure fortified rice from millers for distribution in their feeding programmes. Millers must be assured that demand for fortified rice will be sustained through policy reform measures.
4. There is a necessity to conduct awareness campaigns to create/improve consumer acceptance for fortified rice.
5. A technical document could be created by the World Food Programme (WFP) to understand the feasibility and financial viability of investing in fortified rice production.

The discussion with all the millers tended to centre on understanding two key variables: the expected demand for fortified rice and the profits. A summary of key inputs received during these discussions is as follows:

1. While a few of the millers were aware of the machinery used and the production techniques, most of the millers remained largely unaware.
2. The registration and licensing process for fortified rice is not clear.
3. The millers perceived low return on investment in fortified rice production due to lack of awareness

of costs and uncertain consumer demand. Lack of demand in the market makes it difficult to penetrate the market and make huge investments in machinery.

4. Millers suggested that the Government must create sufficient initial demand for fortified rice via their social protection programmes.

The table below provides a summary of the challenges in rice fortification scale-up and their corresponding recommendations:

SN	Barriers	Recommendations
		Advocacy with government decision-makers
1	Lack of clarity about the roles of government ministries involved in rice fortification	Conduct meetings with the government entities to put rice fortification as a priority in the budgetary allocation process and to develop a cross-ministerial Technical Working Group for rice fortification with well-defined roles and responsibilities.
		Strengthen the regulatory environment
2	Lack of standards for fortified rice and FRK	Advocate with the National Standardization Agency (BSN) to develop standards for fortified rice and FRK followed by the implementation of a quality assurance and quality control (QA/QC) system for rice fortification by providing technical assistance to the Food Safety Competent Authority (OKKP) and provincial food authorities.
		Greater clarity around the licensing and registration process
3	Lack of awareness among millers about the registration and licensing process for fortified rice	Given that most millers are unaware of the registration and licensing process, efforts to improve their knowledge are indispensable. OKKP must better explain/communicate these regulations and processes to the millers through the local Ministry of Agriculture at the municipal level and Indonesian Rice Millers and Traders Association (Perpadi).
		Advocacy with millers
4	Limited knowledge among millers about the production techniques, costs involved, and suppliers of raw materials and machinery required for rice fortification	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.
		Business model return on investment
5	Perceived low return on investment in fortified rice production due to lack of awareness of costs and uncertain consumer demand	Create and disseminate a technical document for millers entailing the health benefits, the technical know-how of rice fortification processes, the costs involved and the economic returns in selling fortified rice.
		Demand creation through government programmes
6	Lack of domestic availability of FRK	To create a demand for fortified rice in the market, invite tenders from millers to procure fortified rice for government programmes. Provide technical support to interested millers for installation of blending machinery. Develop the domestic production capacity for FRK in a phased manner.

7	Fragmentation of millers, thereby increasing transportation costs	Reduction of transportation costs	To keep the transportation costs to a minimum, it is important to ensure that the production, storage and distribution of fortified rice take place in the same province.
8	Lack of awareness about the benefits of consuming fortified rice among consumers	Awareness creation campaigns	Campaign to generate awareness about the benefits of consuming fortified rice among the population and conduct surveys to understand their perceptions.

The development of a sustainable supply chain for fortified rice would require a clear cross-ministerial collaboration and communication strategy. Given Indonesia’s well-developed domestic rice industry, and significant progress already made in rice fortification, the country is in a good position to move to the next level of evolution in terms of rice fortification.





Introduction

Background

Southeast Asian countries are weighed down by the triple burden of malnutrition: high stunting and wasting rates, growing incidence of obesity and widespread micronutrient deficiencies (MNDs) (WFP 2021). One of the largest economies in Southeast Asia, Indonesia (population of 270 million in 2020 (World Bank n.d.)), is burdened with significantly high rates of anaemia and stunting in the most vulnerable groups of the population.

In 2018, 48.9 percent of pregnant women and 84.6 percent of pregnant women/adolescents (15–24 years) were anaemic. Based on the World Health Organization's (WHO) cut-off values for public health significance, anaemia emerged as a "severe" public health problem among children and women, with over 50 percent prevalence (Global Nutrition Report: Country Nutrition Profile n.d.). The risk of preterm birth, maternal and child mortality, and infectious diseases is high in pregnant women with anaemia. Iron deficiency can affect the growth and development of the foetus during pregnancy and the infant after birth.

Iron, vitamin A and zinc deficiencies disproportionately affect women, adolescents and children. These MNDs are contributors to poor growth, cognitive impairments and increased risk of morbidity and mortality. The 2018 Basic Health Survey (RISKESDAS), conducted by the Ministry of Health, indicated that nearly 31 percent of children (6–59 months) were stunted (Basic Health Survey 2018).

The food consumption patterns of the Indonesian population indicate that the food intake of both poor

and non-poor households predominantly comprises carbohydrates, with insufficient consumption of sources of protein, whole grains, fruits and vegetables. Additionally, there has been an increasing trend in packaged and processed food consumption in both urban and rural areas, worsening the nutrient intake of the population (Sirojuddin Arif 2020). All these factors have ensured the continued prevalence of MNDs in the population.

Food diversification and intake of a balanced diet are the best ways to tackle MNDs. However, this is impeded by existing dietary patterns, inadequate calorie intake and lack of affordability. As a result, in order to reduce MNDs, it becomes essential to think of large-scale nutrition intervention programmes. The Government of Indonesia (GOI) is implementing multiple strategies such as supplementation, fortification and diet diversification among its different population groups. Among the basket of interventions being implemented to address MNDs, Large Scale Food Fortification (LSFF) initiatives can play a crucial role in addressing MNDs in the population by reducing the cost of healthy diets and complementing the gaps in supplementation programmes (WFP 2021). The GOI's current fortification initiatives focus on salt iodization, wheat flour fortification and edible oil fortification. Indonesia has approved mandatory legislation on all these food items (Philip Randall 2014). Rice fortification is in the early stages of scale-up. The GOI had distributed fortified rice in one district under its staple food programme, SEMBAKO (Brief of SEMBAKO 2020). A few private millers and government-owned

enterprises are voluntarily producing fortified rice in the country. However, national standards for rice fortification are yet to be developed.

Similar to other Southeast Asian countries, the production and consumption of rice is significantly high in Indonesia. Rice is the most widely consumed staple and is increasingly seen as an important fortification vehicle. The rice consumption per capita is 128 kg per year (Meylinah 2021). The country produces a sizeable amount of rice with a total production of 35.5 million metric tons (Mmt) in 2021 (Meylinah 2021). The country is self-sufficient in rice production. However, the private sector tends to import special rice varieties that are not available locally.

To understand the current status of rice fortification, WFP conducted a landscape analysis study in 2021 to identify the challenges and the opportunities in scaling up rice fortification in the country. Indonesia is currently in the phase of laying down national standards for fortified rice and fortified rice kernels (FRK). The GOI is trying to efficiently scale up the distribution of fortified rice through its existing social safety net programmes. There is a need to generate greater awareness on rice fortification as a strategy to address MNDs among the Government and private sector stakeholders.

For more than a decade, the United Nations World Food Programme (WFP) has been working with governments, the private sector and technical partners across countries in Asia and 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 an effective manner that also enables scale-up, WFP needs to ensure that fortified rice is widely available and accessible through two main platforms, namely the social safety net programmes and the commercial retail channels. Through these two platforms WFP can reach a wider segment of the population within Indonesia that are nutritionally vulnerable and in urgent need of micronutrient interventions. To effectively introduce fortified rice through social safety net programmes and commercial retail channels, it is important to gain deeper insight into the rice milling landscape along with key stakeholders. The analysis of the rice value chain will help identify the key opportunities and challenges in engaging the stakeholders and will help identify the entry points and opportunities for initiating rice fortification and making fortified rice available at scale through social safety net programmes and commercial retail channels in a sustainable manner.

Objectives of the Study

The study 'Understanding the Rice Value Chain in Indonesia: 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 the key players across the rice value chain in Indonesia.
2. Identify and analyse the demand and supply challenges across the rice value chain in Indonesia and identify opportunities for introducing fortified rice through commercial channels and government social safety nets.

Specific objectives - Landscape analysis

- Identify, map and document the key players across the rice value chain that include the rice milling industry; blending and extrusion equipment manufacturers; 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 Indonesia.
- Map all the rice value chain players and identify the rice value chain players that follow good manufacturing practices and are adhering to national/international food safety and quality standards for processed foods in those countries.
- Study and illustrate the rice value chain and identify value chain engagement points/opportunities for potential rice fortification programme support.
- Identify and document the demand and supply challenges faced by the 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 for introduction and scale-up of fortified rice through commercial channels and government social safety nets.
- Map the supply chain and trading of rice (including cost mark-ups along the chain).
- 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 that can be engaged to introduce fortified rice through commercial channels and government social safety nets.
- Based on the consultation and analysis of the private sector players, identify selected private sector players in each country for potential partnership with WFP to introduce and scale up fortified rice through commercial channels and government social safety nets.
- Identify key factors that could enable and contribute to the scaling-up of fortified rice through commercial markets and government social safety nets.

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

The next section talks about the research methodology used for this study.

Research Methodology

This study followed a structured research process, as 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 Indonesia's population
 - Past experience in food fortification
 - The rice industry in Indonesia; size, exports, domestic consumption, etc.
 - The supply chain for rice in Indonesia
 - Key stakeholders in the supply chain, from a fortification perspective
 - Status of rice fortification initiatives and challenges to adoption and scale-up

- Sources used include the following:
 - Available literature comprising research papers, development partners' reports, and project reports from previous pilots such as those from Global Alliance for Improved Nutrition (GAIN), WFP, and the Programme for Appropriate Technology in Health (PATH).
 - Reports and statistics such as those from the Government of Indonesia, United States Department of Agriculture (USDA) and the Food and Agriculture Organization of the United Nations (FAO).
 - A complete list of publications is provided in the References section.
- The initial secondary research helped to identify information gaps and key stakeholders that could provide valuable inputs.
- For each type of respondent, whether industry stakeholders or government/regulatory bodies, an appropriate 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 discussion points/focus information relevant to each of them.

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 to identify the important stakeholders in the Government as well as the rice industry in Indonesia.
 - The websites of multiple millers were mined to find important details such as their milling capacity and their production levels. Accordingly, the millers were classified based on their production capacities.
 - After the development of a list of relevant stakeholders, the names of the relevant people in these organizations were found through additional desk research.
 - Then, appointments were made with these important stakeholders and detailed discussions were held. To obtain a diversity of opinions, stakeholders from the Government as well as the private sector were contacted. This ensured equitable representation of views.

- Additionally, a few experts were referred by respondents of the initial interviews. Accordingly, these people were also contacted.
 - Some of the stakeholders were contacted a second time to get more clarity on some of the points discussed.
 - The WFP team is gratefully acknowledged for facilitating interviews with key decision makers in government entities and regulatory bodies.
- The discussions helped to:
- » Identify and analyse the gaps in understanding of the industry, ecosystem, and level of fragmentation existing in the industry;
 - » Get on-the-ground inputs from stakeholders on barriers to large-scale rice fortifications;
 - » 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 below.

Type of entity	Name of entities	Designation
Large rice millers and exporters	PT Belitang Panen Raya	Owner & Director, Operations
	PT Wilmar Padi Indonesia	Deputy Head, Rice Business Unit
	PT Food Station	Business Development Manager
	PT Daya Makmur Mandiri	Manager
	PT Prima Andalan Djaja Internusa	CEO
FRK suppliers	Royal DSM N.V, (DSM) Indonesia	Account Manager
	DSM Asia-Pacific	Business Development: Rice Fortification
Rice associations	Perpadi (Indonesian Rice Millers and Traders Association)	Chairman
Government entities	Kementerian PPN/Bappenas (National Development Planning Agency)	Policy Planner, Health and Nutrition Community
	BULOG (National Logistics Agency)	Business Director
	OKKP (Food Safety Competent Authority)	Coordinator of Fresh Food Safety Substance Group, OKKP Secretariat

4. Analysis and Report Writing

- All the above inputs were collated, analysed and distilled to create this report.
- In some cases, clarification of certain points was required from the respondents.
- The analysis and report were discussed with the WFP team (including in Indonesia) and their inputs and feedback were incorporated in subsequent versions.

5. Exclusions in the Report

- Detailed cost analysis of producing fortified rice.
- Prospective funding partners to provide aid to the GOI or the private sector.

Report Structure

The report is divided into eight chapters, each focused on a particular aspect, as discussed below:

Chapter	Title	Details
1	Nutrition Profile of Indonesia	The first chapter focuses on the diet composition, the current undernourishment levels and the MNDs in the population of Indonesia. <i>Helps understand the scale of the problem, and the need and urgency for improving nutrition inputs in Indonesia.</i>
2	Food Fortification in Indonesia	This chapter gives a background of the existing food fortification programmes in Indonesia. The chapter also assesses past experience in fortification, difficulties faced while scaling up, and success stories of food fortification (if any). <i>Provides an understanding of institutional experience, and learnings from earlier initiatives with other food items.</i>
3	Rice Overview in Indonesia	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.). <i>This data improves our understanding of the size and scale of the rice ecosystem in Indonesia, and its implications for rice fortification scale-up.</i>
4	Rice Supply Chain	This section details the existing rice supply chain in the country. <i>Provides an understanding of institutional experience, and lessons learnt from earlier initiatives with other food items.</i>
5	Fortified Rice Supply Chain	This section details the current fortified rice supply chain in the country. <i>Provides an understanding of the key stakeholders who are currently involved in rice fortification initiatives.</i>
6	Discussion and Analyses	This chapter focuses on the challenges faced by various stakeholders, when scaling up rice fortification efforts. <i>Helps to understand which government entities, regulatory bodies, and non-government and private players, are important to scale up rice fortification in Indonesia.</i>
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. <i>It provides a detailed roadmap for the successful implementation of scaling up rice fortification in a measured and comprehensive manner. There is also a concluding segment which presents a possible roadmap to successfully commercialise rice fortification.</i>
8	Annexes	Supplementary information and relevant statistics <i>This section provides essential information to support the analyses throughout the report, including:</i> <ul style="list-style-type: none"> - SEMBAKO Programme - Rice Fortification Initiatives in Indonesia - Key Seasons for Rice Plantation and Harvest - Classification of Rice Mills - Varieties of Rice Produced - Key Rice Brands Operating in Indonesia - Cost Mark-up of Rice across the Rice Value Chain - Social Function of BULOG - BULOG Care Nutrition - PT Food Station - Fortified Rice Regulation and Licensing Process - Technologies for Rice Fortification

1. Nutrition Profile of Indonesia



Rice is the main staple of the Indonesian population. Other staples are corn, sago and noodles. The rise in population and a growing middle class, coupled with a high rate of urbanization have led to changes in the food consumption patterns in Indonesia. Today many better-informed and better-off consumers are demanding healthier and more diverse food in their diets (Sirojuddin Arif 2020).

However, between 30 percent and 50 percent of the population in the eastern provinces, Papua, West Papua, West Sulawesi, and Nusa Tenggara Timur, are still unable to afford nutritious food (Suherli 2022). In 2018, the calorie intake of around 21 million people in Indonesia (around 8 percent of the total population) was below the minimum dietary requirement. Despite recent improvements, the food consumption pattern of the Indonesian population is less than ideal, as carbohydrates dominate food intake and the consumption of sources of protein, fruits and vegetables is insufficient. The increasing trend towards processed food consumption in both urban and rural areas is worsening the nutrient intake of the population (Sirojuddin Arif 2020).

Therefore, Indonesia is burdened with micronutrient deficiencies, undernourishment, and high prevalence of anaemia and stunting. Diversifying food production is essential to support nutritional improvement towards more balanced diets in Indonesia. To understand how fortification of food items (particularly rice) can aid in meeting the dietary guidelines for better nutrition in the population of Indonesia, it is essential to understand the micronutrient deficiencies (MNDs) in the country and their effects.

1.1 Micronutrient Deficiencies

The Indonesian population faces high levels of stunting, anaemia and micronutrient malnutrition. The widespread prevalence of MNDs has resulted in the following effects in the most vulnerable groups in the population:

- According to the Basic Health Survey (2018), 48.9 percent of pregnant women were anaemic, of which 84.6 percent were in the 15–24 age group.

- 30.8 percent of children aged 0–59 months were stunted, of which 11.5 percent were severely stunted.
- During the period (2015-2019), the prevalence of undernourishment declined marginally from 9.3 percent to 9 percent (World Bank 2015-2019).

According to the Basic Health Survey (2018) in Indonesia, iron, zinc and vitamin A are the crucial MNDs among women of reproductive age (WRA) and children (Basic Health Survey 2018) (WFP 2021).

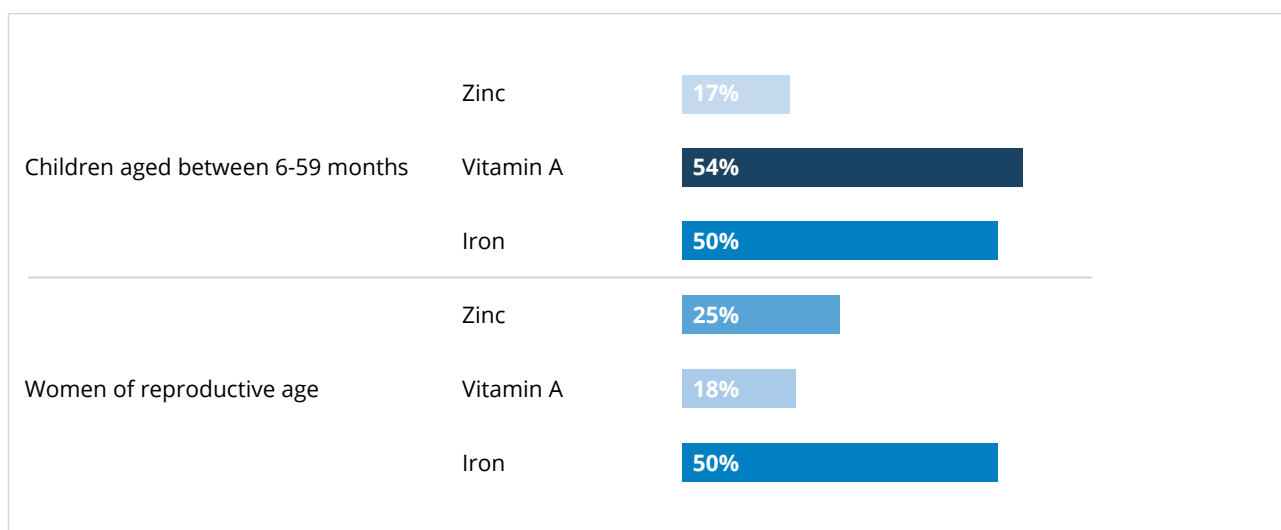
The GOI is implementing multiple strategies such as supplementation, fortification and diet diversification among its different population groups.

- To prevent anaemia, all pregnant women in Indonesia are entitled to receive iron and folic acid supplementation during pregnancy. In 2018, the GOI’s initiative of an “iron tablet administration drive” provided supplementation to 81.2 percent of pregnant women and 48.5 percent of female adolescents. This was a substantial achievement, even though it was below the target of 95 percent set in the 2018 Strategic Plan (Renstra) (M A Dijkhuizen n.d.).
- In addition to this, the Government launched the National Strategy to Accelerate Stunting Prevention, to reduce stunting to below 20 percent by 2024. The number of prioritized districts for stunting reduction was increased from 260 (2020) to 360 (2021). By 2022, it will be extended to all 514 districts/cities (M A Dijkhuizen n.d.).

- To improve the nutritional intake of infants and pregnant mothers, the Ministry of Health provides foods such as fortified biscuits under PMT (Supplementary Feeding Programme).
- As part of its fortification initiative, Indonesia has approved mandatory legislation on salt iodization, wheat flour fortification, as well as edible oil fortification.
- The GOI also invested in the promotion of bio-fortified rice with zinc. These NutriZinc seeds were harvested and redistributed to farmers who were part of government seed subsidy programmes. This initiative targeted the population of nine provinces in Indonesia with high levels of stunting (TP2AK 2020).
- Under its rice fortification initiative, the GOI, along with BULOG, distributed fortified rice among the beneficiaries of the staple food programme, SEMBAKO,¹ in Kupang district (Brief of SEMBAKO 2020).

As shown above, there have been several initiatives towards food fortification. The next chapter further elaborates on the current food fortification initiatives in Indonesia.

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



Source: National Center for Biotechnology Information

¹ [SEMBAKO Programme](#)

2. Food Fortification in Indonesia

Food fortification was introduced in Indonesia as a strategic priority for national development in 1978. Subsequently, the National Food Law (1996) was enacted, with a chapter devoted to food fortification (HarvestPlus 2021). The current fortification vehicles with mandatory legislation include salt, wheat flour and edible oil. Rice fortification is voluntarily fortified by a few millers and government enterprises in the country.

Legislation –

The Indonesian National Standardization Agency (BSN) is required to set national standards for fortification of food items. The Ministry of Industry issues mandatory regulation for the same. Table 1 provides details about fortified food items in Indonesia.

As is evident, fortification of other foods such as wheat, edible oil and salt have received greater institutional attention so far, compared to rice. Given the experience with other food items, similar regulatory support can go a long way in scaling up rice fortification efforts.

Wheat flour fortification –

Indonesia is completely dependent on wheat imports to fulfil demand for wheat flour-based foods in the country. Imported wheat is then milled by local millers.

The fortification of wheat flour by local millers was mandated in the early 2000s. Despite the law, regular wheat flour was available in the market then. In 2008, there was a rise in food prices, including wheat, during the global economic crisis. Consequently, the law for mandatory fortification was revoked to reduce the price of wheat flour. However, it was reinstated in the same year, with improvements in the implementation (HarvestPlus 2021).

Despite these setbacks, the efforts by GOI and Nutrition International (NI) in the past few years have significantly facilitated the scale-up of wheat fortification in Indonesia. NI recommended the alignment of the existing flour fortification standards with global standards, improvement in the food fortification legislation, and the development and implementation of a quality assurance and quality control (QA/QC) system in the local wheat flour industry (Soekirman 2017).

Initially, flour millers used the cheapest type of iron leading to a low impact on reducing iron-deficiency anaemia among the population. With the advocacy of NI and government ministries, the GOI mandated the use of bioavailable iron, such as ferrous fumarate, ferrous sulphate or ferric sodium EDTA (ethylenediaminetetraacetic acid), owing to their higher impact on reducing anaemia (Soekirman 2017).

Table 1: Fortification of food items in Indonesia

Food Item	Mandatory Legislation	Year	Micronutrients added
Salt	✓	1994	Iodine
Wheat flour	✓	2001	Iron, zinc, folic acid, vitamin B1 and B2
Edible oil	✓	2019	Vitamin A
Rice	×	-	Iron, folic acid, vitamin A, B1, B3, B6, B9 and B12, zinc

Source: BSN, FFI

Note: Rice is subject to voluntary fortification. The micronutrients (added in the premix) used by existing fortified rice players are based on recommendations from FRK suppliers.

At present, 87 percent of the wheat flour in the market is fortified according to the Food Fortification Initiative (FFI) (2021) (Philip Randall 2014).

Edible oil fortification –

A voluntary regulation on fortifying cooking oil with vitamin A was issued by the Ministry of Industry in 2012, which became mandatory in 2019 (BSN 2021). However, its implementation took place in 2021 at the factory level and in 2022 at the market level. Currently, the unorganized and unbranded segment contributes more than 60 percent of cooking oil consumption in Indonesia. To effectively scale up oil fortification in the country, it is imperative to develop and implement a regulatory framework for cooking oil for both organized and unorganized sectors (HarvestPlus 2021).

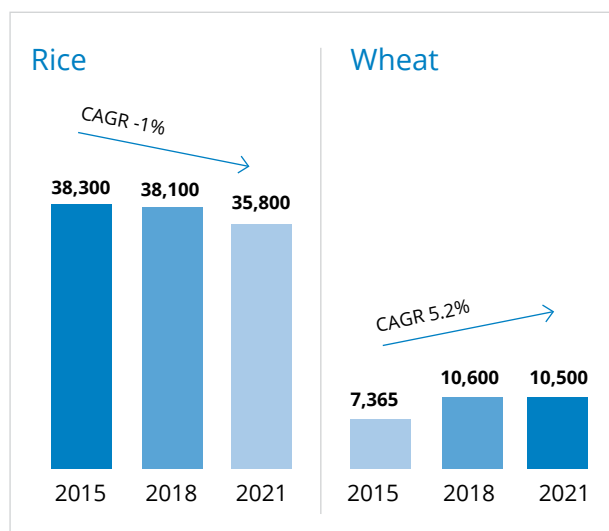
The addition of rice as a fortification vehicle along with fortification of salt, wheat flour and edible oil would considerably improve the overall micronutrient intake of the population of Indonesia. Rice alone could substantially enhance coverage given its status as the most consumed staple in Indonesia. This could go a long way in improving nutrient intake and diets of the Indonesian population.

2.1 Consumption of Key Cereals in Indonesia

Rice is the most consumed staple by Indonesian households. Over the years, a shift in preference to wheat-based food products – such as noodles, pasta and bread especially in the middle- and upper-middle-income groups – has led to a marginal decline in the consumption of rice. Nevertheless, the consumption of rice remains thrice that of wheat (Meylinah 2021).

To improve the diet of the population in the country, the National Development Planning Agency (Kementerian PPN/Bappenas), the Ministry of Health and WFP have been planning to scale up the fortification of rice. As the primary staple cereal, rice is an excellent food vehicle for fortification to improve the nutrition status across all strata of the population.

Figure 2: Consumption of key cereals in Indonesia ('000 mt)



Source: USDA

Note: CAGR stands for compound annual growth rate over a given period

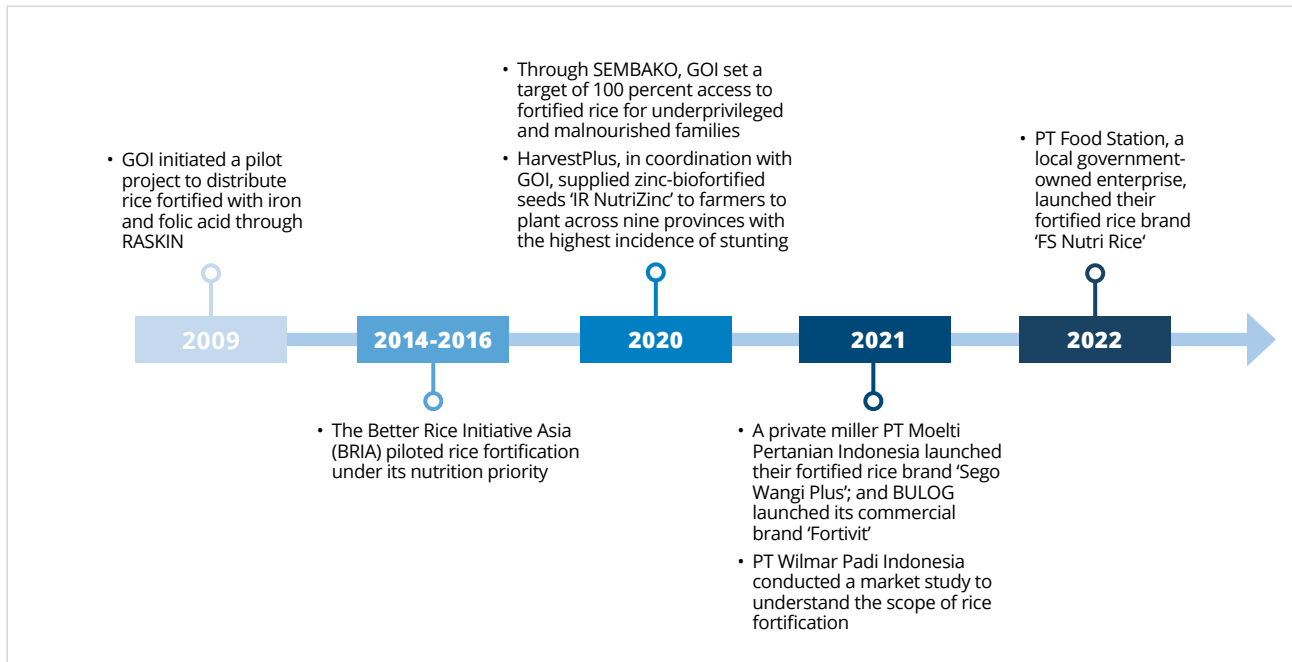
2.2 Rice Fortification Status in Indonesia

The rice fortification programme was initiated in Indonesia in 2009 by the GOI under its social safety net, RASKIN. This was followed by a pilot programme conducted by the Better Rice Initiative Asia (BRIA) (2014–2016) to understand the health benefits of consuming fortified rice and the consumer acceptability for the product (Nutrition International 2021).

In the subsequent years, rice fortification was increasingly used as an instrument to address MNDs and enhance dietary diversity (M A Dijkhuizen n.d.). The GOI, with the support of development partners, has worked to scale up the distribution of industrially fortified rice and bio-fortified rice in the country.

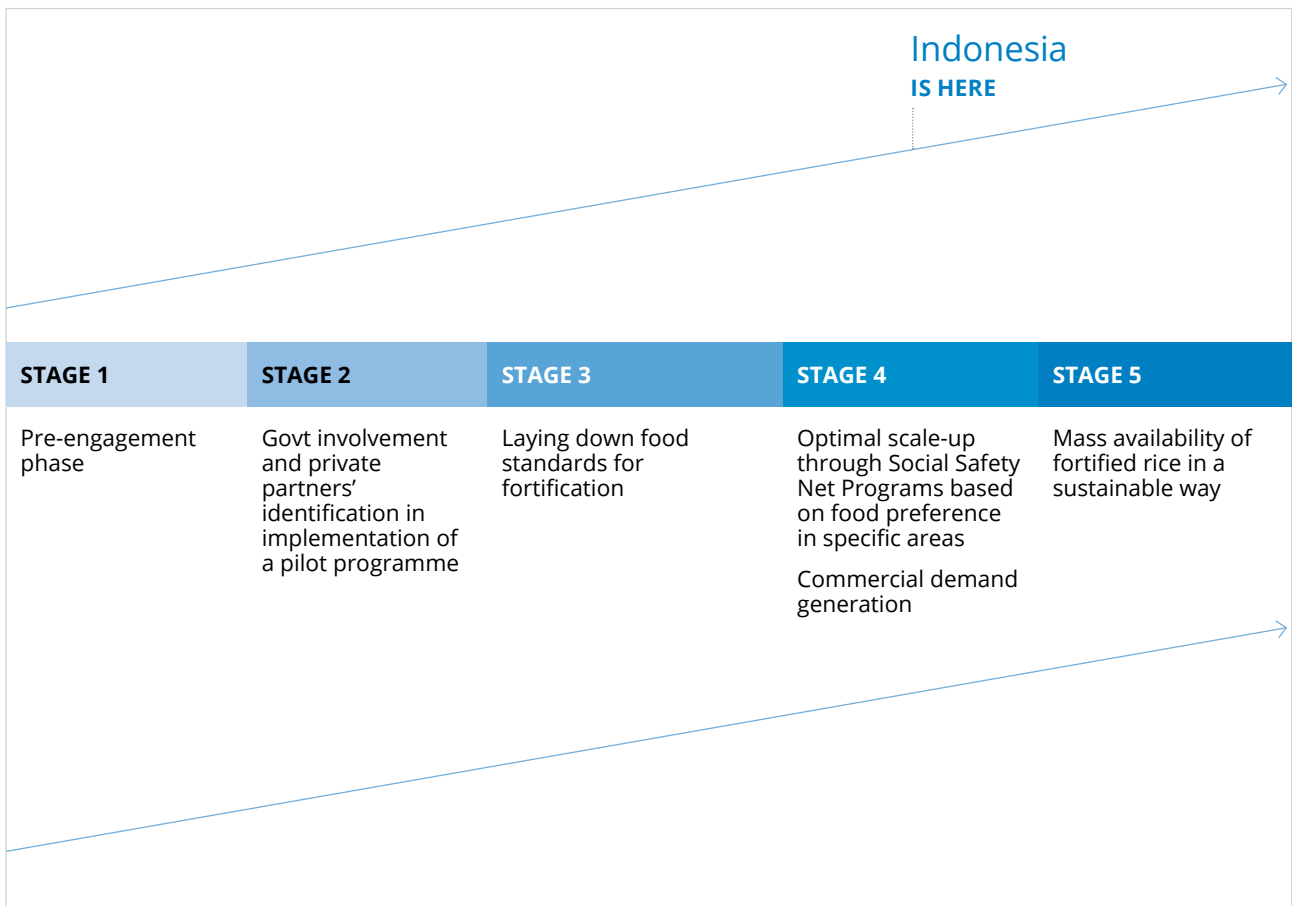
As depicted in figure 4 (Arnawa 2016), there are currently no food safety standards for fortified rice and fortified rice kernels (FRK) in Indonesia. Currently, rice is voluntarily fortified by a few government enterprises and some private millers, and nutrient inputs are based on inputs from FRK suppliers and other experts. Therefore nutrient composition varies across the products made by different rice millers.

Figure 3: Timeline for rice fortification in Indonesia



Source: BRIA report (2016), Asian Development Bank Report (2019), ValueNotes analysis

Figure 4: Indonesia in the stages of fortification scale-up



Source: ValueNotes analysis

Government distribution of fortified rice –

The GOI has been involved in the distribution of fortified rice through the following initiatives.

- The GOI, in partnership with BULOG, distributed fortified rice at a small scale through its social safety net programme, SEMBAKO, in Kupang district. Before 2020, under SEMBAKO, the beneficiaries were provided electronic food cards, distributed by the Government. Around IDR 150,000 was transferred to the beneficiary's food card account through the banking system. They could use their food cards to purchase food items at E-Warongs. After the Covid-19 pandemic, GOI increased the amount of monthly transfer to IDR 200,000. The GOI's goal is to ensure that fortified rice reaches all the SEMBAKO beneficiaries.
- The mechanism of SEMBAKO was again changed in 2021 into a cash-based incentive system. Every three months, the beneficiaries are provided with IDR 600,000. They are required to go to the local post office to collect the cash. The cash can be used at their own discretion. However, it is expected that the beneficiaries will use it to purchase food items.
- Under the Healthy Kitchen Program to Overcome Stunting (DASHAT) in January 2022, the National Population and Family Planning Board (BKKBN) and BULOG distributed fortified rice in Java among pregnant women, breastfeeding mothers, and infants, specifically those experiencing stunting (Betigeri 2021).
- Food Station Nutri rice (FS Nutri Rice, a fortified rice brand) was launched in Jakarta in January 2022 by the Governor of Jakarta. This initiative is undertaken by PT Food Station Tjipinang Jaya, the National Research and Innovation Agency (BRIN), and retailer PT Sumber Alfaria Trijaya (Alfamart) (Haryati 2022).

Private millers supplying fortified rice –

Private millers like M-Tani launched their fortified rice brand targeting the high income groups in the market. Other players like PT Wilmar Padi have also forayed into fortified rice indicating that some private millers do view it as an opportunity.²

While the GOI are on the right path and have made significant progress, much more effort is required to scale up the rice fortification programme. This will require sustained collaboration with the private sector and development partners.

To enable mass fortification of rice in Indonesia, it is crucial to understand in detail the rice industry, the rice processing capacity, roles of the various stakeholders, the supply chain and challenges faced in fortification. The next chapter talks about the size and scale of rice production, consumption and exports in Indonesia.

² [Rice Fortification Initiatives in Indonesia](#)

3. Rice Overview in Indonesia

This chapter provides details on rice production and consumption data, industry structure (rice mills) and the market segmentation of rice by distribution channel.

3.1 Rice Producing Clusters in Indonesia

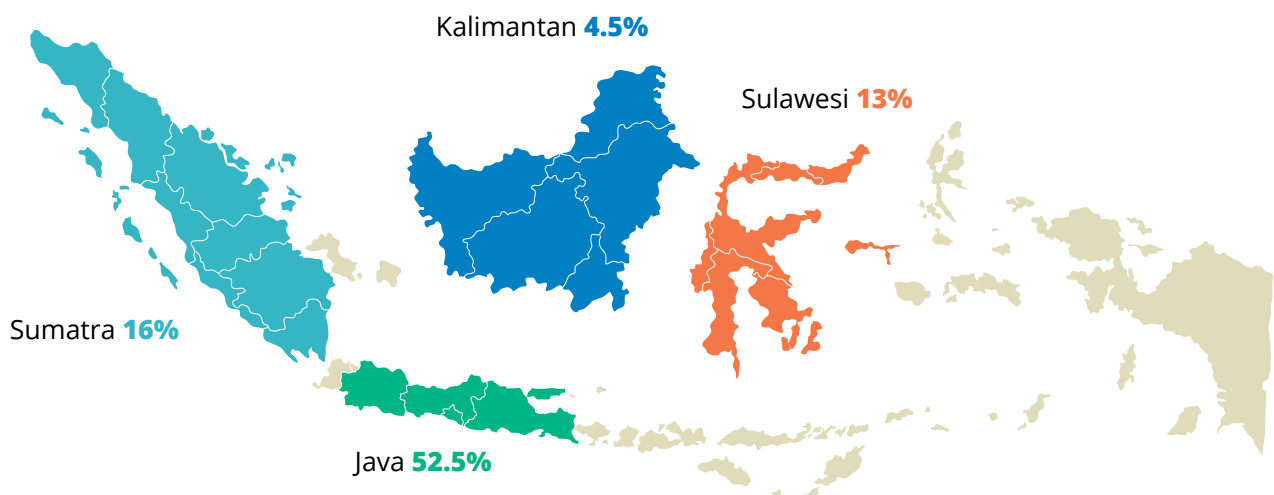
In Indonesia, the Java, Sumatra and Sulawesi regions accounted for about 81 percent of the total rice production in 2021, with Java alone contributing about 53 percent (Meylinah 2021).

The soil in Central Java is highly fertile as it is surrounded by volcanic mountains and ample water resources. Therefore, it is considered as a high-potential region for producing fortified rice. South Sumatra is also a major rice producing cluster, though its paddy production is highly dependent on rain and river water. Droughts and floods are more common in this region.³



Most (85 percent) of the rice mills in Indonesia are located in three states: Java (53 percent), Sumatra (19 percent) and Sulawesi (13 percent). The 10 largest mills in Indonesia are situated in South Sumatra, Bali and Java regions. The classification of mills is explained in the next section.

Figure 5: Rice producing clusters and share of rice production in Indonesia (2021)



Source: BPS, USDA, ValueNotes analysis

³ [Key Seasons for Rice Plantation and Harvest](#)

3.2 Classification of Rice Mills

Rice mills can be classified as large, mid- and small-scale based on their tonnage capacity per hour (see figure 6) (Agroberichten Buitenland 2021). Most mills in Indonesia are operated by private players.

Figure 6: Classification of rice mills by tonnage capacity

Number of Mills	Production Capacity	% Contribution to total production
Large 50-100	5 - 10 mt/hr	< 5%
Mid 2,000 - 2,500	1 - 5 mt/hr	10 - 15%
Small 30,000 - 35,000	< 0,5 mt/hr	80 - 85%

Source: ValueNotes analysis

While small millers in the country are predominantly involved in producing low and medium quality rice, mid- and large-scale millers produce all rice varieties.⁴ The various rice varieties produced by these millers are discussed in the subsequent section.

A few large millers have already ventured into the production of fortified rice (discussed in detail in section 5). Essentially, such large millers are well positioned to be the pioneers in rice fortification given their higher production capacity and availability of financial resources to invest.

It is imperative to understand that large millers have the capacity to invest in rice fortification; however, most of them are not willing to invest due to lack of clarity on the available market for fortified rice (elaborated in section 6.3). Consequently, millers are hesitant to invest in this initiative. At present, they expect a guaranteed demand from the Government to consider venturing into rice fortification.

To develop an efficient fortified rice supply chain, however, millers will need technical and financial support from the Government and development sector partners.



⁴ Classification of Rice Mills

3.3 Varieties of Rice Produced

Rice Production –

Based on the percentage of broken rice, rice can be classified into three varieties:

- Premium – maximum 15 percent broken grains
- Medium – maximum 25 percent broken grains
- Low – higher than 25 percent broken grains

Of the major rice varieties in Indonesia, Sentra Ramos (white, long grain variety) is the most popular. It can be used in the production of fortified rice.⁵

The rice varieties are subject to price regulation. According to the Kemendag (Ministry of Trade) regulation on Maximum Retail Prices (2017) (Ministry of Trade, Kemendag 2017), the price ceiling on medium and premium rice varieties across Indonesian provinces is as shown in table 2.

Special rice varieties such as red, black, organic and fortified rice are exempted from the pricing regulation. Hence, there is no price cap on the product, giving millers the freedom to earn better margins. Current demand for such rice varieties is driven by high-income individuals who are more health conscious; they usually buy rice from modern retail chains.

To enable mass consumption of fortified rice, it is crucial to make the product affordable to the masses. To ensure this, its price should ideally be on par with that of medium rice.



3.4 Domestic Rice Production, Imports and Exports

During 2017-2021, total paddy production in Indonesia declined from 58.5 million mt to 53.3 million mt primarily due to the supply chain challenges brought on by the pandemic and irregular monsoons. The average yield on an area of 11,800 hectares under rice production is 4.7 mt/hectare (Meylinah 2021).

Figure 7 highlights that out of a total 53.8 million mt of paddy production in 2021, 66 percent (35.5 million mt) was processed by local rice millers.

Imports and exports –

In 2020, the country imported less than 1 percent of the rice consumed. Rice exports, as well, are negligible. Over the past five years, Indonesia exported less than 1 percent of its production (Meylinah 2021).

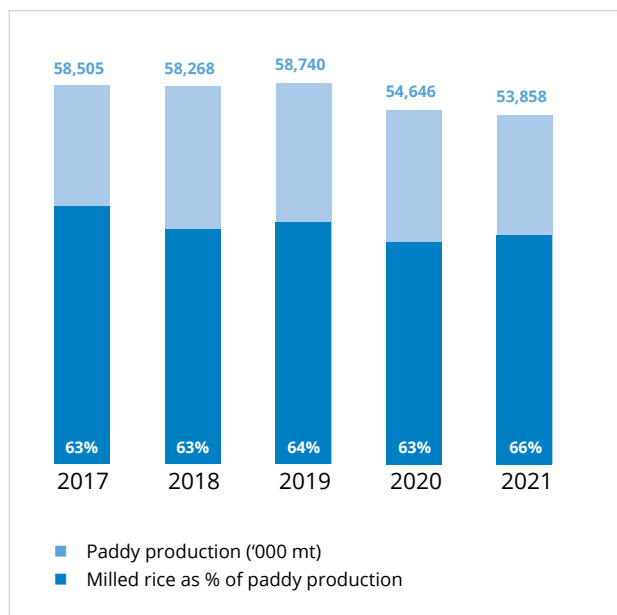
Table 2: Price ceiling on premium vs. medium rice in Indonesian provinces (2021)

SN	Province	Price ceiling	
		Medium (IDR/kg)	Premium (IDR/kg)
1	Java, Lampung, South Sumatra	9,450	12,800
2	Sumatra, except Lampung and South Sumatra	9,950	13,300
3	Bali and Nusa Tenggara Barat	9,450	12,800
4	Nusa Tenggara Timur	9,950	13,300
5	Sulawesi	9,450	12,800
6	Kalimantan	9,950	13,300
7	Maluku	10,250	13,600
8	Papua	10,250	13,600

Source: Kemendag (Ministry of Trade), Indonesia

⁵ [Varieties of Rice Produced](#)

Figure 7: Share of milled rice out of total paddy production ('000 mt) (2017-2021)



Source: USDA

Given that almost all rice produced is consumed in the domestic market, fortification efforts can have a substantial impact. In order to scale up, it will be necessary to choose the most appropriate distribution channels and programmes for supplying fortified rice to different segments of consumers. The next section provides relevant inputs, by analysing rice market segments in more detail.

3.5 Market Segmentation

The Indonesian consumer purchases rice primarily through two types of channels.

- 1. Traditional channel** – Grocery stores, rice kiosks, etc.
- 2. Modern retail channel** – Offline (minimarkets such as Alfamart and Indomart, supermarkets, etc.) and online platforms (shopee.id, etc.)

The share of both modern trade and premium rice are increasing as:

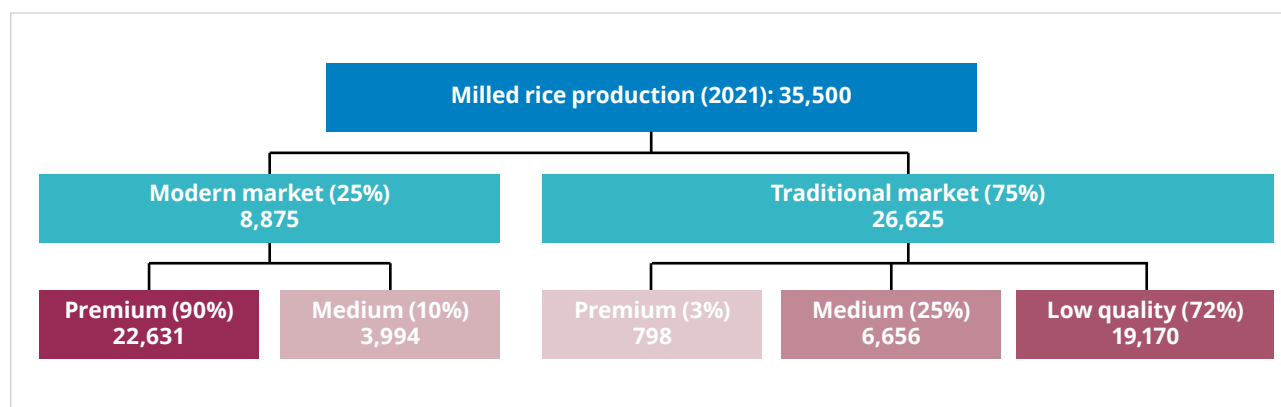
- Consumers, particularly the younger generation, prefer to purchase rice from modern retail channels – both online and supermarkets⁶
- Middle-income consumers are shifting from medium quality to premium rice, the sale of which is more prominent in modern retail chains

Figure 8 demonstrates the split between medium and premium rice produced and sold through traditional and modern retail outlets.

To understand which varieties and distribution channels would be appropriate for supplying fortified rice, it is essential to understand the prices of these varieties and the government policies affecting them.

The next section explains the supply chain of rice in the country to understand the important stakeholders and the potential of developing the fortified rice supply chain.

Figure 8: Percentage of rice sold in traditional vs. modern retail in Indonesia ('000 mt)



Source: ValueNotes analysis

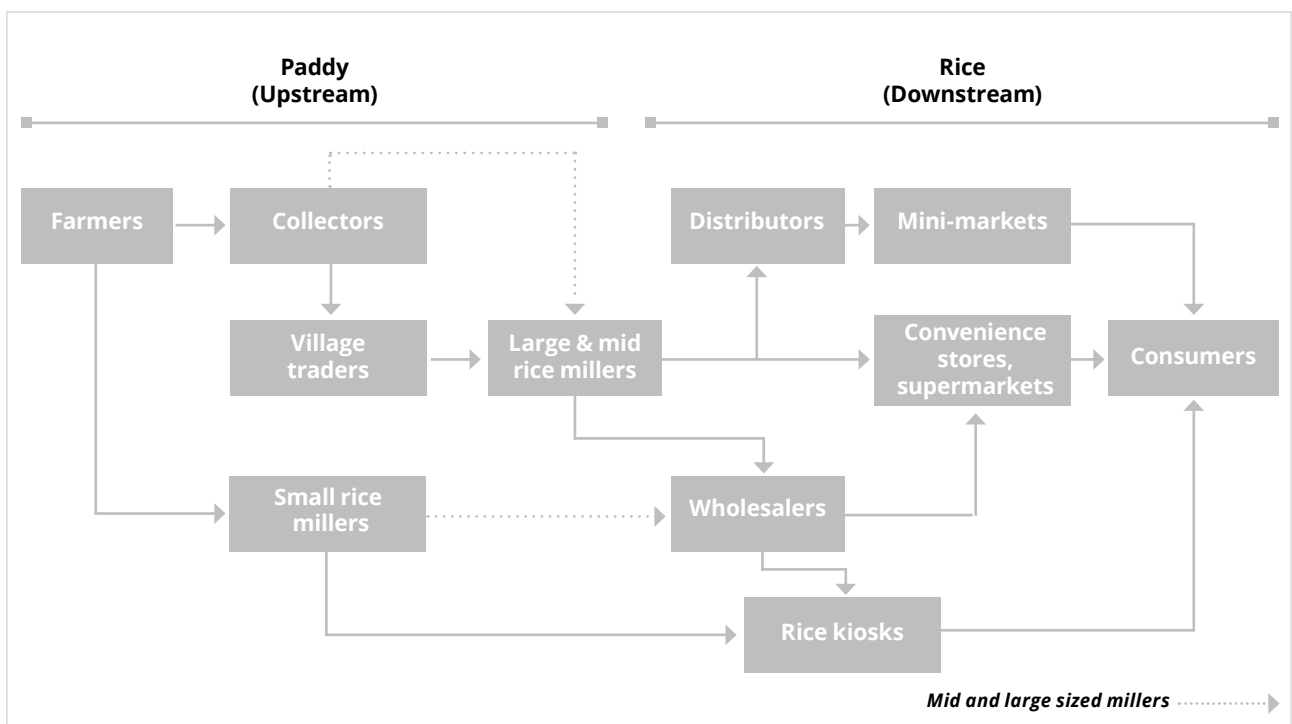
6 Key Rice Brands Operating in Indonesia

4. Rice Supply Chain

In Indonesia, there are separate supply chains for the distribution of rice by private millers and by the government network (Agroberichten Buitenland 2021).

The rice value chain for the private sector in Indonesia is explained in figure 9.

Figure 9: Private millers' rice value chain in Indonesia⁷



Source: ValueNotes analysis

Note: Supermarkets are large self-service stores that sell groceries, medication, household goods, clothing, etc., whereas mini markets are small supermarkets, usually selling food and sometimes, other goods



⁷ [Cost Mark-up of Rice across the Rice Value Chain](#)

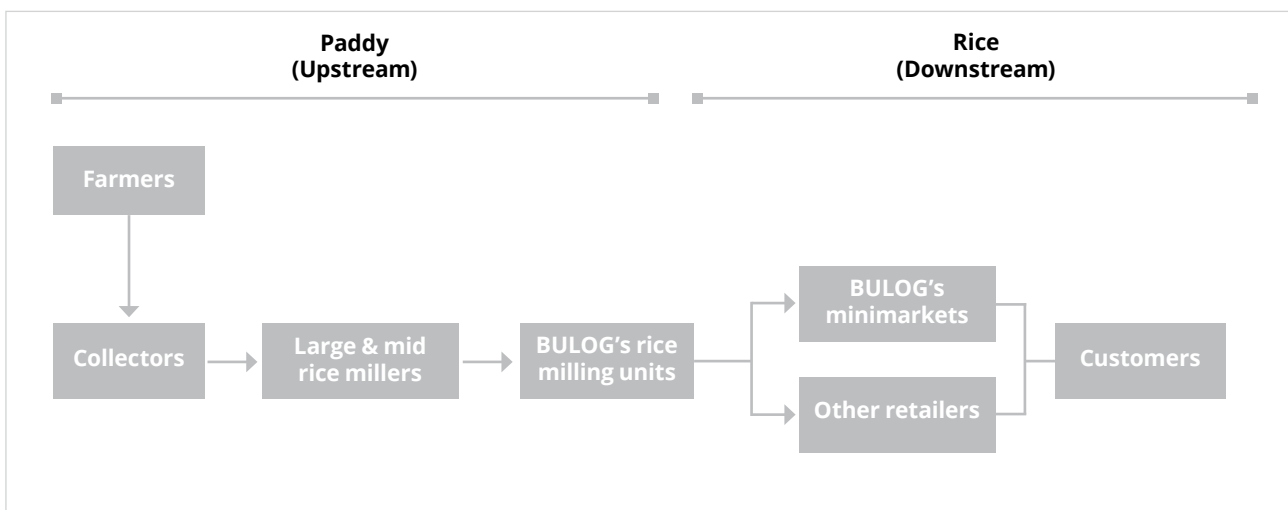
The government channel for selling rice operates through BULOG, which is the National Logistics Agency in Indonesia. They support the central and regional government policies and programmes, with a focus on production, procurement, trading and storage of rice and other food grains (R Rachmat 2019). Their key objectives are:

- Price guarantee to the farmer
- Affordable food supply to target beneficiaries under social protection schemes
- Price stability (maintaining food reserves and price stabilization)⁸

Their value chain is explained in figure 10.

In order to develop a sustainable ecosystem for rice fortification, a robust domestic supply chain for fortified rice will have to be developed. This supply chain must feed into both the value chains described above. Naturally, this will involve collaboration with a variety of important stakeholders, whose roles are discussed in detail in the following chapter.

Figure 10: Government rice value chain in Indonesia



Source: ValueNotes analysis



⁸ [Social Functions of BULOG](#)

5. Fortified Rice Supply Chain

There are multiple stakeholders involved in rice fortification in Indonesia:

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

5.1 Fortified Rice Manufacturers

In Indonesia, there are three types of market players selling fortified rice commercially:

1. State-owned enterprise – BULOG
2. Local government-owned enterprise – PT Food Station
3. Private millers – M-Tani, RNI, etc.

BULOG (state-owned enterprise/SOE)


BULOG is an SOE; however, they can also carry out business activities to optimize the utilization of their food resources (R Rachmat 2019). As a part of their operations, they supply fortified rice to consumers via two distinct channels:

- Distribution programmes in partnership with government entities such as BKKBN⁹
- Modern retail channels



BULOG launched fortified rice as a commercial product in August 2021. They received their product licence from the National Agency of Drug and Food Control (BPOM). Their FRK contains micronutrients including iron, folic acid, vitamin A, vitamin B1, vitamin B3, vitamin B6, vitamin B9, vitamin B12 and zinc.

Table 3: Fortified rice brand (BULOG)

Fortified by Perum BULOG	Price/kg (IDR)	FRK / Premix	Retail channel	Regions catered
	17,000–20,000/kg	Imports FRK from DSM Thailand	Online: <ul style="list-style-type: none"> • Tokopedia.com • Ipangandot.com • shopee.com Offline: <ul style="list-style-type: none"> • The Food Hall • Ranch Market • Gelael 	Jabodetabek, Kab. Lamongan, Kota Palangka Raya, Kab. Tabanan, Kab. Banyuwangi

⁹ BULOG Care Nutrition

BULOG's fortified rice supply chain:

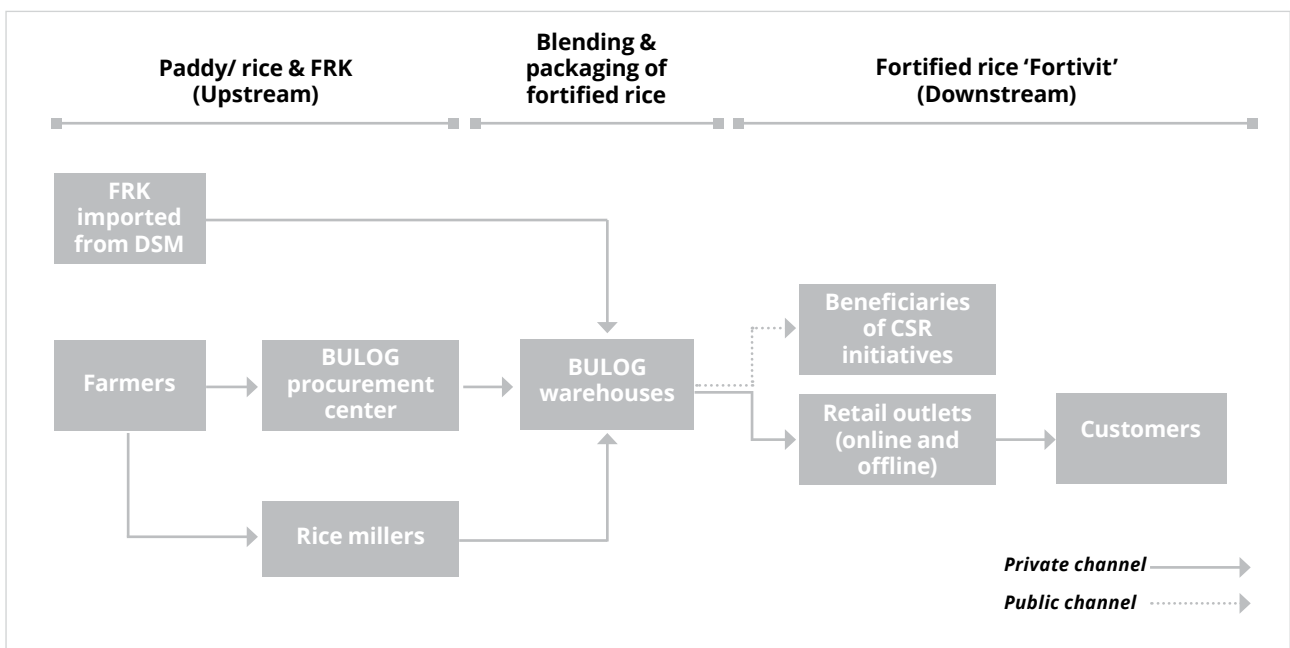
BULOG is an SOE; however, they can also carry out business activities to optimize the utilization of their food resources (R Rachmat 2019). As a part of their operations, they supply fortified rice to consumers via two distinct channels:

- BULOG's procurement centres procure paddy from farmers. In accordance with the Presidential Instruction (PI) No. 5/2015, BULOG can purchase paddy or rice from farmers only when the market price is lower than or equal to the government-announced procurement price for rice (HPP/Harga Pokok Penjualan). HPP effectively ensures a price guarantee to farmers.
- BULOG can also procure rice directly from millers. The procured rice is processed at BULOG's warehouses and blended with the FRK imported from DSM.
- BULOG's commercial brand, Fortivit (under the special rice category), is sold through modern retail channels, both online and offline.
- The fortified rice is also distributed to beneficiaries of BULOG's corporate social responsibility (CSR) initiatives such as BULOG Care Nutrition (BULOG n.d.) (BULOG 2022).

The supply chain of fortified rice sold by BULOG is described in figure 11.



Figure 11: Supply chain of fortified rice (BULOG)



Source: ValueNotes analysis

PT Food Station (local government-owned enterprise)

PT Food Station is a local government-owned enterprise (BUMD) in Jakarta.¹⁰ They are primarily required to maintain the stock of food items, particularly rice, and stabilize its price in the city.

In the commercial market, PT Food Station launched their fortified rice brand, FS Nutri Rice, at a premium price (IDR 17,000/kg) targeting the upper-middle class population in January 2022 (Haryati 2022). Their brand is licensed by OKKP. Their FRK contains micronutrients including iron, folic acid, vitamin A, vitamin B1, vitamin B3, vitamin B6, vitamin B9, vitamin B12 and zinc.

Currently, they only sell in DKI Jakarta through their existing distribution channel (small and medium enterprises (SMEs) and rice distributors) and modern retailers (Alfamart, Indomart, etc.).

The supply chain of fortified rice for PT Food Station is illustrated in figure 12.

Table 4: Fortified rice brand (PT Food Station)


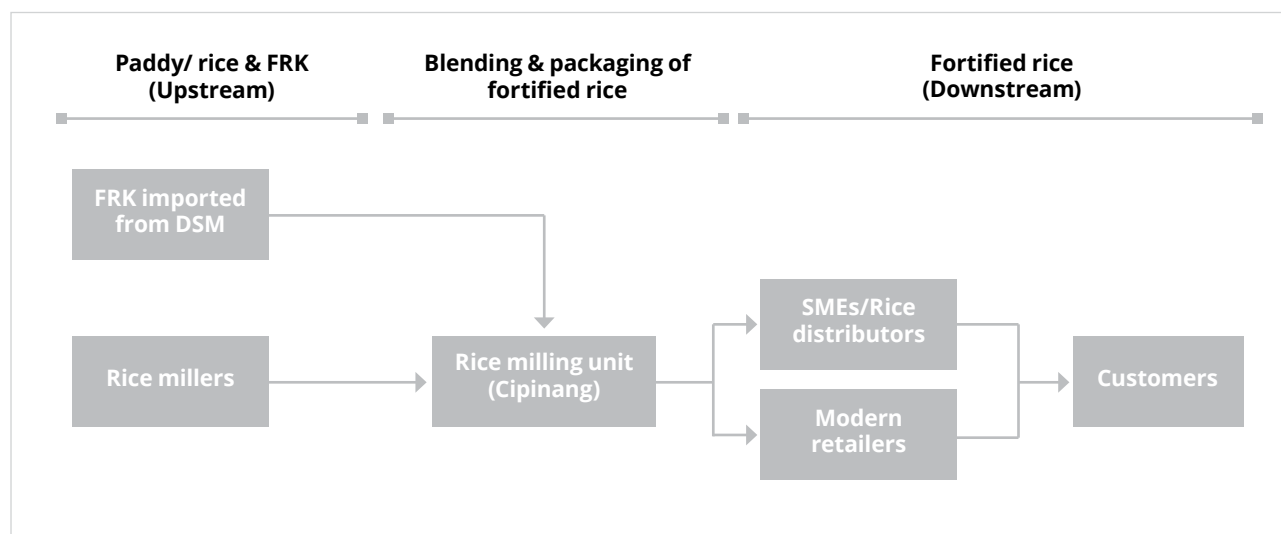
FS Nutri Rice by PT Food Station, Tjipinang Jaya	Price/kg (IDR)	FRK / Premix	Retail channel	Regions catered
	17,000/kg	Premix created by DSM, then produced into a kernel in collaboration with Agency for the Assessment and Application of Technology (BPPT) (now under BRIN)	Online: <ul style="list-style-type: none"> Food Station Official Store (Tokopedia.com) Food Station Official Shop (Shopee Mall, shopee.com) Offline: <ul style="list-style-type: none"> Alfamart minimart 	DKI Jakarta

Figure 12: Supply chain of fortified rice (PT Food Station)



Source: ValueNotes analysis

Note: Cipinang is a central rice market in Jakarta where PT Food Station blends the rice with the FRK.

¹⁰ PT Food Station

Private millers

Currently, only two private millers are involved in the production of fortified rice in Indonesia, as detailed in table 5.

Apart from these brands, PT Graha Diva Nusindo launched their fortified rice brand, Amarta, in 2019 using the method of coating instead of extrusion to fortify rice. However, they ceased their operations within a few months.

Another miller, PT Wilmar Padi Indonesia, conducted a market study and product development research for fortified rice in 2021. They wanted to understand the market for fortified rice; however, they were unwilling to invest due to the perceived difficulty in creating sufficient initial demand.



Apart from private millers, information on other key stakeholders and their roles, are elaborated in the next sections.

5.2 Government Entities

Multiple government entities are involved across functions such as production, standardization, regulation, sale and distribution of fortified rice. The scale-up of rice fortification will require efficient coordination among them and the private sector.

The roles of such entities are discussed in detail in table 6.

Table 5: Fortified rice brands in Indonesia (private millers)

Entity and brand name	Price/kg (IDR)	FRK / Premix	Retail channel	Regions catered
Sego Wangi Plus by PT Moelti Pertanian Indonesia (M-Tani) 	16,000/kg	Imported (in collaboration with PT DSM Nutritional Product Manufacturing Indonesia)	Online: <ul style="list-style-type: none"> Mtanioofficial (Tokopedia.com) Mtanioofficial (Bibli.com) 	Jabodetabek (stands for Jakarta and its satellite cities (Bogor, Depok, Tangerang, Tangerang Selatan, Bekasi))
RM Forte by PT Pertani (subsidiary of PT RNI) 	-	-	-	<ul style="list-style-type: none"> Only supplies their product if they receive bulk orders from NGOs (focusing on health), government entities, organizations, charities, etc. Does not cater to retail customers.

Note: The rice sold by these brands is fortified with iron (Fe), folic acid, vitamin A, vitamin B1, vitamin B3, vitamin B6, vitamin B9, vitamin B12 and zinc. M-Tani also adds niacinamide to its product.

Table 6: Government entities involved in scaling up rice fortification in Indonesia

Authority	Role
Kementerian PPN/ Bappenas (National Development Planning Agency)	<ul style="list-style-type: none"> - Involved in devising national policies and formulating budget plans related to nutrition programmes - Supervises the fortification programmes in Indonesia (i.e. salt, flour, cooking oil and rice) to ensure production levels - Administers external loans, grants, monitoring and evaluation for fortification programmes
BSN (National Standardization Agency)	<ul style="list-style-type: none"> - Facilitates national standardization activities for commercial items, including food products - Responsible for setting food safety standards or SNI (Indonesia National Standard) for fortified rice and FRK - Fortified rice has still not been registered by BSN and there is no existing fortification standard. The standardization process will be carried out by BSN upon request from the relevant technical ministry. In this case, the Ministry of Agriculture is responsible for the quality control of fortified rice, and the Ministry of Health is responsible for recommending the micronutrients composition.
BAPANAS (National Food Agency)	<ul style="list-style-type: none"> - Coordinates, formulates and implements policies related to food availability, prices, security, nutrition, diversification and safety. - Issues regulations and ensures quality control regarding rice that can be used for fortification - Initially, this role was performed by the Food Security Agency (BKP) under the Ministry of Agriculture. Now, this entity has been abolished (Bhwana 2022).
Ministry of Health	<ul style="list-style-type: none"> - Involved in improving and protecting public health in Indonesia - The rice fortification initiative is a concern for the Ministry of Health and its Directorate of Public Health Nutrition - Regarding the needs to fill the micronutrient gap through rice fortification, the Ministry of Health can request the standardization of fortified rice to ensure its micronutrient compositions adhere to the needs of the population
BKKBN (National Population and Family Planning Agency)	<ul style="list-style-type: none"> - Coordinator for stunting prevention programmes in Indonesia
Kemensos (Ministry of Social Affairs)	<ul style="list-style-type: none"> - Responsible for social rehabilitation, insurance, social assistance empowerment and protection of the poor - The technical ministry in charge of the SEMBAKO programme implementation - Under this ministry, the implementation of SEMBAKO is overseen by the Directorate General of Poverty Handling
Kemenko PMK (Coordinating Ministry For Human Development and Cultural Affairs)	<ul style="list-style-type: none"> - Responsible for inter-ministerial coordination, synchronization and oversight of the regulations related to implementing SEMBAKO
OKKP (Food Safety Competent Authority)	<ul style="list-style-type: none"> - OKKP is a unit of the local Ministry of Agriculture in municipal governments. They supervise fresh food items in the market. - Food safety supervision by OKKP is regulated by two laws – the National Food Law and Decree 23 of regional governments (i.e. OKKP's function is conducted by municipal governments). Under the Food Law, OKKP's supervision task covers two main areas: - Pre-market supervision (carried out before the product is distributed in the market) - Post-market supervision (carried out after the product is circulated in the market to ensure that the product is safe for consumers).¹¹
BPPT (Agency for the Assessment and Application of Technology)	<ul style="list-style-type: none"> - BPPT is established under the guidance of the Ministry of Research and Technology - They have developed the technology to produce FRK domestically, using a twin-screw extruder
BRIN (National Agency for Research and Innovation)	<ul style="list-style-type: none"> - BRIN is the holding research agency of all government-owned research agencies - BPPT, previously an independent agency, is now under BRIN

In addition to the above-mentioned government entities, the private sector also has an essential role in developing the fortified rice supply chain in the country. The raw materials (FRK) and machinery (blending machine, extruder) suppliers, as well as rice associations, are significant stakeholders in rice fortification.

¹¹ [Fortified Rice Regulation and Licensing Process](#)

5.3 Other Stakeholders

Rice fortification through the process of extrusion requires FRK, blending machinery and extrusion machinery (if FRK is produced by the millers themselves).¹² Additionally, the role of rice associations as well as technical partners is critical in disseminating information to millers. Their roles are discussed in table 7.

Table 7: Other stakeholders in rice fortification in Indonesia

Authority	Role
FRK suppliers	<ul style="list-style-type: none"> - DSM is a key supplier of FRK to BULOG, PT Food Station and private millers. Other international suppliers of FRK are BASF, etc. - BULOG is trying to produce FRK locally in collaboration with BPPT. The premix is imported from DSM (Thailand). BULOG is testing the FRK produced by BPPT to ensure that its quality is similar to the imported product. - PT Food Station has collaborated with BPPT to procure the FRK produced by BPPT in their production process.
Blending machinery suppliers	<ul style="list-style-type: none"> - Private millers can modify their existing machinery to blend FRK with regular rice at lower costs without investing in expensive machinery - Existing fortified rice producers, such as BULOG and PT Food Station, have customized their control feeder (rice blender) to blend FRK with regular rice. The mixing of FRK with rice is done at the packaging stage.
Extrusion machinery suppliers	<ul style="list-style-type: none"> - FRK is typically produced by using extrusion machinery, which is similar to noodles or pasta making machines - As mentioned in section 5.2, BPPT is in the process of developing the technology to produce FRK domestically using a twin-screw extruder with a capacity of 200 kg/hour. They imported the extruder from China. - BULOG is willing to invest and support BPPT in expanding their production capacity of FRK in the future
Perpadi (Indonesian Rice Millers and Traders Association)	<ul style="list-style-type: none"> - Perpadi is the rice millers and traders association in Indonesia - They are the key entity in developing a communication channel between the Ministry of Agriculture and the millers - They communicate changes in government regulations, important developments and so on to the millers through meetings, gazettes, etc.
Development and technical partners	<ul style="list-style-type: none"> - WFP, PATH and other potential development/technical partners are essential in advising stakeholders in the GOI to scale up the rice fortification programme

¹² [Technologies for Rice Fortification](#)

6. Discussion and Analyses

6.1 Stakeholder Discussion - Summary of Findings

Indonesia is one of the largest rice producing countries in the world. During 2021, the total rice production was 35.5 million mt (Meylinah 2021). Almost all of the rice production is consumed locally, with a minor share of occasional imports. As the most-consumed staple in the country, rice has the potential to be an effective fortification vehicle. Currently, rice is voluntarily fortified by two government enterprises and a few private millers.

The benefits of rice fortification can reach the major rice consuming segments of the population through the GOI's social safety nets. One such programme is SEMBAKO which has already benefited 18.8 million households in Indonesia up to 2021 (Brief of SEMBAKO 2020). It is of utmost importance to include the distribution of fortified rice through this programme and reach all the vulnerable groups of the population. However, the scale-up process of the rice fortification programme will require coordinated efforts by the GOI, the private sector and development partners such as WFP.

As explained in the Introduction, detailed discussions were held with important decision makers in the Government and relevant stakeholders in the rice value chain.

Discussion with government stakeholders –

From the discussions it was evident that government stakeholders are interested in scaling up rice fortification in the country. The focus of discussion with government stakeholders was on the current social protection programmes, the presence of standards, and the need for demand generation to incentivize millers to consider investment in rice fortification. Their key suggestions included the development of a sustainable supply chain for the raw materials and machinery.

The highlights of the discussions with the government entities are provided in table 8.



Table 8: Summary of discussion with government entities

Discussion themes	Respondent	Details
Uncertainty of demand	Kementerian PPN/Bappenas, BULOG	- The uncertainty of demand for fortified rice is the major reason why millers are hesitant to invest in rice fortification.
Use of medium quality rice to produce fortified rice	Kementerian PPN/Bappenas	- The prices of fortified rice should be kept low as consumers are price sensitive.
Lack of food safety standards	BULOG	- Medium quality rice should be used to produce fortified rice. This would reduce the final price of the product; hence making it affordable to the middle- and low-income groups (currently premium rice is used).
Requirement for a technical document to support business model creation	BULOG	- There are no food safety standards for fortified rice, thus indicating absence of a regulatory environment. It is imperative to develop national standards for fortified rice and FRK to ensure consistency in the products available in the market.
Distribution of fortified rice through social protection programmes	Kementerian PPN/Bappenas, BULOG	- A technical document could be created by WFP to outline the feasibility and financial viability of investing in fortified rice production. - A well-defined business model is required to establish the financial viability in importing/locally procuring the raw materials and machinery.
Creating consumer acceptance by awareness campaigns	Kementerian PPN/Bappenas, BULOG	- The Government must procure fortified rice from millers for distribution in their feeding programmes.
WFP support required to conduct an efficacy study	Kementerian PPN/Bappenas, BULOG	- Educating customers and creating acceptance for fortified rice among consumers would be the most challenging part. - The emphasis was on Government involvement (particularly Ministry of Health, Ministry of Social Affairs and BKKBN) in creating awareness among the population about fortified rice and its health benefits. - There is a necessity to conduct awareness campaigns to create/improve consumer acceptance for fortified rice. - Department of Health (DOH) and nutrition bodies should publicize the benefits of consuming fortified rice among the population.
Awareness creation	Kementerian PPN/Bappenas, BULOG	- It is essential to conduct a study to show the efficacy of fortified rice in reducing the prevalence of anaemia, stunting, etc. in Indonesia. - WFP could support the Government in conducting a study about the efficacy of consuming fortified rice for fighting anaemia. This would help to scale up the rice fortification initiative in the country.

Discussion with millers –

The stakeholders in the rice value chain, particularly millers, were aware of rice fortification and its health benefits. The discussion with all the millers tended to centre on understanding two key variables: the expected demand for fortified rice and the profits. They showed hesitation to invest as they were not adequately

aware of these key business variables. They were also unaware of the production techniques involved, the costs and expected profitability, and the raw materials and machinery used.

A summary of some of the key inputs received during these discussions is provided in table 9.

Table 9: Summary of discussions with millers

Discussion themes	Details
Lack of knowledge about production techniques	- While a few of the millers were aware of the machinery used and the production techniques, most of the millers remained largely unaware.
Lack of knowledge about costs	- It is crucial to understand the various costs involved and the possible channels to procure inputs, to better understand the expected profits in rice fortification.
Uncertainty of demand	- The demand for fortified rice is not there in the market. Thus, it is difficult to penetrate the market and make huge investments in machinery.
Affordability of fortified rice	- The prices of fortified rice should be kept low as consumers are price sensitive.
Registration and licensing process	- The registration and licensing process for fortified rice is not clear.
Need for national standards	- It is imperative to develop national standards for fortified rice and FRK to ensure consistency in the products available in the market.
Distribution of fortified rice through social protection programmes	- Millers suggested that the Government must create sufficient initial demand for fortified rice via their social protection programmes. - NGOs can collaborate with fortified rice producers to distribute fortified rice.
Awareness creation	- There is a necessity for educational awareness campaigns by the Government to inform consumers about fortified rice and its health benefits. This might create demand to incentivize millers to consider investing in rice fortification. - The Ministry of Health and Ministry of Social Affairs should be the ministries involved in awareness creation. - Hospitals can be used as a medium to promote the benefits of fortified rice.
Subsidies	- The Government could offer subsidies for procuring FRK and installing blending machinery.

Discussion with other stakeholders –

Discussions were also held with a rice association and an international FRK supplier. The highlights of the discussions are provided in table 10.

The successful implementation of rice fortification requires a coordinated effort among the important

stakeholders in the fortified rice supply chain and a clear understanding of the challenges faced by them. The subsequent section uses inputs from all the earlier sections, as well as inputs from the primary research (interviews with stakeholders) to elaborate on the major challenges in scaling up rice fortification in Indonesia.

Table 10: Summary of discussion with other stakeholders

Discussion themes	Respondent	Details
Consumer preferences and creation of consumer acceptance	International FRK supplier, Perpadi	<ul style="list-style-type: none"> - Creating consumer acceptance for fortified rice might be difficult as Indonesian consumers usually do not budge from their preferred rice varieties and brands. - Educating customers and creating acceptance for fortified rice among consumers would be the most challenging part.
Government's support required in awareness creation	Perpadi, International FRK supplier	<ul style="list-style-type: none"> - The Government should publicize the benefits of consuming fortified rice among the population. - Traditional and digital media could be used to create awareness among consumers about fortified rice and its health benefits.
Role of government ministries	International FRK supplier	<ul style="list-style-type: none"> - Recommended better alignment of roles and functions of the multiple government ministries involved in rice fortification.
Regulatory environment	International FRK supplier	<ul style="list-style-type: none"> - There are no food safety standards for fortified rice, thus indicating absence of a regulatory environment.
Registration and licensing process	International FRK supplier	<ul style="list-style-type: none"> - There is a lack of clarity about the registration and licensing process for fortified rice.
Millers' hesitancy to invest	International FRK supplier	<ul style="list-style-type: none"> - The uncertainty of demand for fortified rice is the major reason why millers are hesitant to invest in rice fortification.
Subsidies	Perpadi	<ul style="list-style-type: none"> - The Government could offer subsidies to millers interested in rice fortification.
Priority to bio-fortified rice	Perpadi	<ul style="list-style-type: none"> - Suggested a greater focus on bio-fortified rice than industrially fortified rice because the latter is more expensive for the Government.
Rice fortification approach	Perpadi	<ul style="list-style-type: none"> - Voluntary rice fortification and/or distribution of fortified rice through government social assistance programmes may be appropriate in the context of Indonesia.
WFP support required	International FRK supplier	<ul style="list-style-type: none"> - WFP must coordinate with the Ministry of Social Affairs to run the fortification programme. They must test fortified rice in the market to gauge the reaction of consumers towards it.

6.2 Challenges in Scaling up Rice Fortification

Challenge 1

Lack of clarity about the roles of government ministries involved in rice fortification

Multiple ministries in the Indonesian Government have different roles in the scaling up of rice fortification as discussed in section 5.2. Due to the involvement of several government ministries with unclear roles, industry stakeholders and development partners perceive the regulatory regime to be complicated.

The development of a sustainable supply chain for fortified rice would require a clear cross-ministerial communication strategy. It must include well-defined roles and responsibilities for the involved government ministries as well as private sector players. An organizational structure would help make an impact on large-scale rice fortification and, in turn, in improving the nutritional health of the population.

Challenge 2

Lack of standards for fortified rice and FRK

Current fortified rice manufacturers follow the WFP guidelines for rice fortification. However, Indonesia does not have formal national standards yet.

The absence of a regulatory environment and well-defined standards is a significant structural impediment. Without standardization, it will be extremely difficult to ensure consistency and quality across all fortified products 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, BSN, in coordination with the Ministry of Agriculture, needs to establish and lay down the food safety standards for producing and distributing fortified rice and FRK in Indonesia.

Challenge 3

Lack of awareness among millers about the registration and licensing process for fortified rice

In the initial years of rice fortification, there was a lack of clarity about the registration process as well as which authorities were involved in issuing licences for fortified rice. This led to confusion at BULOG, which had started the production and distribution of fortified rice under the RASKIN programme. BULOG registered their product with BPOM in 2016 and later, in 2021, they registered

their commercial brand Fortivit with OKKP based on changes in the regulations.

As discussed, fortified rice must be registered with OKKP in the region in which the miller produces fortified rice.¹³ The research found that most millers are not well informed about how to register and the licensing process. This has led to lacunae in the registration and licensing process of fortified rice.

Hence, it is important to adequately disseminate information about licensing and related processes.

Challenge 4

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

Except for a few large millers, most of the millers are unaware of the technical processes involved in rice fortification. They are also not aware of the raw materials such as premixes/FRK that are required, or their likely costs. Nor do they know about the machinery (blending/extrusion) needed for rice fortification. Many are unaware that they can save their costs of investment by modifying existing machinery.

Given the limited awareness about the production process, millers lack 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 Indonesia. This will require coordinated efforts from international agencies such as WFP, donors, government entities and stakeholders in the rice industry.

Challenge 5

Perceived low return on investment in fortified rice production due to lack of awareness of costs and uncertain consumer demand

Given the limited knowledge of production processes as discussed earlier, millers are unable to assess the quantum of investment needed, and the likely returns on this. 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 significant demand and the absence of government support make them very reluctant to make investments in rice fortification. They believe that due to such high investments and

¹³ [Fortified Rice Regulation and Licensing Process](#)

low demand they would have to operate on wafer-thin margins making rice fortification an unviable business.

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

Challenge 6

Lack of domestic availability of FRK

At present, the millers producing fortified rice are importing FRK from other countries.¹⁴ The cost of importing FRK is significantly high. One government entity, BPPT, in collaboration with BULOG, has already ventured into the development of FRK locally. However, more suppliers will be needed. Thus, it is imperative to develop local capability to produce FRK. This would reduce the production costs substantially, ultimately reducing the final price of fortified rice.

Challenge 7

Fragmentation of millers, thereby increasing transportation costs

Indonesia is an island nation. Thus, the rice mills are distributed throughout the country. To keep the transportation costs to a minimum, it is expected that the production, storage and distribution of fortified rice take place in the same province. However, the scale-up of fortification would create barriers in the transportation of FRK to the widely distributed mills across the country. This would add substantially to the millers' costs.

The high transportation costs will result in an inefficient supply chain infrastructure. It is important to undertake studies to optimize the transportation costs.

Challenge 8

Lack of awareness about the benefits of consuming fortified rice among consumers

Currently, the fortified rice producers in the market do try to promote their products, though more needs to be done. BULOG promotes the health benefits of fortified rice through the BULOG Peduli Gizi programme,¹⁵ in partnership with BKKBN and local governments in respective provinces (BULOG 2022). In contrast, millers depend on social media channels, their own websites and word of mouth communication for promotion of their products.

Despite these efforts made by BULOG and a few millers, most consumers are still unaware of the health benefits of fortified rice as the scale of these initiatives is relatively small. Adding to that, as per few millers, the price for fortified rice is perceived to be 10–30 percent higher than 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 demand in the market.

The above-mentioned impediments need to be addressed by a series of interventions, coordination between different entities across the value chain, and sustained over a period of time.

6.3 Commercialization by the 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 for fortified rice.

The stakeholders require a 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 off-take of fortified rice through government-led procurement programmes is required to provide initial economies of scale to manufacturers.

Essentially, this research indicates that commercialization (by the private sector) at this stage does not seem very likely or viable. The prospects for consumer-driven market demand are also not encouraging due to the price differential between fortified and non-fortified rice. In Indonesia, recently, few rice mills have launched fortified rice brands. However, they are selling fortified rice in the special rice category and thereby only catering to the high-income families. The scale-up of these brands will therefore require significant efforts from both the Government and the private sector.

In the next chapter, recommendations to accelerate the scale-up of rice fortification are highlighted.

¹⁴ [Fortified Rice Manufacturers](#)

¹⁵ [BULOG Care Nutrition](#)

7. Recommendations for Scaling up Rice Fortification

In Indonesia, rice is voluntarily fortified by a few government enterprises and a couple of private millers. Currently, Indonesia is in between the third and fourth stage of rice fortification scale-up (as discussed in section 2.2). Today, the pressing need is to develop a regulatory environment for fortified rice and optimally scale up its distribution under the GOI's social safety nets. Appropriate advocacy could bring a change, given the Government's positive actions regarding rice fortification and desire to reduce incidence of MNDs.

The preceding sections have highlighted the challenges that need to be surmounted. Similar experiences in different countries at different stages of evolution towards large-scale rice fortification also lend themselves to optimism that a well-designed programme can succeed. Certainly, this will 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.

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 road map to successful scale-up, including commercialization as well as subsidized distribution of fortified rice under social safety nets.

Recommendation 1: Advocacy with government decision-makers

Conduct meetings with the government entities to put rice fortification as a priority in the budgetary allocation process and to develop a cross-ministerial Technical Working Group for rice fortification with well-defined roles and responsibilities

Indicative timeline: short term (advised to begin within a year)

WFP must try to persuade Kementerian PPN/Bappenas to increase budgetary provisions for rice fortification.

This could be from greater access to government funds, as well as aid from development partners. However, increased funding is a must to successfully scale up the rice fortification programme.

To ensure efficient communication between government decision makers, WFP must advocate for Kementerian PPN/Bappenas to coordinate a Technical Working Group for rice fortification (both industrial and bio-fortified rice). The group must ideally streamline the processes of the essential ministries involved. An organizational structure with clearly defined roles would ensure efficiency and clarity in the implementation of rice fortification programmes.

Added to this, the precise roles of these entities in matters related to fortified rice production, the registration and licensing process, and so on, must be communicated to the millers through the provincial departments of agriculture and Perpadu.

Recommendation 2: Strengthening the regulatory environment

Currently, rice fortification is voluntary in Indonesia. However, to enable mass availability of fortified rice in the long run, it is imperative that rice fortification is 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 that does not meet 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.

2.1 Advocate with BSN to develop standards for fortified rice and FRK

Indicative timeline: long term (however, advised to begin the process within a year)

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 for them. WFP must advocate for BSN to set standards for fortified rice, building on the international guidelines set by WFP. An SNI (Indonesian National Standard) needs to be developed for fortified rice and FRK.

The standards for fortified rice must be centred on the recommendations by the Ministry of Agriculture, Ministry of Health and BKKBN – regarding the micronutrients composition based on the status of MNDs in the population.

2.2 Provide technical assistance to the Food Safety Competent Authority (OKKP) to support the development and implementation of a QA/QC system for rice fortification

Indicative timeline: short term (advised to begin within a year, along with the development of standards)

WFP, in partnership with the regulatory authority OKKP, 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, monitoring FRK production, if FRK were to be produced locally.

OKKP must efficiently monitor and implement the QA/QC system across all Indonesian provinces.

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

Recommendation 3: Greater clarity around the licensing and registration process

Make sure millers are made aware of regulations, licensing and registration formalities and the relevant authorities managing these processes

Indicative timeline: short to medium term (ideally to be communicated after the development of standards)

Given that most millers are unaware of the registration and licensing process, efforts to improve their knowledge are indispensable. OKKP must better explain/communicate these regulations and processes to the millers through the local Ministry of Agriculture at the municipal level and Perpadai. Such efforts would significantly improve clarity about the legal and regulatory framework among the miller community. This in turn, will help to ensure the availability of standardized, quality products in the market.

Recommendation 4: Business model return on investment

Create and disseminate a technical document for millers entailing the health benefits, the technical know-how of rice fortification processes, the costs involved and the economic returns in selling fortified rice

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

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 also not aware of the technical know-how of rice fortification processes and the costs involved and economic returns in selling fortified rice. WFP could partner with the Ministry of Health, Ministry of Agriculture, BPPT (under BRIN) and DSM, to develop a technical report and share it with the millers to inform them about these aspects in detail.

This document needs to be shared with all the top millers to garner interest and to help them understand the business aspect of producing fortified rice.

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: a separate study needs to be conducted to dive deeper on this aspect
 - 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: a separate study needs to be conducted to dive deeper on this aspect
- 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

The information about these basic financial variables (cost of raw materials, investment needed for machinery and expected demand) will help the millers to understand the profitability (return on investment). This will also help to create a business plan which will be essential in securing funds for investment if they sense an opportunity.

Through the technical document, WFP can also advocate with Kementerian PPN/Bappenas to collaborate with the Kemendag (Ministry of Trade and Commerce) to establish financial support for millers to purchase machinery and raw materials required for rice fortification. Creating such documentation will go a long way in enabling appropriate advocacy efforts with stakeholders.

Recommendation 5: 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: medium term (ongoing process – once the technical document is prepared)

Apart from a few large millers, most are unaware of the health benefits of consuming fortified rice. WFP, in partnership with Perpadi, can conduct workshops and individual rice miller meetings to disseminate information about rice fortification in detail. The technical report (recommendation 4) can be leveraged to disseminate the necessary information.

These workshops/meetings can include discussions on:

- i. Health benefits of consuming fortified rice, especially in reducing the prevalence of MNDs and stunting in the population
- ii. Technical processes involved in rice fortification
- iii. Guidance about the financial viability of producing fortified rice
- iv. Success stories of rice fortification in other countries through existing case studies of WFP

WFP can also employ a technical personnel team, in collaboration with the Ministry of Agriculture, to explain the technical processes involved in rice fortification. The information must be passed on to the millers through technical workshops conducted by the departments of agriculture in different provinces/regions and Perpadi.

Details about the raw materials (FRK) and machinery (blending machinery) used in rice fortification must be explained to the millers. Information such as modification of existing machinery (control feeder) to perform the functions of blending machinery must also be conveyed to millers through these workshops. The Government must ensure that there is continuous engagement (and not just one-time meetings or workshops) with those millers to help them at all stages of production and resolve their queries, if any.

Recommendation 6: Demand creation through government programmes

The involvement of government entities is crucial to effectively scale up the rice fortification programme in Indonesia. The scale-up requires a phased approach, as discussed below:

Phase 1: Creation of institutional and/or consumer demand for fortified rice to incentivize millers to invest in rice fortification

Phase 2: Technical support for the installation of blending machinery at millers' premises

Phase 3: Development of a domestic supply chain mechanism for FRK

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

Bangladesh:

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 (WFP 2019) (GAIN Health 2021).

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 eight FRK producers in the country (WFP 2019).

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 (WFP 2019). More than 50 blending units (rice mills) are operational in Bangladesh.

India:

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 (UTs) by 2024 in a phased manner (Cabinet Committee on Economic Affairs (CCEA) 2022).

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 then would be further expanded to include distribution of fortified rice among 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 (Food Odisha 2021) (Jharkhand government 2021) (Mariya Paliwala 2021).

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 (FSSAI 2020), which increased to 157 FRK suppliers across multiple states by April 2022 (FSSAI 2022).

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

Thus, the following recommendations are made for the scale-up of production and supply of fortified rice in Indonesia.

6.1 To create a demand for fortified rice in the market, invite tenders from millers to procure fortified rice for government programmes

Indicative timeline: medium term (ideally should start after the approval of the budget)

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.

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 use in social assistance programmes and emergency responses, as well as in supplementing existing nutrition-related initiatives for the poorer sections of the population. Commitments from the Government to purchase fortified rice in bulk, ideally at subsidized rates, would go a long way in generating initial demand and incentivizing the millers to make the required initial investment. This bulk demand would enable millers to plan for higher capacities, which would provide economies of scale and reduce the costs of fortification.

One such government programme in Indonesia is the SEMBAKO programme, which operates as a cash-based incentive system. The beneficiaries of this programme can use the amount provided to them for purchasing commodities at their own discretion.¹⁶ As of 2021, 18.8 million households (7 percent of the total population) have benefited from this programme. The distribution of fortified rice under this programme would be a significant step to initiate the demand for fortified rice.

The GOI can bring in a policy that only fortified rice is provided to the customers through this programme. To meet the demand, municipal governments can start procuring fortified rice from fortified rice producers by inviting tenders from private millers and/or SOEs such as BULOG, and BUMDs such as PT Food Station.

6.2 Provide technical support to interested millers for installation of blending machinery

Indicative timeline: medium (after awarding tenders to interested millers)

WFP can also help create a support team, in collaboration with the Ministry of Agriculture, to provide

technical support to the millers that have shown interest in rice fortification. The technical workshops could be conducted by the WFP team, in partnership with departments of agriculture in different provinces/regions and Perpadu.

Details about the raw materials (FRK) and machinery (blending machinery) used in rice fortification and the production technique must be explained to the millers. Information such as modification of existing machinery (control feeder) to perform the functions of blending machinery must be conveyed to millers through these workshops. Initially, FRK will have to be imported from other countries by these millers.

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

6.3 Develop the domestic production capacity for FRK in a phased manner

Indicative timeline: long term (after advocacy with millers)

Initially, the large millers could be partners for the initial scale-up of rice fortification. This will help establish the model and create an initial supply chain – as well as providing learnings for further capacity expansion. Thereafter, the programme could be expanded to include medium- and small-scale millers, across locations. Given the geographic challenges and wide dispersion of milling capacity in Indonesia, a hub and spoke model might be suitable – with hubs around major consuming centres (towns and cities), and selected smaller millers to be able to cover as much of the population as possible.

As the demand for fortified rice increases, the demand for FRK will also increase. To keep the production costs for fortified rice to a minimum, it is essential to ensure that FRK is locally manufactured in the country. One government entity, BPPT, in collaboration with BULOG, has already ventured into the development of FRK locally. However, more suppliers will be needed.

The development of the supply chain for FRK can happen in three stages:

1. FRK could be initially imported by large millers until the supply chain is developed.
2. As more millers start fortifying rice, local production of FRK could be initiated in specific regions (hubs) to cater to the demand for those millers.

¹⁶ [SEMBAKO Programme](#)

- Kementerian PPN/Bappenas and BAPANAS can coordinate with BPPT to understand the feasibility of domestic production of FRK. BAPANAS can conduct a study to identify the appropriate regional hubs where FRK production must take place to keep the cost of procurement and distribution of FRK to a minimum.
 - The national food agency, BAPANAS, could invite tenders from private sector manufacturing companies. These companies will have to install extrusion machinery for the production of FRK.
3. As the demand for FRK grows, FRK production could be expanded to other regions. This would ensure greater viability, as it would bring down the logistics and transportation costs.

Recommendation 7: Awareness creation campaigns

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

Indicative timeline: long term (ongoing 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 current health campaigns conducted by BULOG and BKKBN are insufficient to generate the level of awareness needed to address the large Indonesian population. It is essential that the Ministry of Health, in collaboration with BKKBN, run campaigns for the public across media – TV, print and social – about fortified rice and its benefits.

The Ministry of Health and BKKBN can partner with state-owned broadcasters (such as TVRI) and other media channels to run advertisements about the benefits of consuming fortified rice. This would help in generating traction for fortified rice among consumers, especially those that are more health conscious and willing to pay a premium. Given their understanding of MNDs and the importance of vitamin supplements, they are likely to be more inclined to demand fortified rice owing to its nutritional benefits.

Along with television, innovative digital outreach could supplement the awareness efforts, and help reach a certain section of the population (digitally active, younger cohort) at lower cost.

Apart from government funding, aid agencies and CSR funds can substantially enhance this effort.



Conclusion:

Possible Road Map to Commercialization

As discussed in the previous section, the scale-up of rice fortification would require immense efforts from the Government along with WFP, other development partners and donor agencies. The success will depend on continuing 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, and needs several other things to fall into place first. However, based on the recommendations above (in

chapter 7), figure 13 shows a possible road map to commercialization of fortified rice.

Given Indonesia's well-developed domestic rice industry, and significant progress already made in rice fortification, the country is in a good position to move to the next level of evolution (in terms of rice fortification). Naturally, this will need effective coordination between all stakeholders coupled with continuation of the commitment already shown by the Indonesian Government. In the long run, continuing government support and rising acceptance by the public will create a sustainable ecosystem that will help significantly in reducing MNDs in Indonesia.

Figure 13: Possible road map to commercialization of fortified rice



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



Provide financial support (in the form of cheaper and/or subsidized loans from banks, funding from govt. 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 FR production and supply it to the government programmes.



As millers would have already invested, they could consider selling additional FR 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 7), along with the marketing efforts of 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 FR would become more affordable to customers and would not be only limited to the premium customers who were initially targeted.



Annex:

Sembako programme

SEMBAKO Programme

The BPNT programme was changed to SEMBAKO in 2020 (Rizka Diandra Firdaus 2021). Under SEMBAKO, the beneficiaries were provided with electronic food cards, distributed by the Government. Around IDR 200,000 was transferred to the beneficiary's food card account through the banking system. They could use their food cards to purchase food items at E-Warongs. The GOI's goal is to ensure that fortified rice reaches all the SEMBAKO beneficiaries.

The mechanism of SEMBAKO was again changed in 2021 into a cash-based incentive system. Every three months, the beneficiaries are provided with IDR 600,000. They are required to go to the local post office to collect the cash. The cash can be used at their own discretion. However, it is expected that the beneficiaries will use it to purchase food items.

Rice Fortification Initiatives in Indonesia

In Indonesia, rice fortification has been part of the Government's national strategy for more than a decade. In accordance with the National Medium Term Development Plan (RPJMN), the GOI plans to provide a combination of bio- and post-harvest fortified rice through their large social safety net system.

The rice fortification timeline in Indonesia is discussed in table 11.

Table 11: Rice fortification initiatives in Indonesia

Programme	Year	Details
RASKIN	2009	<ul style="list-style-type: none">- RASKIN was a pilot rice fortification project implemented by Kementerian PPN/ Bappenas, the Ministry of Agriculture and BULOG. The funding and technical support was provided by Asian Development Bank (ADB) (26) (27) (28)- However, ADB exited the pilot and the programme was not scaled up due to operational challenges related to the import of FRK, blending modalities and packaging along with limited allocations of fortified rice per individual
BRIA	2014–2016	<ul style="list-style-type: none">- Better Rice Initiative Asia (BRIA) conducted a pilot programme to understand consumer acceptability and efficacy of fortified rice (Nutrition International 2021)- It was financed by the German Federal Ministry for Economic Cooperation and Development (BMZ)- The study, among teenage girls, proved that regular consumption of fortified rice improved the levels of haemoglobin, ferritin and folic acid
BPNT	2017	<ul style="list-style-type: none">- The RASKIN programme was transformed into BPNT in 2017 (Rizka Diandra Firdaus 2021)- BPNT was a non-cash food assistance programme that helped its beneficiaries to purchase rice and/or eggs at a fair price using electronic cards (Rizka Diandra Firdaus 2021).- The food items were available at E-Warongs where the beneficiaries could purchase fresh and good quality products

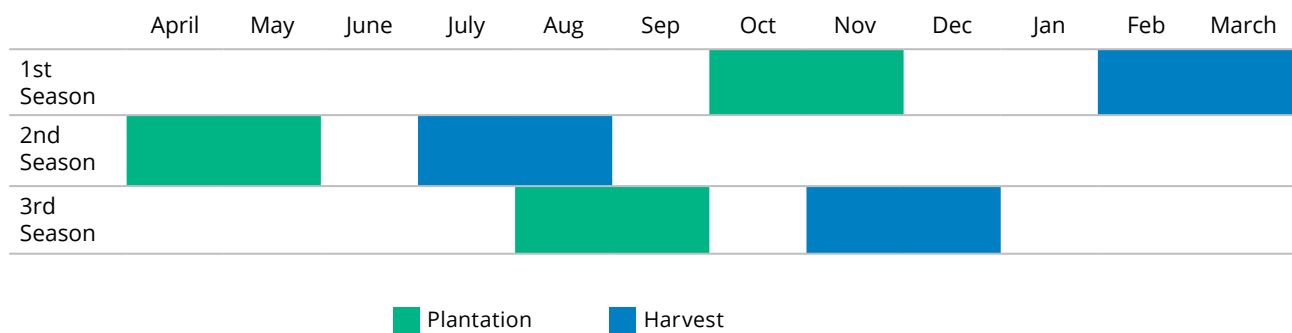
Source: TradeMap

Annex:

KEY SEASONS FOR RICE PLANTATION AND HARVEST

The tropical climate, with abundant rain and high temperatures are a boon for rice production in Indonesia. Rice is planted in three seasons in the country.

Table 12: Plantation and harvest seasons in Indonesia



Source: FAO, Database

Annex:

CLASSIFICATION OF RICE MILLS

The number of mills in Indonesia is estimated to be 182,199 (Agroberichten Buitenland 2021). However, there is some discrepancy in this number, given the country's level of annual production. Accordingly, the ideal number of mills should actually be 37,648, with a composition of 88.23 percent small-scale mills, 8.82 percent middle-scale mills and 2.95 percent large-scale mills.

According to USDA data, in 2021 milled rice production in Indonesia was 34.2 Mmt/year. However, based on the

number of mills in the country, the annual production (62.6 Mmt/year) appears to be almost two times higher than the actual production figures.

There is some discrepancy in the number of mills provided, particularly the number of small mills in the country. It is imperative that the mill numbers as well as their actual milling capacity, number of hours and number of operational days are confirmed to arrive at accurate results.

Table 13: Classification of rice mills in Indonesia

Type of mills	Milling capacity (mt/hr)	No. of mills	% of total mills	Annual production (mt/year)	% contribution to total production
Small	< 1.5 mt/hour	171,495	94%	51,448,500	82%
Mid	1.5–3 mt/hour	8,628	5%	6,212,160	10%
Large	> 3 mt/hour	2,076	1%	4,982,400	8%
Total		182,199	100%	62,643,060	100%

Source: IOP Conference Series

Annex:

VARIETIES OF RICE PRODUCED

Varieties of Rice Produced

Rice varieties in Indonesia can be classified under three categories: premium, medium and low quality.

The rice varieties are listed in table 14.

Table 14: Rice varieties in Indonesia







Variety Name	Sub-variety	Region
White Rice	Mentik, Sokan, Solok-Daro, Cianjur, IR64 (Setra Ramos), Rojolele, Ciherang, Jongkong IR 64, IR-42 Solok, IR64, Mentik Wangi Susu, Pangkuh IR64	Java, Sumatra, Sulawesi
White Indonesian Basmati Rice	Baroma	Yogyakarta
White Aromatic Rice	Pandan Wangi, Ciherang Wangi Pandan, Mentik Wangi Susu, Jalahawara	Java, Yogyakarta
Sticky Rice	Glutinous Rice, Sokan, Purwa-Inpara, Inpari 25 Opak Jaya	Java
Brown Rice	Kurniawati, Sigah	Java
Japonica Rice	Koshihi kari, Batang Lembang	Java
Black Rice	Pulut Hitam , Ambo Tanduk, Wulung, Melik, Cempo, Pari Ireng, Padi Hitam, Laka, Hare Kwa, Aen Meta	Kalimantan, Sulawesi, Java, Yogyakarta

Sources: Statistik Pertanian, www.kompasiana.com, www.journal.biotrop.org, www.factsofindonesia.com, IRRI

Annex:

KEY RICE BRANDS OPERATING IN INDONESIA

Table 15: Key rice brands operating in Indonesia

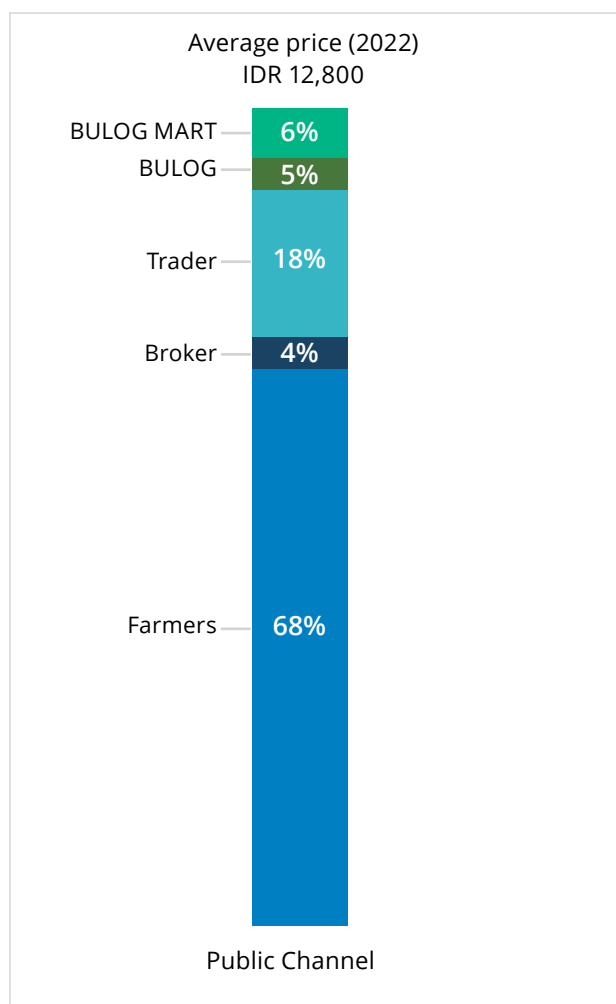
Key brand	Rice mill/Company
Rojolele 	TPS Food
Lumbung Padi Indonesia, Sania Rice 	Wilmar International
Sego Pulen Beras, Setra Wangi Putih Rice 	Food Station
Topi Koki 	PT Buyung Poetra Sembada
Sumo Rice 	Sumo Food
Beras Raja 	PT Belitang Panen Raya

Annex:

COST MARK-UP OF RICE ACROSS THE RICE VALUE CHAIN

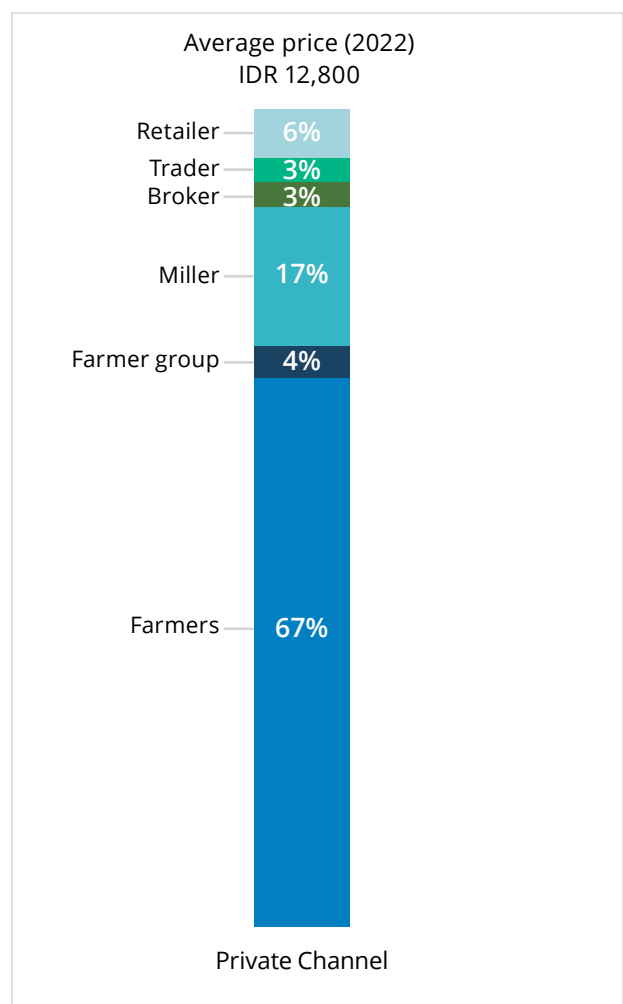
The cost mark-up of rice sold by the public channel and the private channel are depicted in figures 14 and 15, respectively. The average price of rice in 2022 is IDR 12,800 (Global Product Prices 2022)

Figure 14: Cost mark-up for the government channel



Source: ValueNotes analysis, Global Product Prices

Figure 15: Cost mark-up for the private channel



Source: ValueNotes analysis, Global Product Prices

Annex:

BULOG

Social Functions of BULOG

BULOG stores around 1–1.5 million mt of rice on behalf of the central Government. This rice can be used under the following three conditions:

1. Market operation – Also called Ketersediaan Pasokan dan Stabilisasi Harga (KPSH) (supply availability and price stability). If the price of rice in certain markets increases, the central Government will ask BULOG to supply rice to those markets (at the normal price). The price differential will be paid to BULOG by the central Government.
1. Natural disaster – In the regions which suffer from natural disasters, the head of the region is allowed to procure rice from BULOG. The governor of the province has a 200 mt quota, and the city mayor and regent have a 100 mt quota each.
1. For Eastern Indonesia – This is for military groups operating in Eastern Indonesia where the price of rice is around IDR 20,000. Therefore, BULOG supplies rice to these regions at the normal price.

BULOG Care Nutrition

BULOG creates awareness about the health benefits of fortified rice through its distribution programmes such as the BULOG Peduli Gizi programme (BULOG Care Nutrition), in collaboration with BKKBN. Their focus is to reduce stunting cases in Indonesia (BULOG n.d.) (BULOG 2022).

Through this programme, BULOG distributed 11,460 kg of Fortivit Rice to 191 people in East Nusa Tenggara in 2022. They also educated them about its health benefits. They distributed 20 kg of fortified rice for a month to the poor, especially pregnant mothers or malnourished babies, through their widespread infrastructure network in the country.

In collaboration with local governments, BULOG provided assistance, monitoring and training on healthy family nutrition to improve the quality of nutrition in food for the target communities. The people were monitored by health activists to check for improvement in their health status. In one of the initiatives, the result of the monitoring showed positive effects with a reduction in anaemia and stunting cases. However, the efficacy of such results is difficult to ascertain in a short time period (one month). For more accurate results, the health benefit must be tested over a minimum period of 6–8 months.

Annex:

PT Food Station

PT Food Station

In the long term:

- PT Food Station aims to become an aggregator for BUMDs in other areas in Indonesia. They can collaborate with local government bodies and transfer their technology of producing fortified rice.
- They plan to launch fortified rice products through e-commerce platforms, pharmacies, hospitals and other health-care facilities in Jakarta.
- Just like millers and BULOG, PT Food Station plans to supply fortified rice to the Government for its programmes to address MNDs, nutrition improvement, etc.

Fortified Rice Regulation and Licensing Process

Fortified rice category: BPOM holds the authority for processed food items, while the Ministry of Agriculture holds the authority for fresh food items of plant and animal origin. According to the Government's regulation (2018), fresh foods can be consumed directly or used as raw materials, without food additives such as dyes and sweeteners. Hence, FRK is not considered to be a food additive. Consequently, fortified rice is registered as a fresh food item.

Registration body for fortified rice: In 2018, the Ministry of Agriculture mandated the Food Security Agency (BKP) as the competent authority for fresh food security in Indonesia. Suppliers required a product licence from BKP to distribute fortified rice (a fresh food item) in packaged form in the market.

Supervising body for fortified rice: The responsibility for supervising the market now lies with OKKP, which is a unit of the local Ministry of Agriculture in municipal governments. Food safety supervision by OKKP is regulated by two laws: the National Food Law and Decree 23 of regional governments (i.e. OKKP's function is conducted by municipal governments). Under the Food Law, OKKP's supervision task covers two main areas:

- Pre-market supervision (carried out before the product is distributed in the market)
- Post-market supervision (carried out after the product is circulated in the market to ensure that the product is safe for consumers)

The authority of registration and supervision lies with the local governments at the municipal level. The provincial government acts as a coordinator among municipals and a mediator between the local and central Government.

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 1:50-1:200. Two types of extrusion process applied for rice fortification: 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); 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 (Steiger G, Müller-Fischer N, Cori H, Conde-Petit B 2014).

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Annex: Acronyms

ADB	Asian Development Bank
Kementerian PPN/ Bappenas	Kementerian Perencanaan Pembangunan Nasional (Ministry of National Development Planning)
BKKBN	Badan Kependudukan dan Keluarga Berencana Nasional (National Population and Family Planning Board)
BKP	Badan Ketahanan Pangan (Food Security Agency)
BMZ	Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (Federal Ministry for Economic Cooperation and Development)
BAPANAS	Badan Pangan Nasional (National Food Agency)
BPNT	Bantuan Pangan Non Tunai (Non-cash Food Assistance)
B POM	Badan Pengawas Obat dan Makanan (National Agency of Drug and Food Control)
BPPT	Badan Pengkajian dan Penerapan Teknologi (Agency for the Assessment and Application of Technology)
BPS	Badan Pusat Statistik (Statistics Indonesia)
BRIA	Better Rice Initiative Asia
BRIN	Badan Riset dan Inovasi Nasional (National Research and Innovation Agency)
BSN	Badan Standarisasi Nasional (National Standardization Agency)
BULOG	Badan Urusan Logistik (National Logistics Agency)
BUMD	Badan Usaha Milik Daerah (Regional-owned enterprise)
CSR	Corporate social responsibility
DASHAT	Healthy Kitchen Program to Overcome Stunting
DSM	Royal DSM N.V,
FAO	Food and Agriculture Organization of the United Nations
FFI	Food Fortification Initiative
FFP	Food Fortification Programme
FNG	Fill the Nutrient Gap Analysis
FRK	Fortified rice kernel
GAIN	Global Alliance for Improved Nutrition
GOI	Government of Indonesia

HPP	Harga Pokok Penjualan (Government purchasing price)
Kemenko PMK	Kementerian Koordinator Pembangunan Manusia dan Kebudayaan (Coordinating Ministry for Human Development and Cultural Affairs)
KPSH	Ketersediaan Pasokan dan Stabilisasi Harga (Supply availability and price stability)
MITRA	Micronutrient Supplementation for reducing Mortality and Morbidity in Indonesia
MND	Micronutrients deficiency
Kemensos	Kementerian Sosial (Ministry of Social Affairs)
Kemendag	Kementerian Perdagangan (Ministry of Trade)
M-Tani	PT Moelti Pertanian Indonesia
Mmt	Million metric tons
mt	Metric tons
NI	Nutrition International
OKKP	Otoritas Kompeten Keamanan Pangan (Food Safety Competent Authority)
Perpadi	Persatuan Pengusaha Penggilingan Padi dan Beras (Indonesian Rice Millers and Traders Association)
INPRES	Instruksi Presiden (Presidential Instruction)
PMT	Pemberian Makanan Tambahan (Supplementary Feeding)
QA/QC	Quality assurance and quality control
RASKIN/ Rastra	Beras untuk Keluarga Miskin/Beras untuk Keluarga Sejahtera (Rice for the Poor)
RENSTRA	Rencana Strategis (Ministerial Strategic Plan)
RISKESDAS	Riset Kesehatan Dasar (Basic Health Survey)
RPJMN	Rencana Pembangunan Jangka Menengah Nasional (National Medium-Term Development Plan)
SEMBAKO	Sembilan bahan pokok (Staple Food Programme)
SME	Small and medium enterprises
SNI	Standar Nasional Indonesia (Indonesian National Standard)
TP2AK	Tim Percepatan Pencegahan Anak Kerdil (National Stunting Prevalence Acceleration Team)
TVRI	Televisi Republik Indonesia
USDA	United States Department of Agriculture
WFP	World Food Programme
WHO	World Health Organization
WRA	Women of reproductive age

