DETAILED PROJECT REPORT

On Fortified Rice Kernel (FRK)



PREPARED BY:

M/s SHREE SHYAM FOOD PRODUCTS

Shop No 1,2,3 Samta Shopping Arcade, Samta Colony, Raipur (C.G.)

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INTRODUCTION:-

POTENTIAL FORTIFIED RICE KERNEL MARKET IN INDIA

India is the second largest producer of rice worldwide. Rice is the staple food for an estimated 65 percent of the population for whom it constitutes 31 percent of energy intake. It also has the highest uptake in government distribution programs. In this rice fortification is an ideal vehicle context, to bridge nutrient gaps and improve health, dietary particularly among vulnerable populations.

Fortified rice has the potential to rich 740 million vulnerable people in India, especially women and children through the government safety-net programs, making it viable for addressing vitamin and mineral deficiencies for a large section of the population also, the cost of fortification is minimal (between 30 and 80 paisa), especially compared to the negative health and economic costs of vitamin and mineral deficiencies scaling up rice fortification will not only improve the health of Indian's families and communities but improve the productivity of the country at large. PATH is supporting the government of India in its endeavors and initiatives to expand fortification.

Scope and Opportunities for Fortified Rice Kernel Manufacturing

Micronutrient deficiencies are now recognized as an important contributor to the global burden of disease. Food fortification is the process of adding micronutrients (essential trace elements and vitamins) to foodstuffs. Food fortification is a more cost-effective and sustainable solution. It plays a major role in improving the diet and meeting the micronutrient needs of the population. One of the most fundamental decisions underlying food fortification schemes is selecting appropriate foods to be fortified with the essential micronutrients lacking in a population's diet. Criteria to identify potential food fortification vehicles generally include selecting a food that is commonly eaten by the target groups, is affordable and available all year long, and is processed

in such a manner that fortification is technically feasible and can be done economically. Staple foods such as wheat flour and sugar have been popular foods to fortify to address micronutrient deficiencies in several developing countries. This document provides an overview of the importance of rice as a staple food and food vehicle for fortification in countries where populations suffer from micronutrient deficiencies and with a burden of diabetes.

Micronutrient deficiency is very predominant in rice eating populations and it is not so easy to fortify rice with micronutrients. Rice fortification has been an underutilized opportunity because technologies used costeffectively for nearly a century in wheat and maize milling cannot be adapted to rice milling. Fortification of wheat and maize flours involve adding and mixing a fine fortificant powder to equally fine flours. But micronutrient powders simply added to polished rice grains falls off. Adding chemical compounds to adhere fortificant powders to the surface of the rice grain may work to some extent, but most of the added micronutrients will be removed by washing or be lost in the discarded cooking water. One of the most promising and highly accepted benefits of this technology is to fortify rice with micro nutrients. During this hot extrusion technology, rice flour, a fortificants, and water will be passed through twin screw extruder and cuts it into grain-like structures that resemble rice kernels. This process involves relatively high temperatures (90-110°C) obtained by preconditioning and/or heat transfer through steam heated barrel jackets. It results in fully or partially pre-cooked simulated rice kernels that have similar appearance (sheen and transparency) as regular rice kernels called Fortifies Rice Kernels (FRK). So far commercially available rice fortification projects have been using FRK at 1% to regular rice. Currently this practice is being used in Bangladesh Brazil, Burundi, Cambodia, China, Colombia, Costa Rica, Dominican Republic, Liberia, Myanmar, Philippines, Senegal, Tanzania, Vietnam etc. Number of acceptability and efficacy studies have been conducted across the globe. There is absolutely no issue with the acceptability as FRK inclusion rate is only 1%. Rice fortification.

Indian government has been very actively working on introducing fortification of staples such as salt, wheat flour, milk, oil and rice. Food Safety Standards Authority of India (FSSAI) has laid down standards for fortification of these staples. Fortifications of staples other than rice have been carried out aggressively. As rice fortification needs specialized equipment, it is moving slowly. Currently there are only about five manufacturers who have been manufacturing FRK in the country. Rice fortification is currently carried out on a pilot scale in few districts in five states.

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			Target level /kg	
	Micronutri ent	Recommended Chemical Form	of fortified rice	Unit
		Micronized Ferric Pyrophosphate	20	Mg
	Iron	NaFeEDTA	20	Mg
Mandator v	Folic Acid	Folic Acid	1300	g
У	Vitamin B12	Cyanocobalamine	10	g
	Zinc	Zinc Oxide	30	Mg
	Vitamin A	Retinyl Palmitate	1500	g
		Thiamine hydrochloride	3.5	Mg
Optional	Vitamin B1	Thiamine mononitrate	3.5	Mg
	Vitamin B2	Riboflavin	4	Mg
	Niacin	Nicotinamide	42	Mg
	Vitamin B6	Pyridoxine hydrochloride	5	Mg

FSSAI Standards for Rice Fortification

GOAL / PURPOSE

There are tremendous opportunities for FRK in India. There are opportunities in both social safety network and open market. The social safety network includes supplies to ICDS, MDM and PDS programs. India has the largest school feeding program in the world. India feeds more than 12 crores of children every day under Mid-day-meal (MDM) scheme. Already one of the major MDM implementing agencies, Akshaya Patra Foundation started using FRK and are highly satisfied with the results. It is estimated that MDM program may need about 30,000 MT of FRK. Integrated Child Development Scheme (ICDS) is one of the world's largest and most unique programmers for early childhood development. Currently, there are about 10 crores beneficiaries supported in this program. Another opportunity for FRK in the Indian social programs is fortification rice supplied through Public Distribution System through fair price shops. India has 2.4 crore families below poverty line who get about more than commodities through fair price shops. It is estimated that about 35.5 million metric tons of rice is being supplied through PDS program.

It is estimated that about 400,000 MT of FRK is required fortify rice in the social safety network. Fortification of rice in the open market is additional requirement. FSSAI has fixed the cost of FRK, which may increase the cost of rice fortification a mere 60 paise per KG.

Also, there is an additional opportunity of producing fortified dal kernel, which can be used to fortify lentils. Currently there are no FSSAI standards for fortification of lentils but the industry is working with FSSAI to get standards for lentil fortification. Further, Twin Screw Extruder (TSE), which is required to produce FRK is a versatile technology with wide range of application and has great potential in the food industry in India. This technology can be used to make diversified products.

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The above narration suggests that there is excellent opportunity for a Twin Screw Extrusion project. It is estimated that there is a requirement of about 500 extruders of 200 kg/hr capacity to meet the demand of production of FRK in India.

Process of manufacturing fortified rice kernel:

One of the most promising and highly accepted benefits of this technology is to fortify rice with micro nutrients. During this hot extrusion technology, rice flour, a fortificants, and water will be passed through a twin screw extruder and cuts it into structures that grain-like resemble rice kernels. This process involves relatively high temperatures (70-110oC) obtained by preconditioning and/or heat transfer through steam heated barrel jackets. It results in fully or partially pre- cooked simulated rice kernels that have similar appearance (sheen and transparency) as regular rice kernels. So far commercially available rice fortification projects have been using RCR with very high amount of micronutrients and adding this grain at 1% to regular rice.

MAKING FORTIFIED RICE:

By adding Fortified Rice Kernel 1% to regular rice, fortified rice can be prepared.

MARKETING: Direct marketing:

Mid-day meal facilitating agencies like Akshya Patra, Nandi foundation and many others Rice millers who wish to make branded fortified rice marketing

Indirect marketing:

For direct users 10 gram pouches (to add in 1 kg of rice) in homes through Super markets, Retail outlets and online sales.



Project Financials

50000 MTs per year

Max capacity utilisation: 80%

Production capacity: 50000 x80%=40000.00 MTs per year

Input-Output ratio: 100%

Electricity required: 172.5HP +7.5 for Bore well &

others=180HP Water required per day: 2000 liters per day

S.No	Description	Rupees	Amount
			(Rs.lakhs)
	Capital expenditure		
1	Land & Buildings		-On lease-
	10,000 Sft Factory shed		
	Total 10,000 sft @ Rs.7.00 per sft :Rent	70000.00	
	Rental advance 6moths	4,00,000.00	
2	Building development & foundation etc		1.00
3	Plant & machinery		
	A. Existing Plant & Machinery	276.60	
	A. Artificial Rice production Line 180x4	170.00	
	Total	446.60	
	ADD:GST18%	30.60	
	Total	477.20	
	ADD: Packaging & Forwarding charges	1.32	
	5% of 51.50		
	ADD: ERECTION & Commissioning	3.00	
	Charges		
	Total	481.52	

1	Raw Materials			
	Annual working capital calculat	ion	Rs.	Lakh
Total	capital Expenses		494.52	
Preop	erative Expenses		2.19	
Preliminary expenses			1.50	
Technology fees			2.36	
Depos	sits		4.00	
Office	Furniture & equipment		1.00	
Electri	cal cables & fittings		0.60	
Plant &	& machinery		481.87	
Buildir	ng development		1.00	
Land 8	& Buildings		-On lease-	
Total	Capital expenses		Rs.Lakhs	
Total	· · · · · · · · · · · · · · · · · · ·			
Preope	erative Expenses		2.19	
Prelim	inary expenses		1.50	
Total		2.36	2.36	
ADD:	GST 18%	0.36		
Techn	ology fees	2.00		
Buildir	ng Deposit		4.00	
Total		1.00	1.00	
v) wat	ter cooler	0.09		
iv) Co	mputer with printer -1 set	0.30		
iii) Vis	itors plastic chairs 12 xBs 500 00	0.10		
	muter Tables & chair 1 Set	0.43		
	los & Chairs 2 Sats y Rs 15000.00	0.45		
Cffice			0.60	
Total		481.87	481.87	
equipr	ment & other equipment			
		0.55		

	i) Broken Rice		
	Cost per ton Rs.25,000-00		
	(including transportation)		
	Total 40000 x Rs.25,000.00	10000.00	
	2) Premix 1.3% of 40000.00MTs		
	520 MTs x Rs.10,00,000.00 MT	5200.00	
	(including transportation)		
		15200.00	15200.00
2	Packing materials		
	A)25Kgs plastic printed woven sacks		
	40000MT x40= Total 1600000 Nos		
	Sack/bag rate: Rs12.00		
	Total 368640 x Rs.12.00	192.00	
	B) Stitching thread etc	3.70	
	Total	195.70	195.70
3	Utilities		
	i) Electrical charges		
	180HPx4 x80%x 0.754 x16 hours x300days		
	20,84,660 units x Rs.8.11	169.06	
	ii) Water (RO plant will be there. No cost		
	Total	169.06	169.06
4	Repairs & maintenance		
	481.87 lakhs x 3%		14.46
	Insurance @ Rs.5.00 per Rs.1000.00		0.56
	Salaries & wages		
	i) Production manager 2Nos x 1	10.00	
	ii) Skilled workers -2 x8=16 Nos	23.04	
	iii) Unskilled workers -8Nosx 4=32nos	38.40	
	iv) Accounts & Admin. Assistants- 2Nos=2	7.20	
	V) marketing excutive-4 No x	7.20	
	Total	85.84	85.84

8	Building Rent	
	Rs.70,000.00 x12	8.40
9	Administrative overheads	
	40000 MTs	17.28
10	Marketing expenses	
	Rs.3.50 (Rs.0.50	403.20
	(Travelling & incidental expenses)+	
	Rs.3.00 Agency charges)	
	Total annual expenses	16094.50

First year @50% capacity utilisat	ion total annual	
expenses		
16094.50 x50%	8047.25 say	8047.25
Working capital required		
8047.25/12 x2 Months	1341.20	1341.20
Working capital margin 25%		335.30
Working capital loan		1005.90
Project total investment		Rs.lakhs
@50% capacity utilisation		
Total capital Expenses		481.52
Working capital		1341.20
Total		1822.72
Project cost		Rs.lakhs
Total capital Expenses		481.52
Working capital margin		335.30
Total		816.82

Means of Finance	Rs.Lakhs
Equity	335.30
Term loan 923.15 x75%	361.14
Working capital loan	1005.90
Total	1702.34

	Profitability @ 50% capacity utilisatio	n	
A	Total Annual sales income		Rs.lakhs
	Fortified Rice Kernel		
	30000 MTs @25000 MT x 65,000.00 per		19500.00
	ton		
	(Rs.78000.00 is the minimum		
	procurement price by ISCON Bangalore)		
	Total annual sales income		19500.00
В	Total Annual expenses		Rs.lakhs
i)	Working expenses		
	16094.50		16094.50
ii)	Depreciation 15%		
	Building development	1.00	
	Plant & machinery	477.20	
	Electrical cables & Fitting	0.60	
	Office Furniture & equipment	1.00	
	Total	479.8 X15%	71.97
iii)	Interest on loans 13%		
	Term loan	361.14	
	Working capital loan	1005.90	
	Total	957.36x13%	177.71
iv)	Technology fees write-off		2.36
v)	Preliminary expenses write-off		1.50
vi)	Preoperative Expenses write-off		2.19
L		1	

Total annual expenses	16350.23

	Profit	Rs Lakhs
	Total annual sales income	19500.00
Less	Total annual expenses	16350.23
	Profit	3149.77
1	Profit on turnover	
	3149.77/19500x100	16.15%
2	Profit on Total project investment	
	3149.77/1702.34 x100	185.02%