Accelerating Scientific Processing of Cottonseed in India

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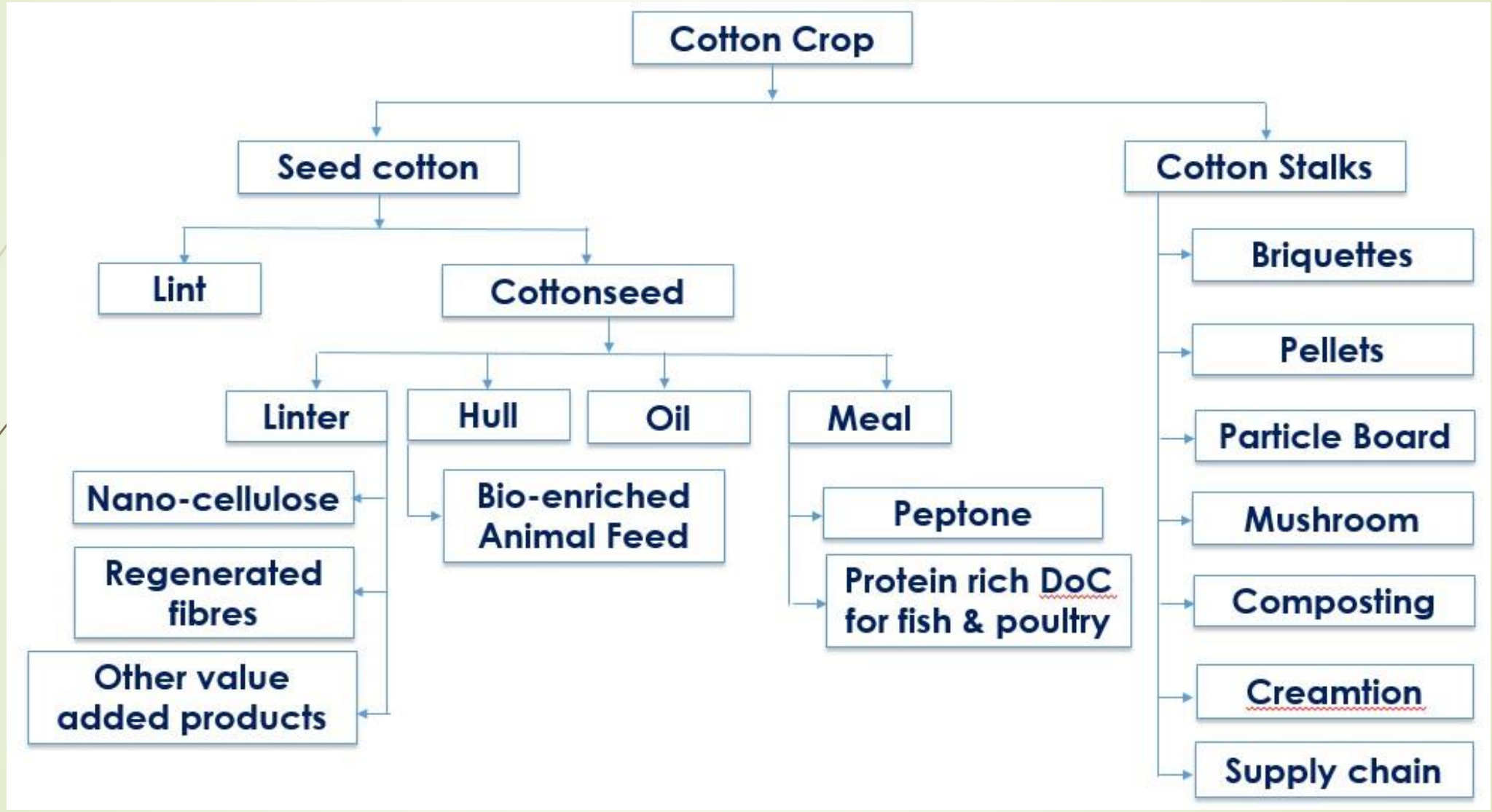
Cotton Value Chain

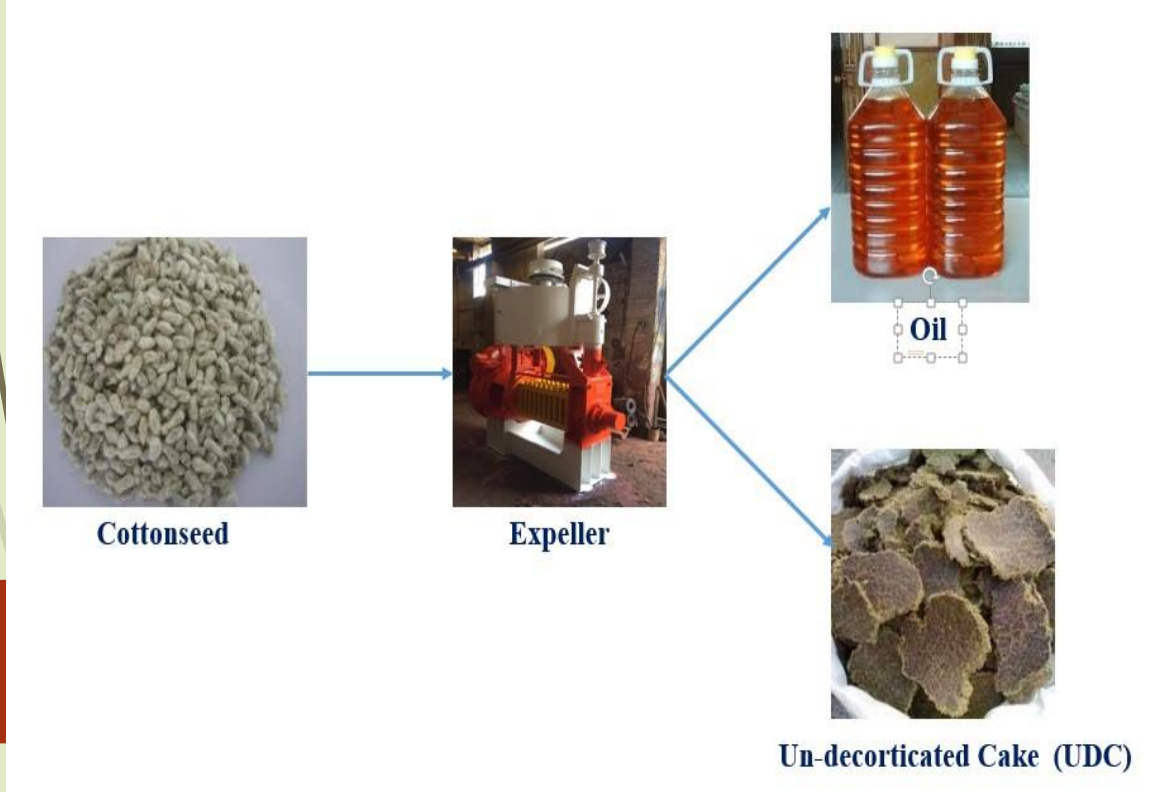


Cottonseed: Golden Goose

Cottonseed is considered as golden goose, since all its parts are used as food, feed and other valuable products

- Area under cotton: 12.8 million ha
- Cotton Production: 315 lakh bales
- 2/3rd portion cottonseed
- Cottonseed Production: Approx. 12.5 million tons
- Secondary/By-product
- Traditional use: Cattle feed, sowing, obtain oil and cake
- Recent Times: Multiple uses - Value addition to linters, hulls, cake and oil
- Linters: 5 to 7 %
- Oil: 17 to 18%
- Protein: 18 to 25%

Traditional Processing of Cottonseed



- More than 90% of cottonseed is presently processed
- Mechanical crushing: Screw expeller to produce oil and cake
- Oil cake contains all the non-nutritional material i.e.; linter, hull, oil and dust etc.
- Oil cake is low in protein content
- All value added products gets mixed in the oil cake
- Oil cake used for dairy cattle's
- About 2,000 processing units in India

Traditional Processing of Cottonseed: Limitations

- Oil yield is low (10%) and Inferior oil quality
- Residual oil (6 to 7%) cannot be extracted which becomes part of oil cake
- UDC is much in demand because of dairymen misconception that more oil in cake results in more fat in milk
- Dairy Nutritionists and Doctors do not advise on such high oil content in feed
- Contains 20 to 22% protein which is very low as compared to around 40 to 42% in scientific processing
- In fact cattle only need more protein in meal not oil
- UD Cake – it does not have export demand out of India
- Valuable by-products like linters and hulls are not recovered

Essential to shift from traditional to scientific processing of cottonseed in the larger interest of the nation

Estimated loss in value of by-products per ton of cottonseed due to traditional processing

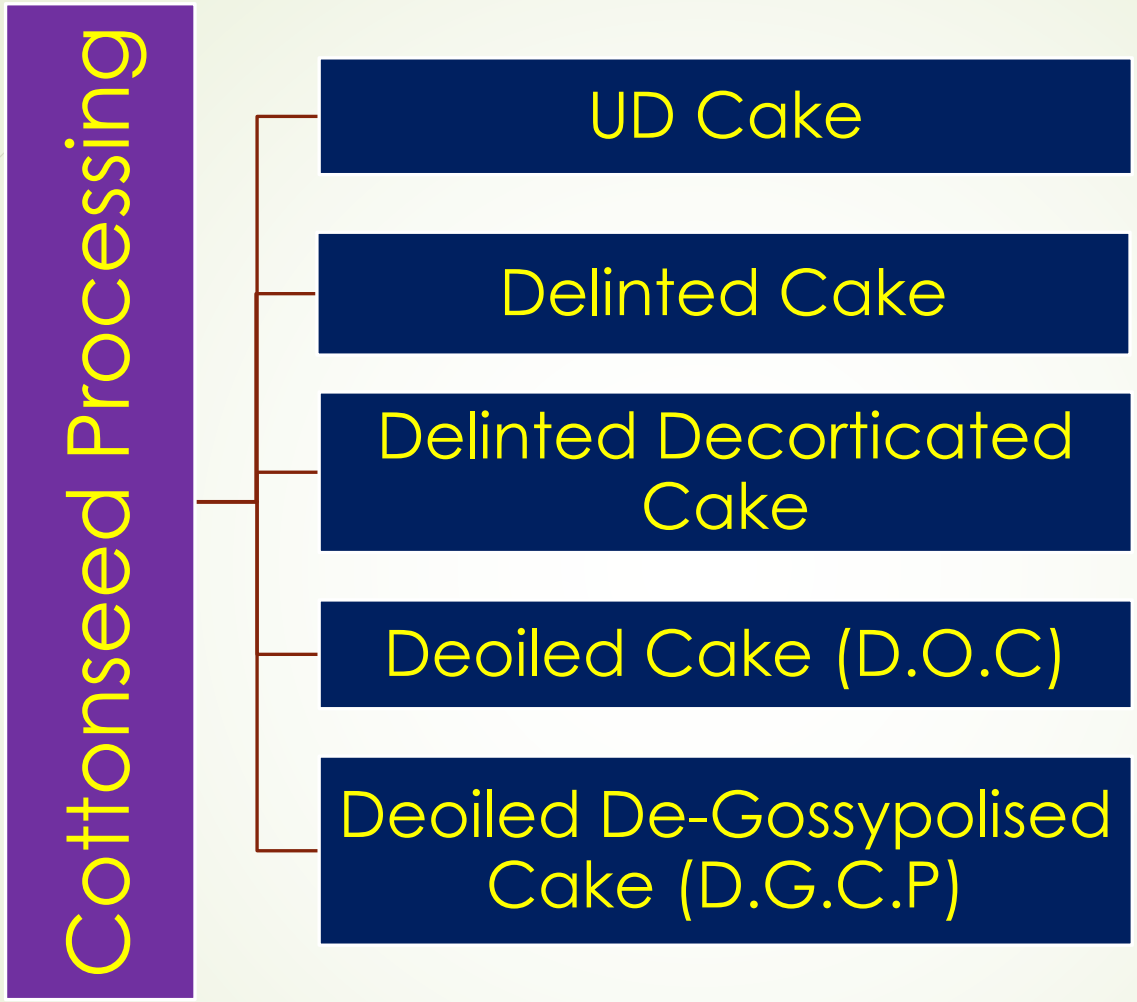
Particular	Recovery (%)	Quantity (kg)	Rate (Rs/ton)	Value (Rs.)
Traditional cottonseed processing				
Cottonseed Oil	10	100	120	12000
Cotton linters	Nil	Nil	NA	NA
Cotton hull	Nil	Nil	NA	NA
UDC (Oil cake)	85	850	30	25500
Total value/ton				**37500**
Scientific cottonseed processing				
Cottonseed Oil	16	120	120	14400
Cotton linter	5	50	40	2000
Cotton hulls	26	260	15	3900
DOC (Degossypolised)	48	480	50	24000
Total value/ton				**44300**
Loss due to traditional processing (Rs./ton)				**6800**

[Average Prices: Cottonseed Oil = Rs. 120/kg, Linter = Rs. 40/kg, Hulls = Rs. 15/kg, UDC oil cake = Rs. 30/kg, DOC (Degossypolosed) = Rs. 50/kg (AICOSCA, 2022)] (Assumption: 5% loss during processing]

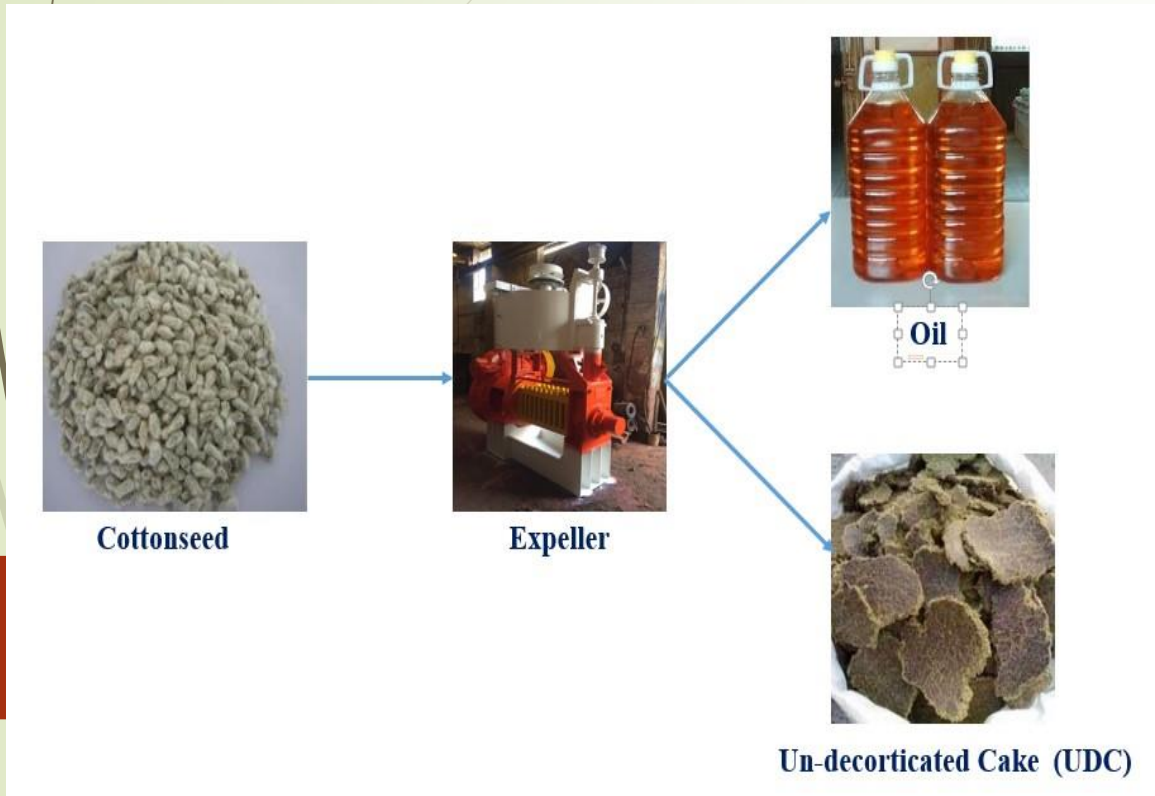
Estimated National Loss due to Traditional Cottonseed Processing

Particulars	Value
Production of cottonseed, (Lakh tons/year)	125
Availability for scientific processing (95%), (Lakh tons/year)	118.75
Loss in value of by-products due to traditional processing, (Rs./ton)	6800
National loss due to traditional processing, (Rs. in Crores/year)	8075

Cottonseed Processing



Traditional Cottonseed Processing: UDC



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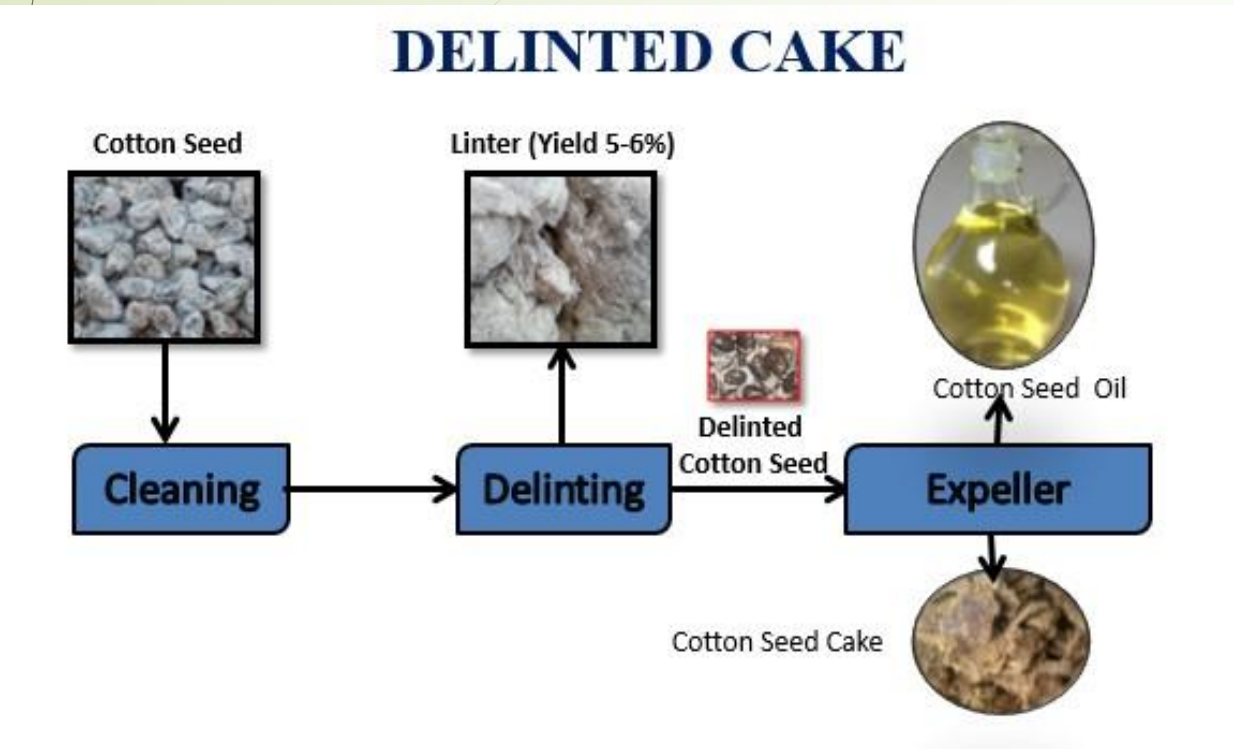
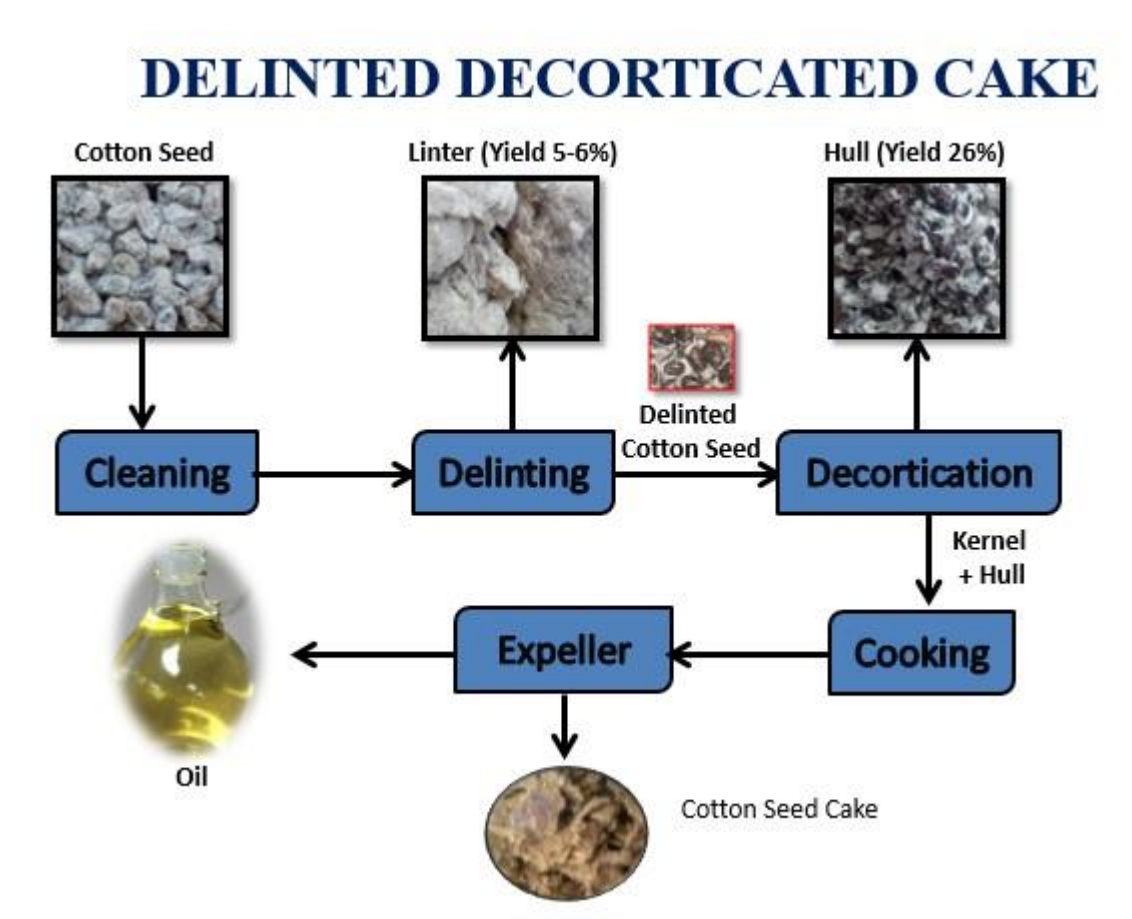
Scientific Cottonseed Processing: Delinted Cake



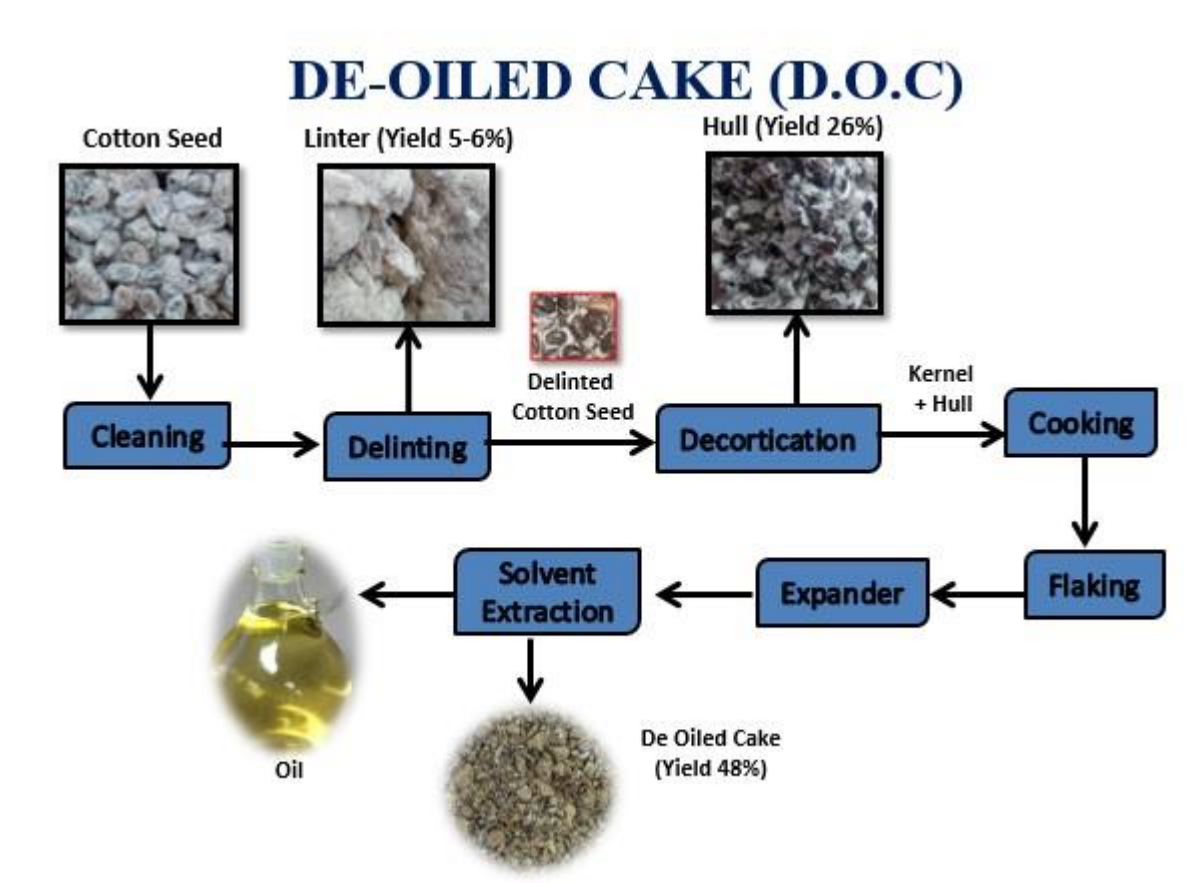
- During cleaning and delinting non-nutritional matter gets removed
- Fiber content is reduced
- Oil recovery is increased
- Nutritional Parameters of the cake is improved
- Protein content increased by 3-5%.
- Profitability of this process is higher as compared to UD Cake
- Cake has export demand
- Linters are recovered for value addition

Scientific Cottonseed Processing: Delinted Decorticated Cake



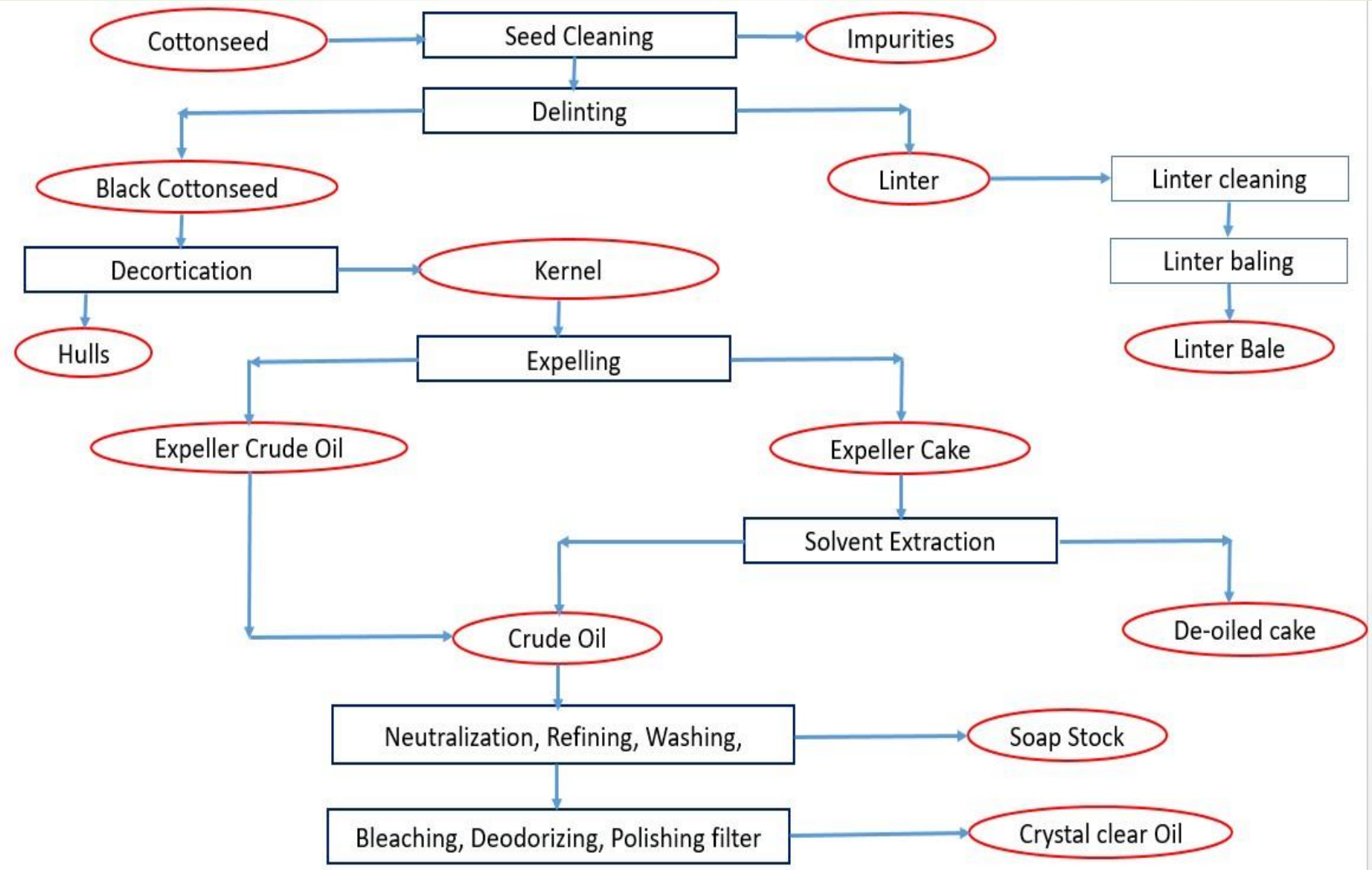
- Additional process of Decortication
- Non-nutritional matter gets removed
- Kernel with desired amount of hulls goes further for Expeller process
- Fiber content is reduced
- Oil recovery is increased
- Nutritional Parameters of the cake is improved
- Protein Content is increased by another 5-7%
- Profitability of this process is higher as compared to UD Cake
- Cake has export demand
- Linters and hulls are separated for value addition

Scientific Cottonseed Processing: Deoiled Cake (DOC)



- Additional Process of Solvent Extraction
- The recovery of Oil is Maximum
- Cake is having desired protein content
- This process produces all the value added products linters, hulls, DOC etc.
- Viable capacity of such process is high (400 ton per day capacity of white cotton seed and above)

Scientific Cottonseed Processing



Scientific Cottonseed Processing

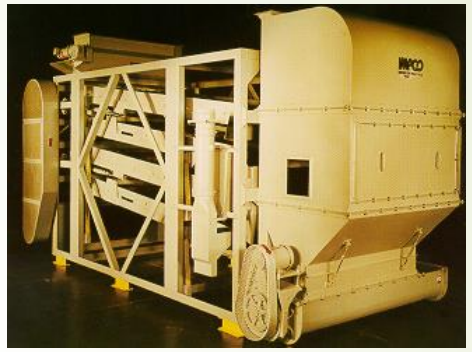
	Cottonseed	Whole Cottonseed Cake (UDC)	Delinted Cake	Decorticated Cake	Solvent D.O.C
Crude Protein	17 ~20%	22~25%	27~32%	32~35%	34~40%
Fat (Oil)	17~21%	7~13%	6~12%	5.5~11%	1~1.5%
Sand Silica		3~7%	3~7%	2%	1~2%
Fibre		32~44%	28~38%	15~17%	15~17%

Scientific Cottonseed Processing: Machinery

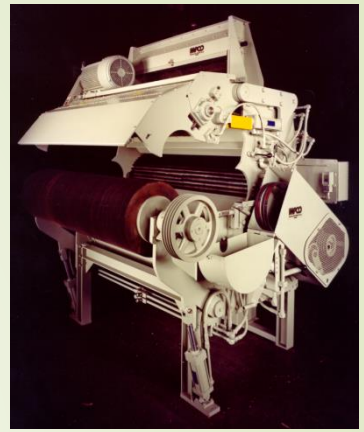
Important Machinery

- Rock and Shale Trap
- Seed Cleaner
- Delinter
- Gummer
- Decorticator
- Lint Cleaner
- Hull Beater
- Bale Press
- Various Conveyors
- Oil Expeller

Rock & Shale Trap



Four tray vibrating cleaner



Delinter

Linter Cleaner

Decorticator

Tailing Hull Beater

Pilot plant for Scientific Processing of Cottonseed

GTC of ICAR-CIRCOT, Nagpur

Industrial Applications: Cottonseed By-products

Linter

- Pulp for paper
- Nano cellulose, Films, Manmade fiber, plastic
- Ethers for pharmaceuticals and , cosmetics, paints etc.
- Absorbent cotton
- Bleached cotton linters: Ordnance factories for production of propellants, gun powder & ammunition

Hull

- Roughages in cattle feed
- Mixing in compound cattle feeds
- Petroleum drilling operations (mud additive)
- Poultry litter
- Production of furfural
- Growing edible mushroom

Meal/Cake

- High protein content (about 40 to 42%)
- Animal feed
- Preparation of peptone
- Filler for plastics
- Fertilizer ingredient
- Poultry Feed/Fish Feed

Oil

- Cooking oil
- Food processing, Bakery and Confectionary
- Cosmetics and personal care, products
- Detergents, Glycerol, Lubricants, Soap stocks
- Heart Oil: “OK FOOD” - American Heart Association

Limitations for Applications of Deoiled Cake

- Gossypol content is a limiting factor for the export of DOC
- Degossypolisation technology to produce protein rich cottonseed cake for non-ruminants is being developed and adopted to some extent
- Once the gossypol content is controlled, cottonseed meal can also be used for non ruminants
- Huge demand both as fish and poultry feed
- Degossypolisation will provide boost to scientific processing
- Reduce the recurring national loss of valuable by-products including precious cottonseed oil

Edible Oil Crises in India

- India : Severe problem of shortage of vegetable oil
- 50% of oil requirement is met through import
- Oil prices are skyrocketing due to inadequate indigenous production and increasing trend of consumption.
- Annually about 6-7 lakh tonnes of cottonseed oil is wasted due to nonscientific processing of cottonseed
- India: Cottonseed oil still not recognized as an important source of edible oil although it is contributing about 10 to 11 lakh tons oil every year
- Oil production can be raised by 40% even with available raw material by application of modern processing technology

Concentrated effort from policy makers and extension agencies are needed to unable to prevent these losses

Reasons for Slow Progress of Scientific Processing of Cottonseed

- Delinting and decorticating are energy intensive operations
- High cost of production of de-oiled cake and refined oil
- High initial cost of investment for scientific cottonseed processing
- Preference of cattle feeders to un-decorticated cake (UDC) over de-oiled cake (DOC)
- Cottonseed cake is not sold on the basis of protein content unlike in foreign countries
- Fluctuations in prices of linters
- Lack of awareness among stakeholders about valuable cottonseed by-products

Interventions to Accelerate Shifting Towards Scientific Cottonseed Processing

- Creation of awareness among stakeholders about cottonseed by-products
- Delinting process can be adopted as part of ginning industry
- Enhanced utilization of deoiled cake in compound cattle feed
- Increasing demand by creating cottonseed by-product based entrepreneurship to utilize them for industrial applications
- Special package for upgradation of cottonseed processing industry to increase the supply of cottonseed by-products
- Research on cottonseed and its processing
- Mission mode approach for scientific cottonseed processing in collaboration with all stakeholder

THANK YOU