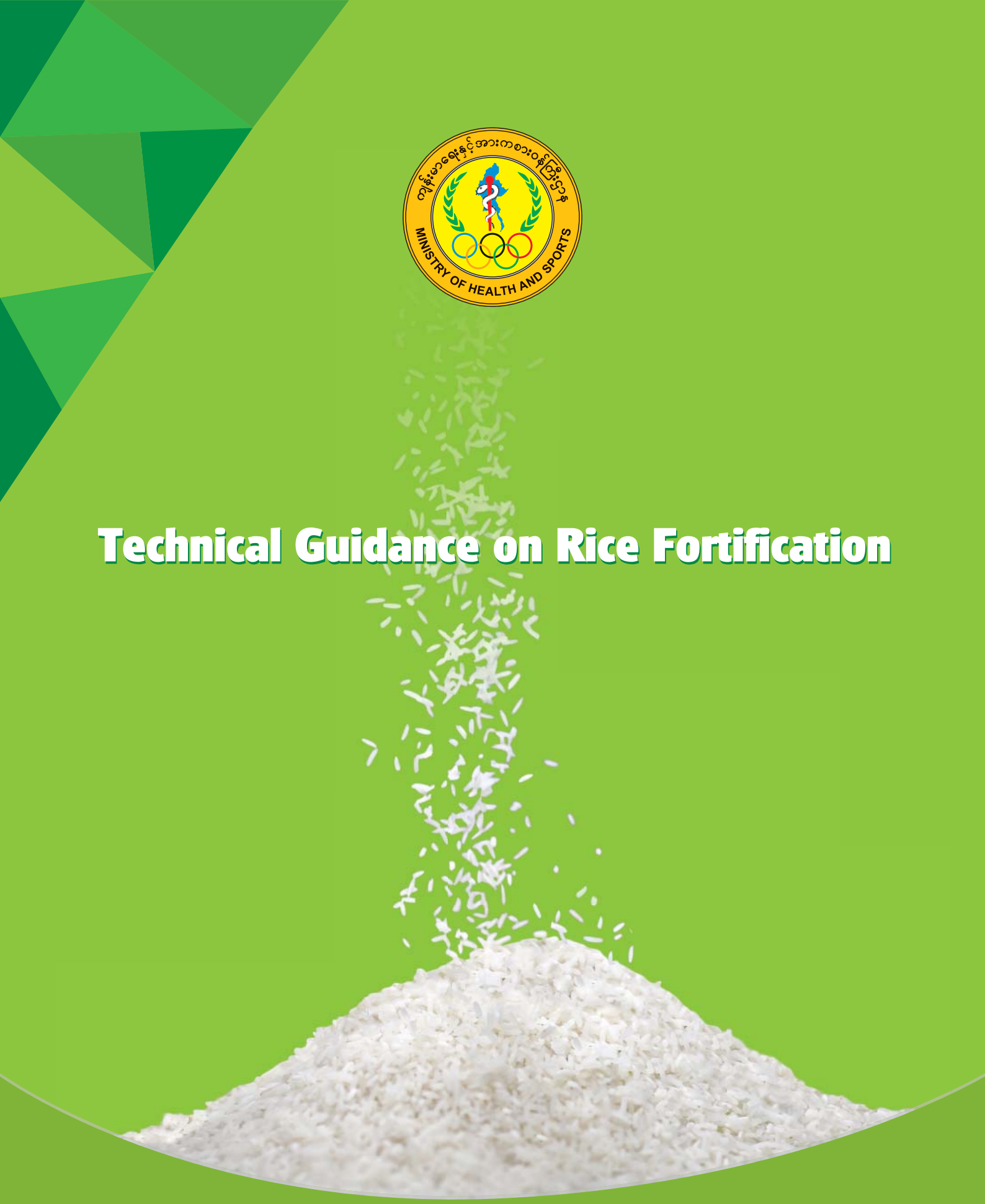
Technical Guidance on Rice Fortification



Ministry of Health and Sports
February 2019 (Version - 1)

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Contents

1. Background

The Government of Myanmar has been implementing the nutrition promotion program through 5-yearly National Plan of Action on Nutrition [1] [2] to improve the nutritional status and overall health of its citizens. The plan identifies food fortification as one of the approaches to reduce micronutrient deficiencies [3] which are amongst the major nutrition problems in Myanmar. Rice is one of the best vehicles for food fortification [4], as it is the staple food of the general population of Myanmar [5].

Accordingly, the National Nutrition Centre under the Ministry of Health and Sports with support from PATH and in coordination with all stakeholders has initiated the introduction of fortified rice in Myanmar since 2013. The national-level Rice Fortification Working Group (RFWG) was formed with the public, private and social sector partners to guide the process and to provide technical support to the implementing partners. RFWG has approved micronutrient content specifications and quality control mechanism for rice fortification in 2014. It also recommends the use of category brand, quality seal and eligibility criteria for the purpose of introduction of rice fortification in Myanmar.

Fortified Rice

Fortified rice is produced by blending fortified rice kernels with traditional rice at a ratio of 1:99 [6][7]. It is intended to be as close as possible to traditional rice in smell, taste, and texture. In this technical guidance, fortified rice kernels refer to premade micronutrient kernels that are produced by blending rice flour and premix (commercially prepared blend of vitamins and minerals) through an extrusion method [6][7][8]. The composition of fortified rice, micronutrient content specifications and quality control mechanism in Myanmar that are described in this guidance are endorsed by RFWG on December 16, 2014 (see Annex A & B).

2. Eligibility criteria for producing fortified rice using the fortified rice category brand and quality seal

A rice miller who plans to produce fortified rice in Myanmar must meet following criteria:

i. Be a registered rice miller or trader.

ii. Be able to demonstrate by principle and practice the adoption, implementation, and recording of good manufacturing practices, good hygienic practices, and a hazard analysis critical control point program.

iii. Present evidence of purchase of fortified grains from a fortified grain supplier or a statement of the miller's own production of those grains, if applicable.

iv. Produce fortified rice products in accordance with the standards endorsed by RFWG and established by NNC (please see Annex B "Fortified Rice Production Quality Control Process - Fortified Rice Production Process")

v. Submit samples of its fortified rice products to NNC and the Myanmar Food and Drug Administration (FDA) as part of initial quality verification and according to the fortified rice production quality control process (Annex B) OR upon request by NNC or FDA.

vi. Allow NNC, FDA, or their designated body to have access to the miller's facilities for quality audits, as part of the quality verification process.

vii. Promptly address any process or product quality issues identified by the NNC or FDA in its quality verification process.

3. Procedure for producing fortified rice using the fortified rice category brand and quality seal

A rice miller who plans to produce fortified rice in Myanmar needs to submit an information package that includes the following:

i. Evidence of permission under respective national law to operate as a rice miller or trader.

ii. Evidence of purchase of fortified grains from a fortified grain supplier or statement of the miller's own production of those grains, if applicable.

iii. Submission of samples of its fortified rice products to NNC and FDA as part of initial quality verification.

iv. Company quality control manual.

v. Evidence that packaging follows food-labeling practice with the use of the fortified rice category brand and quality seal.

vi. A signed disclaimer in which the miller assumes final and legal responsibility for the quality of the verified product, pursuant to the legislation in effect.

4. Category Brand and Quality Seal [9]

The category brand အားပြည့်ဆန် was created to assist consumers to identify fortified rice.

The quality seal  was created to assure consumers that the quality of fortified rice meets the national composition standard endorsed by NNC.

Annex A. Composition of Fortified Rice in Myanmar

General Composition [10]

- Components: iron, zinc, vitamin A, thiamin, niacin, vitamin B6, folic acid, vitamin B12.
- Amount: 100 percent of estimated average requirement of males aged 19 to 50 years old.

Detail Composition

The detail composition recommendation is based on "Proposing nutrients and nutrient levels for rice fortification" by Saskia de Pee [11], which thoroughly assessed the nutritional requirements of different population subgroups and the bioavailability of each nutrient compound added to fortified rice. Based on the rice consumption level in Myanmar, the composition of fortified rice should be >300 mg/d level [12].

Table Nutrient levels proposed for fortified rice at moment of consumption (mg/100 g)[g]

Nutrient	Compound[a]	<75 g/d	75–149 g/d	150–300 g/d	>300 g/d	EAR[b]
Iron[c]	Micronized ferric pyrophosphate	12	12	7	7	
Folic acid[d]	Folic acid	0.50	0.26	0.13	0.10	0.192
Vitamin B12[d]	Cyanocobalamin	0.004	0.002	0.001	0.0008	0.002
Vitamin A[d]	Vitamin A palmitate	0.59	0.3	0.15	0.1	0.357 (f) 0.429 (m)
Zinc[e]	Zinc oxide	9.5	8	6	5	8.2 (f) 11.7 (m)
Thiamin[f]	Thiamin mononitrate	2.0	1.0	0.5	0.35	0.9 (f) 1.0 (m)
Niacin[f]	Niacinamide	26	13	7	4	11 (f) 12 (m)
Vitamin B6[f]	Pyridoxine hydrochloride	2.4	1.2	0.6	0.4	1.1

[a]Source: Steiger *et al.*[12]
[b]It is important to note that these fortification levels aim at providing the EAR (estimated average requirement) by the particular food, which is in line with the WHO/FAO guidelines for micronutrient fortification.[5] When other mass fortification programs are implemented effectively as well, the suggested fortification levels may have to be adjusted downwards.
[c]Concentration of 7 mg/100 g is proposed for both the 150–300 g/d and >300 g/d categories because there are limited data about the effectiveness of iron fortification of rice, choice of iron compounds suitable for rice fortification is limited, and iron deficiency and anemia are important reasons to implement rice fortification. For the <75 g/d and 75–149 g/d categories, the level is almost twice as high. It is important to note that these levels require blending at a higher ratio, such as 1.5:100 or 2:100 in order not to have a fortified kernel that can be distinguished from unfortified kernels. Also, organoleptic properties of this concentration need to be assessed.
[d]Concentrations are the same as recommended for wheat and maize flour.[16]
[e]Concentrations have been set between those recommended for high- and low-extraction flours and at a level that keeps the ratio with iron close to 1.
[f]Concentrations have been set such that they provide the EAR, which is comparable to the levels proposed for folic acid and vitamin B12.
[g]These are targets for consumption. Overages may be added for specifications for production, and ranges can be set for assessing compliance with specifications.

Composition of fortified rice

Nutrient (Fortificant)	Compound Form	Amount recommended for rice consumption of >300 g/cap/d, in ppm (mg/100 g)	Targeted amount in 100 g uncooked rice	Target fortification level, including 30% overage for vitamins to compensate storage losses	Target range ex-factory	Expected range at household level
Vitamin A	Vitamin A palmitate	**0.1000**	100.0 mcg (=RE)	130.00 mcg	115.00-145.00	100.00-160.00
Vitamin B1 (Thiamin)	Thiamin mononitrate	**0.3500**	0.35 mg	0.46 mg	0.40-0.52	0.30-0.60
Vitamin B12	Cyanocobalamin	**0.0008**	0.8 mcg	1.04 mcg	0.90-1.20	0.80-1.30
Folic acid (B9)	Folic acid	**0.1000**	100.0 mcg	130.00 mcg	110.00-150.00	100.00-160.00
Iron (Fe)	Micronized ferric pyrophosphate	**7.0000**	7.00 mg	7.00 mg	6.00-8.00	6.00-8.00
Zinc (Zn)	Zinc oxide	**5.000**	5.00 mg	5.00 mg	4.50-5.50	4.50-5.50
Niacin	Niacinamide	**4.000**	4.00 mg	5.20 mg	4.50-6.00	4.00-6.50
Vitamin B6	Pyridoxine hydrochloride	**0.4000**	0.40 mg	0.52 mg	0.45-0.59	0.35-0.70

Source: Sasika. de Pee Proposing nutrients and nutrient levels for rice fortification. Annals of the New York Academy of Sciences. 2014;1324:55-66. doi: 10.1111/nyas.12478.

Notes:

1. The iron fortificant that can be used in rice is ferric pyrophosphate. Other fortificants, such as Ferric Sodium Ehtylenediaminetetraccetate (NaFeEDTA) and ferrous fumarate, produce a brown-colored kernel.
2. Target range ex-factory applies +/- 10 percent and rounding.
3. The expected range at household level (or anywhere in the supply chain) is for the targeted amount of vitamins as the minimum and ex-factory maximum as the maximum. For minerals, the ex-factory range is taken.
4. The target and expected range cannot be used for quality control because the variation of the concentration in a sample of fortified rice may be beyond the specified range; this is due to the fact that fortified kernels are blended with normal rice at a ratio of 1:99, which is equivalent to approximately 50 fortified kernels per 100 g. Thus, a 100 g sample with less than 45 or greater than 55 fortified kernels already will be outside the target range.
5. Quality control is best done on fortified kernels while applying a larger range of permitted concentration to fortified rice.

Annex B. Fortified Rice Production Quality Control Process

Purpose

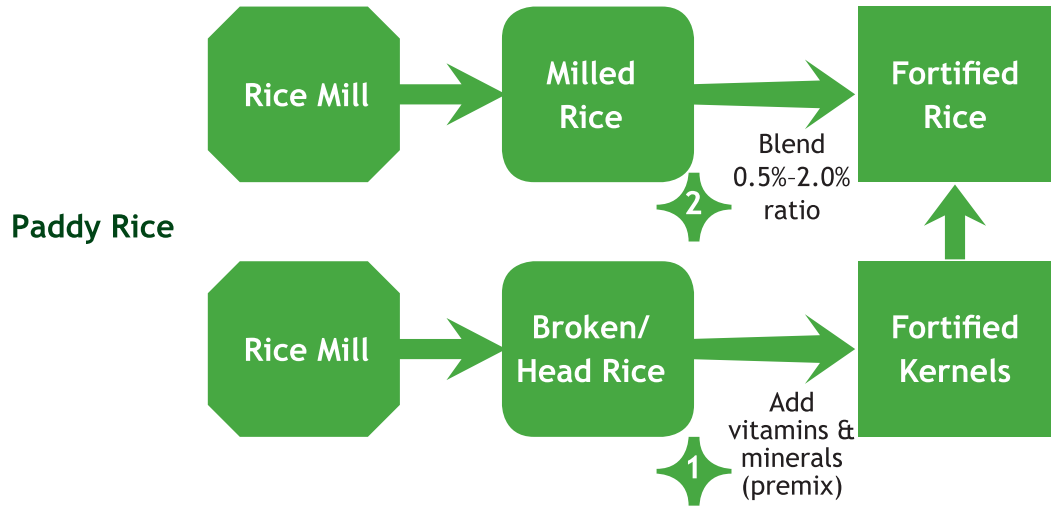
A clear and formal process for fortified rice quality verification is one of the cornerstones for the creation of a sustainable, credible, and effective fortified rice market in Myanmar. Defining, enabling, implementing, and sustaining this process and the associated standards will inspire the confidence of consumer and retailers, and will support rice millers in supplying a high-quality product to the market. This quality control process should underlie the granting of the fortified rice quality seal to products that abide by rice fortification standards.

Guiding Principles

- *Technical soundness and quality.* The quality control process should be technically robust and consistent with quality control principles and procedures prevalent in the food industry. The product specifications (either for the fortified kernels or the fortified rice product, or both) must be validated by an accredited laboratory which adheres to a set protocol for testing of the micronutrient content. The raw materials used in the production of fortified grains must be good quality and meet Food and Drug Administration (FDA) food safety standard.
- *Simplicity and cost-effectiveness.* The quality control process should avoid non-value adding complexity and imposing unnecessary burdens on grain producers, rice millers and the implementing entity. It should be simple to understand and simple to implement, and should have minimal impact on the cost structure of fortified rice in Myanmar.
- *Transparency.* The quality control process should be clearly defined and its description publicly available.
- *A baseline.* The micronutrient content standards associated with the quality control process should reflect the minimal set of micronutrients to be present in any verified fortified rice product commercialized in Myanmar as recommended by National Nutrition Center (NNC), Department of Public Health, Ministry of Health and Sports.
- *Visibility.* Fortified rice brands qualified through this process should be granted the right to use, and be distinguished by, a standard fortified rice quality seal in their packaging and marketing communications.
- *Self-sustainability.* To ensure the long term viability of the quality control process, it should be self-funded by grain producers and rice millers.

Standard Production of Fortified Rice [13]

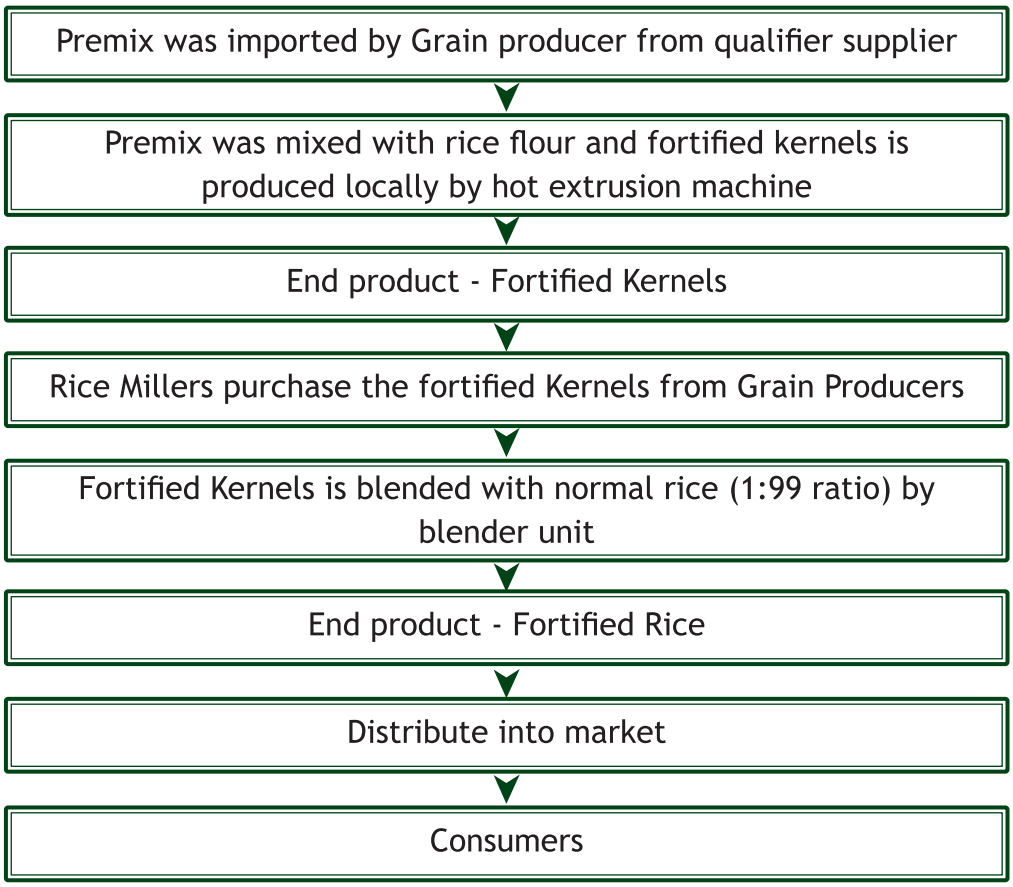
The figure below describes the quality control process of fortified rice.



There are two key sets of standards covered by the quality control process:

- **Micronutrient content standards:** These standards specify the minimal set of micronutrients and the appropriate levels of each micronutrient that should be present in any fortified kernel in Myanmar.
- **Blending ratio standard:** This specifies the standard blending ratio that a rice miller must meet in producing fortified rice brands.

Fortified Rice Production Process



Proposed Quality Control Process [14][15][16][17][18][19][20][21][22]

Internal			Process	External		
Who	When	Where		Who	When	Where
Fortified grain producer	For each premix import	Factory	1. Imposing quality control on the premix to ensure that specifications are met (Obtain certificate of analysis for every delivery of the premix	FDA (in collaboration with NNC)	Import recommendation—first import and every 2 years	At importation site
Fortified grain producer	Monthly	Factory	2. Establishing quality control measures for premix handling and storage			
Fortified grain producer	Daily	Factory	3. Establishing good manufacturing practice, good hygienic practice	FDA	Start of factory running	Factory
Fortified grain producer	Daily	Factory	4. Record keeping of all the quality control activities for the fortified products			
Fortified grain producer	6-monthly	Factory	5.Routinely undertaking analyses of the fortification level of the fortified products	FDA, NNC	Annually	FDA lab, NNC lab
Fortified rice producer	For each fortified kernels purchase	Rice mill	1. Imposing quality control on the fortified rice kernels to ensure that specifications are met			
Fortified rice producer	Monthly	Rice mill	2. Establishing quality control measures for fortified rice kernel storage			
Fortified rice producer	Daily	Rice mill	3. Establishing quality control on the blending process and ratio			
Fortified rice producer	Daily	Rice mill	4. Record keeping of all the quality control activities for the fortified products			
			5. Routinely undertaking analyses of the blending ratio	FDA, NNC	Annually	At retailer

Abbreviations: FDA, Myanmar Food and Drug Administration; NNC, National Nutrition Center.

Annex C. Guide for Fortified Rice Category Brand and Quality Seal

Characteristics of fortified rice category brand and quality seal [23]

The fortified rice brand name Arr-phyae-san and its visual identity were created in response to the challenge of attracting a very specific type of consumer. In order for brand awareness to reach its maximum potential, the visual presentation of a brand across all media at local, national, and international levels must be carefully managed. Visual consistency plays a fundamental role in increasing recognition of the services and products provided by the brand. The purpose of this guidance is to provide a holistic standard for the presentation of the fortified rice category brand and quality seal across an entire range of visual media.

Category Brand

အားပြည့်ဆန်

Guidelines

The brand name should never use colors other than those specified in this manual and should always be created from original, digital artwork and never redrawn.

Minimum Size

The fortified rice category brand name must not be reproduced at a size smaller than 70 mm in length.

Color Treatment

There is one preferred full-color option.

Packaging

General arrangement, front of the package

The preferred position for the logo on the front of the package is at the middle (vertically), right (horizontally), of the package, but the middle (vertically), center (horizontally) is also acceptable if the existing package design requires it.

General rrangement, back of the package

The preferred position for the logo on the back of the package is the top left area, but a top center location is acceptable.

Quality Seal

Guidelines

The seal should never use colors other than those specified in this manual and should always be created from original, digital artwork and never redrawn.

All elements within the seal variations must remain at their fixed proportions and should not be scaled, repositioned, or altered in any way.

Construction

The graphic element is made up of two parts: (1) the central element is a rice grain wreath coming together in the shape of a heart within (2) a green shield.

Family

The quality seal is well proportioned and therefore available only in its stacked version with the height to width ratio of 6 to 5.

Clear Space

The minimum clear space or margin for the fortified rice quality seal is based on the 5 mm version of the seal. On all sides, the minimum clear space should be measured from the farthest edge of the seal. No element, other than the tagline, may encroach on this space.

Minimum Size

The fortified rice quality seal must not be reproduced at a size smaller than 20 mm in height.
(Marberly 2011) (Rizwan Yusufali 2015) (Carmen Forsman 2014)

Color treatment

There is one preferred full-color option. The seal on the yellow field should be used whenever possible. The seal should not be placed on another color without the yellow field or reversed out of either color or imagery.

Packaging

General arrangement front and back: The preferred position for the seal on the front is at the bottom right of the package, but the bottom center is also acceptable if the existing package design requires it.

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LIFT
Livelihoods and Food Security Fund
UKaid
from the British people
European Union
Australian Aid
Swiss Agency for Development and Cooperation SDC
DENMARK
USAID
FROM THE AMERICAN PEOPLE
Government of the Netherlands
SWEDEN
afd
AGENCE FRANÇAISE DE DÉVELOPPEMENT
GRAND DUCHY OF LUXEMBOURG
DEVELOPMENT COOPERATION
NEW ZEALAND Aid Programme
Irish Aid
Rialtas na hÉireann
Government of Ireland