'A Value Chain on Linseed: Processing and Value Addition for Profitability - Production to Consumption System (PCS)'

NAIP, Component 2

BASELINE SURVEY REPORT



Submitted to

Project Monitoring Unit

National Agricultural Innovation Project

Indian Council of Agricultural Research, New Delhi

Submitted by

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I am pleased to present the baseline report of the 'A Value Chain on Linseed: Processing and Value Addition for Profitability - Production to Consumption System (PCS)' project under of National Agriculture Innovation Project (NAIP) component 2 of Indian Council for Agricultural Research (ICAR).

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Members of Consortium Monitoring Unit took all the effort to guide the cluster team, coordinate with all the stakeholders and ultimately take the report to its final shape.

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Ramesh Rawal December 2009

Consortium Principal Investigator

Contents

Executive Summery

The overall objective of the present survey was to assess the socio-economic conditions of the people in the project area prior to intervention as well as assessment of baseline situation of other key elements of value chain on linseed.

For the purpose of data collection; questionnaires and PRAs were used. Wherever required; data was collected from secondary sources such as Gram Panchayat, Panchayat Samiti, district agriculture departments as well as websites of Maharashtra government. Sample of 50 was distributed in eight villages in Nagpur district. In all we got 53 questionnaires, all of which are incorporated. Landholding household was the major criterion for the survey.

The total population of surveyed villages is 4886. Male – female ratio in the population is 868 females per 1000 males**.** Literacy level is very good and fairly equal for men and women. It is 92% for both men and women. Migration is not at all the issue in the area as no respondent reported migration. Data regarding occupation shows that agriculture is major source of livelihood for 100% people. Other subsidiary occupations such dairy and husbandry are at very low scale. Out of total cultivable land in the area only 22.53% land is irrigated. Overall cropping intensity of the area is 125%.

Socially OBCs are major group in the area as they constitute 33% of population. General category constitutes 32%, followed by ST (20%) and SC (15%)

The average landholding is 4.04 ha. Major sources of information for local people are mainly newspaper and extension programmes by agriculture department. The awareness level of people is found moderate because of extension work of Agriculture department as well as State Agriculture University.

At present findings show that linseed is a neglected crop due to low productivity and lack of assured price. Linseed is important because of its nutritional contents, it has 40% oil containing omega-3 fatty acid with 55-60% of alpha linolenic acid (ALA: 18:3). Modern diet is deficient in omega-3 fatty acids. The increase in incidence and severity, early occurrence of degenerative diseases like diabetes, cardiovascular disease, arthritis, cancer, mental disorders etc are largely attributed to this deficiency. Linseed holds the key to Omega-3 nutritional security. Therefore the project aims at entire value chain from production of high yielding – disease resistant varieties of linseed, imparting production technologies and processing of linseed for omega 3 oil and other food products which can be part of our daily diet.

Baseline status of key elements in linseed value chain is as follows;

Element	Baseline Value
High yielding improved varieties	C- 429, yield 94 kg/A
Number of farmers' institutions involved in seed production	Nil
Processing for food application, cold press extraction of omega 3 linseed oil	Linseed oil is not being used for food application
Branding and marketing of omega 3 products	No food fortification through linseed oil is done in India
Omega-3 feed and omega-3 chicken	No omega-3 chicken feed or omega-3 chicken is produced in the country
Researchable Issues	
Linseed Straw utilization	Nil
Linseed cake (lignan recovery)	Nil
Germ plasm Screening	Nil

1. Introduction

Linseed is a neglected oilseed crop in the country and linseed production in the country today is very less due to low productivity. In Maharashtra Linseed is mainly grown in eastern part of Vidarbha particularly in Chandrapur, Gadchiroli, Nagpur, Bhandara, Yeotmal and Wardha districts which are most backward districts in the country. Maharashtra ranks second in India with respect to area of linseed cultivation measuring 68,000 hectares which is further decreasing.

Commercially the linseed is equally important because of its nutritional contents, it has 40% oil containing omega-3 fatty acid with 55-60% of alpha linolenic acid (ALA: 18:3). Linseed holds the key to Omega-3 nutritional security. Linseed is the richest vegetarian source of omega-3 fatty acid. Modern diet is deficient in omega-3 fatty acids. The increase in incidence and severity, early occurrence of degenerative diseases like diabetes, cardiovascular disease, arthritis, cancer, mental disorders etc are largely attributed to this deficiency.

Therefore the project titled 'Value Chain on Linseed: Processing and value addition for Profitability' aims at seed production of high yielding disease resistant linseed variety and imparting improved production technologies to farmers as well as linseed processing for omega 3 oil and other omega 3 products which can be part of our daily diet. It also focuses on research on recovery of bioactive ingredients like lignan from linseed which adds value to linseed.

In view to know present situation of linseed cultivation and linseed processing; a survey was conducted by consortium partners. BAIF collected data on baseline situation of linseed growing farmers and present agriculture practices with reference to linseed. PDKV provided inputs with respect to varieties of linseed grown in project area. BVU took responsibility of market survey of omega 3 products and linseed processing technologies.

1.1. Project objectives and activities

Project objectives;

1. Identification and introduction of high yielding and resistant varieties of linseed crop
2. Processing of linseed crop for Omega 3 oil and omega-3 byproducts.
3. Recovery of lignan from linseed cake for pharma application

Researchable Issues

- Lignan from linseed cake and its pharmaceutical applications
- Use of electromagnetic vacuum drier integrated with linseed processing line
- Linseed straw and cake for animal feed
- Screening of linseed germ-plasm

Partner wise activities

Sr. No.	Activity	Responsibility			
		BAIF	**PDKV**	**BVU**	**EnSigns**
1.	Baseline survey and identification of cluster & farmers	√	√		
2.	Selection of Farmers, Exposure & Training	√	√		
3.	Formation of farmers' institution for linseed promotion	√			
4.	High yielding seed production at farmers field	√	√		
5.	Linseed production (200 acres/farmers)	√			
6.	Linseed processing for high-grade Omega 3 oil production	√	√	√	
7.	Quality Control & Value addition	√		√	
8.	Entrepreneurship development & Market Linkages	√		√	√
9.	Research on Lignan and animal feed	√		√	

1.2. Objectives-Activities-Deliverables

No.	Objectives	Activities	Deliverables
1.	Identification and introduction of high yielding and resistant varieties of linseed crop	Baseline survey	Report
		Identification of cluster & farmers	200 acres/farmers
		Improved package of practices of linseed to farmers	200 acres/farmers
2.	Processing of linseed crop for Omega 3 oil and omega-3 byproducts	Linseed processing for high-grade Omega 3 oil production	Production of high quality omega 3 oil: Extraction of 200-300 kg of oil per day
		Quality Control & Value addition	Development of omega 3 products: At least 2 products
		Branding and Marketing through industrial partners	Forward linkages for omega 3 products
3.	Recovery of lignan from linseed cake for pharma application	Research on Lignan and animal feed	• Cheap Poultry Feed • Lignan Extraction for Phrama application • Residual cake (anti nutrient) for animal and human feed

1.3. Outcomes and outputs

Outcomes

1. Socio-economic changes through gainful Employment generation and income enhancement of the participating farmers.
2. Demonstration of improved production of linseed and value chain of Omega-3 products.
3. Creation of niche markets for the value added eatables for improved human health.
4. Piloting the technologies on Omega 3 products as well as technology to preserve and extract the bioactive compounds.

Outputs

No.	**Output**	**Baseline values**	**Target**
1.	Increased yield of linseed	Traditional seeds: yield 98 kg/Acre	NL 97 - 300 kg/A, NL 260 - 400 kg/A
2.	Production of quality seed of linseed at local level	NIL	50 farmers
3.	Production of high quality omega 3 oil	NIL	Extraction of 200-300 kg of oil per day
4.	Development of omega 3 products	NIL	Development of minimum two products
5.	Forward linkages for omega 3 products	NIL	Branding and marketing of omega 3 products (minimum 2 products)

1.4. Consortium

1. **BAIF Development Research Foundation, Pune**: BAIF as a consortium leader will play an important role of overall programme management, Linseed processing, procurement, programme monitoring, liaison with partners and NAIP.
2. **Bharati Vidyapeeth University, Pune**: BVU will be mainly dealing with value addition and quality control for omega 3 oil and omega 3 byproducts as well research on lignan recovery from linseed.
3. **Dr. Panjabrao Krishi Vidyapeeth, Akola**: All India Coordinated Research Project on Linseed (AICRP Linseed) was initiated in 1987 at College of Agriculture, Nagpur, affiliated to PDKV. PDKV will mainly dealing with improved package of production and protection of linseed to participant farmers.
4. **Ensigns Diet Care Pvt. Ltd**.: Ensigns is the associate industrial partner who will be dealing with branding of omega 3 products and marketing.

2. Baseline Survey

The overall objective of the survey was to assess the socio-economic conditions of the people in the project area prior to intervention as well as assessment of baseline situation of other key elements of value chain on linseed

2.1 Objectives of Survey

- To assess the socio-economic profile of the farmers from the clusters in terms of information on household, education, occupation and household assets as well as infrastructure facilities such as roads and transportation.
- To understand the prevalent farming system including agricultural practices in general and with respect to linseed in particular; mainly in terms of crop production, yield, livestock productivity, market linkages
- Assessment of baseline status of other elements in value chain on linseed.

2.2 Methodology of data collection

Data was collected through the following primary and secondary sources:

- **Primary source**: Household survey and Focused Group discussions were conducted with groups of farmers in area under operation. Standard questionnaire was designed to collect data from individual farmer as per the format provided for NAIP component 2. Since target number of farmers is 200, sample size selected was of 25%. Method of random sampling was used and household survey was done for 53 farmers from 8 villages in the area under operation. Focused Groups Discussions were conducted to understand farmer's perceptions in general and about linseed in particular.
- **Secondary source**: Village level data was collected from Gram Panchayat Offices. Data collected through these sources was tabulated and interpreted as per formats. Focused group discussions were conducted to know present practices followed by farmers with respect to linseed cultivation.

2.3 Data Processing and Analysis

- **Data Entry**: After completion of survey, the raw data collected, was entered and recorded in Excel format. A total of 53 household questionnaires were achieved.
- **Data Analysis**: Simple methods such as means, percentage and frequencies were calculated.

2.4 Documentation of the baseline report

The data collected was compiled using Excel format. Simple methods such as means, percentage and frequencies were calculated. The details of data collected are given in annexure. In the report we have tried to present concise information using tables as well as graphs.

Farmers are categorized as follows;

Land holding (ha)	Category	No. of farmers
0	Landless	0
0 – 1	Marginal	2
1 – 2	Small	8
2 – 4	Semi medium	22
4 – 10	Medium	20
10+	Large	1
Total		53

Findings for annual income are presented landholding category wise in respective chapter of the report. Outputs for net annual income of farmers are based on the farm gate prices of agriculture produce considering input costs for each crop. While calculating inputs cost, cost for seed, fertiliser and pesticide was considered. Crop production data was analyzed on the basis of KG/Ha.

3. Baseline data of sample villages

Traditionally Linseed is grown in the districts of Vidarbha in Maharashtra. As the project is focused on developing value chain on linseed, the selection of farmers and villages was done on the basis of area under linseed cultivation.

Bhivapur and Umred blocks of Nagpur are identified for intervention. Bhivapur is southern block of Nagpur sharing its boundary with neighboring districts of Chandrapur and Bhandara. Survey was done in 7 villages of Bhivapur block. Data was collected through primary and secondary sources. For production of seed, few farmers in Chandrapur district have been identified.

3.1 Infrastructure available in surveyed villages

- **Transport:** All surveyed villages have good connectivity of roads. State Transport bus service and the other modes of conveyance such as Jeep and auto are available.
- **Communication:** With regard to telecommunication service, landline as well as mobile phone facility is available in all villages.
- **Water:** Tap water is available in all villages. Hand pumps and wells are the major source of drinking water. Most of the respondents told that water is scarce in summer.
- **Toilets:** Toilets are not available in any of these villages. Drainage facilities are there in six villages.
- **Education:** There are Anganwadis and Primary schools in all the surveyed villages. Only one village has secondary school. There is Ashram School in one village.
- **Health Infrastructure:** Only one village has health sub centre. People could not tell about ANM visit. Most of them rely on private health practitioners.
- **Electricity Connection:** Power connection is available in 76 villages for domestic use and out of these, 49 villages have power connection for agricultural related activities. Most of the villages were facing load shedding from six to twelve hours.
- **Banking and postal facilities:** There is no bank in said villages. Postal service is available in two villages.

	Number of villages having infrastructure facilities								
	Communication			Bank	Pakka Road	Toilets	Electricity for domestic consumption	Electricity for agriculture	Primary School
	Phone: Land Line	Phone: Mobile	Post						
Mahalgaon	√	√	√	No	√	No	√	√	√
Chikhalapar	√	√	No	No	√	No	√	√	√
Salebhatti	√	√	No	No	√	No	√	√	√
Jhamkoli	√	√	No	No	√	No	√	√	√
Panjarepar	√	√	√	No	√	No	√	√	√
Katkheda	√	√	No	No	√	No	√	√	√
Urkudpar	√	√	No	No	√	No	√	√	√

3.2 Demographic Profile

- **Population**

  The total population of surveyed villages is 4886. (Source: secondary data). Out of 4886, 2658 are men (54%) and 2308 are women (46%). Male – female ratio in the population is 868 females per 1000 males**.**

- **Literacy**

  Literacy level is very good and fairly equal for men and women. It is 92% for both men and women.

- **Migration**

  Migration is not at all the issue in the area as no respondent reported migration.

3.3 Land use pattern

Total seven villages in the area under operation were surveyed named as Mahalgaon, Chikhalapar, Salebhatti, Jhamkoli, Panjarepar, Katkheda and Urkudpar. These villages are located in Bhivapur block of Nagpur district. Block headquarter at Bhivapur is approximately at the distance of 30 kilometers from these villages.

Out of total land, 91% land is under cultivation which amounts to 2295 hectors. Out of land under cultivation, only 33% land is irrigated land.

3.4 Sources of water

There are total 17 wells and 21 hand pumps in the area. Three villages are benefitted by canal and four villages have access to river. Well is a major source of irrigation.

- **Village wise irrigated land**

Village	Irrigated land (ha)	Total land under cultivation (ha)	% of irrigated land
Mahalgaon	110	567	19.4%
Chikhalapar	151	469	32.19%
Salebhatti	40	285	14%
Jhamkoli	80	230.2	34.78%
Panjarepar	126	557	22.62%
Katkheda	25	225	11.11%
Urkudpar	43	218	19.72%
Overall	575	2551.2	22.53%

The data shows that out of total cultivable land in the area only 22.53% land is irrigated.

- **Cropping intensity**

Village	Net sown area (ha)	Gross sown area (ha)	Intensity
Mahalgaon	687.59	670	97.44%
Chikhalapar	315.34	535.2	169.7216
Salebhatti	285	385.7	135.3333
Jhamkoli	230.2	358	155.5169
Panjarepar	557	528	94.79354
Katkheda	225	359	159.5556
Urkudpaar	218	322	147.7064
Total	2518.13	3157.9	125.47

3.5 Agricultural Activities: Crops grown in the area

	Type of crops				
	Cereals	Pulses	Oilseeds	Vegetables	Cash crop
Name of crop	Paddy, wheat, soybean, Sorghum	Pigeon pea, Gram	Linseed	Brinjal, Chili	Cotton

In the surveyed villages major crops grown during kharif are soybean and pulses. Paddy and cotton are also grown to some extent. During Rabi wheat and Gram are the major crops. In the surveyed area maximum land is under soybean (2162.7 ha), followed by wheat (416.3 ha). Leasing system does not prevail in the area.

Crop	Area under cultivation (ha)
Paddy	59
Soybean	2162.7
Sorghum	70.8
Pigeon pea	69.8
Gram	213.8
Brinjal	9
Chili	83.4
Linseed	34.2
Cotton	19

3.6 People's institutions at local level

In the surveyed villages, no institution of farmers is observed. There is no farmers' or milk cooperative. There are women self help groups in all the villages. Total number of SHGs is 67. They are micro-credit groups mainly involved in saving and small credits for domestic needs. There are no cottage industries seen in the area.

3.7 Small/cottage industries

In none of these villages small or cottage industries exist.

3.8 Awareness and adoption

As reported by by farmers extension work by agriculture department is good. Krishi Melas are observed quarterly. Scientists from SAUs also visit occasionally to the area. As the farmers are having good communication facility and access to information from various agencies and institutes, the level of adoption is satisfactory.

3.9 Major crop inputs and prices

Inputs	**Soybean**	**Paddy**	**Cotton**	**Linseed**	**wheat**	**Gram**
Seed (kg/Ha)	84	59	1.41	32	94	32
Amount (Rs/ha)	2423.07	1904	2685	1235	3292	3025
Fertilisers (kg/ha)	86.45	370	400	123	340	84
Amount (Rs/ha)	968.24	3102	3396	1235	2810	845
Pesticides (liters/ha)	3.41	1.85	6.18	0	0	1.48
Amount (Rs/ha)	755.82	598	2013	0	0	543
Total cost	4147.13	5604	8094	2470	6103	4414
Yield Kg/Ha	1235	2008.11	1173	247	1632	741
Market price (Rs/kg)	19	13.75	27.31	35	10.3	17.71

The figures in the table show that famers are in general aware and better off. Soybean in kharif and Wheat in Rabi are the major crops grown in the area. At present linseed is much neglected crop. Present status of linseed is presented is discussed in subsequent chapter.

3.10 Extension services

Major sources of information for local people are mainly newspaper and extension programmes by agriculture department. There are field demonstrations carried out. Occasionally field days, krishi melas are organized. Other sources of information involved private companies producing agriculture products.

3.11 Environment and Social Safeguards issues

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/BP 4.37)	[ ]	[X]
Projects in Disputed Areas (OP/BP 7.60)	[ ]	[X]
Projects on International Waterways (OP/BP 7.50)	[ ]	[X]

A. Risk analysis and related issues

- Adoption of improved package of practices in a holistic way may be a problem if funds are inadequate.
- Marketing of Omega 3 enriched linseed oil may be difficult, as it is an emerging health concept.
- Conflict of interest in using linseed for industrial and feed purposes *vis-a-vis* linseed for food uses in future.
- Training programmes on linseed processing in new technology for Omega-3 rich oil.
- Emergence of new markets on omega 3 rich linseed oil and its by-products in future.
- Availability of partners to carry out the programme on upscale for commercialization.
- Developing and standardization of process of recovery of Lignan from Linseed cake is a challenge in the project.

- Consumer's response may not be overwhelming, without very active promotional exercise.
- Process of supplementation / fortification of various good items with Omega-3, will need further adoptive research

B. **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):

- Omega-3 rich food intake will help due to their therapeutic value among cardiovascular problems, diabetes prone and obese affected populations both in urban and rural areas.
- High potential direct impact would be on household food and livelihoods security of dry land poor farmers is assured through replication of more such models on linseed value chain.
- The indirect benefits will be sustainability of linseed cultivation with better prices in dry land regions of the country, offering fodder security for livestock including meat animals with better productivity and efficiency and dairy production and human food supplementation with Omega-3.
- Increased linseed cultivation will be at the cost of replacement of other crops. Obviously less remunerative crops will be replaced.
- Development of rural feed sector with better utilization of feed resources and increased animal production.
- 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.

C. Measures to Address the Issues:

Farmers' Education and Training on the use of IPM and INM will be conducted for the participating Farmers in the sub-project.

Awareness of risk related factors will be addressed to the stakeholders through orientation sessions on topics such as adoption of improved package of practices in a holistic way, using technologies such as harvesting at physiological maturity & artificial drying to circumvent problems of marketing of linseed, educate them to safeguard the conflicting interests of food uses *vs* industrial purposes by diverting

grains only when it becomes unfit for human consumption thus coming out of food chain.

D. 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. Participating farmers will be trained through demonstration programmes and workshops on various themes relevant to farming including use of IPM & INM, primary processing, post-harvest product preparations, 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 crop management and extension services to participating farmers specifically IPM & INM through training & education programmes.
2. Demonstration of new products preparations to stakeholders.
3. Demonstration of commercially viable Omega-3 rich linseed oil technology
4. Process of Lignan extraction from Linseed cake will be demonstrated
5. Transfer of technology of value-added health foods to stakeholders
6. Dissemination of information and sensitization of line departments of state and central governments to policy makers, planners and project partners for enhancement of linseed production
7. Popularization through information dissemination on safety of developed products to the consumers.
8. Information dissemination through mass and print media on health and nutritional benefits to stakeholders, targeted groups especially cardiovascular, diabetic and obese urban consumers.
9. 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.

4. Socio Economic Profile

Household survey was carried out 50 farmer families from seven villages in the area under operation. Questionnaire was used for this household survey. The data collected compiled and presented in this chapter.

4.1 Family size and occupation

Average family size of surveyed respondents is 6 comprising of 3 males and 3 females.

- **Composition of family by age**

Age	Average no of men	Average no of women
0-5	0	0
6-18	1	1
18-60	2	2
60+	0	0

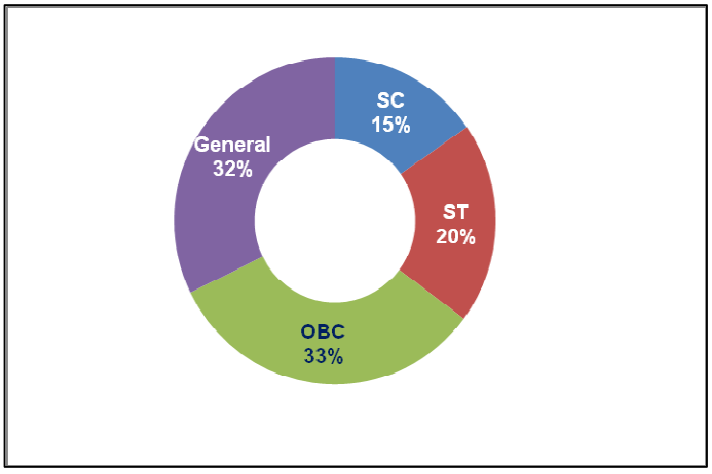
- **Composition of family by status of literacy**

Educated	Male	Female
	3	2
Uneducated	Male	Female
	0	1

4.2 Occupation

All the respondents surveyed are dependent on agriculture.

4.3 Social Composition of the area



As per secondary data, major social categories in the population are Other Backward Classes, General Category, Scheduled Castes and Scheduled Tribes.

5. Profile of land and Water Uses of Sample Farmers

5.1 Land holding

Most of the farmers belong to category of Semi-medium and medium farmers. The break up is as follows;

Land holding (ha)	Category	No. of farmers
0	Landless	0
0 – 1	Marginal	2
1 – 2	Small	8
2 – 4	Semi medium	22
4 – 10	Medium	20
10+	Large	1

5.2 Irrigation

All respondents have source of irrigation. The sources of irrigation for the respondents are as follows;

Source of Irrigation	No of respondents
Canal	6
Well	43
Bore well	6
River	9
Farm pond	4

5.3 Average land holding

Average land holding of farmers in the surveyed are is around 4.04 ha. Its break up into irrigated and non irrigated land is as follows'

Average land holding	4.04 ha
Irrigated land	2.34 ha
Non irrigated land	1.63 ha
Other	0.06 ha

- **Soil Testing**

  Although awareness level found to be good otherwise, only 4 families have availed soil testing. Awareness regarding green manuring was also found poor.

6. Cropping pattern and Net Agriculture income

Area identified for linseed cultivation is traditionally linseed belt. Percentage of linseed farming gradually decreased over last 15 – 20 years. But the middle age farmer is aware of traditional operations of linseed and many of them still cultivate linseed. But it is no more considered as a major crop. It is a neglected crop. Soybean and wheat are the major crops in the area.

Cropping Pattern of the area

Kharif	Rabi	Summer
Soybean, Cotton, Pulses, chili	Wheat, Gram, Linseed	Vegetables

6.1 Linseed

The area under operation is traditionally linseed growing belt. But area under linseed started reducing from last 20 years. Now soybean is seen as a major crop which farmers feel more profitable than linseed. Unavailability of high yielding, disease resistant varieties is another reason for farmers' indifference towards linseed. Focused group discussions were conducted with farmers to understand the practices for linseed and their perception regarding reducing area of linseed. Farmers are growing linseed but it is seen as subsidiary crop. Local varieties are used for sowing. They undertake row to row sowing with the use of seed drill keeping 22 cm distance in between. No irrigation is provided to linseed. Farmers do not apply fertilisers to linseed. They harvest it by uprooting the plant manually. As reported by farmers linseed is vulnerable to the attack of budfly but they do not employ any prevention or control measures. After harvesting, bagging in gunny bags is done and they sale it to nearby market. Average yield of linseed is about 1 quintal per acre. Last year they get price of Rs 3500/- per quintal. Although the rate of soybean is less compared to linseed still soybean is preferred as yield of soybean is high compared to linseed.

People are aware that there is some nutritional value in linseed. Linseed is used for domestic purposes also. There are few oil expellers at local level. Linseed oil is used for cooking purposes and chatani is made. Of course awareness regarding omega 3 is not there.

It became apparent through the discussions that farmers are willing to take linseed as knowledge regarding traditional practices is there in their collective consciousness. However they have certain expectations such as provisions of pesticides and fertilizers

for prevention of budfly and seed treatment as a preventive measure against Wilt and Budfly.

Net income per hectare from different crops

	Soybean	Paddy	Cotton	Linseed	Wheat	Gram
Yield Kg/Ha	1235	2008	1173	247	1632	741
Market price (Rs/kg)	19	13.75	27.31	35	10.3	17.7
Gross income Rs/Ha	23465	27610	32034.63	8645	16809.6	13115.7
Input cost	4147	5604	8094	2470	6103	4414
Net income per ha (Rs)	**19318**	**22006**	**23940.63**	**6175**	**10706.6**	**8701.7**

Economics of Linseed cultivation: As already mentioned linseed is neglected crop. Traditional varieties are used for linseed. Average seed per acre used is 13 KG which costs about Rs. 500/- Fertilisers usually 50 kg of DAP is used per acre which costs around Rs. 500/- No irrigation is given to linseed nor pesticides are used even though it is vulnerable to the attack of budfly. The average yield is 1 Q/A. Although linseed gets good price, (Rs. 3500/-) farmers do not prefer it due to less yield. On an average currently farmers can earn Rs. 2750/- per acre for linseed if there is no pest attack.

Annual income

100% participants depend on agriculture for livelihood. Average net annual income per family is Rs. 48034/- Two households are reported below poverty line. Since other subsidiary occupations practically do not exist, the major source of income is agriculture.

Landholding category	No. of households	Gross Annual Income from agriculture	Average input cost	Net Annual Income from agriculture
Marginal Farmers	2	26600/-	4152/-	22448/-
Small Farmers	8	27443/-	4013/-	23430/-
Semi medium	22	35815/-	6786/-	29029/-
Medium	20	79000/-	10790/-	68210
Large	1	16500/-	12355/-	152645/-

7. Livestock, Poultry and Fisheries Activities

Secondary data of surveyed villages show that there are total 1336 households in eight villages. Total number of animals as per the secondary data is;

Goats	Cows	Buffalo	Bullocks	Chicken
742	735	142	627	706

Out of surveyed 50 households, one family does not have livestock at all. Average heard composition of livestock keepers is as follows;

Type of Animal	No.
Cow (Local)	2
Bullocks	3

Only 9 households have crossbred cows. Only 8 households have buffalo. Only 12 families have goats and 8 have poultry birds. Average lactation yield for local cow is 190 liters and for buffalo it is 407 liters. Average annual income from milk sale is Rs. 35 and from sale of animals it is 8520/- Considering number of animals, average yield and amount of income; it does not seem to be income generating activity in the area. Poultry activity too is at very low scale. Animals mainly bullocks are kept for agriculture purpose.

8. Post harvest activities

No post harvesting measures are undertaken by the farmers except cleaning. Primary cleaning of grain is done manually by traditional method. After cleaning; grain is bagged. It is sold at nearby market.

8.1. Sources of Knowledge

As stated earlier the awareness level of the farmers seems to be good. They have access to newspapers, radio, television, visits of workers of agriculture department as well as scientists of SAUs. In focused group discussion, farmers reported field days organized by agriculture department and university. But only one farmer reported that he attended outside training at KVK, Baramati regarding Amala processing. They purchase seeds and fertilisers from agro service centers nearby. Many of them rely on recommendations of agro service centers also.

8.2. Perception of farmers

Interactions with farmer during surveys show that farmers are well aware of many things. Migration is not the issue. Soybean in kharif and wheat, gram in Rabi are the major crops of the area. Soybean seems to be a crop fetching them money. They feel that present yield for all crops is less and it can be increased.

According to them reasons for low yield are as follows;

- Variation in climate like rise in temperature, uncertain rains
- Degradation of soil due to same cropping pattern for years together
- pest attacks on crop

Suggestions by the farmers

- Developing high yielding and disease resistant crop varieties
- Developing post harvest technologies

Farmers' perception regarding adoption of new varieties found to be positive. They are ready to accept and grow new varieties and follow the scientific practices of management.

8.3. Migration Status

Among the surveyed families nobody reported migration.

8.4. Access to micro credit and loan facilities

Access to micro credit facilities are from nationalized or local banks located at block place. Further, loan/credit facilities are also available from cooperative banks, credit cooperatives. Interest rate of the credit availed by the farmers vary from 7 to 8 per cent. Loan amount is utilised for agriculture inputs such as seeds, fertilisers, pesticides, irrigation devises etc. Few also avail personal loan for vehicles. Loan for agriculture purposes is generally availed through nationalized banks and credit cooperatives. Interest rate of credit cooperatives is around 4 to 5% for agriculture purposes.

9. Baseline situation of other elements in value chain

Our busy life styles and fragmented eating habits mean that we cannot count on getting the Nutrition we need from three meals a day any longer. Food is our natural nutritional source. Fortifying Foods and Beverages with Omega 3 can help address the Nutritional Deficiencies and can ensure an optimal Healthy Life, Reducing the Risk of Diseases. Linseed is a very good source of omega 3 but at present it is underutilized.

India is considered as the third largest producer of linseed in the world. In India linseed is mainly cultivated as rabbi crop. February-April is the main harvesting season in the country. Madhya Pradesh is the leading producer of the crop, which is broadly divided into two categories- peninsular and alluvial types according to the root formations. Major product of linseed is oil which is extracted for varnishes and paints in our country. Very little of linseed oil is used in human consumption. Studies show that every person needs at least a gram of omega 3 every day.

Sources of Omega 3

<table>
<tr><th colspan="2">Vegetarian</th><th>Non Vegetarian</th></tr>
<tr><td>Canola oil</td><td>Grass Fed Food</td><td>Emu Oil</td></tr>
<tr><td>English walnuts</td><td>Olive oil</td><td>Seal oil</td></tr>
<tr><td>Linseed oil*</td><td rowspan="2">Leafy green vegetables (small amounts, but a good omega-3 to omega-6 ratio)</td><td rowspan="2">Fish oil (Salmon, sardines, Mackerel, Herring, Tuna, Bluefish)</td></tr>
<tr><td>Linseed seed (ground)*</td></tr>
<tr><td>Hemp beverages (hemp "milk")</td><td>Pumpkin seeds</td><td>Omega 3 eggs</td></tr>
<tr><td rowspan="2">Hemp seed / hemp nut (ground)/ Hemp oil*</td><td>Soybeans</td><td rowspan="2">Krill (Foods Krill are tiny shrimp like creatures that live in the Ocean)</td></tr>
<tr><td>Soybean oil</td></tr>
</table>

(* highest sources)

Indore, Kanpur, Agra and Gwalior are the main trading centers of linseed oil. Paint and allied industries are the main consumers of linseed oil accounting for nearly 70% of the total consumption. West Bengal, Maharashtra, Delhi and Uttar Pradesh are the main centers of linseed oil consumption in the country.

Linseed oil is the richest source of alphalinolenic acid, an essential omega-3 fatty acid. But it is not at all exploited for this virtue in our country. Linseed oil is very unstable. Air, water, light, heat, metal and time are the six enemies. Technology for its extraction for human consumption must protect the oil from all this during extraction

and subsequent storage. One of the vital elements of this value chain is development of omega 3 food products.

Food fortification of omega 3 through linseed oil is perhaps pioneering work in India. In development of omega 3 products; major thrust will be on formulations with Flaxseed mainly to fortify Food and Beverage. The effort is to bring back Omega 3 into the food Chain directly with 'Zero' Side Effects.

9.1 Current market for omega 3 oil and products

There is no publicly available data on aggregate amounts of omega 3 being sold at food and beverages manufacturers but one can get idea how fast the market is growing by looking at the sales of Martek Biosciences, one of the major suppliers of Omega 3 in US. The total retail sale of food and beverages added of this firm was $600- $800 Million Dollars in 2007

Year	Sales at Current Price	Index	%Change	Sales at constant 2007 Prices	Index	% Change
2005	328	100	-	345	100	-
2006	1404	428	328	1441	418	317.6
2007	5483	1672	290.50	5483	1590	280.6

9.2 Market Scenario for linseed

Global output of linseed is estimated around 2.60 million ton per years with Canada, US, China and India dominating the list of producers. Canada is the leading producer, accounts for nearly 80% of the global trade in linseed. Global production of linseed oil is estimated around 600,000-700,000 tons while linseed meal ranges between 1.1-1.4 million tons.

9.3 Current Scenario: Omega 3 fortified food

It is very difficult to incorporate the entire recommended level of DHA + EPA in a serving of food. This is because most of the available fish oils contain only around 30% of Omega-3 PUFA (polyunsaturated fatty acids). For example, it would require 3 g of fish oil to provide 1 g of EPA + DHA. For fish oil powders it is even worse. Powders contain normally 30% of oil thus the EPA + DHA content of powders fall to around 9-10% only. One needs to add 3 times more powder to add the same level of fish oil to the product. This may be too high if added in a fairly small serving of a

single product. The more viable strategy is to enrich a variety of foods with the aim of 'filling the gap'. If enough foods are fortified the nutritional gap can be easily bridged.

In international market

- Over 86% of Omega 3 products appear in Grain based foods such as Bars, Breads and Cereals.
- Only 6% appear in Omega 3 Eggs and 4% in Dairy Products.
- Fish Oil is used on a large scale to Fortify Milk which alters the taste and leaves a Fishy Smell due to which there is a small percentage of consumer acceptance and hence it has not grown beyond 4% in Dairy Products.
- The growth in Dairy products at 4% is minimal since existing Technologies for Fortification are either based on Fish Oil or Algae Source
- Fish Oil has an offensive Smell and Unpleasant Taste; which vegetarian people do not prefer. Linseed is a vegetarian source of omega 3 fatty acid.
- Algae have Good benefits but it is very expensive and hence increases the cost of the finished product, making it beyond normal consumers reach.

Therefore developing formulations with linseed oil to fortify food and beverage will be major thrust in product development without compromising on the acceptable 'Flavour, Aroma and Taste profile' even after addition of Omega 3. Thus the project aims at processing of linseed oil for food fortification which is currently a missing link in the value chain.

9.4 Strategies for establishing linseed value chain: production to consumption

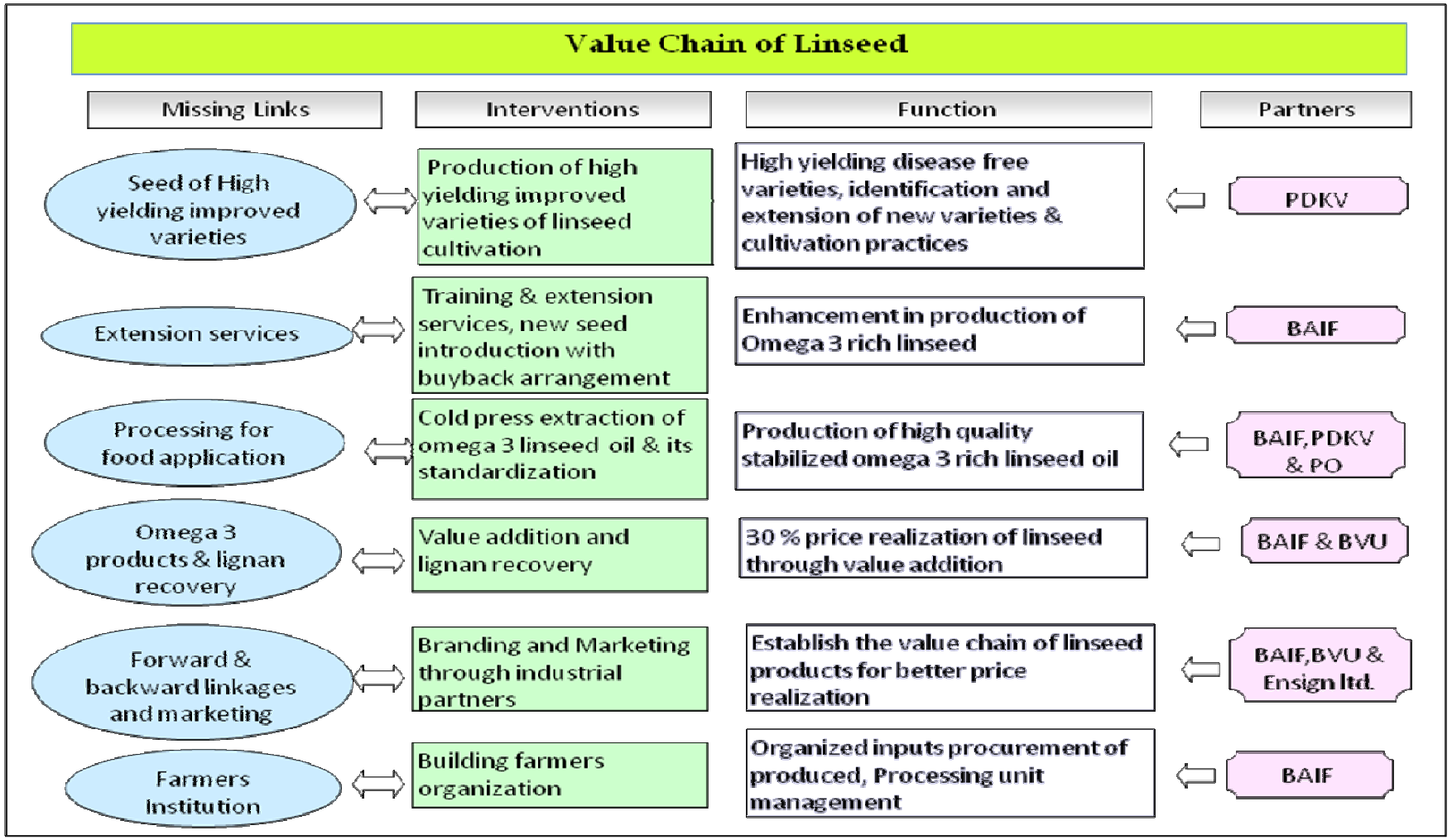
- Production of high yielding, disease resistant varieties of linseed
- Capacity building of farmers to cultivate improved varieties with buy back guarantee (5% incentive on market rate for linseed)
- Linseed processing: Cold press extraction of omega 3 oil (capacity of extraction 1 ton/day)
- Developing omega 3 fortified food prototype
- Omega 3 product development
- Branding and marketing of the omega 3 products, strong forward linkages

9.5 Baseline values of elements in Linseed Value Chain

Element	Baseline Value
Linseed cultivation: promotion of high yielding varieties of linseed	Seed variety used currently C- 429, yield 94 kg/A
Processing of linseed oil for food application, cold press extraction of omega 3 linseed oil	Linseed oil is not being used for food application
Branding and marketing of omega 3 products	No food fortification through linseed oil is done in India
value addition Omega-3 feed and omega-3 chicken	No omega-3 chicken feed or omega-3 chicken is produced in the country
Researchable issue of lignan recovery	No lignan is extracted in our country

9.6 Current data/benchmarking of researchable issues such as lignan

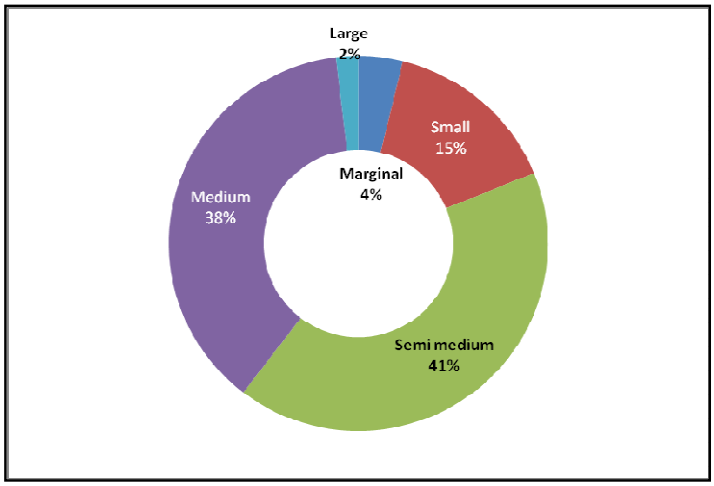
Linseed has 1-3 % lignan and is also one of the very rich sources of lignan. This gets readily converted in human body to mammalian lignan with esterogenic activity. This molecule is of tremendous pharmacological importance. It has been shown to have been very useful to treat and prevent post menopausal syndrome in women, arthritis, and osteoporosis and breast cancer. It has also been shown to have anti atherogenic activity. Therefore isolating this as a buy product from linseed oil unit and establishing its medicinal value will further add value.


Value Chain of Linseed
Missing Links
Interventions
Function
Partners
Seed of High yielding improved varieties
Production of high yielding improved varieties of linseed cultivation
High yielding disease free varieties, identification and extension of new varieties & cultivation practices
PDKV
Extension services
Training & extension services, new seed introduction with buyback arrangement
Enhancement in production of Omega 3 rich linseed
BAIF
Processing for food application
Cold press extraction of omega 3 linseed oil & its standardization
Production of high quality stabilized omega 3 rich linseed oil
BAIF, PDKV & PO
Omega 3 products & lignan recovery
Value addition and lignan recovery
30 % price realization of linseed through value addition
BAIF & BVU
Forward & backward linkages and marketing
Branding and Marketing through industrial partners
Establish the value chain of linseed products for better price realization
BAIF, BVU & Ensign ltd.
Farmers Institution
Building farmers organization
Organized inputs procurement of produced, Processing unit management
BAIF

10. Concluding Remarks

10.1 Economic Profile of Sample farmers

In the surveyed area, profile of farmers; landholding wise is as follows;



- **Occupation:** 100% participants depend on agriculture for livelihood. Average net annual income per family is Rs. 48034/- Two households are reported below poverty line. Economic profile of farmers is as follows;

Landholding category	**No. of households**	**Net Annual Income from agriculture**
Marginal Farmers	2	22448/-
Small Farmers	8	23430/-
Semi medium	22	29029/-
Medium	20	68210
Large	1	152645/-

10.2 Key indicators and their Baseline Values

Indicator	Baseline Value
Yield of linseed	247 KG/Ha
Gross income per Ha	Rs. 8645/-
Net income Per ha	Rs. 6792.5/-
Number of farmers' institutions involved in seed production	00

10.3 Elements of Value chain on Linseed

Element	Baseline Value	Expected Output
Linseed cultivation: promotion of high yielding varieties of linseed	Seed variety used currently C-429, yield 94 kg/A	NL 260; yield 400kg/A
Processing for food application, cold press extraction of omega 3 linseed oil	Linseed oil is not being used for food application	Value addition of Rs. 18/kg to linseed
Branding and marketing of omega 3 products	There is very little awareness of importance of omega-3 fatty acid for human health in our country.	Development and forward linkages for minimum two products
Omega-3 feed and omega-3 chicken	No omega-3 chicken feed or omega-3 chicken is produced in the country	Availability of omega 3 Poultry Feed and omega 3 chicken
Researchable Issues		
Linseed Straw utilization	Nil	Animal Feed
Linseed cake	Nil	• Cheap Poultry Feed • Lignan Extraction for Phrama application • Residual cake (anti nutrient) for animal and human feed
Germ plasm Screening	Nil	Omega-3 profile and lignan content

10.4 Anticipated benefits of value chain

I. Linseed production (Source AICRP Linseed PDKV Nagpur)

i. Nationally released high yielding disease resistant (highly resistant to alternaria blight and budfly) varieties will be provided to the farmers to replace c 429.

ii. The linseed varieties developed under AICRP. Linseed program NL-260, NL-97, Padmini, yield about 4.0 quintal/acre at the farmer level as against the presently used varieties yield only 1-1.5 Quintal per acre

iii. The project gives a buy back guarantee of Rs 40/- Kg or 5% above the prevailing market price whichever is higher, as against presently available price of Rs 35/- Kg.

iv. Thus farmer's net income per hectare of linseed production would increase from Rs 8645/- to 11,000-12,500/-.

v. The seed production activity with 50 farmers would generate employment to 125 persons for 75 days in a year.

vi. The linseed production activity with 200 targeted farmers/acres would give employment to 500 persons for 75 days per year.

II. Omega-3 oil extraction from Linseed (Source BVU and UOS)

i. Linseed will be processed for cold press edible grade omega-3 oil extraction technology.

ii. Omega-3 oil unit will be managed by farmers with the support of industrial partner and the techno managerial support of by BAIF/ PDKV/BVU and support of industrial partner and quality control by BVU

iii. At present farmers are not involved in the linseed processing activity. The project will help to develop new entrepreneurship for farmers and generate new additional income source for them.

iv. The unit will process about 0.5 to 1 ton linseed per day with the production of 200-300 Kg of omega-3 oil per day.

v. In 9 months in a year (25 days per month) 112 tons of Omega-3 oil in year will be produced, if the unit runs to its full capacity for 8 hours per day.

vi. The production cost is estimated to be Rs 161/Kg. Rs 132/- as variable cost Rs 29/- as fixed operating cost inclusive of manpower, depreciation and interest etc as calculated by a cost accountant.

vii. The sale value is expected to be Rs 225/Kg (market value) as per quotation submitted by Industrial Partner.

viii. The profit per Kg will be Rs 64/Kg and for 112 tons app. Rs 71 lakh/ year

ix. Profit will be distributed/invested as per the decision of farmers' institution

x. The unit will give employment to one Plant Manager, 2 skilled, 2 semiskilled and 2 unskilled workers throughout the year.

xi. In this value addition chain, there will be value addition of Rs 18/Kg of linseed with this operation.

III. Linseed cake and linseed straw utilization (Researchable issues)

1. The possibility of utilizing linseed straw will be assessed as Animal feed

2. The efficacy and economics of using linseed cake (still with 10% oil left in it) as chick feed for chicken meat will be researched.

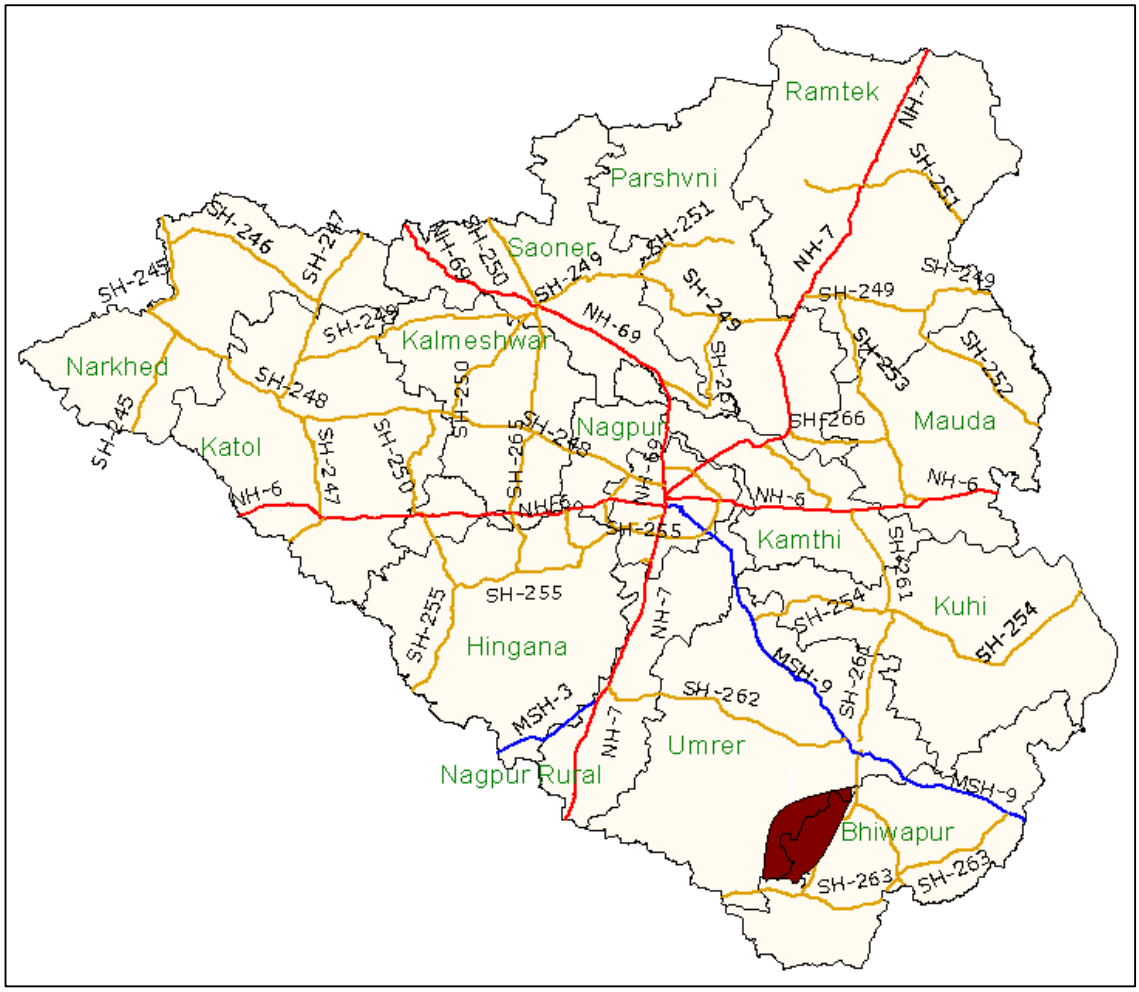
3. Lignan will be isolated from linseed cake and its anti atherosclerotic activity will be assessed.

4. The utilization of residual oilseed cake after removal of Lignan (anti-nutrient) as cattle / human feed will be explored.

5. The present germ-plasm with AICRP-Linseed will be assessed for its omega-3 and Lignan content.

11. Annexure

11.1 Area map



11.2 Questionnaire for household survey

1. **Demographic Profile**: **Family level**

Cluster: Name:	Village		Family Sr. Number:	
Name of Family Head:			Women headed: Yes /No	
Main Occupations of the family			Agriculture / Non Agri labour	
Economic Status:: APL / BPL			Caste: General / OBC / ST / SC	
Annual Total family income in Rs				
Other sources of the Family income	Agri Labour / Livestock / Artisan / Small Business / Private Service/ Govt Service/ Mention if any others…….			
Total family members No.:	Males		Females	
Education wise break up No	Literate.	Illiterate	Literate.	Illiterate…
Age wise breakup of the total Family members:	< 5 yrs	Bet 6 to 18 yrs	Bet 19 to 60 yrs	> 60 yrs
Migration Does your family migrate in search of employment every year: Yes / No If yes, then how many family members migrate every year? Female …/ Male….. / All family Period of Migration (months Below 1 month / Bet 1 to 3 months / Bet 3 to 6 months / Above 6 months What is the average daily wages earned during migration? Rs… / day				
Assets				
Indicate your household capital details : Refrigerator / Cooking Gas / Motorcycle / Bicycle / TV / Radio / Telephone / Mobile / Ceiling Fans				
Indicate your Agricultural capitals details: Diesel Engine / Electric motor /Tractor / Bullock cart / Plough / Seed drill / Spray Pumps				

2. **Demographic Profile: Livestock level**

Livestock holding No.	Cattle		Buffaloe		Goats		Remarks
	M…	F…	M…	F…	M…	F…	
Total Numbers							
No of Milking animals							
What is the average daily production of Milk: per cow…ltrs, per buffaloes. ……Ltrs during last year							
What is the average annual income from sale of Milk Rs: …..							
What is the number of cattle/goats / kids sold during last year's No…… and its average income Rs…							
What is the average No. of eggs / chicken sold per years No…… and its average income Rs……/year							
What is the average annual income from sale of Manure / Bullocks on hire etc…Rs:..							
What are the fodder resources you are using: Cultivated fodder / Agri crop Res / Free grazing on CPR land / Forest land / Purchased							

Are you using: any feed concentrates / supplements, like cakes/ whole grains/homemade concentrate / readymade concentrate mixture. / Purchased. / if yes what is the quantity per milking animal /day
Do you experience the scarcity of fodder, Yes / No if yes in which months……
Do you experience the scarcity of drinking water for animals Yes / No if yes in which months……

3. **Agriculture**

What is the Total Land Holding (acre)	Landless	0.5 to 2.5	2.51 to 5.0	5.1 to 10	10.1 to 25
Cultivated portion					
Non Cultivated portion					

Cropping

	Crops	Irrigated land		Rain fed land		Total cultivable land	Total production	House hold use	Sale		
No.		Area (acre)	Prod (qtl)	Area (acre)	Prod (qtl)	(Acre)	qtl	qtl	qtl	rate/qtl	Income Rs
Kharif											
1	Cotton										
	Rice										
2	Jowar										
3	Tur										
4	Urad										
5	Finger miller										
6	Ground Nut										
	Fodder crops										
Rabi											
1	Chana										
2	Wheat										
3	Jowar										
4	Linseed										
	Fodder crops										

Summer											
1	Ground Nut										
2	Vegetables										
3	Fodder crops										
Perennials											
1	Sugarcane										
2	Mulberry										
3	Fodder crops										
Horticulture											
1	Banana										
2	Citrus										
3	Guava										
Fodder Trees											
1											
2											
Medicinal plants/trees											
1											
2											
3											
Give Details of trees in your own land. Fill number of trees							Mango /Tamarind /Anjan / Karanj / Sag /0ther……./ …….. /				

4. Inputs & Services

For different crops how do you source seeds (traditional, exchange, new, branded, certified etc)	
Source of procurement of inputs and its credit & source.	
Seed	
Fertilizer	
Manure	
Pesticide / Bio Pesticides,	.
Incidence of credit & source	

5. Existing Package of practices

Ploughing	Bullocks/Tractors
Planting	Seed drill /
Use of Spray pump	Yes / No
Use of Compos / Vermi-compost done	Yes / No If Yes Source…..
Bullock pairs hired in a year in days & at what rate Rs.	

6. Allied agricultural activities (Tick mark): Apiary, Rice/wheat processing, trading in fruits, primary processing of medicinal plants, fruit processing, fisheries, sericulture etc.

Fisheries: Sources of water bodies / Species grown; Annual income in Rs.	
Indicate the different sources of irrigation for agriculture(Tick mark)	Canal /Open Well / Bore well / / Nala / River / Other (specify

Interest in the project participation

Would you like to be a flax cultivator if facilities and buy back is assured?	Yes / No

8. **Post Harvest Activity**

Do you undertake any grading of produce , if yes give examples	
Is any value addition being done before marketing of your produce	

9. **Training & Extension**

Did you undergo any vocational programme during last year If yes Name of the course & duration	

10. **Loan & Micro Credit**

Have you taken any loan? If yes please specify (How much, what purpose, at what rate etc)	
Did you get any Govt. support during last year?	

11.3 Format for village survey

Annexure 7 B: Village data Questionnaire							
1. Village		2. Cluster			3. Gram Panchayat		
4. Distance from Cluster Office		5. Total no of families			6. Total no. of landholding families		
7. Village population	Male			Female			Total
8. Population breakup - social groups	SC	ST	DT/NT	OBC	General	Total	BPL families
9 A. Village Land	Total			Agricultural land			Irrigated
							Non irrigated
	Grazing land			Forest			Village
10. Total no of livestock	Goats	Cows (total)		Buffaloes	Bullocks	Poultry	Piggery
		Local					
		Crossbred					
11. Milk collection			Place for Milk sale				
12. Crops	Kharif	Rabbi	Summer	Vegetables	Fruit trees	Fodder crops	
13. Acreage under crops	Crops						
	Land (Acres)						

1. Forest tree species found					
2. Herbal species					
16 Infrastructure Facilities	Education	Primary School		Secondary	Ashram school
		Anganwadi		Total no. of Anganwadi	
	Health	PHC		Sub centre	
17. Diseases seen in last one year		Summer	Rains	Winter	
18. Social groups/ organizations					
SHGs	Youth Groups				
Co-operatives	Farmers		Milk		Sugar
19. Information about development work in last three years					
A. Water Shed Development					
B. Livestock Development					
C. Employment Guarantee Scheme					
D. Other government schemes in village					
E. Health Camps in Last year					

Source of information and period							
20. Other Facilities	Bank	Y/N		Post	Y/N		
	Public Toilets	Y/N		Toilets for women	Y/N		
21. Water Sources	Wells		Hand pumps		Pond		
	Canal		River		Tap water		
22. Electrification	Y/N						
22 A. Use of Electricity	Domestic	Y/N	Agriculture	Y/N	Load shading in hours		
23. Telephone	Landline	Y/N		Mobile	Y/N		
24. Diseased commonly observed among Livestock							
25. Health facility for Livestock							
26. Whether village in connected by Road? Y/N				Road: Kaccha/ Pakka			
27. Transport	S. T.	Jeep	Auto	Other			
28. Nearby Market		Distance from Village			Seed availability Y/N		
Name of surveyor							
Date							

11.4 Format for Focused Group Discussion with Farmers regarding Linseed

Checklist for discussion

I. Crops in grown in the area

II. Inputs for crop: use of chemical fertilisers

III. Farmer's perceptions on crop yield

IV. Status of linseed

i. Varieties of linseed used
ii. Management practices for linseed
iii. Prevention or control measures for pest and diseases
iv. Method of sowing
v. Method of harvesting
vi. Average yield for linseed
vii. Market price for linseed
viii. Present use of linseed
ix. Whether the area of linseed has decreased? If yes why?
x. Sources of Knowledge
xi. Extension services
xii. Suggestions by farmers

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