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Technology on Iron Rice Premix (IRP) and Iron Fortified Rice (IFR)

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Fortificant & Food Vehicle:

FORTIFICANT- a substance, in chemical or natural form, added to specific food vehicle to increase its nutrient value



Ferric pyrophosphate, powder (8% Fe) FCC

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FOOD VEHICLE- it is a means to supply the nutrient





Premix & Fortified Product:

PREMIX- a product formed by combining the food vehicle with a high concentration of fortificant (e.g.: cold and extrusion, coating, dusting)

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Rice



Ferric Pyrophosphate, Powder (8% Fe) FCC



Iron rice premix

SCIENCE AND TECHNOLOGY FORTIFIED PRODUCT- is a product to which a forticant or nutrient in the form of premix has



been added at a certain ratio (e.g. blending)



1q iron premix



200g ordinary rice



Iron Fortified Rice







Ferric pyrophosphate, powder (8% Fe) FCC

-uses super-dispersion technology

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DEPARTMENT OF SCIENCE AND TECHNOLOGY -is a blend of ferric pyrophosphate, an insoluble iron ingredient, and a unique emulsifiers and processing aids

-is readily dispersible in liquid formulations and no precipitation.

-the technology masks any disagreeable iron flavors without affecting the flavor of the final products



Fortificant



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 -is generally recognized as safe (GRAS)
-it is stable against PH, heat, sal t and oxidation and is mild on the gastrointestinal system, providing a nonirritating iron fortification

Ferric Pyrophosphate,

Powder (8% Fe) FCC

-has superior absorption properties



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Types of Rice Premix Technology

 Hot Extrusion -mixture of rice flour, fortificant, binder water, etc. passes through a screw extruder at high temp. (70-110°) to produce fully and partially precooked simulated rice kernel with similar sheen and transparency as regular rice kernels.



Users:

.DSM/Buhler

.COFCO in China

.Superlative Snacks, Inc., Phils

.Nutrition and Beyond Corp., Phils.



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Four Types of rice fortification technology

<u>Cold Extrusion-</u> low temperature (below 70°) process resulting in grains that are uncooked, opaque, and easier to differentiate from regular rice kernels



.Simple pasta press

.does not utilize any additional thermal energy input other than the heat generated during the process

.User: PATH, Vingui in Costa Rica



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3. <u>Coating</u> - combines the fortificant mixture with the ingredients such as gums then sprayed to the rice on the surface of grains kernels in several layers to form the rice-premix.





Users:

CLG-Health in MindanaoWright Enrichment rice-NFA

Advantages of Extrusion over other Technologies:

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1. Premix produced from extrusion is more acceptable in appearance, color and sensory acceptability;

2. The premix is stable and nutrient is retained after rinsing and washing; and

3. Does not use solvent therefore safe



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EXTRUSION TECHNOLOGY

-is simply the operation of shaping a dough-like material by forcing it through a die.







 -it can be used to cook, form, texturize and shape food products under conditions that favors quality retention, high productivity and low cost.





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IRON RICE PREMIX RICE (IRP) Equipment



<u>Continuous Processing Line at FNRI</u> <u>Facility for Premix Production</u>



Mixer

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Blower Conveyor Dryer



Polisher



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Batch-Type Premix Processing Equipment





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IRON FORTIFIED RICE (IFR) Equipment





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Iron Fortified Rice (IFR) Production





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Feeder/Dosifier for Continuous IFR Production









Nutrition & Beyond Corp. San Leonardo, Nueva Ecija



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Batch-type IFR Production Equipment









ANGELICA



Iron is an essential micronutrient. Consumption of iron rich food is expected to build healthy red blood cells, improve physical and mental performance, prevents anemia and strengthen the body against infection. Low iron absorption decreases ability of a person to fight infection and increase vulnerability to transmissible diseases

HOW TO COOK RICE:

- 1. Measure rice in cooking pot. Maglagay ng bigas sa kaldero.
- 2. Wash the rice 1-2 times. hugasan ang bigas isa hanggang dalawang beses.
- 3. Add water (1 ¼ cup to 1 cup rice) 1 ¼ tasang tubig sa
 - 1 tasang bigas.
- 4. Cover and bring to boil, then reduce heat and allow to simmer

for approximately 15 minutes . isalang, takpan at hayang kumulo, painitin ang kanin ng 15 minuto sa mahinang apoy

- 5. Remove from heat and serve. Alisin sa kalan at maaari ng ihain.
- NOTE: The suggested ratio in cooking rice is 1 ¼ cup water for every cup of Rice. But moisture in rice may vary Slightly due to time of the year , Requiring adjustment in water-rice ratio

NUTRITION INFORMATION

Serving Size 1 cup (180 g)	Amount per			
Derving Size F cup (100 g)	serving			
Energy (Calories)	160			
Total Fat (g)	0.5			
Total Carbohydrate (g)	36			
Total Protein (g)	3			
Sodium (mg)	0			
	% RENI			
Iron	15			

Based on RENI for male 19 years old and above

Ingredients:

Ordinadry rice, iron rice premix [flour, binders, micronized ferric pyrophosphate (as fortificant)], and water.

Manufactured by:

Jorge D. Aguilar Commercial Center, San Leonardo, Nueva Ecija

Technology Developed by:

Food and Nutrition Research Institute Department of Science and Technology

PRODUCT OF THE PHILIPPINES



LARGE SCALE PRODUCTION OF IRON FORTIFIED PREMIX AND IRON FORTIFIED RICE FOR THE MARKET TRIAL STUDY IN ORION, BATAAN



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RATIONALE

- Iron Deficiency Anemia (IDA) remains to be a public health concern in the Philippines (FNRI-NNS, 2008).
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- In support to the Food Fortification Law of 2000 (RA 8976).
 - Lack of scientific data on the market trial study, amidst legislation and advocacy for mandatory fortification.
- Iron fortified rice that reaches most households must be quality controlled to ensure food safety.





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General Objective:

To conduct production runs of IRP and IFR and establish its quality during the duration of the market trial study.

Specific Objectives:

- To find/develop a rapid method for determining the iron content in iron fortified rice (IFR);
- To determine the quality of iron rice premix and iron fortified rice at the production level;
- To monitor the quality of IFR at the market and household level.

Launching of IFR in Orion April 8, 2008















Social Marketing Efforts in Promoting Iron Fortified Rice in Orion, Bataan



Posting of labels

Posters



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METHODOLOGY







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METHODOLOGY

1. Physical Analysis



2. Chemical Analysis



3. Correlation Study of Physical and Chemical Analyses

DETERMINATION OF BLENDING RATIO (X) & IRON CONCN (Y_{ACTUAL}) OF PRODUCTION SAMPLES

DETERMINATION OF LINEAR MODEL EQUATION EVALUATION OF THE EQUATION BY CALCULATING Y_{predict} USING MONITORING SAMPLES



Results



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Number of sacks of iron- fortified rice produced/sold

There was a downward sales of IFR because of the 2008 rice crisis

RESULTS CORRELATION STUDY



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Figure 3. Linear Relationship between the physical and the chemical analysis using the 86 production samples

X= blending ratio (physical), independent variable

Y= actual iron concentration (chemical), dependent variable

Equation: Y= 0.819+ 574.114X + Error

Where: error is normally and independently distributed with mean equal to 0.000



Results of Paired Sample Test and Potential Error using Monitoring Data

CERTIFICATION INTERNATIONAL ISO 9001:2008 CIP/4217/09/02/629		Mean	Ν	SD	Significan t (2-tailed)
FNRI	<u>Dealer</u>				
FOOD AND	Actual Chem	3.8376	54	0.90288	0.850
	Predict Chem	3.8202	54	0.54032	
	Potential Error (PE)	2.97			
	Household				
ALE	Actual Chem	3.8376	54	0.90288	0.850
A A A A A A A A A A A A A A A A A A A	Predict Chem	3.8202	54	0.54032	
	Potential Error (PE)	1.26			





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PREMIX PRODUCTION RESULTS



- RIKI

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Blending ratio of iron rice premix at three production runs

- Almost 100% of the premix samples analyzed from the 3 production conducted at Superlative Snacks, Inc, using extrusion technology are within the set specification limits (600-760Fe/100g) as determined by 3 sigma level with a %cv of 5.6.
- Total of 5 tons of premix were produced from the three (3)



Duncan Test for iron premix production

CERTIFICATION INTERNATION AL ISO 9001-2008 CIP/4217/09/02/629	Production N		Subset for alpha = 0.05		SD
FNRL	date		1	2	
FOOD AND NUTRITION RESEARCH INSTITUTE	Nov 2008	96	663.8485		40.22787
DEPARTMENT OF SCIENCE AND TECHNOLOGY	July 2008	28	665.7004		26.35595
	Mar 2008	30		690.4350	33.42360



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Figure 5. Control chart of the mean iron premix production (1st P, Mar. 2008)





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Control chart of the mean iron premix production (2nd P, July 2008)



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Control chart of the mean iron premix production (3rd P, Nov. 2008)



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IRON FORTIFIED RICE PRODUCTION RESULTS





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Blending Ratio of Commercial IFR Production Runs

Blending ration of commercial IFR production runs

Data from the production of commercial IFR rice:

Number of production runs= 11 Standard Deviation= 0.0015283

Act. % within SL= 71.8% Number of data points= 2,091

Mean Blending ratio= 0.004911 Specific Limits (blending Ratio)= 0.004-0.006



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Control chart of the standard deviation of the mean commercial IFR production using 3 sigma level



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Blending ratio of NFA IFR Production Runs



Blending ration of NFA IFR production runs

Data from the production of NFA IFR rice:

Number of production runs= 26 Standard Deviation= 0.0015283

Number of data points= 7,470 Act. % within SL= 76.3 %

Mean Blending ratio= 0.005061 Specific Limits (blending Ratio)= 0.004-0.006



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Control chart of the standard deviation of NFA IFR production runs using 3 sigma level



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Monitoring of commercial and NFA IFR at the dealer and household levels

Data from the monitoring of NFA IFR at health and barangay centers: Mean Blending ratio = 0.005061 Specific Limits (blending Ratio) = 0.004-0.006 Number of samples collected = 388 Actual % within Specification Limit = 86.6%



Conclusions & Recommendation

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DEPARTMENT OF SCIENCE AND **TECHNOLOGY** Physical (rapid) method of analysis can be used to determine the iron concentration of the IFR in lieu of the chemical method.

 Iron rice premix (IRP) and iron fortified rice (IFR) was produced and quality controlled at the production and market level during the duration of the market trial study.



Through private-public partnership, the technology was easily transferred, commercialized and available in the market.



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Conclusions & Recommendation

- The underlying factors of a sustainable commercialization of iron-fortified rice were strong political support, close-knit cooperation and commitment of partners, intensive and continuous social marketing activities and maintaining the quality of the product.
- The result of the study can be used as basis for a province-wide market trial study.





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 - Adaptor of FNRI premix technology
 - Manufacturer of iron rice premix
 - Private company from Paco, Manila
- J.D. Aguilar Commercial Center
 - Private Miller form San Leonardo, Nueva Ecija
 - Blending and delivery of iron fortified rice to rice dealers in Orion Bataan
 - LGU's Orion, Bataan
 - Blending and delivery of iron fortified rice to health centers and barangay hall in Orion, Bataan
- Taiyo Kagaku, Co., Inc., Japan
 - manufacturer of micronized dispersible ferric pyrophospate fortificant





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THANK YOU!