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2. Scope of Value Addition in Rice through Rice Fortification: A Case Study of Jharkhand

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Abstract

Rice is popular staple food for larger than half of the global population, providing the world's calorie intake to the tune of 20% or more. As one of the most widely consumed foods across the world, rice is an important ingredient of diets around the world. In many countries with low per capita income, up to 70% of an individual's calorie intake is taken through Rice based Food. However, while rice is a great source of energy, it lacks sufficient nutritional content except for rich content in carbohydrates and protein. This deficiency is mainly caused by the mechanized Milling process being followed by most countries. During the milling and polishing of rice grain, the external layers of the dehusked rice is removed which is called bran layer. This bran layer contains the main nutrients of rice. Most under developed and developing countries consume high content of rice but due to the rice variety they consume, they lack the intake if nutrients. Rice Fortification, which enhances the nutritional value of Rice, can certainly fill this gap of nutritional deficiency which will great positive impact on public health and increased immunity. Rice fortification enhances the vitamin content as well as micro nutrient content in rice. However, organizing rice fortification in large scale and linking the distribution of fortified rice to the related supply chain infrastructure poses a major challenge. Ease of availability of fortified rice for mass consumption can go a long way in compensating the deficiency of minerals and micro nutrients in milled rice being consumed in low income countries. Moreover, when rice fortification activity which consists of defined addition of micronutrients in the rice, is made

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a mass movement, in order to ensure that the Rice fortification is done as per defined specification, a regulatory mechanism is equally important to ensure and monitor the quality of fortified rice.

A growing number of countries have created the administrative set up for rice fortification and distribution of fortified rice through social safety nets. In India also, the honorable Prime Minister has mandated to provide for infrastructure through government owned FCI and State Food Corporations and distribution of the same through Public Distribution System controlled by Government.In this presentation, the topic focuses upon the scope of post-harvest rice fortification in the state of Jharkhand through Food Corporation of India (FCI) and Jharkhand State Food Corporation through local Rice Millers and improve the nutritional value of Milled Rice by the addition of several essential vitamins, minerals and potentially other nutrients to make any rice variety more nutritious post-harvest and after paddy processing. The popularity of rice as a main food in most part of the world provides ample opportunity to fill the nutritional deficiency in rice-eating countries across the world. Various varieties of vitamins, minerals and other nutrients such as amino acids and fibers can be added in the milled rice to effectively address malnutrition and contribute to the improved public health.

Introduction

Malnutrition and deficiency of micronutrient and vitamins in the food is a major challenge for achieving socioeconomic development and causes big detriment to the health, learning ability and productivity of underprivileged group, which leads to high rates of illness and disability, and tragic loss of human potential high resulting in social and public costs, reduced working ability of the population at large. Thus it becomes essential to overcome the malnutrition of Vitamins and micro nutrients so as to bring socio economic development a success. Presently , large section of population across the world suffer from malnutrition of micro nutrients which substantially contributes to the global burden of disease, affecting the physical and mental development of relatively younger population as well as substantially affecting the work productivity of entire populations. Anemia causes iron deficiency and lack of micro nutrients and anemia seriously affects the inertia and learning capability of huge section of world population. Deficiencies of vitamin A and zinc adversely affect

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child health and lack of folic acid amongst the expectant mothers, causes severe birth problems during their initial days of pregnancy.

India has one of the highest malnutrition rates in the world. Iron, Micro Nutrients and vitamin A deficiencies are assessed to be among the 15 major reasons of disease burden. Iron deficiency in pregnant women is the second major risk factor for increased disease burden. Approximately 1.7 million children are born with congenital birth defects and 7,700 children die annually due to insufficient intake of folic acid.

Rice fortification along with other strategic actions can become one of the major initiatives to counter deficiencies of micro nutrients across the world due to its cost-effective nature and suitability of mass application and relatively simple implementation process of application through mass health security measures and public distribution system. The success of Public Distribution is a strong evidence to justify that it can improve the nutritional intake of the most vulnerable and deserving population.

Food fortification is the process of enriching food with essential vitamins and minerals that regular food taken by low income group, often lack. Fortified rice can be distributed through Public distribution system to a large section of low income population on sustainable basis which needs it most as they are the major class of population which faces the deficiency of Iron, Vitamin & micro nutrients in their food intake.

Many developing and under developed countries uses Rice as its most popular staple food. Thus to address the condition of malnutrition of nutrients Rice fortification can become an important vehicle. Approx. 65-70% of the Indian population eat Rice as its main food. This is precisely the reason that the Government has chosen to distribute the blended fortified Rice through its Public Distribution so that the deficiency of Vitamins and Micro nutrients can be addressed so that it can lead to improved health conditions of people at large . However, currently the consumption of fortified rice is at an early stage in though it has been clinically tested and its operational feasibility has been demonstrated in the safety net programs. With implementation of distribution of blended fortified rice through

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public distribution system, gradually it will gain the momentum and with lapse of time, it is bound to become more popular and sustaining.

Thus Fortified Rice has been identified as one of the vehicles to promote food fortification as a means to address deficiency of Iron, Vitamin & Micro nutrients in India which is posing a serious public health hazard affecting almost all sections of our population, which is impacting their physical and cognitive growth. Food Safety and Standards Authority of India (FSSAI) has come out with comprehensive guideline to standardize, control & monitor rice fortification.

Fortified Rice Kernels (FRK) is made through extrusion in rice shape and is fortified with specified quantity of Vitamins and minerals containing micro nutrients. FRK is normally blended in normal polished raw rice or polished parboiled rice Fortified rice in the ratios ranging from 1:50 to 1:200.

Fortified Rice Kernels have been found to be safe and health booster in many countries across the world. It has been found specially safe and effective in female population and Children. It has been found to be substantially improving the Vitamin A deficiency & night blindness, Iron deficiency and Hemoglobin %, cognitive and physical growth.

Scope of the Project in the Area of Operation

Demand for Fortified Rice is plenty in Jharkhand as there is no plant at present to produce Fortified Rice and The Government of India as well as Jharkhand Government wants to promote the usage of Fortified Rice mainly in Public Distribution System. The major input for Fortified Rice is Broken Rice which is available in plenty in the state of Jharkhand. From a regulatory, public health and nutrition perspective, Rice fortification and wheat fortification are very similar as both are main course of food. However, the method of fortifying rice is not the same as that of fortifying wheat. The most Common method of rice fortification is extrusion technology.

Firstly, the cleaned Broken Rice is pulverized to make Rice Flour. Specified quantity Vitamins and minerals are added in the rice flour in a given proportion. Fortified Rice kernels are made from this

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blended mix through Extrusion method. Once dried, there Fortified resemble the polished raw or parboiled rice grains in size and shape. Even after cleaning, washing and cooking, these fortified kernels retains the nutrients intact. In India, The specification for blending of Vitamins and micro nutrients are specified, controlled and monitored by FASSAI, a government body under Food Safety Standards (Fortification of foods) Regulation, 2016.

Hence a project is being envisaged with the following facilities:

- Broken Rice receiving & Storage.
- Broken Rice Cleaning
- Broken Rice Pulverisation
- Blending facilities to mix Rice Flour and specified quantity of Vitamin & Mineral to make a Pre Mix for Rice Extrusion.
- Fortified Rice Extrusion.
- Drying & Packaging of Fortified Rice
- Fortified Rice storage, Loading & Despatch to customer.

Process Activities:

Raw material Selection

Selection of right quality and source of Raw Material for making extruded fortified rice is very vital. To take care of shelf life and cooking quality of blended fortified rice, there is a need to select right source of raw material. The largest quantity of raw material required is Broken Rice, which is pulverized after thorough cleaning of broken rice. Equally important is to put emphasis on Storage and proper handling infrastructure for the raw material.

Major ingredients include:

i. Rice flour

ii. Food grade Vitamin and Mineral premix

iii. FSSAI approved Acid regulators and emulsifie

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iv. RO Water.

i. Rice flour: Broken Rice is first cleaned through mechanized process and then fed to pulveriser for making Rice flour in mesh size 30-60. The moisture content in the input broken rice should be kept in the range of 11-12% to give better results.

ii. Vitamin and Mineral Premix: Food Safety Standards (Fortification of Food) Regulations, 2016 already provides for the specification for Vitamin & Mineral addition in the premix and the same has to be adhered to, while preparing the pre mix for extrusion of fortified rice kernel.

iii. Emulsifier / Acid Regulator / Antioxidants: These itms are also to be added as per norms specified by Food Safety Standards (Fortification of Food) Regulations, 2016.

iv. Water: Potable water (complying Indian standards for Potable water standards IS 10500 : 2012 amended on 1st June, 2015) shall be used for mixing of ingredients. Normally RO water is used for Water is used as a solute which penetrates the starch structure of the flour and helps in gelatinization of starch.

a) FRK Production Process:

Mixing of Raw Material: Premix prepared for producing extruded fortified rice kernels must adhere to the specification as per customer specification and FASSAI prescription. Water to be added in the premix in such a manner that the gelatinization of premix gives requires results.

Extrusion Process: Extrusion process is the most important and critical activity in the production of FRK rice kernels. The Premix of Rice Flour and additives mixed with water duly hydrated with requisite moisture content**,** is passed through a pre conditioner for achieving partial glutinazation with steal blowing. Then, the hydrated mixture is passed through twin screw extruder, to produce FRk rice kernel, which looks very similar to normal milled rice in shape and size. During extrusion process, extra care is required to maintain specified temperature and the rotation speed of cutters.

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Drying: Extruder discharges uniformed shape FRK rice kernels in continuous flow of discharge on a pneumatice conveying system where it is dried out to bring down the moisture content of FRK rice kernels to the level of 11-13% as per requirement. The drying process also provides stability and strength to the FRK rice kernels.

b) Quality Assurance/ Quality Control (QA/QC)

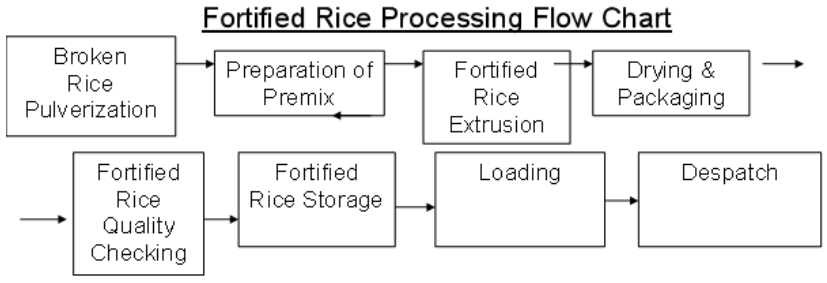
Extruded Fortified kernels are to be tested in FASSAI accredited lab to test and certify the compliance of specification as per FASSAI norms. In addition the strict control is also required in input quality, in process quality and product quality being despatched to the customers in proper packing.

c) Packing and Dispatch

The fortified Rice kernels are packed and despatched in two ways:

In case there is inhouse facility for preparing Blended fortified rice, then the fortified rice kernels are transferred to the blending station where the fortified rice kernels are blended in Milled Polished Rice or Milled and polished Boiled Rice in the specified ratio which varies between 1:50 to 1:200. The blended fortified rice is packed in standard packs as per customer specification and stored for dispatch to customer. In case there is no inhouse blending facility, then fortified rice kernels are packed in standard packings as per customer specification and stored for dispatch to customer. The product shall be stored as per batch number allocated to particular product lot. The product shall be separately stored in storage area. The process of "First in First Out shall be followed in Dispatches. The entire product packaging activity shall adhere to the compliance as per statutory provisions of Weight and Measurement Act.

Fortified Rice Processing Flow Chart



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Marketing & Distribution

The company plans to sell its products to both Government/ Semi Government and Domestic customers. State Food Corporation and Food Corporation of India are the main Government/ Semi Government Customers. In the domestic market, the company plans to sell mainly to Rice Millers who do not have their own Fortified Rice manufacturing facility, for producing Blended Fortified Rice. For captive use, the required quantity of fortified rice produced shall be sent to the Parent Unit M/S Chorus Agro Private Limited located at Tupudana Industrial Area for producing Blended Fortified Rice for sale. The company intends to build a strong sales and marketing team.

The Government Initiatives

In an ambitious attempt to combat the serious problem of anemia due to malnutrition, Prime Minister Narendra Modi made an announcement to mandate rice fortification in all social safety net schemes by 2024. FCI & Jharkhand State Food & Civil Supply Corporation have already mandated the Rice Millers of Ranchi to install the facility for producing Fortified Rice Blended Rice for supply under CMR activity coordinated by them. It is heartening that the announcement by the Prime Minister has given a major boost to further strengthen the ecosystem of rice fortification before it becomes so popular that people at large start consuming Fortified Rice. In addition, many entrepreneurs have already put up Fortified Rice Kernals manufacturing facilities across the country and many more are under construction to meet the existing and future demand of Fortified Rice Kernels (FRK). State sponsored institution - FASSAI is working on FRK standardization and facilitating for setting up more NABL accredited labs and Bureau of Indian Standards Standardization of Extruders/Blenders, to ensure quality and consistency in FRK.

In Jharkhand, the Government has already started trial distribution of Fortified Rice Blended Rice through Public Distribution System. And on 16th September the Government has organized state level workshop to deliberate on the need for distribution of Fortified Rice Blended Rice under National Food Security Program and draw a common understanding to distribute Fortified Rice Blended Rice through Public Distribution System enlarge the same to the whole of the state of Jharkhand.

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FCI and the Ministries of Women and Child Development and Education are working in unison to ensure distribution of 13.70 lakh tones of fortified rice in ICDS and Mid Day Meal. Thus, rice fortification is also providing an opportunity for all the concerned departments to jointly initiate integrated efforts to expand the consumption of Fortified Rice and strengthen the synergies among themselves.

An integrated action is required to create a sustained impact on public health which is currently characterized by Anemia and malnutrition. The government's policy intervention to mandate the distribution the Blended Fortified Rice through Public distribution is a right step forward in this regard.

As far as the availability of Fortified Rice in Jharkhand is concerned, there is a need to form a special joint task force consisting of Concerned Government officials and the representative of Rice Millers to draw a definite plan by the Jharkhand Government about of quantitative sourcing plan of Fortified Rice enriched Blended Rice in the next three years in phased manner so that the demand of Fortified Rice @ 1% the total blended Rice can be worked out and arrangement of communication of the same to the Rice Millers so that they can plan to add the facility of Rice Fortification as well as blending facilities at their manufacturing facilities in a definite time bound programme in order to match the quantity needed by the Jharkhand government to fulfill their requirement. For meeting the demand of Blended Fortified Rice in open market, the Rice Millers can have their own assessment and make provision of requisite plant capacity and infrastructure at their plants to meet the required market demand.

Conclusion

Innovative and appropriate technologies for rice fortification are now available indigenously; however, the real benefit of large-scale rice fortification has yet to be realized till the same is made available across the country through Public Distribution System. If this can be made possible when all the states take appropriate actions in a time bound programme as already planned by the central government, countrywide rice fortification can become a sustainable movement to ensure substantial

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reduction in the mass diseases which are attributable to Low nutrition. Rice fortification is being accorded highest priority by the Central Government to implement the same through Public Distribution and Midday Meal progremmes for delivering cost-effective human nutrition related development on pan India basis. To address the problem of nutritional deficiency in the country, multi-pronged strategies need to be drawn out and implemented in a time bound manner. Mass public awareness need to be build up through various means of mass communication, so that people at large should be ready to diversify their food habits with an understanding to address their health hazards due to anemia and micronutrient deficiencies and the Government has to take initiatives in their policy formulations to ensure the same.

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