

A Novel Food Chain using By-products of Milling Industry for Enhancing Nutritional Security

Environmental safeguard: Activities, issues, impact and mitigation measures

A. Basic Information

1. Project Statistics:

Component code	:	2
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Consortium partners	:	1. Tamil Nadu Agricultural University, Coimbatore 2. Avinashilingam Deemed University, Coimbatore 3. Saga Food Products, Chennai
2. Date of Start	:	April 1, 2009

3. Planned duration : 3 years and 6 months (42 months)
4. Project Cost : Rs. 267.97 lakhs

5. Project Objectives

1. **Production:** To improve the marketability and market value of rice and pulse milling by-products by identifying suitable technologies for safe handling, classification and by establishing their the functional and phytochemical qualities for further processing.
2. **Processing and Value Addition:** To develop six different final products with two layers of product portfolios, one for the resource poor community for nutrition uptake and the other for the affordable consumer to gain access to balanced food, and to identify technologies and equipments for making, handling and packaging of these products.
3. **Specific to Value Chain:** To determine the performance of the developed products by nutrition intervention studies with the target group for certification and popularization.
4. **Market:** To create linkages with public, business and user groups for commercializing the products in the market through training, incubation, systematic licensing to promising entrepreneurs, promoting in government noon meal scheme programs and voluntary organizations.

6. Brief Project Description

The project attempts a comprehensive use of Rice and pulse mill byproducts in nutrition and Functional food use and identify attributes to be analyzed. The project assumes that small scale farmers /millers can manage and use the technology to comparative economic advantage on the premise that products marketed are derived by and offer nutritional and socio-cultural benefits to (increasingly urban) consumers. Linking by product utilizations and health is both a response to the consequences of economic growth but also a way to direct growth in a positive manner.

Further the project involves farmer, multidisciplinary researchers like food nutritionist, dietician, economist, extension worker, small scale processors, food

industrialists, marketer , NGOs, medical research center in catering the needs of farmer and consumer to lead better quality life rural and urban consumers and solving the problems of target groups by phytochemical benefits of the products developed. Broadly, the project consists of five components with different objectives and activities under them.

The **first objective** involves linking the producers, rice and pulse millers and traders for mass collection of the by-products of the milling industry and will be stored before further processing. Suitable classification techniques will be developed for classifying the by-products. The nutritional qualities such as protein, fat, carbohydrate, vitamins and minerals and phytochemicals such as tannins, antioxidants, oryzanols, squalin contents etc will be determined using standard analytical procedures for determining the ratio of these by-products in the final functional foods. Technologies and guidelines for controlled atmosphere storage of the by-products will be developed. The studies on storage will involve determining suitable gas combinations for effective storage and suitable storage containers for retaining desired gas concentrations. Cleaning equipments selection and providing suitable machine for cleaning and destining. Standardizing the grading parameters of the by-products and selecting grading equipments for different by-products. Providing gadgets for washing the brokens to remove the milling dust and other debris to make the final products hygienically sound.

Second objective involves that the components of rice and pulse milling by-products will be suitably selected based on the nutritional and functional qualities of the final products. Suitable machines for the unit operations like the size reduction, mixing, extrusion, fermentation will be designed for making the final products. The performance of the developed machines will be assessed based on their functional, energy consumption, hygiene and other desired parameters.

These machines will be time tested by making the final products at pilot scale for ascertaining their repeatability and durability. A computer simulation model will be developed for designing nutritional and functional foods. The shelf life of the developed products at different gas and temperature conditions will be studied in the laboratory to determine optimum combination of parameters for maximum extension of shelf life based on research issues.

Packaging systems based on natural atmospheres or modified atmospheres will be developed for the different products based on the product nature and the shelf life extension requirement during the market chain. Suitable machines for the packaging will be designed or selected based on availability in the market. HACCP of commercially viable foods will be identified and process protocols will be developed. Scheduling GMP for the convenience and Commercial Products. Analysis of cost benefit ratio of selected value added foods for large scale production. Testing consumer acceptance and marketability of above products/ foods. Defining nutrition labels. Establishing supply chain through large scale production for consumption.

Third objective involves efficacy confirmation studies in laboratory (NIN,Hyd,Out sourcing),permission from government authorities will be obtained to conduct studies in selected urban and rural areas (Coimbatore and Thanjavur). Survey on the basic socio-economic, nutritional and biochemical status of the selected population will be carried out. The intermediate products (composite flour) and products will be used for different recipes of acceptable quality. The recipes will be given to the human volunteers for testing its glycemic value. The subjects are followed up for three month to ensure and assess the fatigue of product supplied. Changes in the clinical picture of fasting, post prandial glucose, glycated hemoglobin and lipid profile will be evaluated among the subjects. Based on the feed backs of the subject the product will be modified to suit the needs. Standardized Raw materials will studied for its storability and product from there on will be produced in pilot unit. The flour will be supplied to pilot unit at IICPT and industrial unit at Saga Food products, Chennai and its machineability will be standardized using (computer stimulated model developed by IICPT). Testing for its end quality as per the specification arrived earlier. Supplemented to the sensory analysis and design of suitable packaging system for the products like Nutribar, composite Flour, extruded products and rice milk.

Fourth objective emphasis on conducting interviews in selected villages in the Cauvery delta region and in selected urban areas in the region. A total of 2000 to 3000 village and urban consumers in villages in Tiruchirappalli, Thanjavur, and Nagapattinam districts will contacted for this bench mark survey. The data base on cropping patterns, methods of marketing and the current economic and nutritional status will be assessed. The rice and pulse mills in other parts of the state and in other states of the country and the methods of selling or disposal of the by-products and their costs will be documented. The taste and flavor preferences of both the rural and urban consumers will be determined based on participatory trials to determine the final product flavor, shape and packaging. The urban and rural markets and niche markets for the developed products in Northern, Southern and Western regions of the state will be assessed. The cost-benefit analysis and break even values of the product based on the costs of equipments, raw materials, energy costs and other operating costs will be documented for different levels of production of each of these products. The state government and central government departments will be sensitized about the value added products to encourage them to use the products in suitable mass feeding programs and to promote the products for export. The economic benefits of the other stake holders in the value chain like the millers, traders and processors of the value added products will be assessed. All individual stake holders in the value chain will be contacted and linked for specific tasks of the individuals. The developed products will be produced in bulk both at the incubation centre at IICPT and by the consortia partner m/s Manna Foods, Chennai.

7. Environmental Category issues in the project

- **Social**

The project develops the products by using the expertise knowledge in extrusion cooking and food grains grown in this region which improves the health and quality life of consumers by their nutraceutical properties. Further, no chemicals, drugs, colours and any harmful ingredients shall be added. Thus the project shall be **socially just**. There shall be no social problematic issues in implementation of the project. On the other hand project will have mostly positive impact. Facilitates accelerated and sustainable transformation of production to value added market driven economy with

inbuilt backup of alleviation of poverty and income generation to farm women and youth through public private partnership of various again.

- **Environmental**

The project proposes to develop new food products using the hitherto unutilized or underutilized by-products of rice & pulse milling industries. These by-products will be counted to economically value added products and will become nutrition rich foods for poor children. Utilizing the wasted by-products like pulse milling powder, rice bran, deoiled bran and bran dust will reduce the dust explosion in areas nearer to rice or pulse milling industries. Thus the project will have positive impact on environmental safety. Hence there are no adverse environmental issues in the project.

8. Safeguard policies triggered (World Bank Policies)	Yes	No
Environmental assessment (OP/BP 4.01)	X	
Natural habitats (OP/BP 4.04)		
Pest management (OP 4.09)		
Cultural property (draft OP 4, 11-OPN 11.03-)		
Involuntary resettlement (OP/BP 4.12)		
Indigenous peoples (OD 4.20)		
Forests (OP/BP 4.36)		
Safety of dams (OP/BP4.37)		
Projects in disputed areas (OP/BP 7.60)		
Projects on international waterways (OPBP 7.50)		

B. Risk analysis and related issues

- Adoption of improved package of practices in a holistic way may be a problem if funds are not adequate.
- Packaging interventions in the un-organized sector is a complex issue.
- Training programmes among un-organized and less educated persons may be a complex problem.
- Availability of partners to carry out the programme on a large-scale for commercialization
- Logistic problems as these models are going to be tried out for the first time in country.
- Consumer's response may not be overwhelming, without very active promotional exercise.

9. Impact assessment: Adequately addressed

10. Potential indirect and/ or long -term Impacts due to anticipated future activities in the project areas (assessment of anticipated conflict/ complimentarily with the current as well as those proposed for the next five years in the areas of activities of the sub-project):

- The health status of the targeted population is improved through value added therapeutic foods consumption keeping many deficiencies (nutrient) and diseases at bay.
- The value added health foods intake will help due to their health traits among subject of non communicable diseases both in urban and rural areas.
- While potential direct impact would be household food and livelihoods security of dry land poor is assured through value addition to traditional diets and also marketing of developed products in the domestic markets.
- Awareness of farmers for achieving better returns with improved marketing approaches.
- Rural entrepreneurship will help in reducing migration to urban areas through enhanced employment and income generation.
- Nutritional profile of population being improved, capacity to work better will be achieved there by earning power and life quality.

11. Identify the key stakeholders and describe mechanisms for consultation with and to them done/ disclosure so far done including pre -project consultations with stake holders workshop before formulating the full proposal, discussing the full proposal with some stakeholders before submission to the PIU:

Public Institutes : Indian Institute of Crop Processing Technology, Thanjavur
Tamil Nadu Agricultural University, Coimbatore
Avinashlingam Deemed University, Coimbatore
Farmers and consumers
National Consultants
Food entrepreneurs
Rice and Pulse mill Associations

Private Participation : Saga food products, Chennai

International Institutes : Cornell University, USA

Preliminary discussions were held with few stakeholders and NGOs before organizing stake holder's workshop. They were made aware of NAIP project, objectives and expected outputs and impact. The final modalities will be worked out after the project approval.

12. Chronology of meetings / activities held in connection with preparation of the concept note & full proposal

S. No	Date and Location	Programme	Participants	Remarks
1.	14 th May 2008	Preliminary discussion NAIP proposal for composite grains	Among IICPT Scientists	To work suitability and mode of approach toward the NAIP project and people to be worked in the project
2.	21 May 2008	Brainstorming Session pm composite grains NAIP project	IICPT, TNAU, ADU, Periyar University, Cornell university Sathguru consultancy of Saga food Industry	Advantages about joint work on composite grains
3.	Nov 27 and 28	Work shop at Hyderabad for project preparation at NAARM	IICPT	Project presentation was accepted
4.	Feb 5&6	RPC	IICPT, ICAR, NAIP	Proposal formally approved
5.	March 25-27 th	MOU Signing	IICPT, TNAU, ADU& saga foods	MOU agreed and signed sent to NAIP

13. Measures to Address the Issues :

A document on safeguard Matrix has been prepared. Cluster of rice and pulse milling industries will be formed and educated regarding by product shelf life enhancement through which we make economically and nutritionally safe products and returns to the farmers, processors.

Awareness of risk related factors will be addressed to the stakeholders through orientation sessions on topics such as adoption of improved package of practice in a holistic way, using

technologies such as modified MAP/CAP for the low value products to safeguard its nutritional quality and develop suitable nutritional enriched products. This will result in technological advancement of classification of high nutrient components. The unorganized sector will be clustered to develop an economical benefit by products and create a nutritional security by making available high nutrient rich products.

The consumers and government agencies like the noon meal scheme personnel and other line departments need to be educated on the environmental safeguard issues.

14. Consultation/ disclosures to be done in future:

Local disclosure through mechanisms such as launch workshop, interfaces during the implementation stage of the subproject for sharing the results and soliciting feedback, one will circulate project brochures and implementation progress from time to time, putting up annual reports on the web site and annual stakeholder workshops wherever feasible.

The consultation/ disclosures will be done as per NAIP guidelines depending on the progress of the project. Training, demonstration programmes and workshops on various themes relevant to farming, primary processing, post-harvest product preparations, packing, labeling, nutritional benefits awareness, recipe making, marketing aspects *etc.* The project findings (brochures/ CDs/ videos/ literatures) will be disclosed time to time and necessary feedback will be collected for further improvement and better implementation. Assistance of different related organizations will be taken.

1. Dissemination of holistic approach to develop value chain for the rice and pulse milling by products
2. Demonstration of new products preparations to stakeholders
3. Transfer of technology of value-added health foods to stakeholders
4. Dissemination of information and sensitization of line departments of state and central governments to policy makers, planners and project partners for enhancement of by-products of grain milling industry for chronic diseases and products consumption
5. Popularization through information dissemination on safety of developed products to the consumers.
6. Information dissemination through mass and print media on health and nutritional benefits to stakeholders, targeted groups especially diabetic and obese urban consumers.
7. Linkages with financial institutions will be enabled so that as when requested the entrepreneurs are adequately financed for their commercial activities. Both print and other media will be fully utilized to attain the desired goals and objectives.

Annexure I: Environmental safeguard: Activities, issues, impact and mitigation measures

Activities	Issues	Anticipated level of impacts		Mitigation measures (Negative Impact)
		Positive	Negative	
Baseline survey				
Integrated extension services for procurement of raw material	Availability raw materials for quality gradation		0	
Procurement, aggregation and storage function in target regions. (Milling & storage of produce)	Shelf- life enhanced, storage grain pests will be controlled	4	0	Modern methods of packing material And MAP
Transport and processing of byproducts	Raw material classification and quality determination	4	0	
Fine -tune technologies for development of functional foods				
Packaging and safe storage	Packaging material disposal	4	0	Bio-degradable packaging material will be planned
Value addition to the procured by products	Byproduct utilization in place	4	0	
Novel food –extrusion technology	Food habits are difficult to change	4	0	Acceptable product and recipe development
Evaluation of novel food grain (analogs) in mid-day meal program for nutritional characters.	Healthy food to children available	4	0	
Assessment of phyto-chemical qualities composition the segregated raw material for food use	Human health-food chain labeling available	5	0	
Evaluation of the value added foods	Availability of health foods for community	5	0	
Implementation of HACCP	Safety certification will be in	4	0	

	place for commercial health foods			
Sensitizing target population, line departments of governments for enhancing grain consumption	Nutritional security is in place	5	0	
Supply chain of By-products to industry and value added products to bulk consumers	Availability of health foods for community	8	0	

Annexure II: Social safeguard: Activities, issues, impact and mitigation measures

Activities	Issues	Anticipated level of impacts		Mitigation measures (Negative Impact)
		Positive	Negative	
Baseline survey	Accurate bench mark information is not available	2		Participatory approaches for data collection will be carried out
Fine -tune technologies for development of functional foods				
Buy back assurance	Market assurance is in place	5		
Procurement of by products from millers	Cluster formation for the collection of raw materials will be developed	3		
Aggregation and storage function in target regions (harvest & storage of produce)	No supply chain management is in place for commercialization	4		
Transport and processing of produce		3		
Development of novel foods from pulse and rice by products	Popular and novel food products are not available in the market	4		Many products will be development
Packaging and marketing	No clear market chain or possible technologies for such products	3		New techniques will be developed
Product(s) for wide spread markets & niche markets	Not available of newly developed products	3		Industrial production
Standardize combinations for making novel foods from pulse and rice by products for mass scale supply	No such technologies are available	3		Nutrition through multi –source of staples
Evaluation of semi-processed novel foods in mid day meal program for nutritional characters	No such foods are available	3		Mid –day meals nourishment is nutritious
Assessment of nutrient composition in formulated novel foods from by products		4		Market for novel foods due to increased consumer awareness on

				nutritional composition of functional foods
Nutritional evaluation of the millet foods for diabetic and obese patients		5		Clinical studies conducted to ascertain therapeutic value of the function foods in-take
Implementation of HACCP	New technologies, so new procedures need to be developed	4		Safety certification is in place
Identification of number of potential food products for wide ranging and niche markets through market survey		4		Few and potential novel foods identified and are prioritized for potential markets
Sensitizing line departments of governments for enhancing by products consumption	Currently only rice based starchy food given in noon meal scheme	2		Nutritional security can be achieved
Entrepreneurship development of stakeholders for intensive cultivation, product development, mechanization.	Not too many people are in the business	3		Hike in income
Taking demo units of processing to field	No such demo units	3		Higher adoption
Branding of novel foods from by-products as healthy foods by training and popularization	No too many branded foods available	4		Health and nutrition is linked with functional products