

Development of Composite Dairy Foods with Enhanced Health Attributes for Commercialization

Environmental and Social Safeguards Management

A. Basic information

1. Project statistics:

Consortium Leader	:	Dr. A. K. Srivastava Director & Vice Chancellor, NDRI (Deemed University), Karnal
Name of CPI	:	Dr. Ashish Kumar Singh, Senior Scientist, Dairy Technology Division, NDRI, Karnal
Name of Co PI	:	Dr. A. A. Patel, Head & Principal Scientist, DT Division, NDRI, Karnal
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Consortium partners		
Public Institutions	:	1. Central Institute of Post Harvest Engineering & Technology, PAU Campus, Ludhiana
NGO	:	1. Arpana Research & Charities, Madhuban, karnal-132001
Industry	:	1. M/S New Millennium Health Foods Pvt. Ltd., Noida
2. Date of start of proposal	:	March, 2009
3. Planned duration	:	3 ^{1/2} years
4. Project Cost	:	Rs. 2.84 Crores

5. **Project Objectives** :
- To harness the nutritional and therapeutic potential of milk by-products (whey and skim milk) and underutilized plant species (pearl millet & barley) for development of functional foods
 - To develop technological package for composite dairy foods (complementary foods, fortified convenience foods and probiotic milk-cereal foods) with enhanced health attributes
 - To validate the consumer acceptability and targeted health benefits composite dairy foods
 - To assess the techno-economic feasibility of the newly developed technologies through linkages with industry, marketing personnel and Self-help groups

6. **Brief Project Description** :
- The project “A value chain on composite foods with enhanced health attributes” is being undertaken by National Dairy Research Institute, Karnal (lead centre) and three partners, Central Institute of Post Harvest Engineering and Technology, Ludhiana (Government R &D institute), Arpana Research and Charities, Madhuban, Karnal(a NGO) and M/s New Millennium Health Foods Pvt. Ltd., Noida (private sector). All these partners are carefully chosen for manageability and to develop efficient value-added technologies for nutritious and health foods using milk by-products namely whey and skim milk and two lesser utilized agricultural crops viz. pearl millet and barley. Central Institute of Post Harvest Engineering and Technology (CIPHET), Arpana Research and Charities, M/s Millennium Health Foods Pvt. Ltd. attribute their competence by virtue of their leadership in their respective fields. CIPHET is the premier institution excelling in the post harvest handling and processing of agricultural produce, design & development of processing equipments.

Other organizations which are considered for linkages include NIN, Hyderabad (role: nutritional labeling and safety), AICRP Network Project on Indigenous Dairy Products at NDRI, Karnal; SRS of NDRI, Bangalore (role: pilot scale technology up-gradation), AICRP-Pearl Millet, Jodhpur (role: promotion of processing varieties), DWR, Karnal (role: evaluation of barley varieties for composite dairy foods); entrepreneurs such as M/s Marvel Foods Pvt. Ltd., Mumbai (role: popularization of developed products); and SINED (Society for Innovation in Entrepreneurship in Dairying) at Karnal for entrepreneurship development in the field of composite dairy foods. National consultants will be involved as associate partners/stake holders in this project.

Broadly, the project attempts to address four major issues with different objectives and activities under them. The first objective aims to develop the processes or techniques for effective utilization of milk

by-products (whey and skim milk) and lesser utilized plant species (pearl millet and barley) for development of novel food products having improved health characteristics. The dairy by-products will be used for the manufacture of protein-rich fractions both in liquid and dried form which has to be incorporated in formulation of health foods. The commercially available varieties of pearl millet and barley will be evaluated for their suitability for value addition. The primary processing techniques like milling, germination, roasting, popping will be standardized to further improve the functionality and nutritional status of grains. The equipments for milling of these grains will be developed and packaging & storage conditions will be optimized.

Second objective aims at developing a technological package for three types of composite dairy foods (complementary foods, fortified convenience foods and probiotic milk-cereal foods) with enhanced health attributes. A complete technological package including formulation, processing techniques, packaging for low cost complementary food and fortified convenience mix (breakfast cereals & porridge) based on milk by-products and pearl millet and barley will be developed. Technology for whey-millet based probiotic products will be standardized. These developed products will be analyzed for their physico-chemical, nutritional and evaluated for storage investigations.

Third objective involves validation of targeted health benefits and consumer acceptability of composite dairy foods. The developed products will be valued for their consumer acceptability and necessary modifications will be done to suit their palate. Similarly efficacy of these products for their claimed health effects will be determined using in-vitro, in-vivo and human trials.

The last objective emphasizes on assessing the techno-economic feasibility of the newly developed technologies through linkages with various stake holders such as industries, marketing personnel and self help groups.

7. **Environmental** :
Category : B
Major issues in the sub-project
 ▪ **Social** :

The milk is a scared item in daily diet of people of the region and wastage of milk & milk nutrients is considered as unholy. Many processing interventions that will be used in product development improve the bioavailability of pearl millet & barley nutrients, which are otherwise not metabolized in the body and contributing towards malnutrition. The composite diary foods that will be developed have resemblance to many locally available foods like *dalia*, *rabadi*, *sattu*. Moreover, the improved nutritional and health promoting characteristics of developed foods will meet their requirements of ‘Wholesome’ food which is available at affordable cost. Further, no preservative, chemical compounds, non-permitted additives like

colours etc. and any harmful ingredients are added. Thus this project is **socially just**. Outcome of this project will enhance the production and utilization of minor cereal crops like pearl millet and barley and also provide an sustainable alternative to dairy industry for whey utilization

- **Environmental** : The project is an attempt to address one of the serious environmental issue dairy industries is facings i.e. of whey disposal because of its high BOD value that make its disposal without any treatment impossible and in many situation treatment requirements are not economically feasible. Moreover loss of valuable milk nutrients The enhancement in area and production of pearl millet and barley the local farmers may handle the problem of depleting water table, faster reduction in soil nutrients in soil and higher residual build up of pesticides and weedicides in water and soil of project area. The continuous production cycle involving rice and wheat has resulted in severe ecological degradation in the states like Haryana and Punjab, where project is located. Thus the project is **ecologically sound**.

8. Safeguard Policies Triggered (World Bank Policies)

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

There are no serious environmental and social risks as the project enhances the whey utilization, minimizes its disposal, increase the effective and judicious utilization of natural resources for cultivation of candidate crops. Apart from also target the health and nutritional status of people specially the vulnerable groups of society. However, certain risk factors that may have effect on the final outcome of the project are listed below.

- Adoption of newer technological packages for product diversification and whey utilization by the industry may not be an attractive alternative for them.
- Persuasion of farmers for growing the improved cultivars and adoption of improved cultivation packages is a complex issue
- Implementation of technological packages in un-organized sector or with small scale entrepreneurs may be difficult
- Popularization of developed health foods among masses require tremendous efforts
- Availability of partners to carry out the programme on large scale

- Training of stakeholders especially farmers and women in primary processing of candidate crops is difficult.
- The process of technology transfer and sometimes IPR issues associated with products/technologies developed during the project may be a major obstacle.

9. Impact assessment (enclosures I and II)

The project mostly will have positive impact on the environment as it is related to utilization of whey a by-product of dairy industry. It is also involving two important agricultural crops i.e. pearl millet and barley for value addition in combination with dairy nutrients to address the problem of malnutrition. The project is also emphasized on improving the livelihood of farmers by providing a better return on their produce and creating opportunities for self-employment & entrepreneurship among young and women.

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 opportunities for effective utilization of whey as well as skim milk offer dairy industries new avenues for product diversification and revenue generation. It will also provide a better return to dairy farmers on their produce.
- The use of pearl millet and barley for novel & health product development encourage farmers their cultivation on commercial scale. It will also promote cultivation and other minor agricultural commodities by the farming community.
- The value added therapeutic foods intake will help in improving the nutritional and health status of people in both in rural and urban areas.
- The indirect benefits will be sustainability of candidate crop cultivation in this region of the country, for improving the fast depleting water table due to continuous rice-wheat cropping.
- Promote crop diversification and provide an alternative to farmers
- Create opportunities for on-farm processing opportunities for rural people
- Adoption of technologies will enhance entrepreneurship among youths, women and other deprived segments of the society
- Rural entrepreneurship will help in reducing migration to urban areas through enhanced employment and income generation.
- Innovative marketing strategies formulation will boost market for health & functional food segments

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:

1. NDRI, Karnal
2. CIPHET, Ludhiana
3. APARNA Research and Charities, Madhuban
4. M/S New Millennium Foods Pvt. Ltd., Noida
5. M/S Marvel Foods Pvt. Ltd. Mumbai
6. NIN, Hyderabad
7. AICRP Network project on Indigenous Dairy Products at Karnal, SRS of NDRI, Karnal
8. National Consultants

9. Religious/Spiritual organizations like ISKON

Preliminary discussions were held with few stakeholders and NGOs before organizing stake holder's workshop. The concept note of the project was presented in the meeting of stakeholders held separately and jointly. The suggestions and modifications were incorporated accordingly. The various stakeholders were also apprised of the activities of project time-to-time through mails or telephone. 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 and full proposal

Sl. No.	Date & Location	Programme	Participants	Remarks
1	27.04.2008	Interactive meeting among the scientists of the Institute	Scientists, Heads of Divisions of NDRI	To orient the staff on the objectives & guidelines of NAIP
2	5.05.2008	Meeting with related field scientists on functional foods	Dairy technologists, Food scientists, Extension scientist, biochemist, Economist,	Discuss about joining hands for NAIP concept note
3	8.05.2008	Interactive meet	Dairy processing divisions, KVK	Discussion about possible proposal
4	10.05.2008	Telephonic discussion	Scientists from VPKAS Almora, GBPUAT, Pantnagar	Proposal related discussions
5	15.05.20078	Group meeting	NDRI Scientists & officers	Fine tuning of the Concept note
6	25.05.2008	Meeting with Director NDRI	NDRI scientists, JD and Director	Discussion regarding the concept note submission
7	20.06.2008	Telephonic discussion	Scientists, CIPHET, Industry personnel	Possibility of networking on composite dairy foods
8	16.08.2008	Pre stakeholders meet	All probable PIs	For full proposal discussion
9	24.08.2008	Meeting with scientist at Review meeting of Network project	Scientists from different SAU's	Interaction meet
10	05.09.2008	Telephonic discussion	Scientists from Pantnagar, CIPHET, VPAKS, DWR and industry	Possible researchable issues
11	16.09.2008 – 18-09-2008	Interactive workshop	At CIFE Mumbai, Stakeholders,	Project related discussion

			experts, NAIP officials	
12	23.-09.2008	Interaction with project Associates	Co-PIs of consortium groups	Fine tuning of objectives & activity
13	25-27.09.2008	Interactive workshop	At NAARM Hyderabad	Discussion on NAIP project and interactions
14.	4.10.2008	Meeting with ARPANA and New Millennium Foods Pvt. Ltd. Noida	Consortium partners	Discussion and finalization of role of partners
15.	15.10.2008	Discussion among consortium partners on budgetary issues of project	Consortium partners	Finalization of budget of partners
16	6.11.2008	TAG presentation	At New Delhi	Project presentation and discussion
17	14.11.2008	Telephonic discussion on issues related to TAG meeting	Consortium partners	Finalization of work programme and project in the light of TAG meeting suggestions
18	29.12.2008	RPC meeting at New Delhi	Expert member	Suggestion by RPC group on focus on research component
19.	2.01.2009	Meeting of Cost Committee	Director Finance & Other Expert Member	Finalization of Project budget

13. Measures to Address the Issues:

Safeguard Matrix pertaining to environmental and social issue likely to be affected by the project has been prepared activity wise. Attempts will be made to add only permitted and natural additives and fortificants during product formulation. The efficacy of added nutrients in terms of bio-availability and bioactivity will be assessed through validation trials. Products that will be developed in project are meant for specific health/age group such as children, women and elderly persons. These products will have known compositional, nutritional and therapeutic profile. Cost of processed foods largely depends on the availability and cost of raw material. Since whey and skim milk are perishable commodities and their transportation to distant places adds only to cost of product, hence these raw materials will also be converted in convenient forms such as dried powder, concentrate. Moreover, the pearl millet and barley production is localized one that may affect the manufacture of newly developed products in other areas of country. Hence these commodities will be primary processed to make them suitable for long term storage and transportation. Various manufacturing techniques employed during product development like spray drying and extrusion processing may result in costly products which are not affordable to people of all segment of society. Hence, alternative processes such as tray drying; dry blending

has also been included in technical programme. Since entrepreneurship development is one of the important objectives of the project, hence majority of technological packages have been designed to suit all sectors i.e. small, medium and large, of industries.

14. Consultation/ disclosures to be done in future:

Disclosure pertaining to project will be done through mechanisms such as launch workshop, industry-institute interfaces during the implementation stage of the subproject for sharing the results and soliciting feed-back. We will circulate project reports, technical bulletins, brochures and implementation progress from time to time, putting up in annual reports and also on the web site of the institute. Annual stakeholder workshops will also be organized to apprise the progress, future plans and any short comings if any in effective implementation of project arise.

The consultation/ disclosures will be done as per NAIP guidelines depending on the progress of the project. Training programmes and workshops on topics pertaining to theme of the project such as primary processing of pearl millet & barley, health food product development, nutritional and therapeutic potential identification, *etc* will be conducted. The project findings (brochures/ CDs/ videos/ literatures/research publications) will be disclosed time to time and necessary feed back will be collected for further improvement and better implementation. Assistance of different related organizations will be taken.

1. Transfer of technology of composite dairy foods to entrepreneurs and industry
2. Training of entrepreneurs on various aspects of, primary processing and value addition in pearl millet, barley and whey
3. Awareness creation among consumers through information dissemination on safety and nutritional aspects of developed products
4. Information dissemination through mass and print media on therapeutic and nutritional benefits to stakeholders, targeted groups especially children, women and aged persons
5. Religious groups like Iskon will be involved for rapid spread of the message of “composite dairy foods” as novel health foods

Consortium PI

National Coordinator

National Director

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

Activities	Issues	Anticipated level of impacts		Mitigation measures (Negative Impact)
		Positive	Negative	
Processing of. whey and skim milk for development of composite dairy foods	Whey & skim milk will be processed to more convenient and nutritionally rich form	5	0	
Identification and standardization of primary processing technologies for pearl millet and barley	Improve the utilization of pearl millet & barley for household and industrial purposes	5	0	
Suitability of the pearl millet and barley for value addition	Suitable varieties will be identified for value addition	4	0	
Development of low cost complementary food using milk by-products and malted grains foods	Nutritious foods will be available to people at affordable cost	5	0	
Development and evaluation of fortified convenience mixes foods	Synthetic fortificants may be used	4	2	Permitted fortifying compounds will be used
Development and evaluation of Whey-cereal probiotic foods	Increase in availability & consumption of probiotic foods	4	0	
HACCP guideline development	Safety criterion will be in place	4	0	
To assess the efficacy of value added foods in the promotion of health	Developed foods may not have significant health benefits	4	1	Health foods are meant for specific target groups
Nutritional profiling of Functional composite dairy products	Promote the consumer's liking for nutritious foods	4	0	
Consumer acceptance studies for newly developed functional composite dairy foods	Choice availability to consumers	5	0	
Economic feasibility analysis , pricing strategies	Processes may be of location specific in nature	4	1	Processes will be designed to suit different locations based on the availability of raw material
Market information system and marketing strategy for newly developed products	Better strategies for enhancing the market for newly developed health foods	4	0	

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

Activities	Issues	Anticipated level of impacts		Mitigation measures (Negative Impact)
		Positive	Negative	
Processing of. whey and skim milk for development of composite dairy foods	Whey & skim milk will be utilized for the value addition.	5	0	
Identification and standardization of primary processing technologies for pearl millet and barley	Increase in usage of pearl millet and barley for human consumption	5	0	
Suitability of the pearl millet and barley for value addition	Suitable varieties will be identified for value addition.	4	0	
Development of low cost complementary food using milk by-products and malted grains foods	Nutritious foods will be available to people at affordable cost. May solve the problem of malnutrition	5	0	
Development and evaluation of fortified convenience mixes foods	Processing involve may increase the cost of developed products	4	2	Appropriate selection of raw material and processing interventions
Development and evaluation of Whey-cereal probiotic foods	Increase in availability & consumption of probiotic foods	4	0	
HACCP guideline development	Safety criterion will be in place	4	0	
To assess the efficacy of value added foods in the promotion of health	Developed foods may not have significant health benefits	4	1	Health foods are meant for specific target groups
Nutritional profiling of Functional composite dairy products	Promote the consumer's liking for nutritious foods	4	0	
Consumer acceptance studies for newly developed functional composite dairy foods	Availability of health foods for community nutrition	5	0	
Economic feasibility analysis , pricing strategies	Technologies may not be feasible at small scale	4	1	Processes will be designed to suit different sectors
Market information system and marketing strategy for newly developed products	Better strategies for enhancing the market for newly developed health foods among all strata of society	4	0	