

PULSES PROCESSING UNIT

1 Introduction

1.1 Current Scenario

India is the largest producer, largest consumer and the largest importer of pulses in the world. In India Pulses are grown in around 24-26 million hectares of area producing 17-19 million tonnes of pulses annually. India accounts for over one third of the total world area and over 20 per cent of total world production. India primarily produces Bengal gram (chickpeas), red gram (tur), lentil (masur), green gram (mung) and black gram (urd). For majority of vegetarian population in India, pulses are the major source of protein. Pulses and pulse crop residues are also major sources of high quality livestock feed in India.

In India pulses are cultivated on marginal lands under rain fed conditions. Only 15% of the area under pulses has assured irrigation. Because of the high level of fluctuations in pulse production (due to biotic and abiotic stress) and prices (in the absence of an effective government price support mechanism) farmers are not very keen on taking up pulse cultivation despite high wholesale pulse prices in recent years. Farmers are getting attracted towards cash crops like Cotton, Maize and Oilseeds (mainly soybeans) because of better return and lower risk.

Nevertheless, improvement in yields, has contributed to higher pulse production in recent years. Most of the increase in pulse production in recent years has been in gram. Low pulse yield in India compared to other countries is attributed to poor spread of improved varieties and technologies, abrupt climatic changes, vulnerability to pests and diseases, and generally declining growth rate of total factor productivity. Chickpeas contributes the single largest share in India's export basket of pulses registering 97.18% and 85.64% share in the total pulses export during 2013-14 and 2014-15 respectively. But in case of imports, Peas (Matar) forms a major share in the total import of pulses. But looking all these issues India is a major importing country of Pulses, although we have seven agro Climatic conditions in our country. We are lacking in exports. Keeping all these conditions in mind, it justifies the setting up of a processing plant of Pulses, especially in Odisha.

1.2 Status of pulse processing in Odisha

Processing activities are not very strong in the Odisha as most of the producers come under small and marginal farmer category who process the pulses at home with the help of grinding stones (chakki) or in the attachakki and rice mills. The main reasons for the nonexistence of the large pulse processing units is the lack of proper infrastructure and lower availability of marketable surplus. Poor infrastructure includes the locally manufactured or assembled machinery or brought from states like Bihar, Uttar Pradesh and Andhra Pradesh. Processing units procure raw materials from local markets and neighbouring districts and finished products also sold to local wholesalers and neighbouring districts and states.

2 Rationale for setting up a processing unit for Pulses

Odisha has good potential to establish pulse processing mill as many districts are engaged in pulse cultivation. It also comes under the major pulse producing state for the pulses like Pigeon pea, Moong bean and Kulthi (Horse gram). The Union Ministry of Agriculture has also implemented Centrally Sponsored Scheme (CSS) of National Food Security Mission (NFSM) covering Pulses in the Odisha state like Accelerated Pulses Production Programme (A3P) and Integrated Development of 60000 Pulses villages in Rainfed Areas to increase the production and productivity by disseminating latest production technologies at the farmers' field. The neighbouring states like West Bengal, Bihar, Madhya Pradesh and Andhra Pradesh are also producing pulses, so it would be easy to procure pulses from there for the processing units.

National Pulses Development Programme now ISOPOM (Pulses), a Centrally Sponsored Scheme, is in operation in the Odisha, State since 1990-96 with objectives of expanding the area & increasing the productivity by incentivizing farmers through provision of subsidy for different seed & non seed components.

2.1 Raw Material Availability

Raw material availability is very important factor for setting up a processing plant and there are many factors which effects the raw material availability, like:

- Unavailability of adequate and good quality raw materials,
- Lack of proper infrastructure,
- The limited availability of finance for procuring raw materials,
- The competition from the neighboring states such as Chhattisgarh, etc.

The credit related constraints can be addressed by the bankers by providing assistance for the establishment, expansion and modernization of pulses processing mills, by providing both working as well as block capital.

2.2 Need of Infrastructure

With lack of storage facilities (i.e. inadequate storage facilities), the farmers are losing a substantial amount of their produce to spoilage, drainage, rodents, etc. and are forced to sale their produce as which becomes non-remunerative for them. The farmers don't follow any scientific method for the post-harvest operations, leading to wastage amounting to 5 to 10 per cent of the produce. Some of the produce is lost during the transportation from fields to the storage houses. Similarly, the storage in gunny bags in closed and unclean rooms is making the produce susceptible to pests and insects. To add value to the pulses, pulses have to be processed and packed as per the consumer demand. Thus, supply of good quality raw materials, adoption of conditioning techniques to loosen the husk without resorting to sun drying, extension of storage facility and infrastructure support, and proper market linkage are important.

3 The Project

The Processing Unit for Pulses will be established with a production capacity of 2MTper hour. The same plant can be used to process all varieties of pulses like; Arhar, Moong, Urd and Gram etc. The land requirement for the facility will be approximately 1 acre.

3.1 Land and Site

Development of the land required for the dal milling depends upon the type of milling operations, wet / dry milling for conditioning the pulses prior to de-husking and splitting operations. Generally, 1.00 acre of land is required for establishing a dal mill having a processing capacity of 4800 MT / annum (additional area may be required for sun drying of soaked grain legume in case of wet processing). This said facility will follow the Dry milling operations only.

3.2 The Facility

The machineries will be of capacity 5 ton/hr. The facility will include the Milling area (Processing area) of 1000sqm, Raw Material Store of 80sqm, Finished Goods Store of 80sqm, Office Space of 40 sqm, Machine Spare Store of 50sqm, Gunny Bag/ Packaging material Storage Space of 50sqm, and Electricity Panel Room of 40sqm The processing area will include the cleaning section, polish section, Sortex plant, milling section and automated pulses bagging (50 kg gunny bag).

3.3 Machineries

Cleaning Section: The cleaning section will be having Pre cleaner and Drum Sieves, two roll machines, Reel machine 4 sheet double and 3 sheet single along with Verm Convour and Roll petty. This process will remove the unwanted particles and sort the grains according to desired shape and size.

Milling Section: Milling section will consist of reel machine double 4 sheet and double 3 sheet, roll petty, Elevator fan close shaft connection pipes dust plant cleaning and milling, and nut bolt pulley bracket bush. This section will be followed by a polishing section.

Polishing Section: The polishing section will be having Polisher, Elevator Verm Convenor. This section will polish the milled grain and send it for sortexing.

Sotex: Sortex will include Elevator, Gravity and dust plants. It separates the processed pulses according to size and grade wise.

The cost of investment in the components of civil constructions is indicated in the financials. The Verm Convour, Polisher and 4 Elevators capacity 3000 per feet.

3.4 Processing of Pulses

Since pulses are commonly consumed in de-husked and split form, the processing of pulses is a definite activity and assumes a lot of importance. The processing of pulses is undertaken at three levels i.e. Primary, Secondary and Tertiary.

- i. **Primary Processing:** Consists mainly of production of cleaned, graded and packaged pulses.
- ii. **Secondary Processing:** Consists of dehusking, splitting, polishing, turmeric coating and also the powdered besan and packaged dal.
- iii. **Tertiary Processing:** Consists mainly of preparation of roasted, fried dal and other associated dal products.

3.5 Conventional pulses milling process

- i. **Wet Milling operations** consisting of Cleaning of chaffs, dirt, etc. > Soaking > Mixing with red soil > Conditioning > Dehusking and Splitting > Separation and Grading > Dehusked & Split Pulses > Bagging
- ii. **Dry Milling operations** consisting of Cleaning of Chaffs & dirt > Pitting > Pre-treatment with Oil > Conditioning > Dehusking and Splitting the mixture of husk, broken & Powder > Grading > Polishing > Grade I Pulses

3.6 Products (Main Product and By-Products)

Recovery rate of Dal from the processing facility is around 75%. The other by-products of the pulses processing are husk, broken pulses, powdered pulses, un-husked/de-husked whole pulses etc. The products along with their share in percentage are indicated in the table- 1.

Table 1: Products and By-products from the facility

Item	Share in %
De husked & Split Pulses	75
Fine Dust Powder	0.5-1
Brokens	0.5-1
Husk	13-15
Unhusked Pulses	1
De husked Whole Pulses	1
Total	100

The main products of the pulses processing units consisted of de-husked & split pulses and husk which constituted around 80-82 per cent and 13-14 per cent of the total respectively. The by-products like fine dust powder, brokens, un-husked pulses and de-husked whole pulses which constituted around 1 per cent each of the totals. The processing units were selling the main products i.e. de-husked & split pulses and the husk only and the by-products were taken away by the labourers working in the unit.

3.7 Process Flow for Pulses Processing

The description of various operations involved in the pulses processing are mentioned below.

3.7.1 Cleaning & Grading

Cleaning helps in removing the husk, dust, etc. from the pulses and grading is done to segregate the grain legumes of desired shape and size on a rotating type of cleaner.

3.7.2 Pitting

An empty roller machine is used for cracking the husk layer and for scratching the clean pulses passing through it. This is done for loosening the husk from sticking to the cotyledons in order to facilitate subsequent oil penetration. Cracking and scratching of husk takes place mainly by friction between pulses as material is passed through narrowing clearance. During the operations, some of the pulses are de-husked and split and are separated by sieving.

3.7.3 Pre-treatment with oil

The scratched or pitted material is passed through a screw conveyor and mixing of some edible oil like linseed is done in it. Pulses coming out of the screw conveyor are kept out about 8 to 10 hours to diffuse oil.

3.7.4 Conditioning

Pulses are conditioned by ultimate soaking / wetting, drying and temporary moisture of 3.5 per cent added after about 8 hours and grain is dried in sun again until all the pulses are sufficiently conditioned. The whole process of alternate wetting and drying is continued for two to four days. Pulses are finally dried to about 10 to 12 per cent moisture content prior to de-husking and splitting.

3.7.5 De-husking & Splitting

For de-husking of conditioned pulses carborundum coated emery rollers are used. In one pass 50 per cent of the pulses are de-husked. The de-husked split pulses are separated by sieving and husk is aspirated off. Un-split pulses and tail pulses are again de-husked and milled in a similar way. For complete de-husking and splitting, the whole process is repeated two to three times.

3.7.6 Polishing

Polishing is completed by treating de-husked and split pulses with small quantity of oil.

3.7.7 Weighing and Packaging

After polishing, the de-husked pulses are packed in bulk or retail packing, as desired. The packing material may be pre-printed or plain packs.

4 Financials

4.1 Technical Building

Table 2: Item wise cost in technical building in Rs Lakhs

Item	Size (Sq.mt)	Total Cost Rs. Lakh
Raw Material Store	80	9.60
Finished Goods Store	80	9.60
Processing Area	1000	120.00
Office Space	40	4.80
Machine Spare Store	50	6.00
Gunny Bag Storage Space	50	6.00
Panel Board Room	40	4.80
Misc. Space (incl. Toilet and Others)	60	7.20
Total	5000	168.00

The total estimated cost of the pulses processing unit is calculated to be **Rs.168.00lakh** excluding contingencies.

4.2 Plant and Machinery

The estimated cost of plants and machinery for the processing units which includes Cleaning, Milling section, Sortex, polishing and bagging with control Panels and other misc items like DG set, insurance, freight and erection charges , internal and external electrification is estimated to be **Rs 217.01 Lakh** excluding contingencies. The total cost of machinery plant at the reference year is indicated in the Table.

Table 3: Plant and machinery used

Item	Number	Cost (Rs. In Lakh)
Pre-Cleaner	1	32.37
Milling section	1	75.92
Polishing section	1	8.85
Sortex	1	3.95
Bagging	1	1.00
Erection and other charges	LS	27.92
DG set(400 KVA)	1	25.00
Electrification(Internal & External)	LS	42.00
Total		217.01

4.3 Miscellaneous Fixed Assets

The miscellaneous fixed assets such as office furniture, office equipment, fixture, fire fighting equipment and other misc. items is estimated to be **Rs 27.00 lakh**

4.4 Pre-operative Expenses and security deposit

The pre-operative expenses which includes the preparation of DPR and interest during construction(IDC) with misc. expenses is estimated to be **Rs 24.00 lakh**

4.5 Total Project cost

The total project cost is estimated to be **Rs 483.08.Lakh**. The item wise break up is given below

Table 4: Total Project cost in Rs Lakhs

Item	Cost (Rs. In Lakh)
Land	10.00
Land development	11.71
Technical Building	176.40
Plant and Machinery	227.86
Misc. Fixed Assets	28.35

Total Fixed Assets	454.32
Margin Money for working capital	4.76
Pre-Operative Expenses	24.00
Total	483.08

4.6 Processed parameters

4.6.1 Cost of Operations

The processing capacity of the units is calculated to be **2 MT per hr**. The units were operating for approximately 210 days / seven months in a year as the processing activity taken up during the three to four months of rainy season comes zero. Besides that, the work was suspended in some cases due to the non-availability of workers during the festive seasons and other operational difficulties. The overall working period was thus estimated to be 210 days and the processing capacity of the units was estimated to be 4800 MT per annum.

Table 5: Cost of operation at 60% utilization of plant

Different cost head	Amount(Rs lakhs)
Labour cost	8.82
Water	1.26
Raw material cost	1575.00
Power & Fuel	24.60
Marketing expenses	92.53
Administrative Expenses	0.61
Salary	24.84
Repair & Maintenance	3.97
Total cost	1,731.63

4.6.2 Purchase price of raw materials

The major item of operation cost was the purchase price of the raw materials i.e. pulses. Since the units were processing different types of pulses, the cost / purchase price of those were different. Apart from that, the price differed from time to time, depending upon the availability. The price immediately after the harvesting was lower in comparison to price after a considerable time gap. Further, the units were sometimes procuring pulses from outside their respective districts so as to avail the same at a lower rate. The stock of local pulses was sufficient for around 5 months of processing activity, after which the units had to depend either on the pulses from outside the district or the state. The average purchase price of the pulses was estimated to be **Rs. 50000/- per MT**, even though the actual purchase price varies in the range of **Rs. 40000/- to Rs. 50000/-**, depending on

market demand. Around 90 per cent of the cost of operation of the units was accounted for by the raw materials.

4.6.3 Cost of Gunny Bags

The price of gunny bags of 50 kg was reported to be **Rs. 10/ per** piece.

4.6.4 Salaries / Wages

For efficient running the plant unit, we need total 19 permanent employees. These included 4 operators, 2 marketing person, 1 store Incharge, 1 accountant, 1 admin, 7 skilled labors and 1 security. The total overhead on salary wages is estimated to be **Rs 41.40Lakh** per annum.

Table 7: Profitability Statement

Particulars	Y1	Y2	Y3	Y4	Y5	Y6	Y7
Income	1,850.63	2,159.06	2,467.50	2,775.94	2,775.94	2,775.94	2,775.94
Expenditure	1,731.63	2,018.12	2,304.86	2,591.89	2,595.43	2,599.30	2,603.56
Variable Cost	1702.21	1985.91	2269.62	2553.32	2553.32	2553.32	2553.32
Labour Cost	8.82	10.29	11.76	13.23	13.23	13.23	13.23
Water	1.26	1.47	1.68	1.89	1.89	1.89	1.89
Raw Material Cost	1575.00	1837.50	2100.00	2362.50	2362.50	2362.50	2362.50
Power & Fuel	24.60	28.70	32.80	36.90	36.90	36.90	36.90
Marketing Expenses	92.53	107.95	123.38	138.80	138.80	138.80	138.80
Fixed Cost	29.42	32.20	35.25	38.57	42.11	45.99	50.24
Administrative Expenses	0.61	0.71	0.82	0.92	0.92	0.92	0.92
Salary	24.84	27.32	30.06	33.06	36.37	40.01	44.01
Repair & Maintenance	3.97	4.17	4.37	4.59	4.82	5.06	5.32
Gross Profit	118.99	140.95	162.64	184.05	180.51	176.63	172.38
Depreciation	35.54	35.54	35.54	35.54	35.54	35.54	35.54
Interest On Term Loan	43.96	43.96	38.47	31.14	23.81	16.49	9.16
Interest On Working Capital	27.60	32.16	36.73	41.31	41.31	41.31	41.31
Preliminary Expenses Written Off	6.00	6.00	6.00	6.00			
Profit Before Tax	5.90	23.28	45.90	70.06	79.85	83.30	86.37
Taxes	-	-	10.54	22.60	27.46	30.01	32.24
Profit After Taxes	5.90	23.28	35.36	47.46	52.39	53.29	54.13
Retained Profit	5.90	23.28	35.36	47.46	52.39	53.29	54.13
Net Cash Accrual	47.44	64.82	76.90	89.00	87.93	88.83	89.67
Cumulative Cash Accrual	47.44	112.26	189.16	278.16	366.09	454.92	544.59
Gpm	8.02%	8.02%	8.02%	8.02%	8.02%	8.02%	8.02%
Npm (Before Tax)	0.32%	1.08%	1.86%	2.52%	2.88%	3.00%	3.11%

4.7 Financial Indices

The IRR comes to be **21.16%** and the pack back period is **2yrs 4 months**. The details of key financial indices are given below.

Table 8: Economics of Sample Processing Units (Rs. Lakh)

Particulars	As per 4th Year
Net profit after tax	47.46
Internal rate of return	21.16
Breakeven point	51.85
Payback period (years)	2.30

4.8 Means of Finance

The contribution from the promoter will be taken as 30% of total project cost which is calculated Rs 144.92 lakhs and rest Rs 338.16 lakhs will be taken as term loan.

Means Of Finance					
Equity		30%	144.92		144.92
Term Loan	13.00%		338.16		338.16
Financial Institutions	12.00				-
	Total		483.08	-	483.08