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Understanding the Rice Value Chain in Timor-Leste: Defining the Way Forward for Rice Fortification

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Executive Summary

Timor-Leste (population of 1.3 million in 2022) is a low income Southeast Asian country with a high prevalence of hunger and malnutrition (Timor-Leste Population and Housing Census 2022). According to the Timor-Leste Food and Nutrition Survey 2020 (TLFNS), the prevalence of anaemia is higher among the most vulnerable, especially women of 15-49 years (38.9%) and children (62.7%). Only one third of children aged 6-23 months (35.4%) and two thirds (65.4%) were achieving minimum dietary diversity. Rice is the most consumed staple in the country with 85 percent of the Timorese consuming it on a daily basi=s, making it appropriate for food fortification.

To address micronutrient deficiencies, the Government of Timor-Leste has decided to introduce fortified staple foods through the public and private sectors. Consultations with government and private sector stakeholders revealed their interest in rice fortification and an awareness of its health benefits.

In summary, inputs received during these discussions are as follows:

1. There is a need to legislate a regulatory framework (standards) for fortification of staple foods.
2. Capacity building of stakeholders such as food importers, producers and regulators is essential to success of this initiative.

During consultations with domestic millers, the feedback received was focused on the need to make rice fortification a commercially viable and feasible initiative. A summary of inputs received during these discussions is as follows:

1. As rice fortification in Timor-Leste is in the initial stages, there is a need for agencies like WFP to support capacity building of domestic millers on technical and operational aspects of fortifying rice.
2. Adequate consumer awareness and demand must be generated.
3. In order to sustain the momentum of the initiative and address the immediate needs of the most vulnerable, government should consider mandatory inclusion of fortified rice in social protection programmes including the Merenda Escolar (school meals).
4. The Ministry of Tourism, Commerce, and Industry could provide subsidies, credit access, trade relaxations and other measures to support and promote the production of fortified rice.

Currently, the government is reviewing the food fortification decree law for promulgation. This, coupled with capacity building of stakeholders, will lead to transformative changes across the domestic rice value chain. In alignment with government's roadmap to operationalize the initiative, the priorities for implementation of the food fortification decree law are as follows:

1. In the short term, the focus is on promulgating the decree law, the initial rollout of switching all food imports to fortified staples and building a robust regulatory environment.
2. In the medium term, the focus will be on assisting domestic millers to produce fortified staple foods locally.
3. The long-term focus will be on creating consumer awareness and sustaining the gains made.

Based on interactions and consultations with stakeholders, the readiness to introduce and implement the food fortification initiative (especially for rice) was evident. However, capacity gaps were also evident and the need for the technical support of agencies such as WFP is required for the entire ecosystem to reach a level where they can sustainably implement the initiative.

1. Introduction

Background

Formed in 2002, Timor-Leste (population of 1.3 million in 2022) is a low income Southeast Asian country with a high prevalence of malnutrition (Timor-Leste Population and Housing Census 2022), indicating insufficient micronutrient intake among the population (WFP 2021).

High rates of anaemia and stunting affect the country's most vulnerable populations. Micronutrient deficiencies such as iron and vitamin A disproportionately affect women, adolescents, and children, engendering poor growth, cognitive impairments, and increased risk of morbidity and mortality (WFP 2021). The prevalence of anaemia was found to be highest among children and women, affecting 62.7 percent of children aged 6–59 months and 38.9 percent of women aged 15–49 years (Ministry of Health 2020), the latter classified as a 'moderate' public health problem as per World Health Organization (WHO) international guidelines.[1]

Food fortification and intake of a nutritious and diverse diet are one way to address micronutrient deficiencies. However, adoption is difficult for economic and food security reasons in Timor-Leste. The food consumption pattern of the population is less than ideal, as carbohydrates dominate the calorie intake. The majority of food consumption consists of cereals, primarily rice, followed by tubers. A nutritious diet, as recommended by WHO, remains unaffordable for 75 percent of Timorese households (WFP 2019). As per the Food Insecurity Experience Scale, 34.8 percent of households are moderately food insecure and 15.6 percent are severely food insecure (TLFNS 2020). This makes large-scale nutrition intervention programmes necessary (WFP 2021). The Government of Timor-Leste recognizes nutrition as a priority and has incorporated several multisector and sector-specific and nutrition-specific policies (WFP 2019).

In 2019, WFP conducted the Fill the Nutrient Gap (FNG) study in Timor-Leste to identify suitable foods for effective fortification interventions. The Timor-Leste government, with the support of WFP, has developed and is reviewing a food fortification decree law that is expected to make fortified staple foods available for all sections of the population. When promulgated, this law is expected to bring transformative changes to the country's rice landscape.

Local production of rice in Timor-Leste only meets 30 percent of domestic demand (WFP 2017). Self-sufficiency in rice production has been impeded by the nature of the terrain, inadequate modernization of the local rice industry, and availability of cheaper imported rice.

For more than two decades, WFP has been working with governments, the private sector, and technical partners across countries in Asia Pacific, (Bangladesh, Bhutan, Cambodia, India, Indonesia, Myanmar, Nepal, Pakistan, Sri Lanka, and Timor-Leste) to make rice more nutritious through post-harvest fortification. WFP provides technical assistance on policy and regulatory frameworks, advocacy, analysis and evidence generation, programming, capacity strengthening of supply chain actors, and consumer awareness.

To introduce rice fortification in a sustainable manner that can reach the wider nutritionally vulnerable population and can be scaled up, the fortified rice needs to be widely available and accessible through two main channels: social protection programmes and commercial retailers. Insight into the rice value chain helps to identify opportunities and challenges in engaging with stakeholders to make fortified rice available at scale.

Objectives of the study

The study 'Understanding the Rice Value Chain in Timor-Leste: 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 to:

1. undertake a detailed landscape analysis to identify and map the key players across the rice value chain in Timor-Leste and;
2. identify and analyse the demand and supply challenges across the rice value chain in Timor-Leste and identify opportunities for introducing fortified rice through commercial channels and government social protection programmes.

Specific objectives

- Identify, map, and document the main players across the rice value chain including the rice milling industry; blending and extrusion equipment manufacturers, fortified rice kernel (FRK) manufacturers and suppliers of vitamins and minerals/multi-micronutrient premixes; private food safety and quality testing laboratories, and retail organizations.
- Map all the rice value chain actors and identify those that follow Good Manufacturing Practices and are adhering to national/international food safety and quality standards for processed foods.
- Study and illustrate the rice value chain and identify value chain engagement points/opportunities for potential rice fortification programme support.
- Identify and document the demand and supply challenges faced by the main actors across the rice value chain (infrastructural, capital availability, regulatory, supply chain, import/export regulations/ policy, taxation, policy, and political environment)

[1] Moderate anemia as per WHO range: 20 - 39.9 percent

and identify opportunities for introduction and scale up of fortified rice through commercial channels and government social protection programmes.
- Map the supply chain and trading (including cost mark-ups).
- 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 barriers for a range of rice fortification options.
- Review and hold consultations with relevant government and private sector stakeholders to identify potential private sector actors that can be engaged to partner with WFP to introduce fortified rice through commercial channels and government social protection programmes.
- Identify the barriers and enabling factors that could contribute to the scaling up of fortified rice through identified channels.

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

Research methodology

A structured research process was followed.

1. Project set-up and plan:
    - Project kick-off and discussions with WFP stakeholders to better understand context, objectives, and expectations.
    - Knowledge shared 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
    - Intensive desk research was conducted on several topics:
        - Nutrient deficiencies in the Timorese population;
        - Experience in food fortification;
        - The rice industry in Timor-Leste - size, exports, consumption, etc.;
        - The supply chain for rice;
        - Stakeholders in the supply chain from a fortification perspective and;
        - Status of rice fortification initiatives and barriers to adoption and scale-up.
    - Sources used include:
        - Available literature comprising research papers, development partners' reports, and project reports from previous pilots such as those from World Bank, WFP, etc.;
        - Reports and statistics such as those from the Government of Timor-Leste, United States Department of Agriculture (USDA), Food and Agriculture Organization (FAO), etc., and;
        - A complete list of publication references is provided in the bibliography.
    - The initial secondary research identified information gaps and stakeholders that could provide valuable inputs.
    - Discussion guides were developed for each type of respondent.
    - During this process, the ValueNotes team had several discussions with WFP stakeholders to fine tune the list of respondents.

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 and the rice industry in Timor-Leste.
        - A list of relevant people in these organizations was developed through additional desk research.
        - Detailed discussions were held with these stakeholders from government and the private sector, giving a diversity of opinions and ensuring equitable representation of views.
        - Experts referred by respondents in the initial interviews were contacted and included in discussions.
        - Where necessary, clarity was sought in further interviews.
    - The discussions helped to:
        - Flesh out gaps in understanding of the industry and ecosystem.
        - Get real-world inputs from stakeholders on barriers to large-scale rice fortification and;
        - Understand the constraints of different stakeholders and possible future actions that might help reduce or remove some of the barriers.

- Respondents

Type of entity	Names of entities	Designation
Large rice millers and traders	Acelda Unipersonal Lda.	Director
	CAACUB Maliana	President
Rice importers	Daya Marketing Group	Owner
	Loja Creating Furak	General Manager
	Lisun Timor	Branch Coordinator
Government entities	National Logistics Centre (CLN)	Director, Executive Director and Head of Warehouse
	Ministry of Education, Youth and Sports	Director
	Ministry of Health	Director
	Ministry of Tourism, Commerce, and Industry	Directorate General

4. Analysis and report writing:
   - All inputs were collated, analyzed, and distilled to create this report.
   - Where necessary, clarification was sought.
   - The analysis and report were discussed with the WFP team and their inputs were incorporated in this version.

Report Structure

The report is divided into eight chapters, each focused on a particular aspect.

Chapter	Title	Details
1	Nutrition profile of Timor-Leste	Focuses on the diet composition, the current undernourishment levels and the micronutrient deficiencies in the population of Timor-Leste. Helps understand the scale of the problem and the need and urgency for improving nutrition inputs in Timor-Leste.
2	Food fortification in Timor-Leste	Gives a background of the existing food fortification programmes in Timor-Leste. Assessment of past experiences in fortification, difficulties faced while scaling up, and success stories on food fortification. Provides an understanding of institutional experience and lessons learnt from earlier initiatives with other food items.
3	Overview of Timor-Leste rice ecosystem	Elaborates on the rice industry including historical production trends, consumption, exports, imports, production clusters, millers' capacities, rice varieties in demand, etc. Helps to understand the size and scale of the rice ecosystem in Timor-Leste, and its implications for rice fortification scale-up.
4	Rice supply chain	Details the existing rice supply chain in the country. Provides an initial understanding of the stakeholders that need to be involved in rice fortification initiatives.
5	Fortified rice supply chain	This section details the current fortified rice supply chain in the country. Provides an understanding of the stakeholders currently involved in rice fortification initiatives.
6	Stakeholders discussion and analysis	This chapter provides further details of critical stakeholders and their respective roles. Helps to clarify the bottlenecks in scaling up rice fortification in Timor-Leste, crucial for suggesting remedial measures or effective solutions.

7	Recommendations for scaling up rice fortification	Synthesizes the findings from earlier chapters and suggests specific recommendations to address or mitigate the barriers to scale-up. Identifies the main stakeholders that need to be brought on board to address different issues. Provides a detailed roadmap for the successful implementation of scaling up rice fortification in a measured and comprehensive manner.
	Annex	Supplementary information and relevant statistics Provides essential information to support the analyses throughout the report including: • Main seasons for rice planting and harvest • Selling price of rice • Rice exporting countries • Role of different entities in the rice supply chain • Technologies for rice fortification

1. Nutrition profile of Timor-Leste

The primary diet in Timor-Leste is highly dependent on starchy staples such as rice, bread, cassava, and tubers (root vegetables) (WFP 2019). Rice is the most consumed staple food in the country; more than 85 percent of households consume it on a daily basis. Cereals contribute 63 percent of the total calorie intake, and rice alone accounts for 45 percent. Milk, meat, and eggs make up 9 percent; vegetable oils 6 percent; sugars 3 percent; and fruits and vegetables only 2 percent. Other food items contribute to 17 percent of the calorie intake (FAO 2021).

While the majority of the Timorese population can meet its daily energy requirements, the lack of diversity in their diet leads to inadequate nutritional intake, causing widespread micronutrient deficiencies (WFP 2019). To understand how fortification of food (particularly rice) could aid in meeting the dietary guidelines for better nutrition, it is essential to understand the micronutrient deficiencies in the country and their effects.

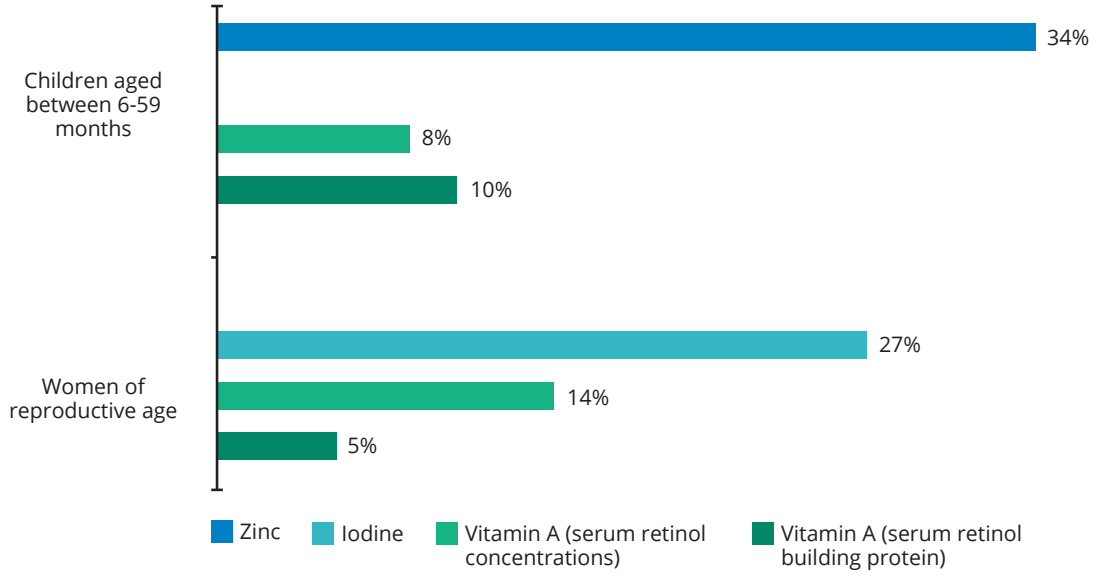
1.1 Micronutrient deficiencies

The widespread prevalence of micronutrient deficiencies has resulted in the following effects in the most vulnerable groups in the population of Timor-Leste:

- In 2020, 38.9 percent of women of reproductive age were anaemic (Scaling up Nutrition 2020).
- The prevalence of stunting among children aged 6 to 59 months was 47.1 percent in 2020 compared to 50.2 percent in 2013 (Ministry of Health 2020). Based on WHO 2018 criteria, this prevalence rate of stunting is classified as a 'very high' public health problem.
- The prevalence of wasting among children aged 6 to 59 months dropped from 11 percent in 2013 to 8.6 percent in 2020 (Ministry of Health 2020).

Iron, zinc, and vitamin A are the crucial micronutrient deficiencies among women of reproductive age and children aged between 6 and 59 months as shown in Figure 1.

Figure 1: Micronutrient deficiencies (%) among the vulnerable population groups in Timor-Leste (2020)



Source: Ministry of Health

While there has been improvement in certain nutrition parameters, the prevalence of anaemia and levels of stunting in the Timorese population remain cause for concern

To combat the prevalence of micronutrient deficiencies, the government has undertaken multiple initiatives over the years.

Table 1: Government initiatives to address malnutrition in Timor-Leste

Year	Programme	Entities involved	Description
2006	School Feeding Programme (Programme Merenda Eskolar)	Ministry of Education, Youth and Sports, Ministry of State Administration, WFP, CARE International	• The programme aims to improve nutrition conditions for school-aged children and decrease the number of dropouts (CARE 2019). • The Government signed a declaration with School Meals Coalition to expand the programme (Government of Timor-Leste 2021).
2009	Promoting sustainable food and nutrition security in Timor-Leste	Timor Global (private food processing company), WFP, Ministry of Health	• The programme was aimed at improving the health and nutritional status of pregnant and breastfeeding women, and children aged 6 to 59 months in four districts. • It was done through child feeding initiatives, micronutrients supplementation and community management of acute malnutrition linked with supplementary feeding (MDG Achievement Fund 2009).
2011	Ministry of Tourism, Commerce, and Industry launched iodized salt	Ministry of Tourism, Commerce, and Industry, Ministry of Health, UNICEF, United States Agency for International Development (USAID)	• The iodized salt programme was launched in Bobonaro district for the prevention of malnutrition and goiter (Government of Timor Leste 2011).
2011–2030	National Health Sector Strategic Plan 2011-2030	Ministry of Health	• The plan intended to reduce the incidence of micronutrient deficiencies and associated malnutrition among vulnerable groups such as mothers and children (Ministry of Health, Timor Leste 2011).
2014	National Action Plan for a Hunger and Malnutrition Free Timor-Leste (PAN-HAM-TIL)	United Nations Development Programme (UNDP), Australian Department of Foreign Affairs and Trade, USAID, China Aid, National Council for Food Security, Sovereignty and Nutrition in Timor-Leste (KONSSANTIL)	• 'PAN-HAM-TIL' was a collective undertaking aiming for zero hunger and malnutrition by 2025 (FAO 2014).
2014–2019	The National Nutrition Strategy	Ministry of Health, WFP, UNICEF	• Launched to address nutrition challenges of the country through inter-sectoral action plan and to align targets to the National Development Plan 2012-2030. • The purpose of the programme was to accelerate the reduction of maternal and child undernutrition through implementation of nutrition-specific interventions (Ministry of Health, Timor Leste 2014)

2019	HATUTAN programme	Government of Timor-Leste, USDA, CARE International, Water Aid	• A five-year project funded by the USDA through the McGovern-Dole International Food and Early Childhood Programme. HATUTAN will support the government's school lunch programme. • In 2020, under the McGovern-Dole programme, USDA provided fortified rice for the school meals programme (CARE, Mid-Line Evaluation McGovern-Dole Food for Education Program 2021) (CARE 2019).
2020	Scaling Up Nutrition Movement (SUN Movement)	Scaling Up Nutrition (SUN) Movement, Government of Timor-Leste	• Timor-Leste joined the SUN Movement • The platform allowed the country to share the challenges related to malnutrition and learn from successful cases to improve nutrition. • The country joined a network of agencies, institutions, and donors, contributing decisively to improve the health and well-being of the population in Timor-Leste (Government of Timor Leste 2020).
2022	'Say no to 5S (Starvation, Soil-Transmitted Helminthiasis, Skin Disease, Smoking and Sugary/Alcoholic Drink) in Schools'	Ministry of Education, Youth and Sports , Korea International Cooperation Agency (KOICA), WFP, WHO	• The main objective of this programme is to support the school feeding programme over four years. • As part of the project, WFP will introduce mineral- and vitamin-rich fortified rice. It targets 79,000 children in over 400 schools in Baucau, Bobonaro, and Manufahi (WHO 2022).

It is imperative to further scale up the efforts of the government with a specific focus on the fortification programmes to ensure that overall nutrition status improves.

2. Food fortification in Timor-Leste

In 2008, the Government of Timor-Leste and WFP signed a memorandum of understanding on specialized nutritious fortified foods specifying a coordinated effort to process locally produced food. The agreement intended to increase the long-term availability of nutritious foods, thereby reducing the extent of hunger and malnutrition in the country (WFP 2019) . This includes fortification of salt, wheat, oil, a corn and soy blend (Timor-Vita), and rice.

Regulatory authority and legislation

In 2017, the Government of Timor-Leste established a special independent authority called Inspection and Monitoring Authority on Economic, Sanitation and Food Activities (AIFAESA). It consists of representatives from the ministries of Health; Agriculture and Fisheries; Commerce, Industry and Environment and; Tourism, Art, and Culture. They conduct routine inspection and monitoring of products and food sold in restaurants and supermarkets (WFP 2017). Regular checks on the expiration dates of imported foods are conducted by the Ministry of Commerce, Industry and Environment (FAO 2018).

Currently, there is no legislation for the production of fortified foods. The government drafted a national legislation for salt iodization in 2010, but it has not yet been enacted.

In 2021, WFP collaborated with the Ministry of Tourism, Commerce, and Industry and the Ministry of Health to develop a mandatory food fortification decree law (United Nations, Timor-Leste 2021). The two ministries are currently in the process of enacting the law. Table 2 provides details about the micronutrients that will be mandatorily fortified in the respective staples as per the proposed decree law.

Table 2: Fortification of food items in Timor-Leste

Food item	Micronutrients added
Salt	Iodine
Oil	Vitamin A, vitamin D
Rice	Vitamin B_{12}, iron, folic acid, zinc
Wheat flour	Vitamin B_{12}, iron, folic acid, zinc

Note: Food fortification decree law (in progress). Mandatory fortification of salt, oil, rice and wheat flour will be applicable once the national food fortification decree law is passed. Source: Public Health Nutrition Journal, WFP

Salt fortification

The Ministry of Health, in collaboration with UNICEF, drafted a decree law for fortification of iodized salt in 2010. However, the draft legislative bill is yet to be passed (Karen Codling 2017).

The Ministry of Tourism, Commerce, and Industry and the Ministry of Health, with support from UNICEF and USAID, launched iodized salt in 2011 for the prevention of malnutrition and goiter in the country. At the time of launch, 55 percent of the population had been consuming iodized salt (Government of Timor Leste 2011). In 2016, the consumption increased to 85 percent of Timorese households (The DHS Programme 2016). Currently, the government, along with UNICEF and WFP, is planning to include salt iodization in the proposed food fortification law (UNICEF 2021).

Wheat fortification

Timor-Leste imports fortified wheat from Indonesia where wheat flour fortification has been mandatory since 2002. However, consumption of wheat in Timor-Leste accounts for only 5 percent of the total calorie intake of the population, having a negligible impact on their nutritional status (WFP 2017).

Soy and corn fortification (Timor-Vita)

In 2012, Timor Vita, a locally produced fortified food blend (made of corn and soy) was produced and distributed through a public-private partnership between Timor Global (a local food production company), the Ministry of Health, and WFP (WFP 2019) (Sustainable Development Goals Fund (SDGF) 2014). However, in 2019, distribution was discontinued due to budgetary constraints and unavailability of inputs. The government instead chose to distribute ready-to-use supplementary food, which was more feasible to procure. The Ministry of Health has earmarked budget for WFP to support the reactivation of production and distribution of Timor Vita in 2023.

Rice fortification

Rice fortification is in the initial stages of development in Timor-Leste. WFP is partnering the government to introduce and scale up rice fortification. Given the high rates of rice consumption in the Timorese diet, rice is a promising means of delivering essential micronutrients. Among the four staple foods under consideration, rice is locally produced and has the potential to be a focus of improvement. One of the unique aspects of Timor-Leste's rice fortification initiative is the lead taken by the Ministry of Tourism, Commerce, and Industry, (in several other countries the initiative is led by the Ministry of Health), positioning rice fortification more as an addition to the domestic rice value chain and not only a public health intervention.

2.1 Rice fortification status in Timor-Leste

Initiation

The initial discussions on rice fortification in Timor-Leste began in 2008, when WFP signed a memorandum of understanding with the Ministry of Health and the Ministry of Tourism, Commerce, and Industry to process and fortify locally produced food. In 2017, WFP conducted a rice landscape analysis to understand the viability of launching rice fortification in the country.

Acceptability trial

In 2019, the Ministry of Education, Youth and Sports and WFP conducted acceptability trials for fortified rice, which included organoleptic (sensory) quality tests at two schools in Dili district. The results were promising. Most students could not differentiate between unfortified and fortified rice on parameters such as taste, smell, colour, appearance, and texture (WFP 2020). The rice fortification programme was subsequently planned to scale up to 400 schools in three municipalities by 2024.

Fortified rice distribution under school feeding programme

As part of the school feeding programme, USDA donated fortified rice under the McGovern-Dole Food for Education programme (CARE, Mid-Line Evaluation McGovern-Dole Food for Education Program 2021). In March 2022, the 'Say no to 5S' project was launched, through which WFP is planning to introduce fortified rice as a part of the school feeding programme to 400 schools across three municipalities. WFP recently concluded a baseline study in the three municipalities to assess school infrastructure and the school meal supply chain, fortified rice, and nutrition for the 'Say No to 5S' project (WHO 2022).

Strategic partnerships with government entities

WFP has been actively involved with the Government of Timor-Leste in scaling up the rice fortification initiative. The following government partnerships have been undertaken:

1. In 2020, WFP partnered with the multistakeholder Technical Advisory Group for Rice Fortification.
2. WFP held consultations, capacity assessments, training on rice fortification and advocated with line ministries to introduce fortified rice in the social safety net programmes and on the open market (Annual Country Report 2021).
3. The Ministry of Tourism, Commerce, and Industry invested US dollars (USD) 100,000 to initiate rice fortification and dsm-frimenich provided an in-kind donation of 5 MT of FRK for the production of fortified rice.
4. WFP installed blending machinery at a National Logistics Centre (CLN) warehouse in Tibar to facilitate local production of fortified rice (Annual Country Report 2021).
5. In partnership with the government, WFP initiated a six month awareness campaign on a local TV station, promoting rice fortification and details on the school feeding programme in relation to WFP's capacity strengthening efforts (Country report, October 2022).
6. WFP capacitated two domestic rice millers (Acelda, Baucau and Graca Agro, Bobonaro) with fortified rice blending systems and training for their technical staff on operational aspects of rice fortification.

Food fortification decree law

To scale up rice fortification, in 2021 the Ministry of Tourism, Commerce, and Industry and the Ministry of Health asked WFP to support the development of a legal and regulatory framework for staple food fortification (through a national decree law). WFP hired SGF, a national legal firm, and developed the draft decree law for the fortification of rice, wheat flour, oil, and salt. The food fortification decree law will make fortification of rice mandatory in Timor-Leste. Its formulation and implementation are part of the Consolidated National Action Plan for Nutrition and Food Security and the National Health Sector Nutrition Strategic Plan 2022-2026.

The final version of the food fortification decree law was submitted to the Ministry of Tourism, Commerce, and Industry for submission to the Council of Ministers in January 2022. The Presidency of the Council of Ministers office is currently reviewing the decree law on food fortification (WFP 2022).

Activities to boost commercial scale-up

The Government of Timor-Leste and WFP took the following steps to further boost commercial scale-up in the country:

1. In April 2022, WFP conducted training for officials from the Ministry of Tourism, Commerce, and Industry on technical and policy aspects of rice fortification.
2. In May 2022, WFP finalized a technical agreement with two millers as partners (Graca Agro Trading and Acelda) and provided blending machines to support rice fortification activities (WFP country brief 2022).
3. Leveraging the blending facility installed by WFP in CLN, approx. 47 MTs of fortified rice was produced and distributed to flood victims by the government in May 2022.
4. WFP conducted capacity strengthening activities for local rice millers, including training for the technical staff of two domestic rice millers to scale up rice fortification (WFP country brief 2022).

To enable mass fortification of rice in Timor-Leste, it is crucial to thoroughly understand the rice industry, processing capacity, roles of the various stakeholders, the existing supply chain, and barriers.

Figure 2: Journey of rice fortification in Timor-Leste

2008
WFP signed a memorandum of understanding with the Government of Timor-Leste on food fortification.

2017
WFP conducted a rice landscape analysis to understand the viability of launching rice fortification.

2019
Pilot scale rice fortification acceptability trials conducted by WFP and the government.

2020
USDA donated fortified rice for school feeding programme under the McGovern Dole Food for Education Program.

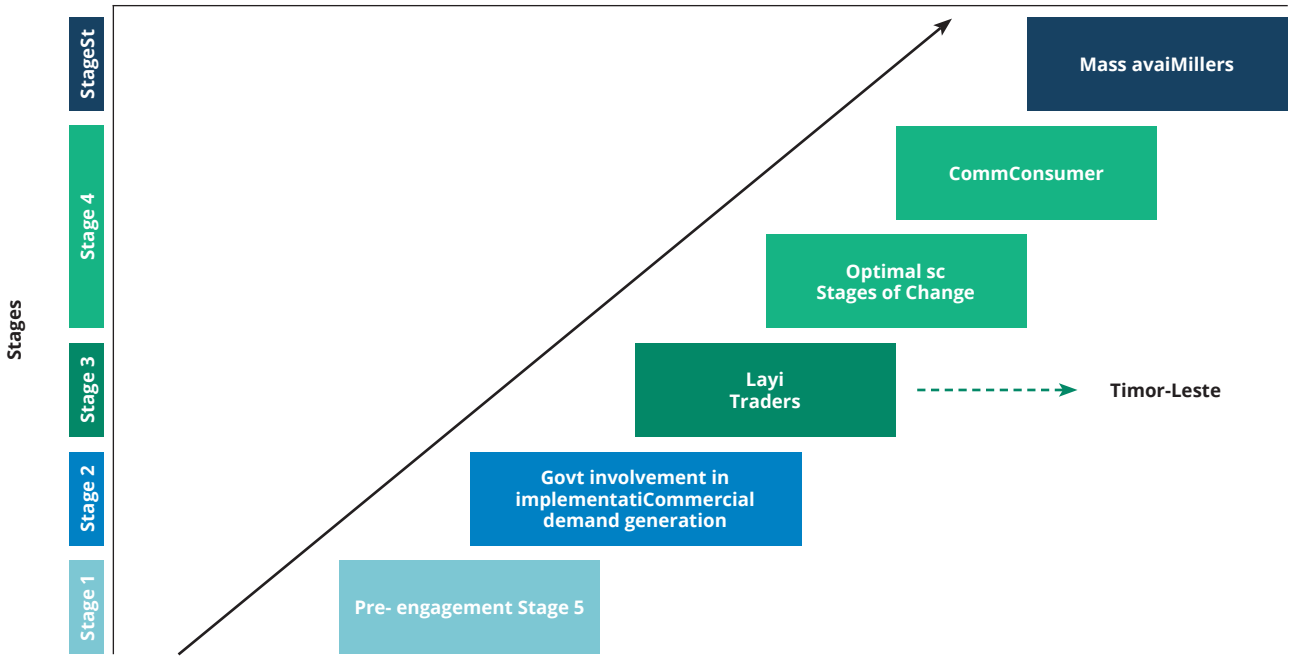
2021
- Developed draft decree law on food fortification through a consultative process with all relevant stakeholders.
- The Ministry of Tourism, Commerce, and Industry invested USD 100,000 to initiate rice fortification and dsm-firmenich donated 5MT of FRK.
- WFP installed blending machinery at CLN for local production of fortified rice.

2022
- WFP, the Ministry of Tourism, Commerce, and Industry and the Ministry of Health developed the decree law on food fortification, which is under consideration of Coucil of Ministers.
- WFP capacitated two domestic rice millers with fortified rice blending machines and training for their technical staff on technical and operational aspects of rice fortifiation and awarded contracts for the production of fortified rice to two new millers (Acelda and Graca Agro).
- Government of Timor-Leste (CLN) locally produced 47MTs of fortified rice, which was distributed to 10,000+ individuals during emergency flood response.

WFP initiated a six month awareness campaign on local TV for promotion of rice fortification.

Source: WFP, ValueNotes analysis

Figure 3: Stages of rice fortification scale-up in Timor-Leste



Source: WFP, ValueNotes analysis

3. Overview of Timor-Leste rice ecosystem

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

3.1 Domestic rice production, imports and exports

Rice production

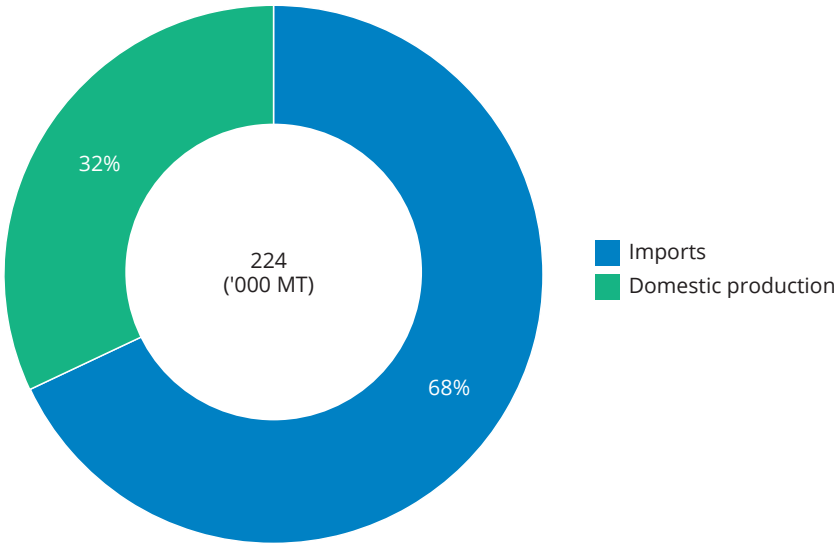
Due to the unfavourable environmental conditions for rice production, rice yields in Timor-Leste are poor.

In 2021, the total milled production was 72,000 MT, and 60 percent of the total paddy production was milled during rice processing (WFP 2021).

Imports and exports

The local millers only meet around 30 percent of the total rice consumption. In 2021, a total of 152,000 MT of rice was imported (WFP 2021). India, Thailand, Vietnam, and Pakistan are the major suppliers of rice to Timor-Leste (Trademap 2017). Timor-Leste has negligible rice exports.

Figure 4: Share of domestic production and imports in Timor-Leste (2021)



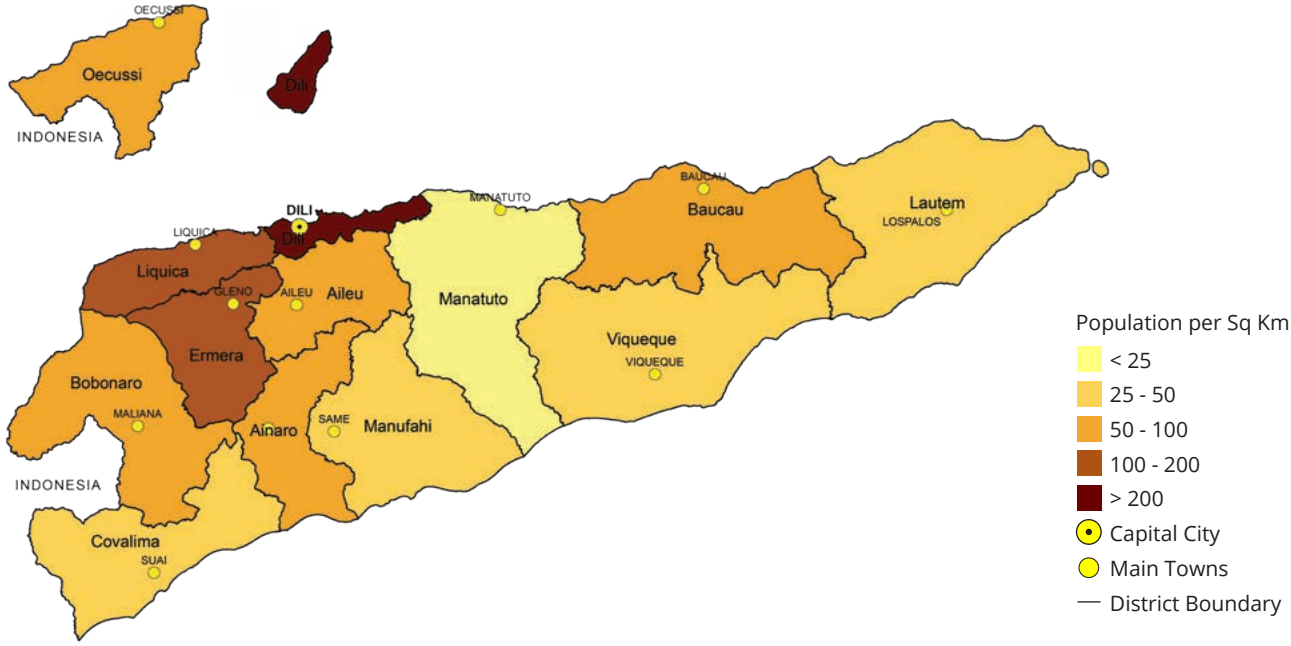
Source: WFP, ValueNotes analysis

3.2 Rice producing clusters in Timor-Leste

There are five major rice producing districts: Baucau, Viqueque, Bobonaro, Covalima, and Região Administrativa Especial Oé-Cusse Ambeno (RAEOA).

The district of Dili does not produce any rice. However, being the commercial hub of the country, it has a significant role in the rice supply chain of Timor-Leste (FAO 2021).

Figure 5: Rice producing clusters in the Timor-Leste and share of rice production (2021)



3.3 Classification of rice mills

Rice mills can be classified as large, medium, and small based on their tonnage capacity per hour. However, in Timor-Leste, a major portion of domestically produced rice is milled at household and commune mills. There has been no study to ascertain the total number of small and commune mills in the country (WFP 2017). There are only a few medium sized rice mills in the country with an average capacity of less than 15 MT/day; 15 percent of the domestically grown paddy is sent to these mills to be processed (FAO 2018).

Table 3: Medium scale rice mills in Timor-Leste

Mill Name	Milling Capacity (MT/day)	Location
Acelda	8	Bacau
Sorte-Agro Maliana	7-8	Maliana
Kaninuk Star	8	Dili
Asosiasaun Agrikultura CAAKUB	5	Maliana
South Rice Production	15	Fatuberliu-Manufahi
Graca Agro Trading	8	Maliana

Source: WFP

3.4 Market segmentation

The primary rice varieties available in the market are white rice, red rice, and black rice. The various kinds of rice produced by local rice mills include Nakroman, local Red, IR 64, Siheran, Membramo, Singapura and Siaun (FAO 2021).

The consumer purchases rice through two channels:

1. **Traditional channel** – Includes traditional grocery stores and wet markets. The majority of the population resides in rural and remote regions and purchases rice through this channel. Farmers also produce rice for family consumption or sell it directly in their neighborhood.
2. **Modern channel** – Includes supermarkets, hypermarkets and grocery stores located in the cities. Retail stores such as Leadermart, Seara, Meimart, and Lita Store cater to the population living in Dili. 'Loja Agricultura', a store supported by the Ministry of Agriculture and Fisheries, retails agricultural products and local produce such as rice on behalf of registered members (individual farmers, farming groups, or cooperatives/associations) (Oxfam 2019).

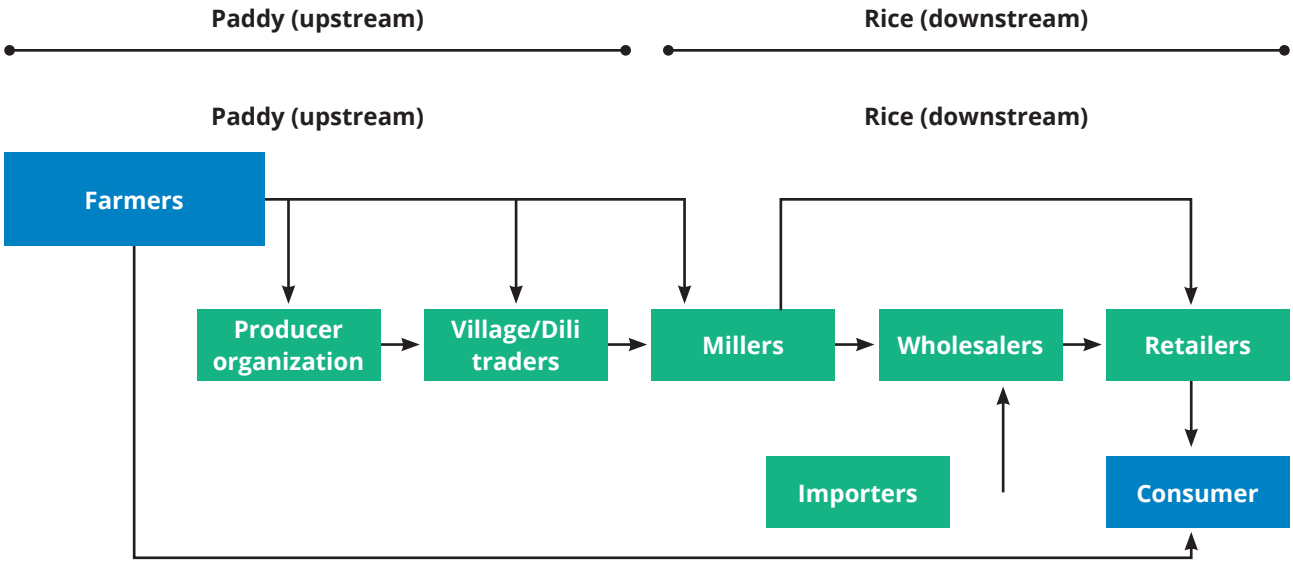
4. Rice supply chain

In Timor-Leste, there are separate supply chains for the distribution of rice by private millers and through the government network. Owing to the low productivity of agricultural lands, most of the locally grown rice is used for self-consumption.

The rice value chain for the private sector in Timor-Leste is shown in Figure 6.

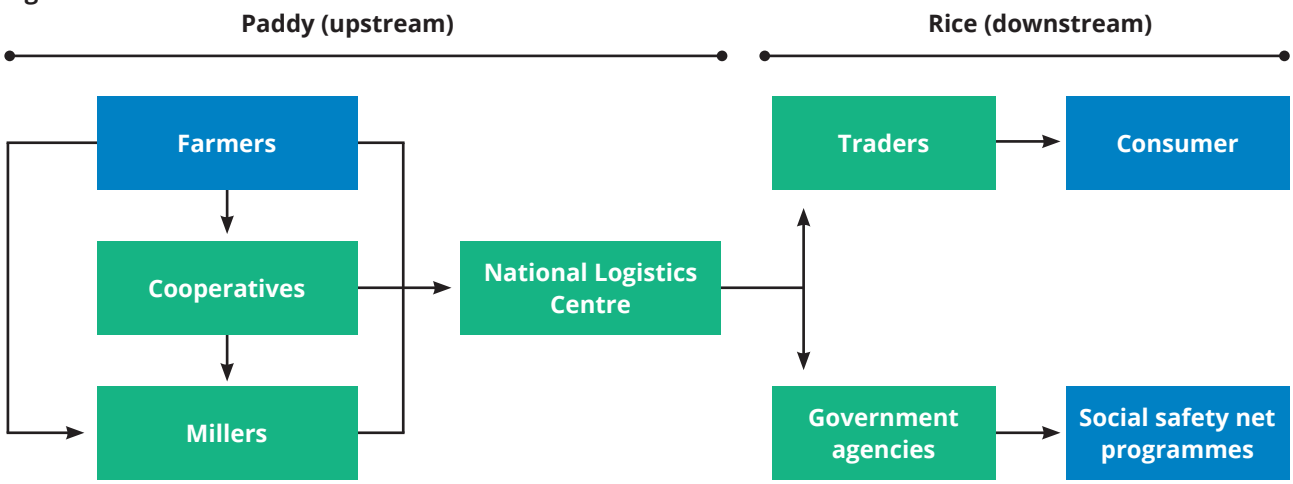
The government distributes rice through school meal programmes and relief measures during disasters, epidemics, etc. Their rice value chain is shown in Figure 7.

Figure 6: Private millers' rice value chain in Timor-Leste



Source: WFP, ValueNotes analysis

Figure 7: Government rice value chain in Timor-Leste



Source: WFP, ValueNotes analysis

5. Fortified rice supply chain

Currently, a fortified rice supply chain does not exist in Timor-Leste. To develop a sustainable ecosystem for rice fortification, a robust domestic supply chain for fortified rice will have to be developed. There are no domestic suppliers of FRK and machinery, i.e., blenders and extruders. Initially, fortified rice will have to be imported from other countries.

Multiple stakeholders would be crucial in the fortified rice supply chain in Timor-Leste:

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

5.1 Fortified rice manufacturers

In Timor-Leste, fortified rice has only been used for distribution in social safety net programmes such as school feeding and emergency response food distribution. In 2022, WFP supported a government partner (CLN) and two domestic food industry partners (Graca Agro Trading and Acelda) in capacitating their facilities with blending machinery to produce fortified rice. Leveraging the blending facility installed by WFP in CLN, approx. 47 MTs of fortified rice was produced and distributed to flood victims by the government in May 2022. However, given the limited number of domestic rice millers, it is important for WFP and government to consider equipping all established rice mills with blending capabilities. Implementing mandatory fortification of rice will help to create adequate demand and incentives for the rice millers to fortify all the rice sent to the market.

5.2 Government entities

There has been limited government involvement in agricultural marketing and trade. Because of budgetary constraints, the government's strategic grain reserve stopped operating for a few years but has now resumed with assistance from WFP (Landscape Analysis for Nutrition in Timor-Leste 2017). At present, multiple government entities are involved across functions such as production, standardization, regulation, sale, and distribution of fortified rice; scaling up rice fortification will require efficient coordination among them.

Table 4: Government entities involved in scaling up rice fortification in Timor-Leste

Authority	Role
Ministry of Tourism, Commerce, and Industry	• The primary entity which coordinates with the private sector for importing, milling, and distributing fortified rice • Lead the implementation of rice fortification in private sector and social protection programmes • Lead the efforts on legislation of the standards for fortification
Ministry of Health	• Provides technical assistance for all fortification related activities • Lead the inspection of fortified rice produced and enforce legal and regulatory requirements.
Ministry of Education, Youth and Sport	• Lead the inclusion and scale up of fortified rice in the school feeding programme
Ministry of State Administration	• Lead the implementation of introduction and scale up of rice fortification in the school feeding programme. • Allocate adequate budget for introduction of fortified rice in the school feeding programme
National Council for Food Security, Sovereignty and Nutrition (KONSSANTIL)	• Members of KONSSANTIL include Ministry of Agriculture and Fisheries, Ministry of Finance, National Directorate of Statistics, Ministry of Health, Ministry of Social Solidarity and Inclusions, Ministry of Tourism, Commerce, and Industry , and Ministry of Education Youth and Sport • Within KONSSANTIL, the Government of Timor-Leste has established the Technical Advisory Group as a taskforce for rice fortification. • Lead the multisectoral coordination for introduction and scale of rice fortification. • Oversee and steer the rice fortification initiative to scale across public and private sectors.
Ministry of Agriculture and Fisheries	• Implement programmes related to farmers and agriculture • Lead the Technical Advisory Group of KONSSANTIL
CLN	Key implementing agency for fortification of government rice procured locally and internationally. • Fortify all the rice handled through government for social protection and emergency response, directly through CLN warehouses or through private rice millers.

5.3 Other stakeholders

Rice fortification via the process of extrusion requires FRK and blending machinery. FRK producers will need extrusion machinery. In addition, the role of rice associations as well as technical partners is critical in disseminating information to millers. Their respective roles are discussed in Table 5.

Table 5: Other stakeholders in rice fortification in Timor-Leste

Stakeholders	Role
FRK suppliers	• Supply adequate quality and quantities of FRKs to produce fortified rice. • Ensure quality of the FRK is adequately maintained across the rice value chain.
Blending machinery suppliers	• There are no local blending machinery suppliers in Timor-Leste. • In 2022, WFP provided blending equipment to Acelda, Graca Aro Trading and CLN.
Extrusion machinery suppliers	• There are no domestic machinery suppliers in Timor–Leste. • Some of the international companies supplying machinery are BUHLER and Satake.
Rice associations	• Rice associations are not very active in Timor-Leste. • Asosiasaun Agrikultura (CAAKUB), with support from Agro-Commerce, Ministry of Agriculture, and Japan International Cooperation Agency, promotes consumption of local rice in the country.
Development / technical partners	• Development partners (WFP, Japan International Cooperation Agency) are essential to capacitate and advocate with stakeholders on how to scale up the rice fortification programme.

6. Discussion and analyses

6.1 Stakeholder discussion: Summary of findings

Timor-Leste is a major importer of rice, with a total of 152,000 MT of rice imported in 2021 (68 percent of consumption), primarily imported from Vietnam, followed by Thailand, India, and Pakistan.

Currently, domestic rice millers have just started producing fortified rice and private importers are considering and planning to initiate importation of fortified rice. The Ministry of Tourism, Commerce and Industry, with support from WFP, has finalized the standards of fortification in terms of the nutrients and their proportions. The government is in the process of passing the food fortification decree law. Once promulgated, there is a need to provide adequate lead time for stakeholders to equip and capacitate themselves to initiate full-scale distribution of fortified rice as the law would make it mandatory for all rice to be fortified. It is important to defer enforcement and legal actions until the lead time for operationalizing the standards has been agreed.

As indicated in Chapter 1, detailed discussions were held with decision makers in the government and in the rice value chain.

Discussion with government stakeholders

It was evident that government stakeholders are interested in scaling up rice fortification in the country. The focus of discussion with government entities was on the current fortification status, the barriers being faced, and the support required by them.

The highlights of these discussions are shown in Table 6.

Table 6: Summary of discussion with government stakeholders

Discussion themes	Entity	Summary of interviews
Mandatory rice fortification	Ministry of Health	• The Ministry of Tourism, Commerce, and Industry is in the process of passing the food fortification decree law which will make it mandatory for all rice to be fortified.
Introduction of fortified rice	Ministry of Health, Ministry of Education, Youth and Sport, CLN	• Fortified rice has been introduced in the school feeding programme, beginning with schools in four municipalities (Ermera, Liquisa, Manatuto, and Ainaro).
Focus on domestic production	CLN	• The government plans to increase domestic production and reduce dependence on imports in the long term.
Assistance for blending processes	CLN	• WFP installed a blending machine and provided technical assistance to CLN to initiate fortified rice production.
Assistance for fortification	Ministry of Education, Youth and Sports , Ministry of Tourism, Commerce, and Industry	• Since 2020, USDA has been providing technical assistance to the school feeding programme as part of the McGovern-Dole Food for Education programme. • The Department of Foreign Affairs and Trade and KOIKA are currently the main funding partners of the fortification initiative.
Budgetary challenges	CLN, Ministry of Health, Ministry of Tourism, Commerce, and Industry	• CLN aims to increase the reach of grains to remote areas. However, budgetary constraints are an impediment to setting up centres in remote areas. • The budgetary provision per child is too low to provide the kind of nutritious food that the programme expects.
Need for quality check	Ministry of Health, Ministry of Tourism, Commerce, and Industry	• At present, Timor-Leste does not have the infrastructure (laboratories and skilled human resources) to ensure that food items are fortified as per recommended guidelines. • There is a need to set up enforcement regulations to ensure the quality and safety of fortified rice. • Even if fortification of imported rice is made mandatory, infrastructure set-up and training of personnel would need to be conducted.

Support offered	Ministry of Health	• The Ministry of Health will provide information about micronutrients and their proportions to the relevant stakeholders.
		• Ministry of Health will play a key role in:
		  • endorsing standards of fortified food;
		  • conducting cost analysis of fortified rice;
		  • promoting fortified rice;
		  • providing FRK to fortify local rice and;
		  • providing technical personnel for laboratories.

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. Millers required deeper insights on the key business variables. They also needed to gain knowledge about the production techniques involved, the costs and returns on investment, and the raw materials and machinery used. Millers typically sell packaged, branded rice primarily to restaurants and urban supermarkets. Their consumers are primarily middle to high income groups.

Table 7: Summary of discussion with millers

Discussion themes	Summary of interviews
Barriers in the rice industry	• It is important to address the barriers of inefficient technologies and high costs of production in the domestic rice industry . • The price of local rice is only affordable to middle and high income population groups. • There is a lack of proper storage facilities especially in the shops, which leads to rotting of rice.
Knowledge about production techniques and costs	• Millers would need further capacity building on the cost and economics involved for fortified rice. • Consistent and intensive efforts might be needed to sustainably build capacity on the use and maintenance of machinery and the production processes.
Distribution of fortified rice through social protection programmes	• Millers expect the government to procure fortified rice from them for distribution in social programmes.
Willingness to launch brand	• Millers need further assistance and capacity building on improved packaging and branding measure that can support establishing fortified rice as a standalone product in the market.
Awareness creation	• All respondents emphasized the importance of awareness creation, leading to increased demand for fortified rice. • The millers suggested that business stakeholders across the rice value chain need to be knowledgeable about fortified rice so that consumers are well informed.

Discussion with other stakeholders

Consultations were also held with rice importers.

Table 8: Summary of discussion with other stakeholders

Discussion themes	Entity	Summary of interviews
Mandatory rice fortification	WFP CO	• Timor-Leste is in the process of passing the food fortification decree law that would make it mandatory for all rice to be fortified. • Initially, all imported rice should be mandatorily fortified. • As local capacity develops, mandatory fortification should be scaled up to include domestic rice.
Past experience of fortified rice	Importer	• The importers have limited experience in selling fortified rice.
Barriers in the rice industry	Importer, WFP Country Office (CO)	• Timor-Leste is import-dependent owing to lack of sufficient production, and because of unsophisticated techniques used by millers. • The low agricultural budget of the government is also an impediment to increasing local production of paddy. • Unless all importers are mandated to import fortified rice, it will be difficult to compete with importers of unfortified rice. • Imports face delays due to unnecessary procedures and inefficient management at ports.
Price of fortified rice	Importer	• Importers lacked information about how rice fortification might impact its price. • Their estimated price of fortified rice was USD1 higher per 25-30 kg than the price of non-fortified rice.
Supply of FRK	WFP CO	• At present, FRK is being imported from Thailand and China. • Local production of FRK will be explored once there is an established demand for fortified rice.

Social safety net programmes	WFP CO	• Social protection programmes provide regular demand for domestic rice millers. Programmes such as school feeding can help to sustain momentum and foster economic diversification.
Government support required	Importer	• The fortification initiative must be sustainably driven by the government and adequate awareness generation efforts are required to sensitize the population to the benefits of fortified rice. • Government to make import of fortified rice compulsory for all importers, so that fortified rice importers do not lose market share to cheaper imports of unfortified rice.
Support offered	WFP CO	• In Timor-Leste, WFP would support the government and the domestic food industry including importers on technical, operational and commercialization aspects of introducing and scaling up of rice fortification in the country.

The successful implementation of rice fortification requires a coordinated effort amongst key stakeholders in the supply chain and a clear understanding of the challenges faced by them.

6.2 Roadmap for the implementation of the mandatory food fortification decree law and scale up of rice fortification

In 2017, WFP conducted a rice landscape analysis to assess the viability of launching the rice fortification initiative in Timor-Leste. The report shed light on different variables affecting rice fortification in the country as follows:

1. The agricultural sector is highly dependent on traditional farming methods, resulting in low domestic rice production. This will impede the pace of scaling up fortified rice production by domestic rice millers.
2. The cost of locally produced rice is much higher than the cost of imported rice.
3. Domestic rice millers lack adequate credit and financial resources to upgrade machinery and are challenged with limited market access to major cities and ports.
4. The lack of warehousing facilities and food safety and quality control further impedes the pace of scaling up.

To overcome these barriers and incorporate rice fortification, the landscape analysis recommended the government develop a Food Act which would include food fortification standards; mandate all imported rice to be fortified; and consider importing fortified rice from Vietnam and other countries.

As 68 percent of domestic rice consumption is fulfilled through imports, implementation of mandatory rice fortification should begin with imports, while simultaneous efforts should be made to strengthen and consolidate the domestic rice industry.

Bringing the food fortification decree law into force is a major step towards successful implementation of rice fortification in Timor-Leste. With a population of 1.3 million, stakeholders are confident that mandatory fortification will be successful in Timor-Leste.

6.3 Barriers to implementing rice fortification

During conversations with private sector stakeholders it was clear that the majority of importers and millers require a deeper understanding of the available market for fortified rice. It is crucial to understand the implications of the mandatory food fortification law on the stakeholders and the challenges faced by them.

Barrier 1

Need for technical assistance to importers about the food fortification decree law and the sourcing of fortified rice in the international market

With the majority of rice being imported, rice importers will play a key role in the success of this initiative. There is a clear need for capacity building of importers on the technical aspects and global and regional context of rice fortification. Providing importers with information about the food fortification law and the import partners for fortified rice will ensure a sustainable import supply chain.

Barrier 2

Absence of a regulatory framework to ensure enforcement of the food fortification decree law

Once the food fortification decree law is brought into force, effective enforcement of the law will require the establishment of a robust regulatory framework. Effective enforcement will require certain prerequisites, including:

- Laboratories to test if imported fortified rice meets the standards of fortification as per the food fortification decree law.
- A robust regulatory mechanism for quality assurance and quality control of imported FRK and fortified rice at ports, to ensure they meet food safety parameters and standards of fortification.
- In the domestic rice industry, it will be imperative to ensure producers of fortified rice comply with guidelines in the food fortification decree law, including product labeling.

Barrier 3

Need to create awareness among leading and mid-sized millers about the food fortification decree law, the process involved, technical challenges and cost of blending fortified rice

As the initiative is at the early stages and few of the domestic rice millers are producing fortified rice, there is a clear need to capacitate rice millers on independently sourcing raw materials such as FRK. Continuous hand holding is expected by the millers on the technical and operational aspects of the blending machines and commercialization of fortified rice. Government entities and development partners have some understanding about the size and capacity of rice mills in the country. However, potential roadblocks arising from the lack of an adequate blending infrastructure need to be assessed in detail. Addressing these knowledge gaps will support sustainable and efficient scaling up of production and distribution of fortified rice in Timor-Leste.

Barrier 4

Lack of feasibility of domestic production of FRK

Domestic production of FRK can play a significant role in stabilizing and catering to the needs of the domestic supply chain (public and private sector) in meeting their FRK needs. However, the establishment of domestic facilities would need to be deferred until sufficient demand is generated.

Barrier 5

Need for awareness amongst the population about fortified rice and its benefits

Most millers and importers in Timor-Leste do not advertise or promote their products. Given that the Timorese population is unaware of the benefits of fortified rice, it falls upon the government to invest in awareness campaigns and advertise the benefits of fortified rice.

Timorese people are sensitive about the taste and texture of rice and demand might be limited if the benefits of fortification are not well understood.

Barrier 6

High dependence on subsistence farming leading to challenges in fortification

Approximately 70 per cent of the population relies on subsistence agriculture (Caleb Gorton 2018) and this is applicable to rice. Rice is mostly processed at commune mills which primarily use traditional machinery. Small and commune mills cater to a large segment of the population but have very low milling capacities, therefore providing training and blending machinery to them may not be feasible. There is no clarity on the exact number of these mills, making quality monitoring difficult.

All these barriers need to be addressed by a series of interventions and coordination between different entities across the value chain, sustained over a period of time.

7. Recommendations for scaling up rice fortification

To scale up fortification in Timor-Leste, the government is focused on effectively passing and implementing the food fortification decree law. For the successful implementation of mandatory food fortification, WFP has outlined a roadmap which is divided in three stages as follows:

Stage 1 (within 12 months)

- Initially, 25 percent of domestic rice and 50 percent of imported rice should be fortified.
- All social protection programmes that involve distribution of rice should switch to fortified rice.
- The national laboratory should be capacitated to test standards for FRK and the quality of fortified rice.
- Information, education and communication materials should be developed and their distribution initiated.

Stage 2 (within 24 months)

- Mandatory fortification of rice should be scaled up to 50 percent of domestic rice and 75 percent of imported rice.
- All key officials at the municipality level should be trained in quality assurance and checking.
- Officials responsible for enforcement of the law should be trained and monitoring of blending ratios should begin.
- Awareness should be generated via government communication channels.

Stage 3 (within 36 months)

- Mandatory fortification should be scaled up to include 90 percent of domestic rice and 100 percent of imported rice.
- After training officials, quality assurance and control laboratories should be set up at the municipality level.
- Training for quality monitoring should be scaled up to include officials at the sub municipality level.

Since consumption of rice depends on imports, implementation of the food fortification decree law should begin with imports. As soon as the food fortification decree law is passed, all imports of rice should have mandatory fortification. To generate initial demand, the Ministry of State Administration could start procuring fortified rice by inviting tenders from private importers. This should be followed by mandatory fortification in domestic production. Tenders could also be invited from a few private rice millers.

As milling capacities increase, it should be scaled up to include all millers who sell rice commercially.

The recommendations that follow provide a detailed roadmap to successful scale-up of rice fortification.

Short term

Recommendation 1: Advocacy with importers

Inform importers about the prospective food fortification decree law and its implications

Given the dependence on subsistence farming in Timor-Leste, domestic production of fortified rice will require some lead time to reach scale. In the initial stages, fortified rice will have to be imported. The Ministry of Tourism, Commerce, and Industry with assistance from other government entities and WFP, could hold discussions with importers about the challenges of importing rice, and provide advice and technical guidance.

These meetings with importers can include discussions on:

1. Awareness about the food fortification decree law and its impact on rice imports and;
2. Social safety net programmes that include distribution of fortified rice.

Create awareness about the suppliers of fortified rice in international market

Of its total rice imports, Timor-Leste imports 16 percent rice from India and 83 percent from Vietnam. The Ministry of Tourism, Commerce, and Industry, with WFP assistance, could help importers connect with rice export associations and fortified rice exporters from these countries. They must also be informed about standards of fortification required for imported rice. Importers could use their existing contacts with exporters from these countries. To ensure effective implementation of mandatory fortification, it is imperative that these channels are established before the food fortification decree law is enforced.

Recommendation 2: Strengthen the regulatory environment

Provide technical assistance to AIFAESA and the Ministry of Tourism, Commerce, and Industry to support the development of a regulatory framework for rice fortification

Based on the roadmap outlined by WFP, a regulatory framework should be set up to ensure that the imported FRK and fortified rice are as per the national standards for fortification.

It is recommended that the Ministry of Tourism, Commerce, and Industry, with assistance from WFP, equip the national laboratory to test standards for imported fortified rice. The laboratory should either be located at the port or in close proximity to the port. The Ministry of Tourism, Commerce, and Industry should coordinate with food safety authorities at the exporting countries to ensure that fortified rice is tested and certified at source as per standards outlined in the food fortification decree law. Port officials should be trained to check documents to ensure imported rice meets the standards of fortification. In the medium term, the laboratory will also help in quality assurance of FRK for domestic production of fortified rice. AIFAESA should develop a robust mechanism where samples of fortified foods are tested at regular intervals.

Laboratories should be developed in the municipality and sub-municipality levels (long term) to ensure that domestic rice millers comply with the food fortification decree law. AIFAESA should also check for effective use of the logo 'Ai-han fortification' on product packaging to ensure there is no false labeling of rice. This will help to monitor the quality of fortified rice and imported FRK, and with monitoring FRK production if it were to be produced locally.

Medium term

Recommendation 3: Advocacy with millers

Inform millers about the food fortification decree law and production techniques for rice fortification

WFP, with assistance from the Ministry of Tourism, Commerce, and Industry, can create awareness among the leading millers, including:

1. Awareness of rice fortification, the food fortification decree law and how it will impact rice production;
2. Blending process involved in rice fortification and;
3. Social safety net programmes that would require a supply of fortified rice.

The government must ensure that there is continuous engagement (not just one-time meetings or workshops) with private stakeholders to help them at all stages of production and resolve their queries.

Conduct a blending assessment for millers to assess capabilities and the need for installation of new machinery or modifying existing machinery

WFP could conduct blending assessments with contracted millers to assess the requirement for blending machinery, whether new machinery is required or existing machinery can be modified. WFP could provide millers with information on how to modify existing machinery and help procure machinery for millers.

Initiate the pilot of a blending operation with contracted millers to produce fortified rice

Once the initial assessment is completed, WFP, with the help of the Ministry of Tourism, Commerce, and Industry, can install blending machinery at miller's premises. A pilot blending operation can be set up where millers are provided with imported FRK and training to produce fortified rice. The fortified rice could be bought by the government for social protection programmes. Simultaneously, WFP could train mill employees in the production process.

Initiating a pilot blending operation with millers will help WFP and the Ministry of Tourism, Commerce, and Industry to understand costs and operational issues around rice fortification. This will enable the Ministry to fine-tune its approach in terms of subsidies needed, while providing WFP with insight into specific technical assistance needs. The operation can then be scaled up to include all mills that would produce fortified rice.

Provide millers with the information on suppliers of FRK in the international market

Existing imported rice suppliers such as Vietnam, India, Pakistan and Thailand, can be explored for supply of FRK to Timor-Leste. Similar to the process followed for the imports of fortified rice, WFP can assist the Ministry of Tourism, Commerce, and Industry in coordinating with the exporters of FRK in these countries and the Ministry can help connect millers to suppliers of FRK.

Long term

Recommendation 4: Awareness creation campaigns

Conduct acceptability trials and create awareness among consumers about the health benefits of fortified rice

WFP has conducted an acceptability study with schoolchildren. Similar studies could be conducted with a more diverse set of the population.

WFP has also initiated a six month advertising campaign on local TV station, promoting rice fortification to spread awareness of its health benefits.

The Ministry of Health and the Ministry of Agriculture and Fisheries, with support from WFP, could collaborate with importers and millers to educate rice retailers about the benefits of fortified rice. This could help address consumer concerns about the quality of rice and fear of adulteration, if any.

Recommendation 5: Strengthen the domestic rice supply chain

Provide farmers and millers with the required financial and technical support to boost local production of rice and reduce dependence on imports

In the long term, it is expected that the local rice industry will develop, and domestic production of fortified rice will increase. WFP, in consultation with the Ministry of Agriculture and Fisheries, is already collaborating with farmer associations to find solutions for the barriers which are impeding growth of local rice industry. The following recommendations have been made:

1. The government could provide financial assistance to farmers (through bank loans and subsidies) for switching from traditional to modern methods of farming.
2. The Ministry of Agriculture and Fisheries, in collaboration with WFP and FAO, could conduct workshops for farmers to educate them about seed quality, soil health, advanced irrigation techniques, etc.
3. The Ministry of Agriculture and Fisheries, with assistance from the Japan International Cooperation Agency, could provide farmers with high quality inputs and loans to upgrade irrigation techniques (such as drip irrigation).
4. Technological advancement would significantly help millers to scale up their production capacities and, ultimately, compete with cheaper imports. Millers can be provided with loans at subsidized interest rates to modernize.

The scale-up of the rice fortification programme depends on the effective implementation of the food fortification decree law. This requires coordination among all stakeholders coupled with long-term commitment. Eventually, a combination of a regulatory environment and effective compliance by private stakeholders will create a sustainable ecosystem. This will help significantly in reducing micronutrient deficiencies in Timor-Leste.

Annex

Key seasons for rice planting and harvest

In Timor-Leste, two climatic zones exist: one in the north, the other in the south. They are divided by mountains and a central plateau.

During the wet season the northern part has one rainfall peak lasting between four to six months. The southern part has two rainfall peaks during the wet season which lasts between seven and nine months. The first southern peak is between December and February and the second in May and June.

Table 9: Planting and harvest seasons of rice in Timor-Leste

Region	Season	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
North	Wet												
	Dry												
South	Wet												
	Dry												

Planting Harvest

Source: FAO

Selling price of rice

Table 10 details the prices of the top rice varieties.

Table 10: Average prices of white rice in Timor-Leste

Year	Local rice (USD/kg)	Imported (USD/kg)
2017	2.00	1.25
2018	2.00	1.25
2019	NA	NA
2020	1.71	0.54
2021	1.44	0.58
2022	1.36	0.58

Source: WFP

Key rice brands imported by Timor-Leste

The importers consulted in this study imported rice primarily from Thailand, Vietnam, India and Pakistan. The brands of rice imported are detailed in Table 11.

Table 11: Key rice brands imported by Timor-Leste

Key rice brand	Importing country
Boek	Pakistan
Fos Global	Thailand
Bintang	Thailand
Nasi Enak	Thailand
Nasi Wangi	Thailand
Royal Lobster	Thailand
Manu Vitoria	Thailand
Folsom	Thailand
Gostu Loos	Thailand
Brom Merah	Thailand
Beras Wangi	Vietnam
Tali Merah	India
Columbus	Pakistan

Source: ValueNotes Analysis

Role of different entities in the rice supply chain

Table 12: Supply chain participants and their roles

Serial number	Key players	Step involved in
1	Farmers	Seed selection, land preparation, crop establishment, crop care and maintenance, harvesting, threshing, and hauling are performed by the farmers. Crops are usually used for household consumption although throughout the country farmers will occasionally sell some of their products, particularly when there is a surplus or a family emergency.
2	Producer organizations	Producer organizations include farmers and millers engaged in marketing and organizing sales and production assistance. In Timor-Leste, producer organizations are not very active.
3	Traders	In cases of surplus production, farmers may sell processed rice to traders who take care of transportation, packaging and sale in urban areas. Traders act as middlemen and sell the rice from farmers (mostly in rural areas) to large millers (in urban areas).
4	Millers	Collection, de-husking, grading, packaging and labelling. Most rice is milled in small milling machines owned by the community. There are 6 mid-size millers in Timor-Leste (<15 MT/day).
5	Wholesalers	Supply milled rice to retailers or sell it directly to consumers.
6	Retailers	Buy rice from millers or wholesalers and sell it through traditional retail stores (wet markets, sari-sari stores, etc.) and modern retailers (supermarkets, hypermarkets, online, etc.).
9	Importers	Import and supply rice produced in countries such as Thailand, Vietnam and India.
10	Consumers	End users who influence the demand for rice in the market.

Technologies for rice fortification

Rice can be fortified using different technologies such as dusting, coating, cold extrusion, warm extrusion and hot extrusion.

Extrusion, appropriate for Timor-Leste, is a fortification technique in which FRK is added to the polished rice in ratios ranging from 1:50 to 1:200.

Cold Extrusion, 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 process remains below the melting temperature of the rice starch (30–40°C) and gelatinization of the starch does not take place.

Hot Extrusion applies additional heat energy 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, is 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 a similar appearance to normal polished rice (George Steiger 2014).

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Abbreviations

AIFAESA	Inspection and Monitoring Authority on Economic, Sanitation and Food Activities
CLN	National Logistics Centre
FAO	Food and Agriculture Organization
FRK	Fortified rice kernel
KOICA	Korea International Cooperation Agency
KONSSANTIL	National Council for Food Security, Sovereignty and Nutrition in Timor-Leste
SBN	SUN Business Network
SUN	Scaling Up Nutrition
UNDP	United Nations Development Programme
TLFNS	Timor-Leste Food and Nutrition Survey 2020
USAID	United States Agency for International Development
USD	United States dollar
USDA	United States Department of Agriculture
WFP	World Food Programme
WHO	World Health Organization

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