

A Value Chain on Enrichment and Popularization of Potential Food Grains for Nutraceutical Benefits

Environmental and Social Safeguards Management in NAIP

A. Basic information

1. Project Statistics:

Consortium Leader	:	Dr. J H Kulkarni, Vice Chancellor, UAS, Dharwad
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Name of CoPI	:	Dr. M Y Kamatar, Principal Scientist, UAS, Dharwad
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Consortium Partners	:	1. KLE's MRC, Belgaum 2. BAIF, Dharwad 3. Chandana Food Products, Gadag 4. Jaya Food Products, Bangalore
2. Date of start	:	June 1, 2008
3. Planned duration	:	4 years and 6 months
4. Project Cost	:	Rs. 385.984 lakhs

5. Project objectives:

- **Production:** To create remunerative market for foxtail and little millet grains through establishing primary processing and build up of supply chain, consumer awareness and preference.
- **Processing:** To access and enhance nutraceutical value of foxtail and little millet through appropriate processing methods, and develop value added products for health benefits
- **Byproduct Value Addition:** To efficiently utilize the byproducts for health and economic benefits by incorporating the byproducts in convenience and traditional foods.
- **Specific to Value Chain:** Field level evaluation of the value added products for health benefits and nutritional certification to facilitate popularization and promotion of nutraceutical food products in the social market.
- **Market:** To strengthen the domestic market by entrepreneurship development and commercialization of value added nutraceutical food products through linkages with marketers, industry, public catering & philanthropic institutes through ICT.

6. Brief Project Description

This consortium lays stress on the two nutraceutically dense crops namely, foxtail, and little millets. The project attempts a comprehensive use of millets and their byproducts in nutrition and therapeutics and identify attributes to be analyzed. The project assumes that small scale farmers can manage and use traditional agro-and wild biodiversity 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 biodiversity and health is both a response to the consequences of economic growth but also a way to direct growth in a positive manner

The project being multi-institutional involves scientific investigations, activities for improvement of livelihood options and improved market access, business opportunities for long term sustenance of intended activities where all the stakeholders come together, participate and benefit. Thus the proposal has a very well defined stake holder participation and well defined target groups. The project involves farmer, multidisciplinary researchers like crop breeder, 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 nutraceutical benefits of the products developed.

The project involves of five components with different objectives and activities to meet the theme of production to consumption value chain. The first objective aims at increased farm production of foxtail and little millet, procurement and primary processing for continuous supply chain management for commercial production of ready to eat healthy

and nutraceutical foods for these two millets. The grain will be subjected to improved primary processing for cleaning, grading and enhancing shelf - life through proper packaging for creating value-addition to the grain for selling in up-markets and trading. The interventions here are creating market demand for millets, bulking and aggregation of farm produce and link up with product preparation for continuous supply chain management. Seeds of identified high yielding land races and improved cultivars which are specific to an end product will be supplied to targeted farmers. Further, new genotypes for suitable for specific products will be identified through evaluation of landraces or other germplasm lines of selected millets and registered before sharing with farmers and entrepreneurs. Land races collected in this project shall have agronomic, cultural and social values to the local farmers and are fit to local specific environment, marginal lands of have stability, diversity and need less external inputs for cultivation. Collection of land race and base line survey shall be done in collaboration with BAIF center Dharwad. Establishment of millet Processing unit will facilitate the farmers, traders and processors to reduce the cost of transportation and marketing Thus the journey of each farm produce from the farm gate to the plate of consumer plays a crucial role in determining the price of raw food grains. Continuous supply chain enhances farm income and benefits farmers by linking with industries. Thus the project shall be economically viable.

Second objective of the project is to development of economically viable value added nutritionally enriched millet based foods enhances consumption, convenience and empowers the communities to attain nutraceutical benefits and promote health. In this direction, nutraceutically enriched foods like high fiber foods, low glycemic foods, low fat, high complex carbohydrate foods, composite flours, convenience foods such as high fiber biscuits, bread, bun etc shall be developed. Further, convenience foods/composite mixes from selected grains for improved nutrition and health life quality shall be developed of sensory profile of developed therapeutic and convenience foods shall be established Nutritional profile of the developed products shall be established by out sourcing to NIN, ICMR, Hyderabad.

After the development of the value added products they shall be nutritionally labeled by National Institute of Nutrition, Hyderabad for nutrifacts. Thus labeled health and nutraceutical products developed shall be evaluated for their efficacy testing by the dieticians on the vulnerable groups for improvement of health traits of non communicable diseases both in urban and rural groups. This role shall be done by Medical Research Centre, Belgaum. This tested value added and health products of foxtail and little millets shall be produced on large scale for popularization and commercial marketing by Chandan Food Products, Gadag and Jaya Food Products, Bangalore.

Different packaging systems and shelf life studies of the developed products from selected grains shall be done by primary packaging such as pouches of different gauges of food grade quality for millet rice, semolina, grits, flour etc. and secondary packaging materials with special properties for retention of organo-leptic qualities and shelf life for the value added products will be ascertained through research issues. HACCP of commercially viable foods will be identified and process protocols will be developed.

To create awareness and economic empowerment to rural and urban under privileged for household nutrition security following activities shall be done: Skill based training to SHGs, youth, small scale food processing on value added communicably variable products. In-depth technology transfer to established food entrepreneurs for designer's food communicably. Sensitizing the stakeholder, farmer consumer, Industries and related government officials regarding nutraceutical value added whole grain products. Capacity building to scale up small level food processes. Popularizing value added wholegrain products through innovative ICT.

Thus, the present approach is to link up the entire PCS value-chain through appropriate interventions in identification, procurement, and bulking, processing, product and market development, tagging or branding as health food and to ensure the availability to common man at home and in public catering institutions. A value-chain on whole grain foods is expected to impact positively not only on income generation (farmers and needy in the value-chain) but also ensuring nutritional security of the consumers. It offers employment in general and women in specific as it involves small and medium scale enterprises. This developed model can be extended to other nutraceutical rich grains. Utilization through value addition to byproducts of whole grains is absolutely necessary in up scaling social and economic benefits. Economical benefits of whole grain cultivation is loaded with environmental benefits as they are relatively less resource intensive, less water consuming and support livestock in the ecosystem by means of offering both green and dry fodder (Stover) to the cattle in the fodder-scarce dry land regions of the country.

The project assumes that:

1. Collaborative public private partnership enhances continuous and timely supply chain system in both directions (forward and backward linkages) and benefit stake holders like small farmers, small scale primary processors, food industry and marketers.
2. Consumption of whole grain value added products will improve health and work output of farmers and economically underprivileged and general populations, through nutraceutical components.
3. Food approach, through consumption of whole grains plays a major role in promoting health status by decreasing morbidity and elevating nutritional status, is sustainable and culturally acceptable.
4. The proposed value chain has an inbuilt plan to assure market to the farmers and continuous supply of raw material to processors/ traders and health benefits to consumers. Therapeutic food chains are made accessible to target groups for management of health disorders.
5. The drought resistant grains will provide bread for poor farmers during ecological adversity and imbalance

Monitoring and evaluation of the project with respective process, product and performance indicators evaluation of the project shall be done by participatory approach from base line survey to post implementation of the project. The participating partners are CFTRI, BAIF, Chandana and Jaya food Industries, UASD being the lead centre. The major disciplines involved are plant breeding, agronomy, Food Science, Nutrition,

Biochemistry, Agriculture Economics and Marketing, Soil Science, Extension and other social sciences along with extension KVKs.

Summarized roles of the consortium partners are as follows:

Sl. No.	Name	Role	Responsibilities
1.	UAS, Dharwad	Overall planning co-ordination and execution of the project.	1. Evaluation & identification of suitable land races of crops 2. Value addition and development of health and therapeutic foods with suitable packaging, shelf life and labeling. 3. Pricing and cost analysis of developed products 4. Establishment of millet processing units 5. Monitoring of the project 6. Training and entrepreneur's skill development
2	BAIF, Dharwad	Collection, and procurement of land races and raw food grains	1. Collection of farmers' variety of candidate crops. 2. Procurement & storing of raw food grains 3. Establishing market links.
4	Jaya Food Products, Banagalore	Production and Supply and marketing of millet foods	Large scale production and supply of value added products to domestic market and marketing of products with novel strategies.
4.	KLE Medical Research Center Belgaum	Efficacy testing of developed foods on target population for nutraceutical benefits	1. Testing on human volunteers. 2. market survey of health foods.
5.	Chandan Food Products, Gadag	Production and supply and marketing of health and therapeutic foods for domestic markets	Large scale production and supply of value added products to domestic market and marketing of products with novel strategies.

7. Environmental category issues in the sub project

Social: The project develops the products by using the indigenous knowledge and food grains grown in this region which improve 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

whole grain 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. Hence there are no negative impacts on social aspects. Infact there are only positive benefits.

Environmental : Project has a strategy to link nutrition, health and conservation of bio-diversity is reproduced below:

“The project assumes that small scale farmers can manage and use traditional agro-and wild biodiversity 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 biodiversity and health is both a response to the consequences of economic growth but also a way to direct growth in a positive manner. **Hence there are no adverse environmental issues in the project.**

Land races collected in this project shall have agronomic, cultural and social values to the local farmers and are fit to local specific environment, marginal lands of have stability, diversity and need less external inputs for cultivation. **Thus the project is ecologically sound.**

Further, the project facilitates accelerated and sustainable transformation of whole grain 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.

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)		X
Pest management (OP 4.09)		X
Cultural property (draft OP 4, 11-OPN 11.03-)		X
Involuntary resettlement (OP/BP 4.12)		X
Indigenous peoples (OD 4.20)		X
Forests (OP/BP 4.36)		X
Safety of dams (OP/BP4.37)		X
Projects in disputed areas (OP/BP 7.60)		X
Projects on international waterways (OPBP 7.50)		X

B. Risk Analysis and related issues

There are no serious environmental and social risks as the project enhances the land races, indigenous knowledge and conserves the biodiversity and improves quality life of consumers by therapeutic benefits. Increase and implementation of land races and

indigenous knowledge does not require chemical fertilizers and pesticides, there are no environmental risks. However, following risks are anticipated:

- 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

The project mostly will have positive impact as it involves improving the natural resource management and enhancing the crop productivity through farming systems approach. Wherever negative impact is perceived through individual interventions, appropriate mitigation measures have been planned.

- 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.
- The indirect benefits will be sustainability of candidate crop cultivation in dry land regions of the country, offering fodder security for livestock including meat animals with better productivity and efficiency and dairy production.
- Increased candidate crop cultivation will be at the cost of replacement of other crops. Obviously less remunerative crops will be replaced.
- 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.

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.

A value-chain on whole grain foods is expected to impact positively not only on income generation (farmers and others in the value-chain) but also ensuring nutritional security of

the consumers. It offers employment in general and women in specific as it involves small and medium scale enterprises. This developed model can be extended to other nutraceutical rich grains. Utilization through value addition to byproducts of whole grains is absolutely necessary in up scaling social and economic benefits. Economical benefits of whole grain cultivation is loaded with environmental benefits as they are relatively less resource intensive, less water consuming and support livestock in the ecosystem by means of offering both green and dry fodder (Stover) to the cattle in the fodder-scarce dry land regions of the country.

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

Farmers, Farm women, Research Institutions, Government and Non-government institutions engaged in improving Agriculture, Rural and Urban Health are the key stakeholders for this project. Several rounds field visits to farms and rural households, discussions and brainstorming sessions with stakeholders and workshops were organized during the pre project consultation. Total of 12 consultative, group meetings, workshops have been conducted by involving all the stake holders like farmers, marketers, business men, exporters, Social scientists, BAIF, KVKs, Medical Research center, crop breeders, food nutritionists, economists, public catering institutions, religious institutions, Chandana food products and Jaya food products to plan and organize the proposal.

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

S. No.	Date & Location	Programme	Participants	Remarks
1	05.04.2006	NAIP orientation & sensitization programme	Heads of the department of University & Colleges	To orient the staff on the objectives & guidelines of NAIP
2	24.09.2006	Meeting with related field scientists on whole grains	Breeders, Food scientists, Extension workers, biochemist, Economist, Marketing specialists	Discuss about joining hands for whole grain project
3	16.02.2007	Annual Technical Meet	Food Science & Nutrition staff & other staff of UAS	Discussion about possible proposal
4	29.08.2007	Group meeting	UAS Scientists & officers	Proposal prevention
5	29.09.2007	Group meeting	UAS Scientists & officers	Fine tuning of the proposal & proposal selection
6	15.11.2007	Telephonic discussion	Director, NIN, Hyderabad	Possibility of networking in phytochemicals work
7	20.11.2007	Telephonic discussion	Scientists, CFTRI, Mysore	Possibility of networking in phytochemicals work
8	28.11.2007	Pre stakeholders meet	All probable PIs	NAIP sensitization workshop
9	10.12.2007	Meeting with staff of ASF, Hulkoti	Scientists from ASF	Interaction meet
10	10.12.2007	Meeting with staff of BAIF, Dharwad	Scientists from BAIF	Interaction meet
11	18.12.2007	Meeting with physicians & Dietician	Staff from KLE's MRC, Belgaum	Discussion about research requirements
12	26.12.2007	Meeting with consortium partners	Co-PIs of consortium groups	Fine tuning of objectives & activity

13	28.12.2007	Meeting with top officials of ICAR	At NAS, New Delhi, ICAR top officials proponents	Discussion on NAIP project and interactions
14.	9.1.2008	Finalization of budget	PI & CoPI with TAG2 members & National co-ordinators partners	Finalized
15.	22.2.2008	Revision as per TAG 2 meetings	PI & CoPI with TAG2 members & National co-ordinators partners	Suggestions attended
16.	06.3.2008	Revision as per TAG 2 meetings	PI & CoPI with TAG2 members & National co-ordinators partners	Suggestions attended
	08.04.2008	Technical Advisory group meeting (TAG2)	PI & CoPI with TAG2 members & National co-ordinators	Discussion & attend the suggestion
17.	02.5.08	Revision as per (NAARM) Workshop suggestions and guidelines	Consortium partners	Suggestions attended
18	06.5.08	Revision of budget as per RPC & Cost committee meetings	PI & CoPI with RPC members	Suggestions attended
	19.05.2008	PMC meeting of NAIP	PI & CoPI with TAG2 members & National co-ordinators	Discussion & attend the suggestion
19	11.08.2008	CAC Meeting	CAC Members with Consortium partners	Launching workshop. Discussed the action plan for 2008-09 incorporated the suggestions.
20	11.11.2008	Planning & Review meeting for enumerates	Consortium Partner (BAIF)	Discussed on conduct of baseline survey work.

21	08.01.2009	M& E Meeting	Consortium Partner, Scientists and M&E consultants	Discussed M&E and Baseline survey work.
22	01.03.2009	Meeting with farmers	Gadag District farmers	Discussion about site selection
23	25.03.2009	II CAC meeting	CAC Members with Consortium partners	Discussed the progress of 2008-09 and baseline survey with National Director & CAC members.
24	11.05.2009	Meeting with Food Scientist STEP, Bagalkot	Scientists & SHG groups	Training on packing.
25	21.05.2009	Meeting with the another project of component 2, NRCS	PI & CoPI of two projects	Discussion on the action plan
26	25.06.2009	Meeting with Consortium partner	PI & CoPI UAS, KLE's MRC Belgaum.	Discussion on the action plan of 2009-10

13. Measures to Address the Issues:

This project focuses on value addition to existing millet crops & increases the area under millet crop. Millets are grown with minimum use of inorganic fertilizer & water. Pesticide use is very much minimum in millets. Further organic farming shall be encouraged. Laboratory wastes like chemicals, glass wares and food waste shall be carefully disposed. Hence there are no negative impacts for environmental and social safeguard. On the other hand there will be positive impacts on environmental and social levels. These positive impacts are listed below:

- 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.
- The indirect benefits will be sustainability of candidate crop cultivation in dry land regions of the country, offering fodder security for livestock including meat animals with better productivity and efficiency and dairy production.
- Increased candidate crop cultivation will be at the cost of replacement of other crops. Obviously less remunerative crops will be replaced.
- 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.

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 feed-back, 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 feed back will be collected for further improvement and better implementation. Assistance of different related organizations will be taken.

1. Dissemination of holistic crop management and extension services to farmers through other partners.
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 nutraceutical grain 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.
8. Religious groups will be involved for rapid spread of the message of “millets for good health” both as prophylactic and health merits.



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	
Baseline survey				
Integrated farm extension services with buy-back	Effect on crop diversity/fodder availability increased	5	0	
Procurement, aggregation and storage function in target regions. (harvest & storage of produce)	Shelf- life enhanced, storage grain pests will be controlled	4	0	Modern methods of packing material, solar drying
Transport and processing of produce	Clean grain for marketing	4	0	
Fine -tune technologies for development of millet foods				
Packaging and marketing	Packaging material disposal	4	0	Biodegradable of packaging material will be planned
By-product value addition	Byproduct utilization in place	4	0	
Value addition to traditional diet	Food habits are difficult to change	4	0	Inter weave the grains in culturally accepted recipes
Evaluation of semi-processed millets in mid-day meal program for nutritional characters.	Healthy food to children available	4	0	
Assessment of nutraceutical composition in candidate grains	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 place for commercial health foods	4	0	
Sensitizing target population, line departments of governments for enhancing grain consumption	Nutritional security is in place	5	0	
Supply chain of grain to industry and value added products to bulk consumers through public catering institutions	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	
Integrated farm extension services with buy-back	Effective crop diversity/ fodder management practices in place.	5	0	
Procurement of grains from farmers	Mixture of various variety of grains	0	2	Fair price has to be given for farmers
Aggregation and storage function in target regions. (harvest & storage of produce)	Supply-chain management measures for commercialization in place	4	0	
Transport and processing of produce	Availability of grains should be in place	0	3	Proper transport should be ensured
Packaging and marketing	Ensuring product safety	4	0	
By-product value addition	Usage of byproduct in ready to eat foods	4	0	
Value addition to traditional diet	Incorporation of nutrients in traditional diet	4	0	
Evaluation of semi-processed millets in mid-day meal program for nutritional characters.	Nutrient rich food available to children	4	0	
Assessment of nutraceutical composition in candidate grains	Increased market for millet products due to the awareness of its benefits	5	0	
Evaluation of the value added foods	Providing nutritional food to the target population	5	0	
Implementation of HACCP.	Quality assurance to the population	3	0	
Sensitizing target population, line departments of governments for enhancing grain consumption	Nutrition security to the society	3	0	

Supply chain of grain to industry and value added products to bulk consumers through public catering institutions	Awareness of health foods to the community	5	0	
Development of convenient foods: millet flakes, millet incorporated cookies, dosa mix, supplementary food	Time saved and availability of ready foods	4	0	
Identification of number of potential food products for wide ranging and niche markets through market survey	Less number of products found and marketing of them is enhanced	3	0	