# A Case for Fortified Rice

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Govt. of Odisha

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# A Case for Fortified Rice

Government of Odisha

ଶ୍ରୀମତୀ ରଞ୍ଜନା ଚୋପ୍ରା ଭା.ପ୍ର.ସେ
କମିଶନର ତଥା ସଚିବ,
ବିଦ୍ୟାଳୟ ଓ ଗଣଶିକ୍ଷା ବିଭାଗ, ଓଡ଼ିଶା
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मध्याह्न भोजन योजना
Mid Day Meal Scheme
State Project Management Unit (MDM)

## Foreword

I am glad that the pilot project for the fortification of rice served in the Mid-Day Meal programme in Gajapati district, Odisha is being documented. The collaborative pilot project implemented by Government of Odisha and World Food Programme reduced the prevalence of anaemia among school children to an extent of 6 percent point over a period of two years. The project is now being implemented by Government of Odisha. State Government is committed to provide wholesome, nutritious and adequate food with required calorie and protein content to school children through Mid-Day Meal programme.

Fortification of Mid-Day Meal has been a pioneering initiative of Government of Odisha to address the hidden hunger among the school children. The booklet, "**A Case for Fortified Rice**" documents the experience, lessons learnt, challenges, strategies and economics of fortification from the aspects of project implementation in a remote tribal dominated district. I hope the booklet will help the policy makers and the project implementers as a useful resource and contribute significantly to the fortification initiative of Mid-Day Meal for the State and outside. It is also expected that the booklet will also help streamline the fortification process and make it more focused, efficient and effective in meeting its objectives.

Smt. Ranjana Chopra

# ACKNOWLEDGEMENTS

WFP would like to extend its gratitude to its government partners at the national and state level for offering their unwavering commitment to the pilot project on operationalizing rice fortification through the platform of the Mid-Day Meal scheme in Gajapati, Odisha. WFP would like to thank Ms. Ranjana Chopra, Commissioner cum Secretary, Department of School and Mass Education, Government of Odisha; Mr. Gangadhar Sahoo, State Nodal Officer, Mid-Day Meal, Government of Odisha; Ms. Usha Padhee, Ex-Commissioner cum Secretary, Department of School and Mass Education, Government of Odisha; Mr. Basudev Bahinipati, Ex-District Collector, Gajapati; Ms. Mansi Nimbal, Ex-District Collector, Gajapati; Mr. Prasant Kumar Mohapatra, Ex-District Education Officer, Gajapati and Mr. Sanjib Kumar Singh, District Education Officer, Gajapati for their support and encouragement through the course of the project.

The successful implementation of the project was made possible by the implementing agency – PEACE (People's Educational Action and Communal Evocation), rice miller - Sri Sairam Rice Mill and the evaluation agency – Sambodhi Research & Communications..

**WFP's Project Implementation Team**
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## PREFACE

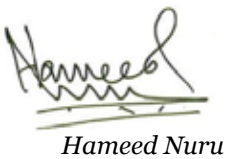
**FOOD FORTIFICATION** is safe and cost effective in the prevention of micronutrient deficiencies and has been widely practiced in developed countries for more than a century. Given fortification's well established dividend of US$30 saved for every single dollar invested, it is a smart investment that can help supplement the overall response to malnutrition in large populations. The Copenhagen Consensus Center – a think tank that researches the smartest solutions for the world's biggest problems, ranked fortification with micronutrients among the top three international development priorities in 2008.

Fortification has the greatest potential to improve the nutritional status of a population when implemented within a comprehensive nutrition strategy, which should include other interventions such as supplementation and diversification of the food basket. Key issues to ensure a sustainable fortification programme include: identification of the right food to fortify for the target population, ensuring quality of product, and consumption of sufficient quantity of the fortified food. To accomplish these aims, there needs to be demand that is sustained through behaviour change communication at the consumer level, and ready access to a sufficient supply of products that maintain standards set through a legislative process, from production to point-of-consumption. Government monitoring of compliance to standards and public-private partnerships are essential to ensure a competitive market for fortified products.

For rice fortification, India has all the necessary ingredients that go into a successful fortification programme. With an exceedingly committed government, leading nutritionist and food technologists, world-class technology, and a robust private sector, India is indeed well placed to provide fortified rice through both government food safety nets as well as the open market.

WFP has a long history of work in fortification in India. More recently, WFP successfully handed over a replicable model for fortification of rice served to school children under the Mid-Day Meal programme in Gajapati, Odisha. The pilot project helped reduce anaemia amongst school children, and was well accepted by the children who liked eating the iron-rich rice. It is estimated that with an additional cost ranging between Rs.0.08-0.12 per beneficiary per day, the Government of Odisha will be able to provide fortified rice to all children consuming mid-day meals in Odisha.

Working together with the government, private sector, civil society organizations and UN agencies, WFP has been supporting the strengthening of government food safety nets by making them more effective and efficient. Building a case for the mainstreaming of fortified rice into the government's food safety nets is a firm step in this direction. Leading response to the targets set under Sustainable Development Goal 2 – Zero Hunger, WFP is working towards ensuring that every man, woman and child has access to adequate and nutritious food.



*Hameed Nuru*
*Representative and Country Director*

# ACRONYMS

| | |
|---|---|
| ***ANM*** | *Auxiliary Nurse Mid-Wife* |
| ***AWC*** | *Anganwadi centres* |
| ***COA*** | *Certificate of Analysis* |
| ***DID*** | *Difference in Difference* |
| ***DSME*** | *Department of School and Mass Education* |
| ***FCI*** | *Food Corporation of India* |
| ***FRK*** | *Fortified Rice Kernels* |
| ***FSSAI*** | *Food Safety and Standards Authority of India* |
| ***GoO*** | *Government of Odisha* |
| ***HDPE*** | *High Density Polyethylene* |
| ***ICDS*** | *Integrated Child Development Services* |
| ***IDI*** | *In-Depth-Interview* |
| ***IFA*** | *Iron and Folic Acid* |
| ***MDM*** | *Mid Day Meal* |
| ***NABL*** | *National Accreditation Board for Laboratories* |
| ***NHED*** | *Nutrition Health Education* |
| ***NNMB*** | *National Nutrition Monitoring Bureau* |
| ***QA/QC*** | *Quality Assurance/Quality Control* |
| ***RDA*** | *Recommended Dietary Allowance* |
| ***TPDS*** | *Targeted Public Distribution System* |
| ***WFP*** | *World Food Programme* |

# CONTENTS

CHAPTER 1

# HOW STRONG IS THE CASE FOR FORTIFICATION OF RICE?

## Rice fortification is a safe and easy way for delivery of micronutrients

**INDIA HAS MADE** remarkable social and economic progress in the last 25 years. High economic growth has raised the per capita income and reduced poverty significantly. Despite this, the country has faltered on many crucial indicators. The nutritional status of the country has not kept pace with its surge on the economic front, which is a matter of grave concern. There is under-nutrition among large segments of the population, specifically among vulnerable groups like infants, young children, adolescents, women and the elderly.

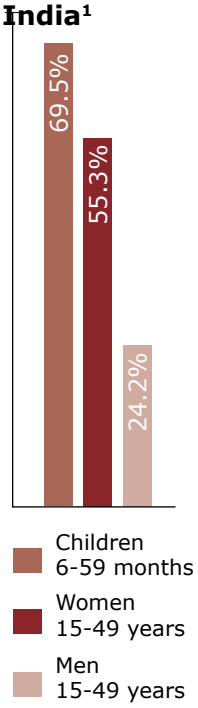
According to the National Family Health Survey III (2005-2006) anaemia is seen in 7 out of 10 children under the age of five, and as many as 38% of children under five years of age suffer from chronic malnutrition in India[1].

According to a survey carried out by the National Nutrition Monitoring Bureau (NNMB)[2] in 2012 across 10 states, the median intake for most nutrients was less than 70% of the recommended dietary allowance (RDA) for Indians (Annex 1), especially for school children, adolescents, and pregnant women. RDA is the average daily level of intake sufficient to meet the nutrient requirements of nearly all (97-98%) healthy people.

To address the situation governments, multilateral agencies and civil society respond through direct and indirect interventions. In 2013, India enacted the National Food Security Act that assures subsidised food grains to two-thirds of the population through the Targeted Public Distribution System (TPDS). In addition to TPDS, the National Food Security Act also covers the Mid Day Meal (MDM) scheme, the world's largest school lunch programme, and the Integrated Child Development Services (ICDS) Scheme which provides food and basic healthcare for mothers and young children below the age of six.

Yet, many health indicators still show up poorly in most parts of the country. In spite of recent improvements in the nutritional status of children, the progress has been slow and a lot more needs to be done. This is particularly true of micronutrient deficiency disorders, specifically anaemia. Miconutrient deficiency disorders are associated with a range of short and long-term consequences including maternal and child mortality, increased illness,

**Prevalence of anaemia in India[1]**




**65%**
**of Indians consume rice as a staple**

mental retardation, and poor cognitive and physical development. The consequences therefore negatively affect socioeconomic development at a household, state and national level.

## WHY FORTIFY RICE?

One way to deliver micronutrients is through fortified food. Food fortification can lead to relatively rapid improvements in the micronutrient status of a population, especially of vulnerable groups. It comes at a very reasonable cost, especially if advantage can be taken of existing technology and local distribution networks. Furthermore, it does not require any behavioural change on the part of the consumer.

Salt is a classic example. By making it mandatory by law to add iodine to all salt meant for human consumption[3], India is making significant progress towards addressing iodine deficiency disorders.

Among the various fortification modalities available, rice is an excellent product for delivering micronutrients to a very large number of people since 65% of Indians consume rice. Rice also constitutes a significant percentage of the grains distributed and cooked under the government social security nets.

Fortified rice, if provided through delivery channels that ensure maximum coverage like the MDM or TPDS, can reach every family under the scheme.

The high consumption of rice also reflects a lack of dietary diversity. Rice fortification therefore is an opportunity to improve dietary diversity by adding micronutrients.

## FORTIFICATION TECHNIQUES AND TECHNOLOGY OPTIONS

For a developing country like India, fortified rice is best produced through the extrusion technology. The extrusion method is preferred for the production of fortified rice owing to its low cost and stability across processing, storage, washing and cooking.

Overall, there are three main technologies for producing fortified rice - coating, extrusion and dusting. In the coating method, the nutrient (vitamin and mineral mix) is combined with ingredients such as waxes and gums. It is then sprayed on the surface of rice grains in several layers. This is then blended with polished rice in a ratio of 1:100. Manufacturers in Costa Rica, the Philippines and the United States use this process.

In dusting, micronutrients in the form of fine particles are blended with bulk rice. This method makes use of the electrostatic forces between the rice's surface and the micronutrients. However, with this technology, excess washing and cooking leads to significant loss of micronutrients. In developing countries where intensive rice washing is practiced, dusting is not recommended.

In the extrusion technique, milled rice

### PRIOR RICE FORTIFICATION INITIATIVES IN INDIA

Rice fortification is not new to India. Attempts have been made in the past to introduce fortified rice through existing public sector schemes. The Naandi Foundation ran a rice fortification programme from 2008 up till 2010, using MDM as a delivery channel. During the programme, 1,000 metric tons of rice was served to 60,000 beneficiaries.

Akshaya Patra Foundation also delivered 3,300 metric tons of fortified rice to 1.85 million beneficiaries through the MDM scheme in Rajasthan.

is pulverised and mixed with a premix containing vitamins and minerals. Fortified Rice Kernels (FRK) are produced from this mixture using an extruder machine. The kernels resembling rice grains are then blended with milled rice in the proportion varying from 0.5% to 2%[4].

## SCIENCE AND SAFETY

Since early 2000, 13 efficacy trials have been published that assessed the impact of fortified rice on micronutrient status. All studies used FRKs produced through extrusion technology. Each study was conducted in a controlled environment. They aimed to compare the impact on

### RICE FORTIFICATION AROUND THE GLOBE

Rice fortification is mandatory in the following countries:
Costa Rica, Nicaragua, Panama, Papua New Guinea and the Philippines.

In Brazil, Colombia, the Dominican Republic, South Africa and the United States of America, rice fortification is voluntary.

## Fortifying rice with micronutrients and providing it to a large number of people is a viable way to plug the nutritional gap

micronutrient status among individuals who received fortified rice versus those who received non-fortified rice and micronutrients in supplements instead.

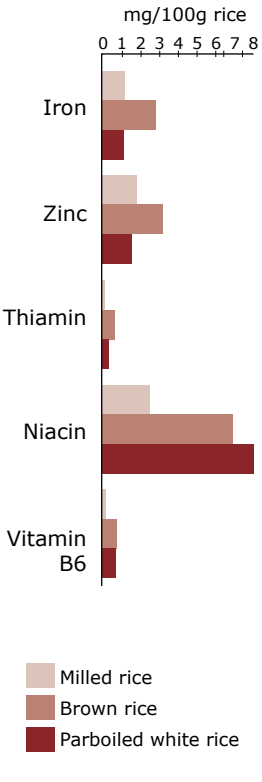
In nine of the studies, rice was fortified only with iron, and in one study only with vitamin A. In the remaining three studies, a combination of micronutrients (iron, zinc and vitamin A) was used.

The studies were conducted in low and middle-income countries including the Philippines, India, Nepal, Thailand, Mexico and Brazil. Study populations included children aged 6-23 months, preschool and school children, women of reproductive age and anaemic individuals. The amount of fortified rice that was provided in the studies varied from 50 g per week to 140 g per day and was often provided as one meal per day. The blending ratios of the fortified rice ranged from 0.5% to 2.5% and the iron content varied from 6-56 mg.

Out of the 13 efficacy studies using rice fortified with either iron alone or in combination with other micronutrients, five studies found an improvement in anaemia prevalence and haemoglobin levels implicit within it. Six of the eight studies that assessed the iron status found an improvement in it. The evidence for other micronutrients similarly concludes that vitamin A, folic acid, thiamine and vitamin B12 can be effectively added to rice[5].

Fortified rice has also been evaluated under less controlled, more programmatic conditions in four studies across the Philippines, Thailand and Costa Rica. Three of these studies demonstrated an improvement in the parameters being studied. These parameters included incidence of anaemia, beriberi and neural tube defect, along with haemoglobin levels.

**Miconutrient content in different rice[16]**




Vitamin A, folate, vitamin B12 content is negligible in milled, brown or par-boiled rice

### WFP AND RICE FORTIFICATION

WFP has been at the forefront and one of the leading agencies working towards increasing knowledge and acceptance of rice fortification around the world, particularly in Asia and Latin America. WFP has in-house technical expertise on rice fortification and has been closely involved in supporting governments, United Nations and international non-governmental organization partners, academia and the private sector through realistic guidance taking into account food technology, research, manufacturing and programming needs. As a result of the same, countries in the Asia region such as Sri-Lanka, Cambodia, Bhutan, Nepal apart from India are taking steps towards introduction of fortified rice. The Government of Bangladesh in partnership with WFP, has formally begun scaling up of rice fortification to reach beneficiaries with fortified rice through the government safety nets and aim to establish a sustainable commercial market for fortified rice in Bangladesh by 2017.


CHAPTER 2

# SETTING UP THE KITCHEN

## Utilising existing state run schemes to implement rice fortification

**TO IDENTIFY THE OPTIMAL** delivery option for fortified rice an assessment of public health needs, rice supply chain and feasibility of rice fortification needs to be done.

Mandatory rice fortification offers the best opportunity to reach the most people in a cost-effective and sustainable way. In a country like India, social safety nets with their large scale coverage and focus on the vulnerable are an ideal platform to introduce fortified rice. Schemes like the Targeted Public Distribution System (TPDS) provide food grains at subsidised costs to both rural as well as urban populations. Social safety nets can also function as a catalyst for mandatory fortification.

The social safety nets to be considered for introduction of fortified rice are the Targeted Public Distribution System (TPDS), the Mid-Day Meal (MDM) Scheme and the Integrated Child Development Services (ICDS) scheme.

Another delivery platform, in the form of voluntary rice fortification may also be considered. This would require commercial rice producers to fortify

**100 million**
**school going children are being covered under the MDM scheme**

their produce with micronutrients. The fortified rice could then be made available in markets. However, unlike government food programmes, this platform does not ensure that fortified rice reaches the undernourished sections of the population due to constraints on coverage as well as escalated costs.

### TARGETED PUBLIC DISTRIBUTION SYSTEM

The TPDS is the country's largest food distribution programme. It provides essential food grains like rice, wheat and coarse cereals to almost two-thirds of the population at subsidised rates each month.

As per the last national census in 2011, there were 269.7 million people below the poverty line[6]. In the same year 43,102 metric tons of subsidised food grains were distributed, which included 24,325 metric tons of rice[7].

### INTEGRATED CHILD DEVELOPMENT SERVICES

The Integrated Child Development Services (ICDS) was introduced in 1975, to address the health and early education needs of children below the age of six. It also looks at the nutritional and health requirements of pregnant women, lactating mothers, and children at Anganwadi centres (AWC).

AWCs provide supplementary food for 300 days in a year[8]. Children between the ages of three to six years visit the AWCs for on-site meals everyday while the younger children receive a take home ration.

According to recent government data 0.96 million metric tons of wheat, 0.69 million metric tons of rice and 12 thousand metric tons of maize were distributed in 2014-2015[9].

### MID DAY MEAL

Since 2009-10, the MDM scheme has consistently covered more than 100 million school children in nearly 1.2 million schools and educational institutions across the country.

Over 2 million metric tons of food grains are allocated to the MDM annually[11]. It has been a widely successful welfare programme that not only raised the nutritional status of children but also improved school attendance significantly.

To achieve its objective of improving nutritional levels, the calorific value of a MDM lunch is fixed by the Government of India at 450 calories and 12 gm of protein for a primary school child, and 700 calories and 20 gm of protein for an upper primary school child[12].

### CHOOSING THE MID DAY MEAL FOR PILOT

A good way to deliver fortified food to school children is through the Mid Day Meal scheme (MDM), which caters to all boys and girls studying in government, local body and government-aided primary and upper primary schools. After widespread consultations with various stakeholders, the WFP selected the MDM scheme for rice fortification implementation.

#### Mid Day Meal in Odisha

Approximately 21,343 metric tons of rice grains are allocated by the Odisha State Government each quarter, which provides lunches for 3.25 million primary school children under the MDM programme[13]. For upper primary schools, nearly 11,886 metric tons of rice are allocated for 1.67 million children. As of July 2016, the MDM scheme in Odisha costs ₹4.58 per child in primary schools and ₹6.83 per child in upper primary schools[14].

Since 2009-10, the MDM scheme has consistently covered more than 100 million school children across the country

In order to highlight the potential of influencing nutrition at the right age, the food fortification project was piloted in Gajapati. It is a district in the poorer, southwest region of the state.

## INTRODUCING RICE FORTIFICATION IN GAJAPATI

WFP selected Gajapati to introduce its rice fortification initiative because it has been identified as heavily burdened by malnutrition[10]. It also has a high share of tribal population who are most susceptible to malnutrition, due to economic and social backwardness.

Since the state government was already providing rice based hot cooked meals to school children in primary and upper primary classes, the intervention only required that the rice used in MDM meals be fortified with iron.

The Gajapati initiative was therefore conceived as part of WFP's current engagement with India that takes into account several stages. These include designing pilot projects after discussions with state and national governments to tackle gaps in design, knowledge or technology; implementing the pilot project and demonstrating results; and assessing, evaluating and documenting to prepare a replicable, cost-effective model. This process can then be scaled up with some initial support.

CHAPTER 3

# RECIPE FOR FORTIFICATION

## Mobilising multiple agencies to deliver fortified rice to targeted beneficiaries

**WFP** collaborated with the Department of School and Mass Education, Government of Odisha to distribute fortified rice for Mid Day Meals (MDM) across 1,449 government schools in the district.

### PILOTING RICE FORTIFICATION

The pilot aimed to support the fortification of 5,352 metric tons of rice over a period of three years under the MDM programme in Gajapati, Odisha. The overall goal of the project was to operationalise fortification of rice through the MDM platform.

The project sought to ensure that at least 90% of the intended population between the age groups of 6 to 14 years received fortified rice based meals to reduce the prevalence of anaemia by 5%.

For the pilot to have any effect, it was necessary to train and build the capacity of state government officials for the procurement of fortified rice and to assure its quality. It also required training for the miller to blend regular rice grains with fortified rice kernels.

The main aim of the Gajapati project was to develop a replicable model for the Odisha state government. The model would be based on supply chain management, production, distribution and quality control of fortified rice for the school lunch programme.

For ease of operation, the pilot project was divided into six clear segments—fortification; supply chain management; capacity building of teachers and school management; information, education and communication; quality assurance and control; and monitoring.

During the project, rice from Food Corporation of India (FCI) warehouses was fortified at a central rice mill and further distributed to schools across Gajapati for the MDM lunch. To support fortification of rice for MDMs, WFP entered into a contract with a producer of FRKs. The FRK producer was responsible for the regular delivery of FRKs at the rice mill in Gajapati.

For further details on roles and responsibilities of the various stakeholders in the project, refer to Annex II.

**99,231**
**children in 1,449 schools covered under Mid Day Meal Scheme in Gajapati**

### CERTIFIED QUALITY

Each lot of FRKs was received with a Certificate of Analysis (COA) from an NABL accredited lab to ensure quality and the requisite nutritional content.

The miller then used a specialised blending machine provided under the project to mix the FRK in the proportion of 1 part to 100 parts of rice. QA/QC protocols for quality assurance and quality control were laid down at the mill. The fortified rice was packed and distributed in coloured 25 kg HPDE plastic bags, clearly marked as MDM rice and displaying the date of manufacturing. Steps were taken to

ensure that the supply chain at the school level was not broken.

Samples of raw and cooked fortified rice were lifted and tested by an NABL accredited laboratory monthly and quarterly, respectively, to ensure fortification at the right levels.

## RAISING AWARENESS AND BUILDING CAPACITIES

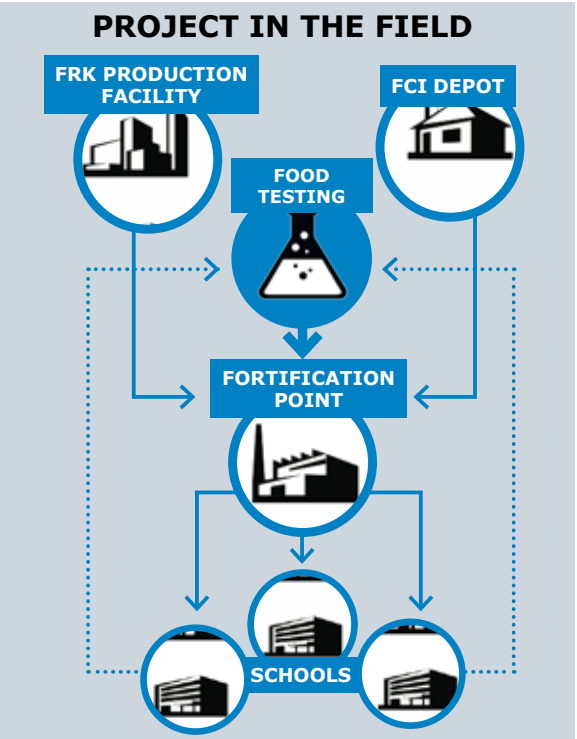
Since fortification of rice is new to the community it was essential to build awareness, sensitisation and regular communication with programme implementers, school teachers, cooks of the MDM, the school children and the community. This ensured the regular consumption of fortified rice. Activities in the local language and culture were organised to educate people about fortified rice and its benefits. Local folk media, posters and flyers were used to raise awareness among the community as well.

Regular Nutritional Health Education (NHED) sessions were conducted with school children, and teachers were educated about the causes of anaemia, its consequences and the strategies to address it. There was a focus on their role in the project, addressing any issues of acceptability by school children, proper storage of rice and other vital issues.

MDM cooks were trained to adopt efficient ways of cleaning, washing and cooking the rice which would help retain its nutritional value.

### NUTRIENT BOOST

The rice ration in Mid Day Meals is 100g and 150g for primary and upper primary students. Each 100g of fortified rice provides 10mg of iron translating into over 50% of the recommended daily allowance of iron between the age groups of 6 to 14 years.




**Nutrition Health Education sessions are conducted in schools while focus group discussions are conducted with communities**

## MONITORING

The project had a built-in system of monitoring wherein regular information was collected from the rice mill and schools on tonnage of rice fortified, tonnage of fortified rice distributed, iron content in the raw and cooked fortified rice, acceptability of fortified rice by school children, storage of fortified rice at the school level, and pipeline breaks in the supply of rice.

Government officials, WFP project team and the staff of the implementing agency regularly monitored the project through visits to the rice mill and schools. Monitoring checklists used can be found in annexes III and IV.

The project was also reviewed and assessed on a biannual basis by a technical advisory group at the state level consisting of policy makers from relevant departments at the national and state level, experts and WFP.

CHAPTER 4

# KEEPING AN EYE ON THE COOKING POT

Periodic evaluation and strategic intervention helped fine-tune the implementation and increase the impact.

**TO ASSESS THE** full impact of fortified rice, data was collected in the following stages: before the project started: baseline, halfway through it: midline, and at the completion of the programme: endline.

The research framework of the study was built around three basic questions:

*1) Was there a change?*

*2) Was the change due to the intervention of supplying fortified rice?*

*3) What were the factors that contributed to the change?*

The evaluation used the difference in difference (DID) method to study the differential effect of intervention in project area as compared to the control area.

## METHODOLOGY

Data was collected three times from a number of school children in Gajapati, where the project was implemented, and in neighbouring Rayagada district for comparison, since they have similar background characteristics. The study captured information from children between the age groups of 6-14 years about haemoglobin levels, height and weight, availability of health services, morbidity profile, awareness of nutrition and good health practices, and attitude towards schooling and learning.

**5%**
**fall in the prevalence of anaemia at the midterm assessment**

Additionally, a school facility checklist was devised to collect data on toilets and drinking water. Separate questionnaires were developed for teachers and parents. Since the schools administer the MDM, quantitative and qualitative questions were framed for teachers to learn about the MDM, storage, cooking, supply, malnutrition and fortification. The questions for parents looked at factors that prevent ensuring a balanced diet at home.

The study also conducted in-depth interviews with community leaders and stressed the need for community awareness and action in order to address the problem of malnutrition. Information was recorded at the rice mill where the fortified rice was produced.

## BASELINE SURVEY

The baseline evaluation was conducted in December 2012 to provide an in-depth analysis of the situation in the area of operation to benchmark key performance indicators, help in operations planning, and establish the basis for impact assessment after the project was completed. At the baseline, information was collected from a total of 1,899 children in Gajapati and 1,920 children in Rayagada district.

The survey found high levels of anaemia

in boys and girls in both districts. School attendance was low, at a daily average of 58%. The survey also showed that many teachers, parents and community members weren't aware of what micronutrient deficiency and anaemia were.

## MIDLINE SURVEY

In April 2014, a mid-term evaluation was conducted among a sub-set of children surveyed at baseline. The goal was to monitor progress, improve efficiency of the project and find out whether the implementation required any course correction in terms of orientation and emphasis.

In this survey, information was gathered from a total of 526 children in Gajapati and 384 children in Rayagada. A biomedical assessment was performed on a sub-sample of 388 students in Gajapati and 396 in Rayagada, in order to record the level of haemoglobin among the school children.

The mid-term assessment, conducted after one year of project implementation, showed a 5% fall in the prevalence of anaemia in Gajapati compared with the 1.2% increase in Rayagada. The findings of the midline survey revealed a significant increase in the number of students who were consuming the MDM daily.

There was a marked improvement in the average day-mean attendance of 25.2% for all schools across Gajapati. The results of the mid-term evaluation showed a positive trend in terms of results, especially related to anaemia levels, school attendance rates and acceptability of the fortified rice by school children and other stakeholders. A similar trend was visible in the control district on most of the applicable indicators except the prevalence of anaemia.

## ENDLINE SURVEY

The endline evaluation, conducted in February and March 2015, was aimed at assessing the impact of the rice fortification project and measuring the key performance indicators.

The survey was carried out in 60 schools each in the project (Gajapati) and comparison (Rayagada) districts. A total of 2,054 respondents were covered in Gajapati and 2,109 in Rayagada. A marked improvement was noticed in the reduction of anaemia in the project district compared with the comparison district.

Analysis of the endline survey indicated an increase in the consumption of MDM lunches, particularly on all six school days. Students indicated that fortified rice was liked and well accepted. Awareness about malnutrition and combative actions had jumped significantly.

Another significant finding was a widespread acceptance of the programme among government stakeholders at all levels.

## ETHICAL CONSIDERATIONS

In the three surveys, informed consent was obtained from all participants. The respondents were assured that the information they provided would be strictly confidential and only be used for research. Care was taken to ensure that proper hygiene was maintained in collecting blood samples.

The evaluation design involved interaction with human subjects and required approvals from the institutional review board, which were obtained before operations started.

CHAPTER 5

# RESULTS WERE WORTH WAITING FOR

## Gajapati saw a greater reduction in anaemia than Rayagada—a six percentage point difference that can be directly attributed to fortified rice

**THE MOST STRIKING** outcome of the Gajapati rice fortification project through the school Mid Day Meal (MDM) scheme was a significant reduction in anaemia. The improvement was as much as 20 percentage points in Gajapati compared with 14 percentage points in the neighbouring Rayagada district where the fortified rice was not supplied. This showed a clear 6 percentage point reduction that can be attributed to the consumption of fortified rice with a high degree of certainty.

However, the overall decrease in both the districts was due to a sum total of other factors which may include but not be limited to the weekly supply of iron and folic acid (IFA) tablets.

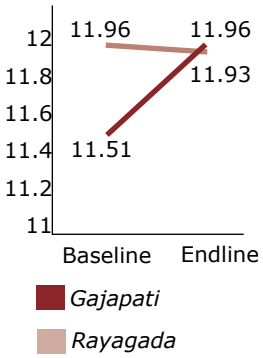
At the time the final survey was done in early 2015, 54.7% of the 1,960 school children had normal haemoglobin levels compared with 34.6% in 1,600 boys and girls at the end of 2012. This compares with 37.8% in 1,424 children in Rayagada at the baseline survey that improved to 51.6% in 2,083 children at the endline.

The data for anaemia was disaggregated by severity, sex and age group to further understand the reduction in the prevalence of anaemia. Significantly, the fall in anaemia was higher among the younger children.

The baseline survey showed that the haemoglobin level was significantly lower in the project district of Gajapati (11.51 g/dl) compared with Rayagada (11.96 g/dl). The endline survey revealed that there was a slight decrease in mean haemoglobin level in the control district Rayagada (11.93g/dl), while it was noticeably higher in Gajapati (11.96 g/dl). Even for this indicator, the younger age group of children showed a marked rise (0.56 gm/dl) in the level while there was mild decrease in the age group of 12 to 14. The distribution of mean values was consistent among both boys and girls.

Anthropometric measurements were also taken to assess malnutrition: weight, stunting and thinning. It was found during the baseline survey that 1 in 5 children approximately 21% were underweight in Gajapati. The incidence of stunting and thinning was seen in about 14% in each

**Mean HB level (g/dl)[17]**



**20** percentage points decrease in anaemia in Gajapati

**14** percentage points decrease in anaemia in Rayagada

**6** percentage points improvement is due to fortified rice

category of children.

All three indicators improved at the end of project activities, particularly stunting, which saw a reduction of up to 4.6%. In comparison, there was no significant increase in any of the three malnutrition gauges in the control district of Rayagada.

Besides the direct biochemical and anthropometric assessment, various other indicators were also investigated that included morbidity profiles, cognitive ability, and awareness levels. All the factors together constituted the overall effect of the project intervention. Statistical tests of significance were carried out for each indicator, which were supplemented by in-depth, qualitative interviews to draw insights.

To assess differences in cognitive ability, tests were given to the children of classes five and eight in language and math. Although class eight students showed better results in mathematics in Gajapati, there was no significant difference between the survey participants in Gajapati and Rayagada.

However, it was found in the qualitative surveys that teachers as well as parents agreed that the fortification scheme was especially helpful for children coming from poorer backgrounds, as they often had inadequate or no breakfast. There was a consensus among teachers that attendance rates had improved because the children were falling ill less often. They also said that the learning ability of the children had improved.

As in the previous indicator, parents and teachers in this case too said in the qualitative survey that the overall health of the children had improved significantly. Many respondents also strongly claimed that the children exhibited higher levels of activity in the two years between the baseline and endline surveys.

The survey also aimed to establish a logical link between cause and effect, so certain contextual factors were considered as well. This was based on secondary research on

"The health of the children has improved in the last two years. They are now less anaemic and are stronger than they were before"
—As reported by ANM in IDI at Gumma, Gajapati

health and education services received at school, attendance and enrolment rates and infrastructure available in the schools.

In terms of the consumption pattern of the school meals, it was found that as much as 99% of the children in the project area ate school meals, compared to 97.3% of children before the rice fortification initiative.

The endline survey also found that rice cooking practices improved in 88.3% of the schools in Gajapati as compared with 8.3% in Rayagada.

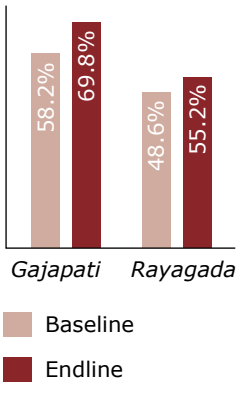
Another important indicator of the consumption of MDM lunches is the mean attendance rate, which is arrived at using attendance and enrolment data. This figure went up considerably in Gajapati compared with Rayagada.

More than 96% of children at endline reported no change in the taste of MDM. The concept of fortified rice was also found to be acceptable among government officials and teachers, who are primarily responsible for administering various welfare schemes.

### Rice as a Vehicle for Fortification

Rice fortification reinforces, complements and supports the ongoing Government run nutrition improvement programmes. Rice fortification is also technically effective and operationally feasible to implement in government social safety nets.

**Mean attendance in schools[17]**



CHAPTER 6

# ADDING MORE KITCHENS

## Using the success of the pilot intervention to reach out to other districts, states and the country

**THE PILOT PROJECT** in Gajapati demonstrated its operational feasibility and its technical effectiveness. It facilitated the 'know-how' in the district administration necessary for the management of such a project and is currently being sustained in the district by the DSME, GoO with their own human and financial resources.

WFP continues to work with DSME, GoO to scale up rice fortification in a phased manner. To do so, multi-micronutrient fortified rice would be distributed for consumption in MDM in four blocks of the Dhenkanal district in Odisha. In addition to iron, the rice will be fortified with zinc, vitamin A, thiamine, folic acid and cynacobalamin.

However, scaling up rice fortification in the MDM at the State level is not without challenges.

### INCREMENTAL COST

The incremental cost per beneficiary daily on account of fortification in Gajapati was 24 and 36 paise for primary and upper primary school children respectively. The cost of fortification is determined by a multitude of context specific variables such as the structure and capacity of the rice industry, the complexity of the supply chain, the policy and regulatory environment and the scale of the relevant programme.

The retail price increase for fortified rice

The FSSAI rice fortification standards will provide a valuable framework for states to design their own fortification programmes

as per information available from global experience ranges from an additional 1% to 10%. As rice fortification expands, production and distribution achieve economies of scale, costs are expected to reduce.

The additional cost in MDM inclusive of all associated costs is expected to vary between ₹ 0.08-0.12 per beneficiary per day, depending on each of the above factors as well as nutrients added.

This cost would need to be absorbed by either the central or state government or both on a cost sharing basis in addition to existing subsidies and funds for the MDM. In schemes such as the targeted public distribution system the cost can be passed on to the consumer as well.

### LACK OF POLICY DIRECTION

There is lack of policy guidance on integration of fortified foods in MDM. Issuance of a guidance note or an advisory on the same from the Central government to the States will assist in providing the states with the necessary framework and support.

The recently issued standards for rice fortification by the Food Safety and Standards Authority of India (FSSAI) will go a long way in providing state governments with a framework to design their respective fortification programmes. The rice fortification standards issued by FSSAI are placed in Annex V.

### LIMITED PRODUCTION CAPACITIES OF FRK

There are limited producers of FRK in the country. The limited production capabilities give rise to issues of monopoly and also limit the scale-up of the project. It is therefore necessary to establish more FRK producers and set guidelines and incentives for them.

### INTEGRATION IN SUPPLY CHAIN

In the Gajapati project, rice was fortified at a WFP contracted rice mill, mid-way between the direct deliveries of rice from the Food Corporation of India to the schools.

Fortification of rice along with paddy milling or fortification of rice at the Food Corporation of India (FCI) godowns may be more appropriate points for fortification. Pushing fortification further up the rice supply chain would also help to reduce its incremental cost.

### FRAGMENTED RICE INDUSTRY

The rice milling industry is the biggest agro-processing industry in India, with an annual turnover of over ₹2500 crore and around 85 million tons of paddy milled every year.

There are small, medium and large scale millers, a classification which is based on the capacity of the rice mill. The capacities of different mills range from 250-300 kg/hr to 10 tons/hr.

82,000 single hull units and over 2,600 double hull units are registered. However there are numerous unregistered mills throughout the country.

Over the years there has been a steady growth of improved rice mills in the country[15]. Given this widespread fragmentation, introduction of fortification can be a challenge.

**More**
**FRK producers are needed in India for rice fortification scale up**

## AFTERWORD

India – home to the world's largest government food safety nets, where 65 percent of the population predominantly consumes rice, there is a strong case for mainstreaming fortified rice into food safety nets as one of the responses to address micronutrient deficiencies.

As established in this document, rice fortification can be easily integrated into the existing supply chain of the Mid-Day Meal programme and other food based social safety nets, and is a safe and effective method to deliver micronutrients to children and communities. Fortified rice is well accepted, and tastes and looks just like regular rice. More specifically, the fortification of rice is a cost effective method of addressing anaemia, and with an additional cost of Rs. 0.8/ kg of rice, it is possible for Governments to provide fortified rice to not only children covered under the Mid Day Meal programme but to households as well.

The evidence gathered through the course of the work done by the government, NGOs and WFP in the area of rice fortification points to an urgent need to have in place a national policy for the inclusion of fortified rice into food safety nets. This policy push will not only nutritionally enhance food safety nets, but will also generate interest from the private sector to play a bigger role in the fortification of rice.

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## ANNEXURE I

### Average intake of nutrients among all age groups (pooled data from across states)[1]

| Age Group | | Energy (Kcal) | Total Protein (g) | Fat (g) | Calcium (mg) | Iron (mg) | Vitamin A (µg) | Thiamine (mg) |
|---|---|---|---|---|---|---|---|---|
| 1 - 3 Years | RDA | 1060 | 16.7 | 27.0 | 600 | 9.0 | 400 | 0.5 |
| | Intake | 767 | 21.3 | 14.8 | 247 | 5.8 | 151 | 0.5 |
| 4 - 6 Years | RDA | 1350 | 20.1 | 25.0 | 600 | 13.0 | 400 | 0.7 |
| | Intake | 1082 | 30.3 | 17.9 | 263 | 8.9 | 177 | 0.8 |
| 7 - 9 Years | RDA | 1690 | 29.5 | 30.0 | 600 | 16.0 | 600 | 0.8 |
| | Intake | 1303 | 36.5 | 20.4 | 290 | 10.5 | 184 | 1.0 |
| 10 - 12 Years (Boys) | RDA | 2190 | 39.9 | 35.0 | 800 | 21.0 | 600 | 1.1 |
| | Intake | 1462 | 40.3 | 21.9 | 306 | 12.1 | 221 | 1.1 |
| 10 - 12 Years (Girls) | RDA | 2010 | 40.4 | 35.0 | 800 | 27.0 | 600 | 1.0 |
| | Intake | 1401 | 38.6 | 20.7 | 293 | 11.4 | 198 | 1 |
| 13 - 15 Years (Boys) | RDA | 2750 | 54.3 | 45.0 | 800 | 32.0 | 600 | 1.4 |
| | Intake | 1659 | 46.0 | 24.0 | 343 | 13.4 | 244 | 1.3 |
| 13 - 15 Years (Girls) | RDA | 2330 | 51.9 | 40.0 | 800 | 27.0 | 600 | 1.2 |
| | Intake | 1554 | 42.4 | 22.5 | 319 | 12.8 | 244 | 1.1 |
| 16 - 17 Years (Boys) | RDA | 3020 | 61.5 | 50.0 | 800 | 28.0 | 600 | 1.5 |
| | Intake | 1839 | 50.0 | 27.8 | 385 | 14.8 | 261 | 1.3 |
| 16 - 17 Years (Girls) | RDA | 2440 | 55.5 | 35.0 | 800 | 26.0 | 600 | 1.0 |
| | Intake | 1656 | 45.3 | 24.4 | 337 | 13.5 | 246 | 1.2 |
| Adult Men (Seden-tary) | RDA | 2320 | 60.0 | 25.0 | 600 | 17.0 | 600 | 1.2 |
| | Intake | 1895 | 52.7 | 31.3 | 453 | 15.4 | 298 | 1.4 |
| Adult Men (Moderate) | RDA | 2730 | 60.0 | 30.0 | 600 | 17.0 | 600 | 1.4 |
| | Intake | 2079 | 56.7 | 30.0 | 431 | 17.2 | 294 | 1.6 |
| Adult Women (Seden-tary) | RDA | 1900 | 55.0 | 20.0 | 600 | 21.0 | 600 | 1.0 |
| | Intake | 1709 | 46.5 | 27.5 | 414 | 13.7 | 291 | 1.2 |
| Adult Women (Moderate) | RDA | 2230 | 55.0 | 25.0 | 600 | 21.0 | 600 | 1.1 |
| | Intake | 1832 | 49.2 | 26.6 | 372 | 14.4 | 251 | 1.3 |
| Pregnant Women (Seden-tary) | RDA | 2250 | 82.2 | 30.0 | 1200 | 35.0 | 800 | 1.2 |
| | Intake | 1773 | 48.6 | 28.1 | 418 | 13.7 | 291 | 1.3 |
| Lactating Women (Seden-tary) | RDA | 2500 | 77.9 | 30 | 1200 | 25 | 950 | 1.3 |
| | Intake | 1927 | 52.2 | 29.6 | 411 | 15.8 | 304 | 1.4 |

[1] Anon.2012. 'Diet and Nutritional Status of Population, Prevalence of Hypertension and Diabetes among Adults, and Infant and Young Children Feeding Practices – Report of Third Repeat Survey. National Nutrition Monitoring Bureau.

| Riboflavin (mg) | Niacin (mg) | Vitamin C (mg) | Dietary Folate (µg) |
|---|---|---|---|
| 0.6 | 8 | 40 | 80 |
| 0.4 | 5.3 | 16 | 55.5 |
| 0.8 | 11 | 40 | 100 |
| 0.5 | 8.2 | 25 | 81.1 |
| 1 | 13 | 40 | 120 |
| 0.6 | 10.1 | 29 | 97.1 |
| 1.3 | 15 | 40 | 140 |
| 0.6 | 11.6 | 34 | 107.1 |
| 1.2 | 13 | 40 | 140 |
| 0.6 | 11 | 32 | 103.2 |
| 1.6 | 16 | 40 | 150 |
| 0.7 | 13.3 | 36 | 120.7 |
| 1.4 | 14 | 40 | 150 |
| 0.7 | 12.3 | 38 | 111.1 |
| 1.8 | 17 | 40 | 200 |
| 0.8 | 14.5 | 41 | 132 |
| 1.2 | 14 | 40 | 200 |
| 0.7 | 13.3 | 39 | 120.9 |
| 1.4 | 16 | 40 | 200 |
| 0.8 | 15.3 | 51 | 137.3 |
| 1.6 | 18 | 40 | 200 |
| 0.9 | 16.7 | 46 | 149.5 |
| 1.1 | 12 | 40 | 200 |
| 0.7 | 13.8 | 48 | 120.9 |
| 1.3 | 14 | 40 | 200 |
| 0.8 | 14 | 39 | 130.3 |
| 1.4 | 14 | 60 | 500 |
| 0.8 | 13.8 | 43 | 129 |
| 1.5 | 16 | 80 | 300 |
| 0.8 | 15.5 | 47 | 137.1 |

## ANNEXURE II

### Roles & Responsibilities of Stakeholders involved in the Gajapati project

| Name of the Stakeholder | Responsibility |
|---|---|
| Rice Miller | • Blend the rice lifted from the Food Corporation of India (FCI) and the fortified rice kernels (FRK) in the ratio of 1:100 in the specially designed blender provided by WFP.<br>• Arrange transportation for lifting of milled rice from FCI depot to the rice mill as per the FCI release order. Be responsible for loading/unloading of FCI Rice.<br>• Arrange clean and demarcated storage facilities for FCI Rice, FRK and Fortified Rice. Ensure stringent norms of hygiene and standards of quality of the above enlisted stocks and equipment as per WFP guidelines.<br>• Arrange Insurance Coverage for the entire stocks as listed above.<br>• Arrange for appropriate weighing scales, packaging material, stationary items required for the blending operations.<br>• Undertake regular repair and maintenance of the blending equipment.<br>• Provide support during sample collection by laboratory staff.<br>• Engage competent and trained staff and laborers in the fortification or blending unit.<br>• Engage competent and trained staff and laborers in the fortification or blending unit.<br>• Maintain books of records in respect of FCI rice, FRK, fortified rice etc;<br>• Maintain a feedback register for government or other stakeholders to provide feedback upon a visit<br>• Share weekly & quarterly reports on quantity of fortified rice produced and issued to schools, balance of FRK, FCI Rice & processed rice. |
| Implementing Agency | • Organize regular Stakeholder consultations/ workshops at the district and block level to sensitize the programme implementers, field level functionaries, the community and its leaders about the project, its need, health benefits and status.<br>• Organize regular well planned multi-media awareness campaigns in all the villages covered under the project to create awareness about micronutrient malnutrition (with a special focus on anemia), causes, consequences, strategies to address the same including the importance of consuming fortified rice.<br>• Sensitize and capacitate the school teachers and cooks of schools covered in the project about the project, their role, micronutrient malnutrition (causes, consequences, solutions), food safety & hygiene, record maintenance vis-à-vis the project, handling of problems that may arise on account of the project (distrust, illness attributed to consumption of fortified rice etc.)<br>• Organize regular health and nutrition talks/discussions for the MDM beneficiaries covered under the project with a focus on micronutrient malnutrition.<br>• Develop, print and disseminate appropriate information, education and communication and training material.<br>• Select, regularly engage and train self-motivated volunteers (2 per block) from within the community. These volunteers to act as a resource bank for information on micronutrient malnutrition, regularly engage with the community and its formal and informal leaders to ensure project momentum.<br>• Monitor the implementation of the project in the schools, highlight problems with regard to implementation of the project (deterioration of fortified rice, rejection of cooked fortified rice by the MDM beneficiaries etc.) to the project coordinator and engage in problem resolution wherein in the identified task falls within the purview of the TOR and report to WFP on a monthly basis with regard to the tasks enumerated above.<br>• Undertake planning (micro-planning), organizing and implementation with regard to all the above in consultation with the WFP project coordinator and in accordance with a mutually agreed project implementation plan. |

| | |
|---|---|
| Laboratory | • Sample collection of raw fortified blended rice and cooked fortified rice from the project location and working the logistics for the sample from the project site to the location of the laboratory.<br>• Testing the raw fortified blended rice for total iron content, moisture content, mesophilic aerobic bacteria and yeast & moulds and cooked fortified rice for total iron content, mesophilic aerobic bacteria and yeast and moulds. The following test methods were used.<br>Moisture Content - ISO 712-2009<br>Total Iron Content - AOAC 944.02<br>Mesophilic aerobic bacteria - ICC no. 125, AACC 42-11<br>Yeast & Moulds - ICC no. 146, AACC 42-50<br>• Sharing the test results for each sampling activity within week of sample receipt at the laboratory testing facility. The release of the finished product (which in this case is fortified rice for distribution and consumption in the Mid-Day Meal of government schools in Gajapati, Odisha) is dependent upon the test results, this is a highly critical responsibility. |

## ANNEXURE III

### Monitoring Checklist – Rice Mill

*Date:* *Name:*
*Designation:*

| Items | Requirements | Inspection Methods |
|---|---|---|
| 1 Establishment/Rice Mill<br><br>1.1 Storage areas for FCI Rice, Fortified Rice Kernels, Blended/ Packed Fortified Rice, empty packaging material such as gunny bags and woven PP/ HDPE bags | 1.1.1 Designated areas for each product shall be provided separately in order to prevent mix-up and contamination<br>1.1.2 Building structure shall be strong, easy to clean and maintain<br>1.1.3 Storage areas shall be able to prevent entry of pests, insects, rodents etc<br>1.1.4 Storage areas shall be able to protect against moisture<br>1.1.5 Adequate ventilation shall be provided | 1.1.1 Check storage areas, structure and control measures against pests, insects, rodents, moisture etc |
| 1.2 Areas assigned for blending and packaging operations | 1.2.1 Areas shall be assigned with adequate working spaces and clearly separated from one another so as to prevent contamination | 1.2.1 Check the layout of the Rice Mill and operating areas |
| 1.3 Blending equipment, weighing scale | 1.3.1 Blending equipment shall be regularly cleaned and maintained.<br>1.3.2 Specifications, types, sizes and calibration of equipment, weighing scale and utensils used in the production shall be appropriate for production capacity. | 1.3.1 Visual inspection of the equipment |
| 2 Control of Blending, Packaging and Marking Operations<br><br>2.1 Batch Blending ratio of FCI Rice and Fortified Rice Kernels | 2.1.1 FCI Rice and Fortified Rice Kernels shall be blended in 1:100 ratio. | 2.1.1 Check the weight measurements of FCI Rice and FRK for 1 batch.<br>2.1.2 Interview operators/supervisor and/ or Rice Mill owner |
| 2.2 Blending time | 2.2.1 Each blending cycle shall follow a min blending time of 3 minutes to ensure blending efficiency | 2.2.1 Confirm the blending time through a stop watch or wall clock.<br>2.2.2 Interview operators/supervisor and/ or Rice Mill owner |

| | | |
|---|---|---|
| 2.3 Packaging & Marking | 2.3.1 Each batch of fortified blended rice shall be discharged onto a clean tarpaulin sheet .<br>2.3.2 Each batch fortified blended rice shall be weighed & packed in 25kg woven PP or HDPE bags with an inner PE liner.<br>2.3.3 Each bag shall carry the Batch & Lot number marked with a water proof permanent marker | 2.3.1 Visual inspection<br>2.3.2 Visual inspection<br>2.3.3 Visual inspection, Interview operators/ supervisor and/or Rice Mill owner |
| 2.4 Stacking of fortified blended rice | 2.4.1 Brick work method of stacking shall be followed<br>2.4.2 Vertical stack height shall be restricted to 12-14 feet so as to avoid injury, allow ventilation and access for sampling<br>2.4.3 Fortified blended rice bags shall not be directly placed on the floor. Shifting racks/pallets/tarpaulin sheets etc shall be used to prevent damage | 2.4.1 Visual inspection<br>2.4.2 Visual inspection<br>2.4.3 Visual inspection, Interview operators/ supervisor and/or Rice Mill owner |
| 2.5 Personal Hygiene | 2.5.1 Operators, Supervisor, Rice mill owner and Visitors shall adhere to personal hygiene practices | 2.5.1 Visual inspection of on-duty operators, supervisor and others |
| 3 Record Keeping | 3.1.1 Following records shall be maintained at the Rice Mill:<br>General information about the Rice Mill<br>Receipt of FCI Rice<br>Receipt of Fortified Rice Kernels (FRK)<br>Production figures<br>Dispatch of fortified blended rice to schools<br>Information related to rice mill closure or breakdown<br>Information related to external visits to the Rice Mill | 3.1.1 Review the records |

| | | |
|---|---|---|
| 4 Transportation<br>4.1 Transportation of fortified blended rice | 4.1.1<br>Vehicles used for transportation of fortified blended rice shall be clean, tightly closed or able to prevent the product from rain, insects/pests or other environmental factors<br>4.1.2<br>Fortified blended rice bags shall be handled with care during loading/unloading and transportation in order to avoid damage | 4.1.1 Visual inspection at the time of loading<br>Visual inspection at the time of loading |

## ANNEXURE IV

### *Monitoring checklist - Schools*

*Block:* *GP:*

*Date & Time of Visit:*

*Name of school:*

*Name of Head Master/In-charge or Teacher:*

*Name of the Cook/Helper/SHG:*

*Number of students:* *Primary :* *Upper Primary :*

### *Detailed Observations*

| Parameter | Observation | Remarks |
|---|---|---|
| Fortified Rice Stock available at school<br>1. Monthly school requirement<br>2. Quantity available at school<br>3. Production date of stock<br>4. Weight of randomly selected fortified rice bags (unopened)<br>5. Way bills/Challans regarding receipt of fortified rice at school | | |
| Stock rotation through FIFO (First-In-First-Out)<br>1. Awareness about FIFO – Yes or No<br>2. FIFO practiced – Yes or No | | |
| Storage practice for fortified rice<br>1. Stacked bags<br>2. Bags opened for use | | |
| Cooking method<br>1. Awareness of cook cum helpers<br>2. Water-drain<br>3. Water-tight | | |
| Protocols for utilization of empty bags<br>1. Retained by school for use as seating mats, gardening or student education purpose<br>2. Sold in the open market | | |
| Feedback mechanisms in place<br>1. Any complaints received from students/cook cum helpers regarding taste, smell, color of cooked fortified rice<br>2. Observations made by DSME staff during visit to the school in the past 1 month (Name & designation of DSME staff to be reported as well) | | |

### *Any other Observations:* _____

_____

_____

## ANNEXURE V

### Standards for Fortified Rice[1]

*Rice, when fortified, shall contain added iron, folic acid and vitamin B-12 at the level given in the table below:*

| S. No | Nutrient | Level of fortification per kg |
|---|---|---|
| 1. | Iron - (a) Ferric pyrophosphate (b) Sodium Iron (III) Ethylene diamine tetra Acetate, Trihydrate (NaFeEDTA); | 20 mg |
| 2. | Folic acid - Folic acid; | 1300 µg |
| 3. | Vitamin B12 - Cyanocobalamine, Hydroxycobalamine; | 10 µg |

*In addition, rice may also be fortified with following micronutrients, singly or in combination, at the level given in the table below:*

| S.No | Nutrient | Level of fortification per kg |
|---|---|---|
| 1. | Zinc-Zinc Oxide | 30 mg |
| 2. | Vitamin A - Retinyl Palmitate; | 1500 µg RE |
| 3. | Thiamine (Vitamin B1) - Thiamine Thiamine hydrochloride, Thiamine mononitrate; | 3.5 mg |
| 4. | Riboflavin (Vitamin B2)- Riboflavin , Riboflavin 5'-phosphate sodium; | 4 mg |
| 5. | Niacin-Nicotinamide, Nicotinic acid; | 42 mg |
| 6. | Pyridoxine(Vitamin B6)-Pyridoxine hydrochloride; | 5 mg |

[1] *Released at the "National Summit on Fortification of Food: Enriching Food, Enriching Lives" by Food Safety and Standards Authority of India (FSSAI) on 16th October, 2016*


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