



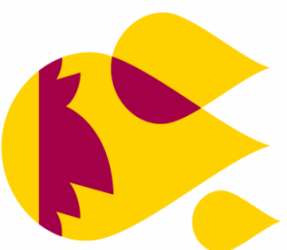
Flax Bio-village: Concept-Linseed Value Chain for Omega-3 Nutritional Security

Authors

Hegde M V ¹, Ghorpade P B², Gosavi P³,
Hegde N.G⁴, Wagh U.V⁵ and Kadam S S⁶

Affiliations

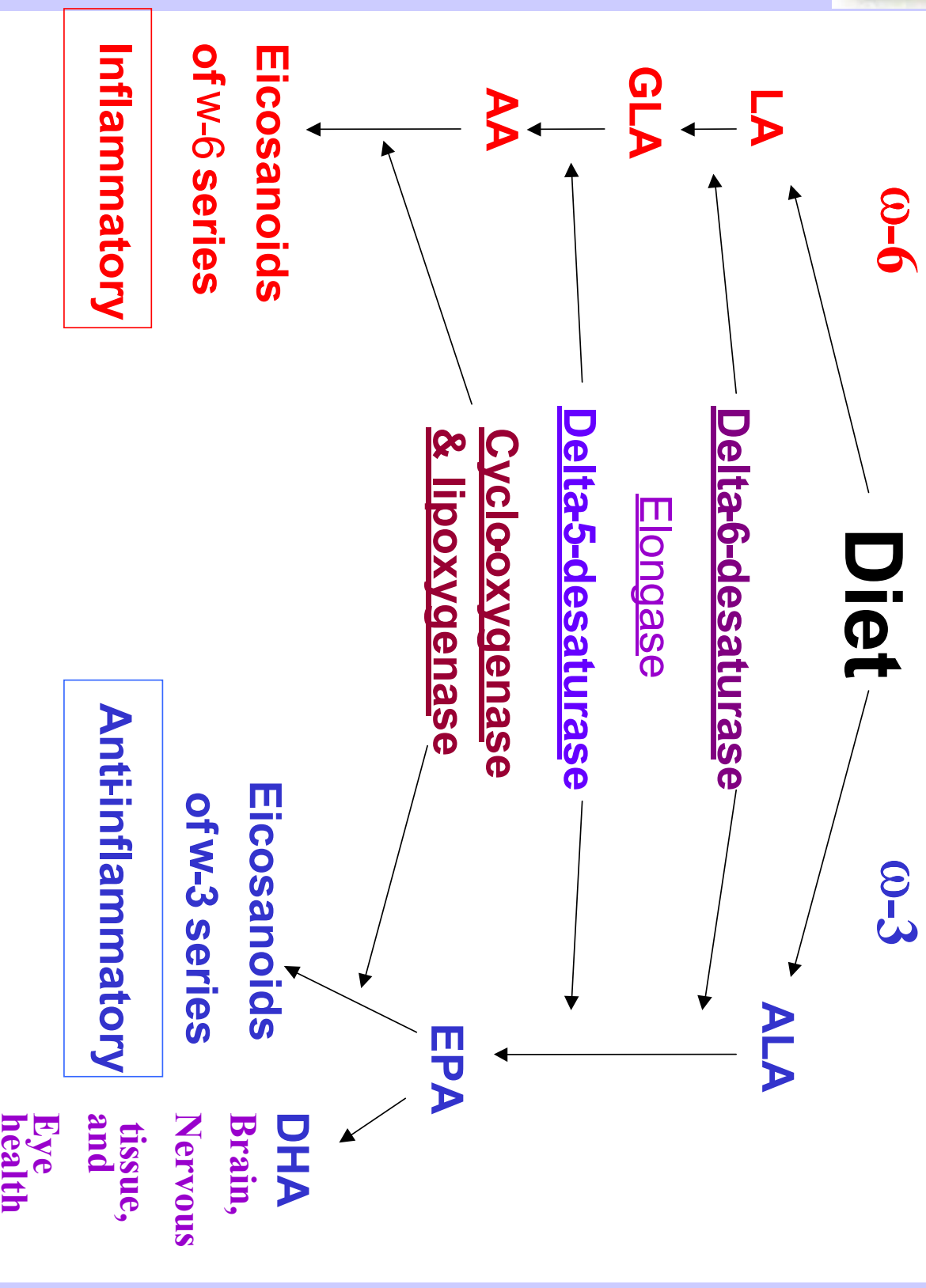
1. *Scientific Advisor, Bharati Vidyapeeth University, Pune 411043 India*
2. *Principal Scientist, AICRP. linseed, PDKV, Nagpur, India*
3. *Handmade Paper Expert, Pune 411004 India*
4. *President, BAIF, Development Research Foundation, Pune 411052, India*
5. *Founder Director, IRSHA. Bharati Vidyapeeth University, Pune 411043*
6. *Vice Chancellor, Bharati Vidyapeeth University, Pune 411030.*



**World Congress on Oils and Fats
& 28th ISF Congress**
27 - 30 September 2009 • Sydney Australia

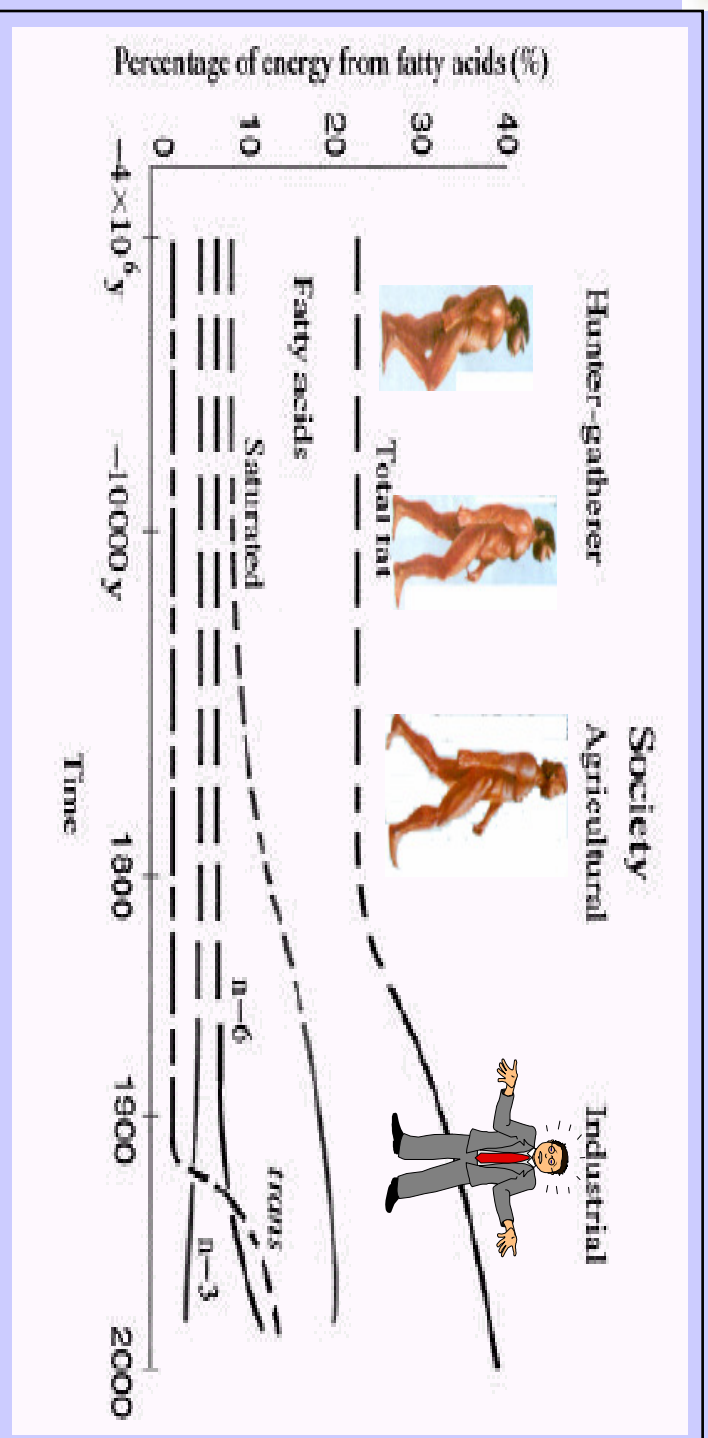


Essential Fatty acids in human health:





Omega-3: An endangered nutrient



- Our prehistoric food consisted of 1:1 ratio of $\omega 6$: $\omega 3$
- This ratio is skewed to 40:1 in today's diet
- With dire consequence to human health today



Modern food is deficient in omega-3 fatty acids

ω -3s: victim of industrialization

Impact of Industrial revolution and the processing of food stuffs to facilitate transportation, packaging and stability

- Vegetable oils dominant in ω -6
- Fatten livestock loaded with ω -6
- Milk and dairy products deficient in ω -3
- Chicken and eggs deficient in ω -3
- Farm raised fish deficient in ω -3
- Hydrogenation of oil

▪ ω -3 decreases the shelf life of food: purposely avoided to suite marketability



**High
caloric
diet**

↓
oxidative stress

↓
free radicals

↓
**cellular
injury**

DISEASE



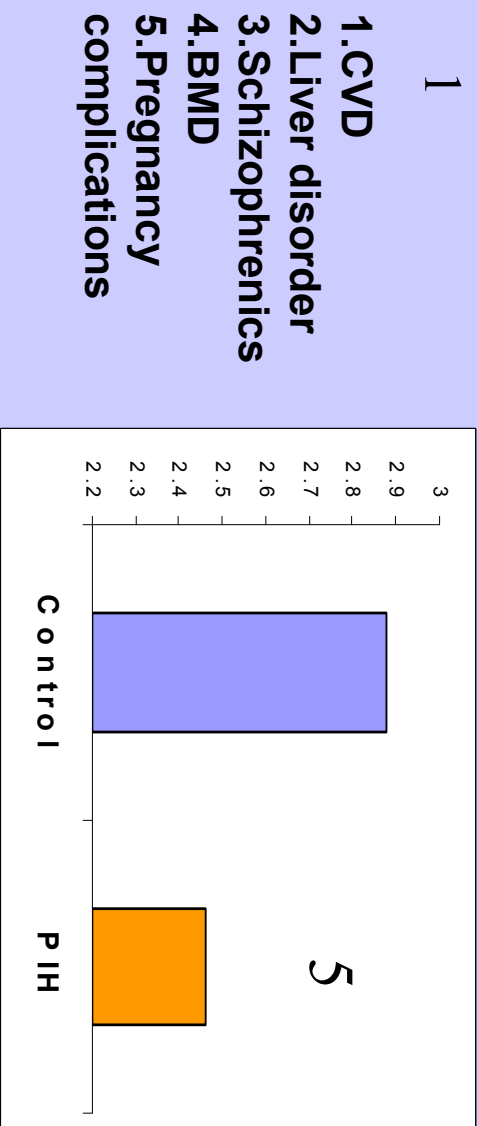
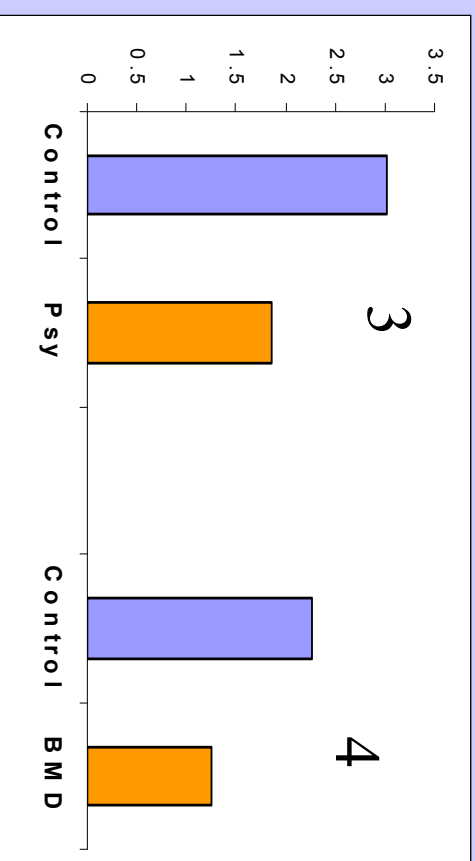
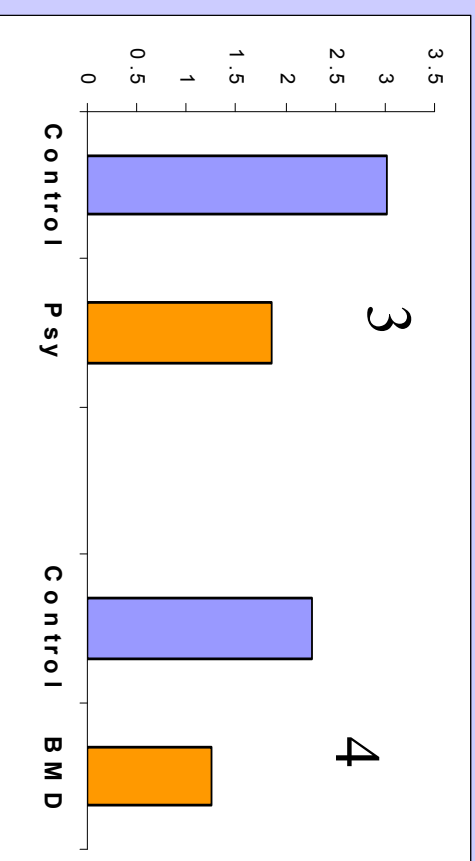
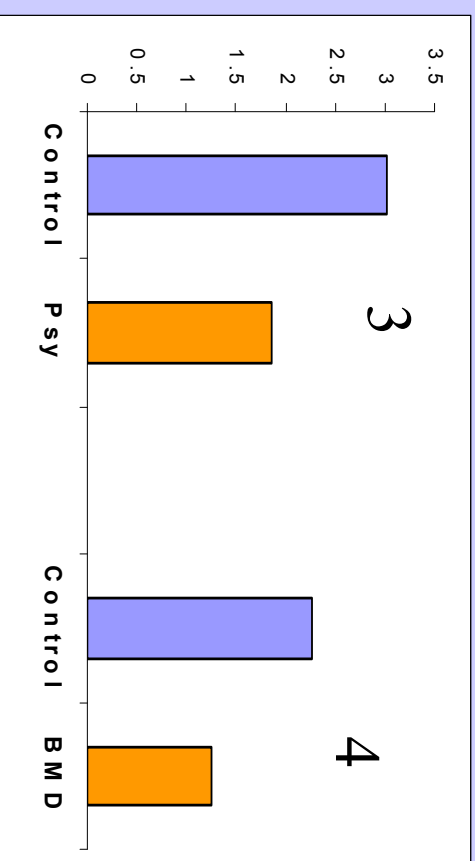
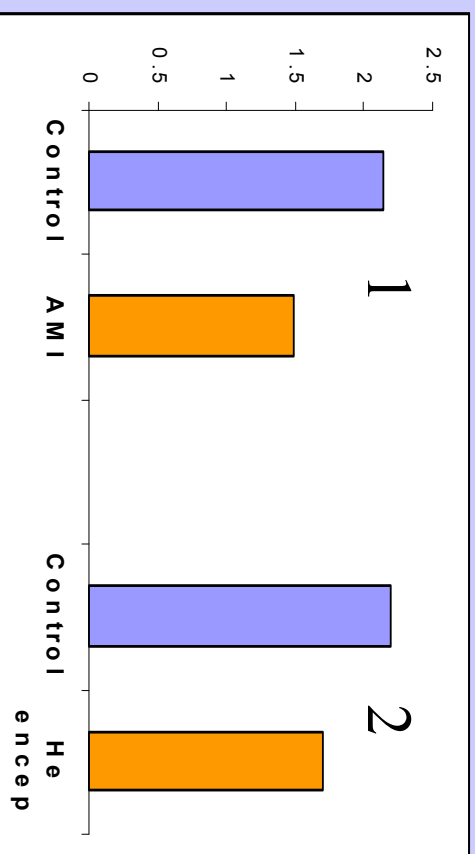


Healthy controls had always significantly higher levels of omega-3 fatty acids than the corresponding ill patients

ILL



HEALTHY



- 1.CVD
- 2.Liver disorder
- 3.Schizophrenics
- 4.BMD
- 5.Pregnancy complications

DIABETES

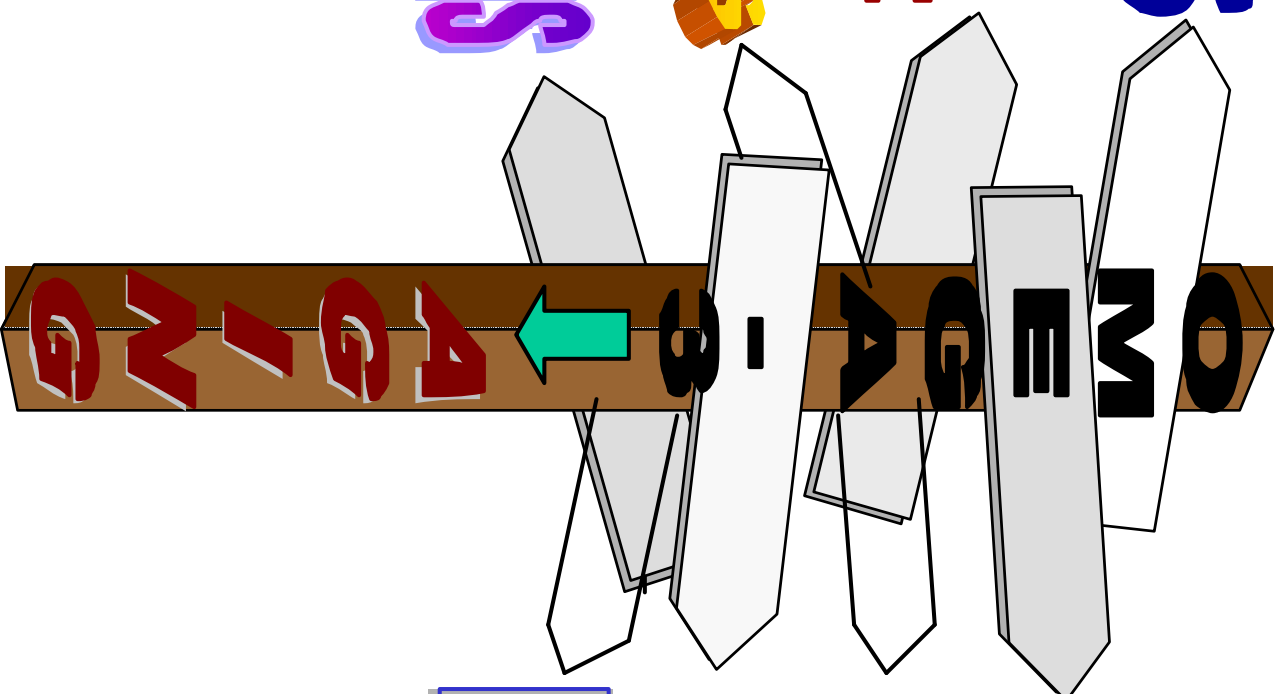
RENAL

DISEASE

MENTAL

DISORDERS

ARTHRITIS



CANCER

PSORIASIS

ECZEMA

HEART DISEASE



Omega-3 supplements along with regular treatment regimen gives better outcome

	SZ Pre	SZ Post	SZ-WHO
BPRS-T	45 ± 16.5	35 ± 13.7	32 ± 9.9
P TOT	19 ± 9	14 ± 6.7	13.0 ± 6.1
NTOT	20 ± 8.1	15 ± 6.8	16 ± 6.3
G TOT	42 ± 13.6	31 ± 11.5	30 ± 8.1
PANSS TOT	80 ± 26.9	61 ± 22.7	59 ± 17.4
QOL	51 ± 23.3	65 ± 22.9	67 ± 20.6
OTOT	9 ± 3	11 ± 3.2	11 ± 3.1

BPRS: Brief psychiatric rating score

P TOT : Positive symptom factor

NTOT: Negative symptom factor

G TOT: General psychopathology score

PANSS TOT : Total score

QOL: Total quality of life score

OTOT: Total outcome score

Schizophrenics show 60% better outcome



Omega-3 Eggs are heart friendly

Results of consumption 2 eggs /day for four days a week for two weeks in human healthy volunteers are presented here):

	Triglyceride s (<150)	Triglycerides (>150)	Cholesterol (<200)	Cholesterol (>200)
BEFORE	93.8	189.7	166.9	237.4
AFTER	92.5	141.6	184.0	198.1
P-VALUE	0.8	0.0005*	0.07	0.001**

NORMALIZING LIPID PROFILE EFFECT OF OMEGA-3 EGGS:

* Significant decrease in subjects triglyceride levels >150

**Significant lowering effect of cholesterol in subjects with levels >200



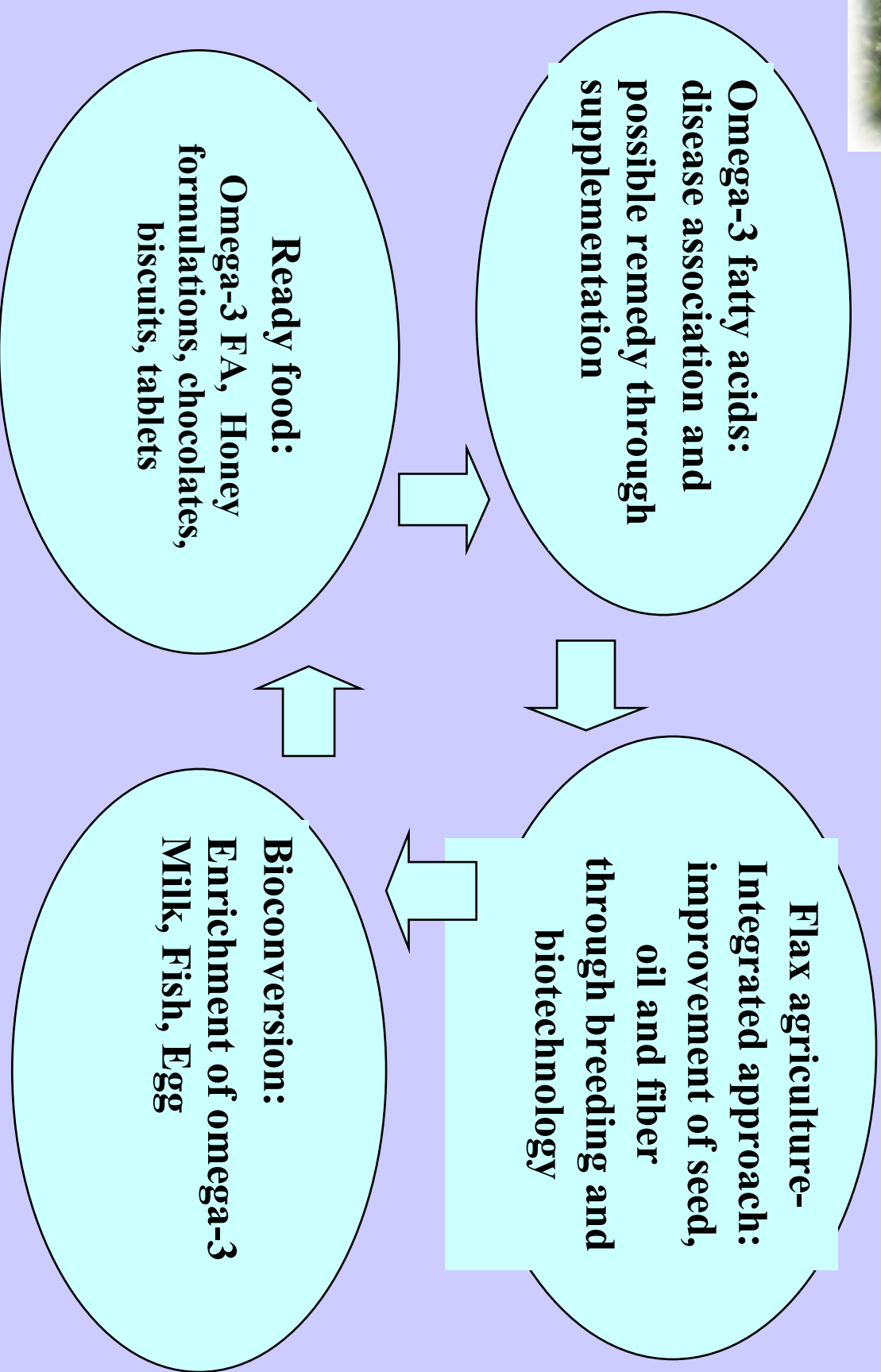
The global cry therefore has been
“Bring Back Omega-3 Fatty Acids
into Food Chain”.

How?

Flax seed (Linseed) holds the key



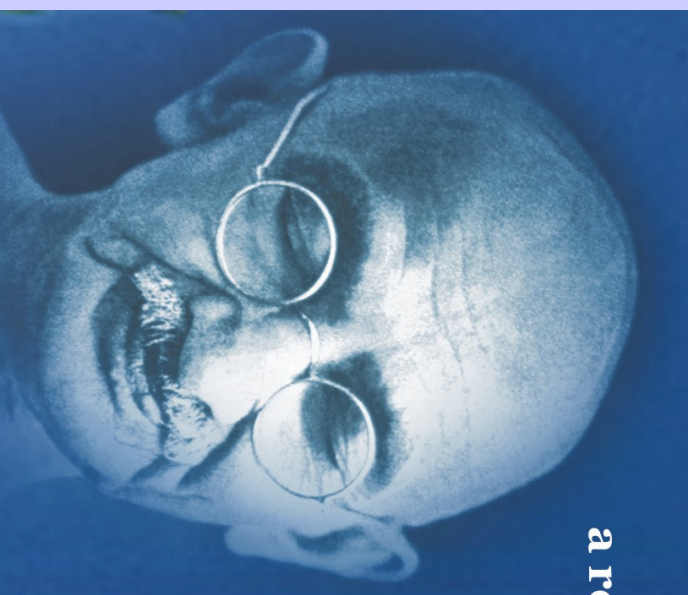
BVU, THURST





Lin seed the savior

- Linseed has 40% oil
- Richest vegetarian source of omega-3 fatty acid with 55-60% of alpha-linolenic acid (ALA; 18:3).
- Nature has put plentiful omega-3 fatty acids in this seed, well protected from oxidation under its brown hard coat.



"Whenever flaxseed becomes a regular food item among the people, there will be better health."

-Mahatma Gandhi



Linseed- Neglected crop

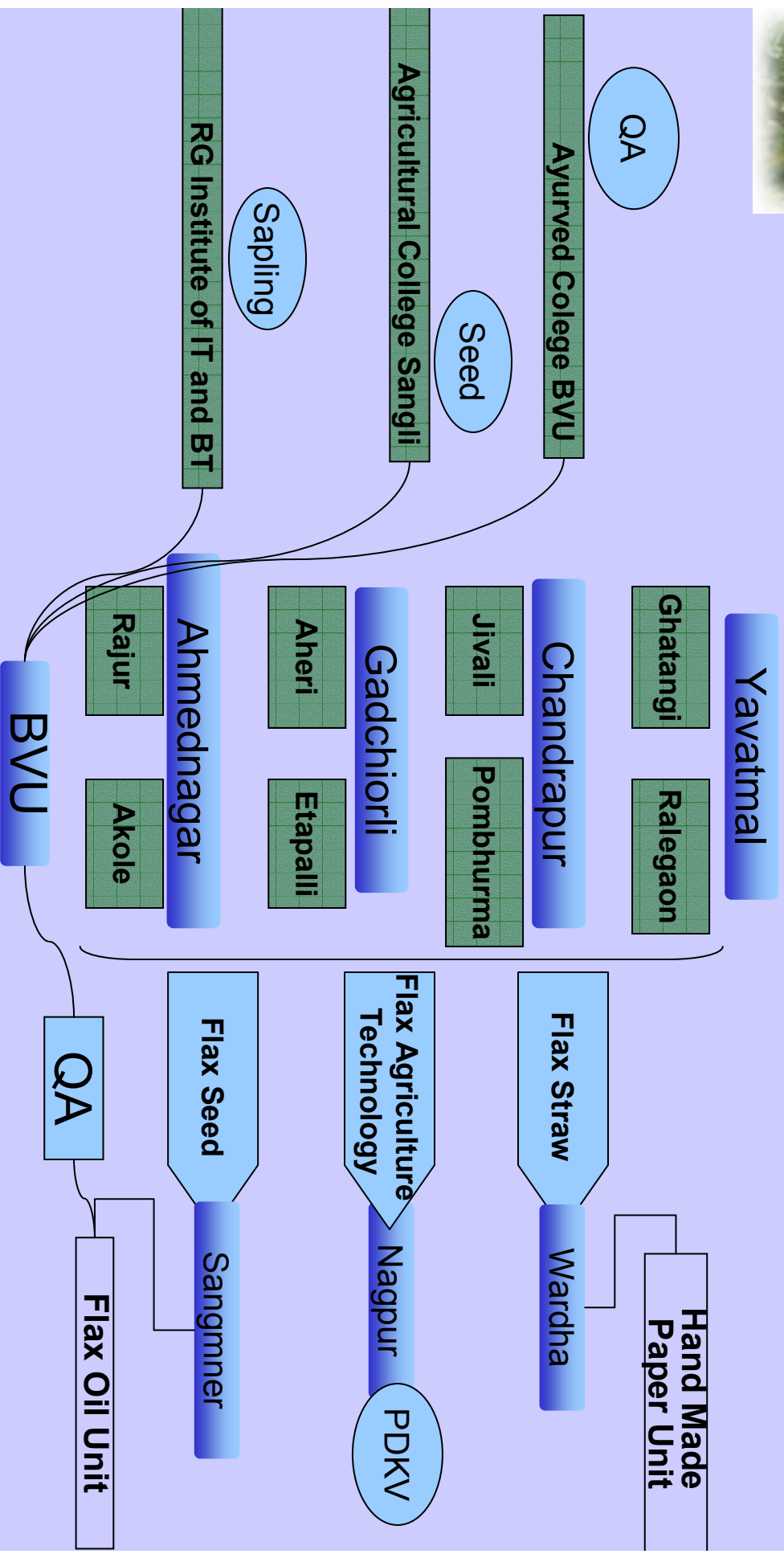
- The linseed production in India is very meager as farmers do not get good yield and good assured price for the same. Further, more than 80% of it is used in varnishes and paints as the linseed is generally considered inedible.



- High yielding, disease resistant linseed varieties (Padmini, NL-97, NL 260) developed by PDKV, are now provided to farmers, through ICAR, NAIP projects, that has dramatically improved productivity and their income from linseed to two to three times.



NAIP-3: Operational Area



Sustainable Rural Livelihood for Backward districts



- To provide additional income and entrepreneurship in rural setting, very high quality, hand made paper has been developed from linseed straw.



- High grade edible Omega-3 Oil extraction units, with cold storage facility, has been set up to add value to linseed.
- With ICAR NAIP support



world patent: Stabilization of omega-3

Six enemies : *water, heat, air, metal, light, time*

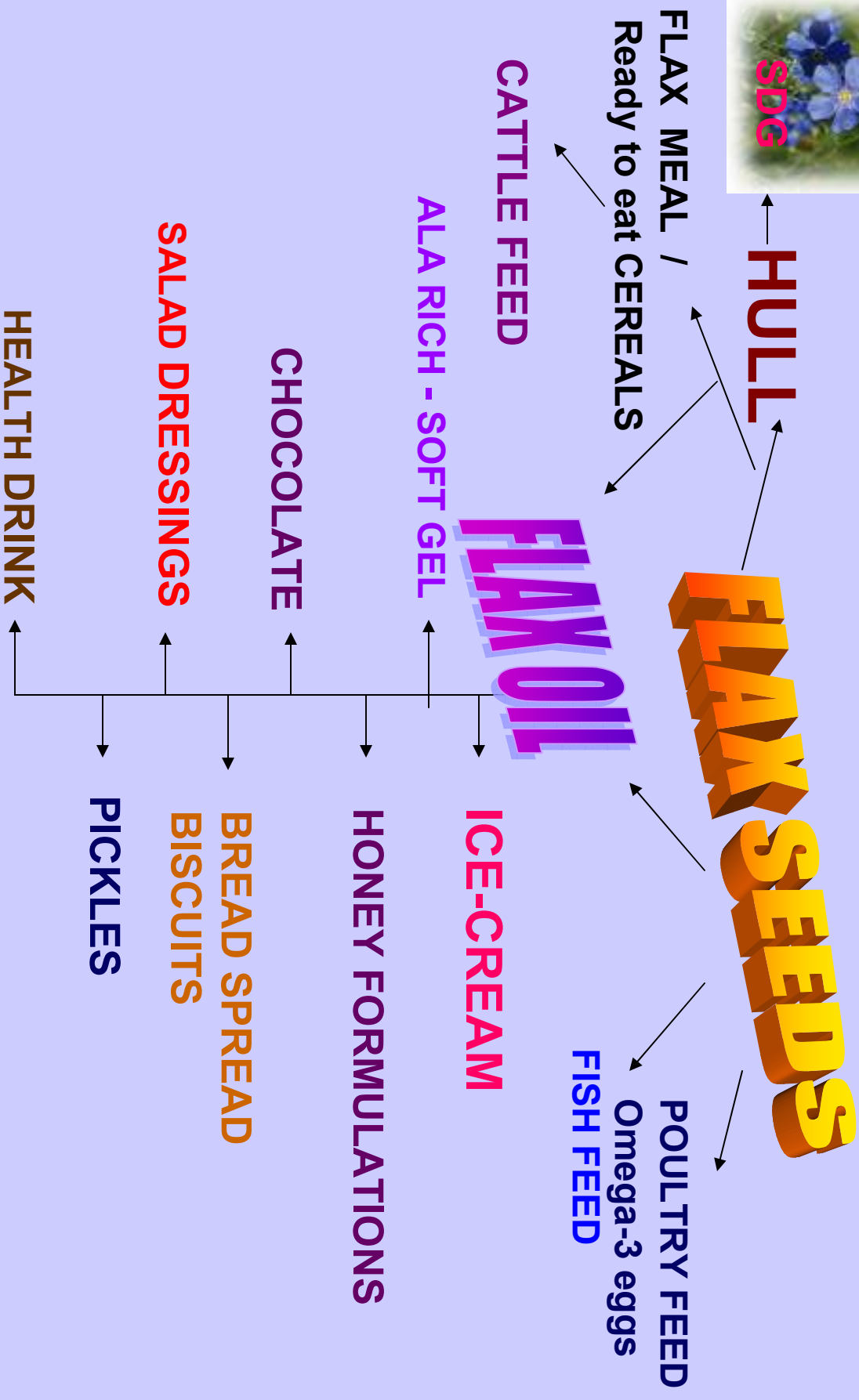
- *Difficult to market because of low shelf life*
- *Therefore we have developed technology for the stabilization of omega-3 fatty acid*
- *We have developed omega-3 enriched products such as biscuits, chocolates, jams etc*

Stabilization of omega-3 FA : PCT/IN 2005 / 000163

Now in national phase : India and US



PRODUCT DEVELOPMENT FROM FLAX SEEDS



PRODUCT DEVELOPMENT FROM FLAX STRAW: Hand made Paper



High Grade Flax oil : Cold Press Extraction Unit (ICAR.NAIP Component 3 at Sangamner Ahmednagar district)

- A unit producing 300 Kg flax oil daily, has been set up
- 1000 Kg flaxseed processed daily
- **Products : Flax Oil, Flax omega-3 products**
- Flax meal (with 10%residual oil) fish and poultry feed
- **(Value addition: More than 2.5 times)**
- Generation of entrepreneurship and rural employment
- **Quality control research and development activities with regard to flax oil and flax meal as fish and poultry feed poultry and fish products**



OMEGA-3 EGGS: HEALTHY

Developed with DBT support



Omega-3 levels (10-17 fold)

Healthy



Vitamin E levels (Twice)

Cholesterol (Significant reduction)

Unhealthy



Omega-6 and Sat fatty acids

**without affecting FCR, egg wt, yolk volume,
laying capacity**



DHA and DHA+ AA enriched eggs

EGG	Cholesterol (mg)	DHA%	AA%
Commercial Regular	240	0.45	0.03
Omega-3	206*	5.0**	0.15
AA, DHA	181*	4.19**	1.7***

* Cholesterol significantly reduced

** 12 fold enriched DHA

*** 56 fold AA enriched specially designed for infants

Country eggs have higher DHA



Omega-3 eggs boosts flax agriculture

- Current flax production in India is 250 thousand tons
 - We need to ‘triple the production’ just to meet the demand from poultry
 - (40 billion omega-3 egg production)
 - Omega-3 egg production boost flax agriculture,
 - Flax agriculture, post-harvest technology for human health and IQ: ICAR.NAIP 2
-
- Flax- Biovillage: sustainable livelihood:**
- ICAR. NAIP 3: Sponsored mode with BAIF
 - DR Ghorpade Nagpur AICRP. Linseed (PDKV)



Social Impact:

- Present egg production / consumption: 40 billion: Per capita consumption: 39
- Should double within 4-5 years with the large scale production of more acceptable omega-3 eggs
- Promotion of flax agriculture to achieve this through: ICAR, NAIP 2 and 3
- One egg per capita increase can add :25 thousand more jobs in rural setting
- This adds to both: health and wealth
- Significant reduction: in morbidity and mortality





- With lucrative backward linkage with farmers for Flaxseed production and effective forward linkage with market to reach out to the consumers, the “Flax Bio-village Concept” when implemented to its full measure, is most likely to have very positive impact on human health with the resultant “Omega-3 Nutritional Security”



Thank you