



Economic Performance and Constraints Faced by Tur Dal Processing Units- Bharuch District, Gujarat

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Authors' contributions

This work was carried out in collaboration among all authors. Author DH designed the study, wrote the protocol and wrote the first draft of the manuscript. Whereas authors SR, LRD and BC managed the literature searches and analysis of the study. All authors read and approved the final manuscript.

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ABSTRACT

The study of economic performance of Tur dal processing units in terms of cost is very essential for accelerating the growth of agriculture processing industries. The present study was undertaken to work out the unit fixed costs, variable costs, production costs and returns of processing of Tur dal and different constraints faced by Tur dal processors of Bharuch District of Gujarat. The primary data pertained to consecutive three years i.e., 2017-18, 2018-2019, and 2019-20 were collected from the sample of three Tur dal mills from Bharuch, Ankleshwar and Vaghra talukas of Bharuch district. The results indicated that the average capital investment for a dal mill per unit was Rs. 7, 10, 00,000. The average fixed cost and average variable cost per quintal was of INR 46.10 and 245.46 respectively. Hence, average processing cost per quintal was worked out to be Rs. 291.56. The gross return per quintal of processed tur dal was Rs. 5754.50. The average content of tur dal and by-products was in the proportion of 72 per cent and 28 per cent respectively, by weight. The recovery in one quintal of tur was 65 kg of tur dal, 7 kg of broken dal and 28 kg of chala/chuni/ dead

seed. The net returns per quintal after processing was found to be Rs. 579.61. It was found that, inadequate supply of raw material for processing especially during off season was the major constraint faced by the dal mill owners followed by units not running on full capacity utilization during offseason and irregular electricity supply to run the unit, etc.

Keywords: Tur dal; processing unit; constraints; cost and returns.

1. INTRODUCTION

Pulses are the dried edible seeds of leguminous crops. These are most essential component of traditional food baskets for a well-balanced diet and as a low-fat source of protein. The major pulses grown in the country are Chickpeas (Chana), Pigeon peas (Arhar/ Tur Dal), Urad (Urad Dal), Mung (Moong) and Red lentils (Masoor) etc. Redgram (*Cajanus cajan* (L.) Millsp.) is one of the foremost pulse crops and finds a significant position in the Indian farming system. In India redgram ranks second among important pulse crops next to Bengal gram. Red gram is mainly consumed in the form of split pulse as dal after processing, which is an essential supplement of cereal based diet. Thus, processing of agricultural products has become of great importance. Processing creates form utility in the agricultural products which help in getting remunerative prices. Some of the agricultural products need processing so as to convert them in edible form viz., pulses, paddy, sugarcane and oilseed crops need processing to make them suitable for final consumption, which is of great importance for present situation (Wagh et.al., 2014) [1]. Dal milling is the 3rd largest processing industry in India after rice and wheat milling. India is the largest producer and consumer of pulses in the world and dal milling industry promises excellent potential to boost our economy, due to enormous opportunities both in the domestic and export market (Bhagwat and Shelke, 2013) [2]. In India, agro-processing is regarded as the "sunrise sector" of the economy in view of its large potential for growth and socioeconomic impacts on employment, income generation and exports (Grover et al., 1996) [3]. The processing of Tur dal is generally done in two steps, loosening of husk by wet or dry method and dehusking and splitting using suitable machines. The beneficial effects of processing on the nutritive values of food pulses are envisaged in two areas: (a) Improved bio-availability of nutrients and (b) Partial or complete removal of anti-nutritional and toxic compounds. Milling of pulses means removal of husk and splitting the grains into two equal halves. Thus, the study of economic performance

of Tur dal processing units in terms of cost is thus very essential for accelerating the growth of agriculture processing industries and consequently the present study was undertaken to study the costs and returns of processing in Tur dal Mills and to find out the constraints faced by Tur dal in the gujath area.

2. METHODOLOGY

2.1 Collection of Data

In the present investigation, a sample of three Tur dal mills from Bharuch, Ankleshwar and Vaghra talukas of Bharuch district were studied purposively to accomplish the objectives of the study. The primary data for consecutive three year 2017-18, 2018-2019, and 2019-20 were collected from selected dal mill owners with the help of well-structured questionnaire by personal interview.

2.2 Analytical Framework

The sample dal mills from which the data were collected belonged to the large size category with a capacity of nearly 100 quintals/ 10 tonnes per day built on an area of nearly 1-1.5 acres. The local season for the processing of tur dal was considered a 4 months period from February to May. The estimates of milling capacity of dal mills included fixed investment, fixed and working costs, returns etc. were obtained on per unit, per season basis for the individual dal mills. The data were analyzed to find out the unit fixed costs, variable costs, production costs and returns of processing of pulses. A tabular method of estimation was used in the study.

3. RESULTS AND DISCUSSION

3.1 Economics of Processing

Processing is the first stage of marketing for agricultural commodities; Most of the agricultural commodities are subject to different processing stages before being supplied to the consumer. Processing is necessary to improve the keeping quality of the product. It also stabilizes the

market by regular supply. Processing not only creates form utility but also influences place and time utility. Processing is very important in case of pulses. Generally, tur is consumed in the form of dal (split grain). So, processing specially making dal is an important marketing function of tur crop. Thus, studying the economics of processing of tur dal is relevant. The expenditure on capital investment, fixed and variable costs were as follows:

It is revealed from the Table 1 that the total investment in capital assets (inclusive of land) of a Tur dal mill was worked out to be Rs. 7,10,00,000. Out of the total investment cost, nearly 49.30 per cent cost was accounted by land. The investment on machineries and other equipment was the major investment followed by buildings and other structures which individually shared about 35.21 and 14.08 per cent of the total investment cost, respectively. The other item of investment cost was office furniture which accounted for a negligible 1.41 per cent of total investment cost.

3.2 Average Annual Cost Structure of Tur dal Mills for the Year 2017-18

3.2.1 Fixed cost

Fixed cost included depreciation and interest on fixed capital. Depreciation on items such as building, machinery and office furniture. In case of building and machinery, the current value was accounted and the depreciation at the rate of 1.5-2.0 per cent was charged. In case of office furniture the depreciation rate was 2.25- 2.5 per cent of the current value. Interest on fixed capital was charged at the rate of 10 per cent per annum. This comprised of rent on land, depreciation on machinery and equipment, building and other structures, office furniture and insurance. Thus, the total fixed cost came to Rs. 538175 per unit per season. The details are given in Table 2.

3.2.2 Variable costs or operating cost of dal mills

It is the cost incurred in operating the unit. The variable resources used during the year 2017-2018 were estimated on the basis of pulses processed per dal mill. The results in this regard are presented in Table 3. It included the cost of empty bags, salaries of employees, labour charges, maintenance charges, water charges, telephone charges, stationary charges, licence

fee, etc. The total working capital of the processing unit was Rs.2755000. It can be seen from the table that out of this, the cost of empty bags accounted to Rs. 729600. Other important items were salaries of employees which amounted to Rs. 190000, labour charges of Rs. 1140000, electricity charges, water, telephone and stationery charges as well as maintenance charges which accounted for Rs. 304000, Rs. 237500 and Rs. 142500, respectively. Interest on working capital was charged at the rate of 12 per cent per annum. Thus, the total variable cost came to per unit Rs.2865200 per season.

$$\begin{aligned} \text{Total Cost/ Season (2017-18)} &= \text{Total Fixed Cost} \\ &+ \text{Total Variable Cost} \\ &= \text{Rs.} \\ (538175+2865200) &= \text{Rs. 3403375} \end{aligned}$$

$$\begin{aligned} \text{Total Cost/ qtl (2017-18)} &= 3403375/ 12000 \\ &= \text{Rs. 283.61} \end{aligned}$$

3.2.3 Cost of processing of tur per season

The total quantity of tur processed during the season was 12000 quintals and total cost (Rs. 538175 as fixed cost + 2865200 as variable cost) was Rs. 3403375.

3.2.4 Cost of processing tur per quintal

The total quantity of tur processed during the season was 12000 quintals. The total cost incurred per quintal was Rs. 283.61 per quintal.

3.2.5 Recovery in processing of tur

As seen in Table 4, the average content of tur dal and by- products was in the proportion of 72 per cent and 28 per cent respectively, by weight. The recovery in one quintal of tur was 65 kg of tur dal, 7 kg of broken dal and 28 kg of chala/chuni/ dead seed.

3.2.6 Prices of tur grains, tur dal and by-products

The actual prices at which tur grains was purchased and product and by-products of tur were disposed off by the processors were as follows. Tur was purchased at a price of Rs. 4,750 per quintal. The selling price of tur dal varied with the grade of the dal. The average selling price of dal was Rs. 7382 per quintal. Broken dal was sold at a price of Rs. 5700 per quintal and chala/chuni/dead seed was sold at a

price of Rs. 1450 per quintal mainly as a cattle feed. The net returns per quintal on processing of tur dal was Rs.569.39. (Rs (5603-(4750+283.61) = 569.39)

3.3 Average Annual Cost Structure of Tur dal Mills for the Year 2018-19

3.3.1 Fixed cost

As depicted in Table 5, in case of building and machinery, the current value was accounted and

the depreciation at the rate of 1.5-2.0 per cent was charged. In case of office furniture, the depreciation rate was 2.25- 2.5 per cent of the current value. Interest on fixed capital was charged at the rate of 10 per cent per annum. This comprised of rent on land which accounted to Rs. 235200.00, depreciation on machinery and equipment which accounted to Rs.163333.3, building and other structures to Rs.65333.33, office furniture to Rs. 8166.67 and insurance i.e., Rs. 32666.67. Thus, the total fixed cost came to Rs. 555170 per unit per season.

Table 1. Items of Capital Investment of Tur dal Mills. (Rs/ processing unit)

Sr. No.	Particulars	Value (Rs)	Per cent
1	Land	3,50,00,000	49.30
2	Building and other structures	1,00,00,000	14.08
3	Machinery and Equipment	2,50,00,000	35.21
4	Office furniture	10,00,000	1.41
5	Total (Rs)	7,10,00,000	100.00

Table 2. Average Fixed cost of Tur dal Mills for the year 2017-2018 (Rs/unit)

Sr. No.	Items of cost	Value/ season (Rs.)
1	Rent on land	228000.00
2	Depreciation on buildings and other structures	63333.33
3	Depreciation on machineries and equipment	158333.33
4	Depreciation on office furniture	7916.67
5	Insurance	31666.67
6	Interest on fixed capital	48925.00
	Total Fixed Cost (TFC)	538175.00

Table 3. Average Variable cost of Tur dal Mills for the year 2017-2018 (Rs./unit)

Sr. No.	Items of cost	Value/ season (Rs.)
1	Cost of empty bags (25 kg bag)	729600
2	Salaries of employees	190000
3	Labour charges	1140000
4	Electricity charges	304000
5	Maintenance charges	142500
6	Water, telephone and stationery charges	237500
7	License fee	11400
8	Interest on working capital	110200
	Total working capital	2755000
	Total Variable Cost (TVC)	2865200

Table 4. Average Returns of Tur dal Mills for the year 2017-18 (Per Qtl)

Sr. No.	Particulars	Rate (Rs/kg)	Value (Rs)
1	50 kg Grade A Dal	76.0	3800
2	15 kg Grade B and C Dal	66.5	998
3	7 kg Broken dal	57.0	399
4	28 kg Chala (Cover)/ Chuni/ Deadseed	14.5	406
	Total Returns (per quintal)		5603
	Net Returns (per quintal)		569.39

Table 5. Average Fixed cost of Tur dal Mills for the year 2018-19 (Rs/ plant)

Sr. No.	Items of cost	Value/ season (Rs.)
1	Rent on land	235200.00
2	Depreciation on buildings and other structures	65333.33
3	Depreciation on machineries and equipment	163333.33
4	Depreciation on office furniture	8166.67
5	Insurance	32666.67
6	Interest on fixed capital	50470.00
Total Fixed Cost (TFC)		555170.00

Table 6. Average Variable cost of Tur dal Mills for the year 2018-19 (Rs/ unit)

Sr. No.	Items of cost	Value/ season (Rs.)
1	Cost of empty bags (25 kg bag)	752640
2	Salaries of employees	196000
3	Labour charges	1176000
4	Electricity charges	313600
5	Maintenance charges	147000
6	Water, telephone and stationery charges	245000
7	License fee	11760
8	Interest on working capital	113680
Total working capital		2842000
Total Variable Cost (TVC)		2955680

Table 7. Average Returns of Tur dal Mills for the year 2018-19 (Per Qtl)

Sr. No.	Particulars	Rate (Rs/kg)	Value (Rs)
1	50 kg Grade A Dal	78.0	3900
2	15 kg Grade B and C Dal	68.0	1020
3	7 kg Broken dal	57.5	402.5
4	28 kg Chala (Cover)/ Chuni/ Deadseed	15.0	420
Total Returns (per quintal)			5742.5
Net Returns (per quintal)			549.93

3.3.2 Variable costs or operating cost of dal mills

The variable resources used during the year 2018-2019 were estimated on the basis of pulses processed per dal mill. The results in this regard are presented in Table 6. It included the cost of empty bags, salaries of employees, labour charges, maintenance charges, water charges, telephone charges, stationary charges, licence fee, etc.

The total working capital of the processing unit was Rs.2842000. It can be seen from the table that out of this, the cost of empty bags accounted to Rs.752640. Other important items were salaries of employees which amounted to Rs. 196000, labour charges of Rs. 1176000, electricity charges, water, telephone and stationery charges as well as maintenance charges which accounted for Rs.313600, Rs.

245000 and Rs. 147000, respectively. Interest on working capital was charged at the rate of 12 per cent per annum. Thus, the total variable cost came to Rs.2955680 per unit per season.

3.3.3 Cost of processing of tur per season

The total quantity of tur processed during the season was 12000 quintals and total cost (Rs. 555170.00 as fixed cost + 2955680 as variable cost) was Rs. 3510850.

3.3.4 Cost of processing per quintal of tur dal

The total quantity of tur processed during the year was 12000 quintals. Therefore, the cost of processing of tur dal per quintal was Rs. 292.57 per quintal.

Total Cost/ Season (2018-19) = Total Fixed Cost + Total Variable Cost

$$\begin{aligned}
 &= \text{Rs } (555170+2955680) \\
 &= \text{Rs. } 3510850 \\
 \text{Total Cost/ qtl (2018-19)} &= 3510850/ 12000 \\
 &= \text{Rs. } 292.57
 \end{aligned}$$

3.3.5 Recovery in processing of tur

As seen in Table 7, the average content of tur dal and by-products was in the proportion of 72 per cent and 28 per cent respectively, by weight. The recovery in one quintal of tur was 65 kg of tur dal, 7 kg of broken dal and 28 kg of chala/chuni/ dead seed.

3.3.6 Prices of tur grains, tur dal and by-products

The actual prices at which tur grains was purchased and product and by-products of tur were disposed off by the processors were as follows. Tur was purchased at a price of Rs. 4900 per quintal. The selling price of tur dal varied

with the grade of the dal. The average selling price of dal was Rs. 7569 per quintal. Broken dal was sold at a price of Rs. 5750 per quintal and chala/chuni/dead seed was sold at a price of Rs. 1500 per quintal mainly as a cattle feed. The net returns per quintal on processing of tur dal was Rs. 549.93. (Rs (5742.5-(4900+292.57)= 549.93)

3.4 Average Annual Cost Structure of Tur dal Mills for the year 2019-20

3.4.1 Fixed cost

As depicted in Table 8, the fixed cost comprised of the following items. The rent on land accounted to Rs.240000.00, depreciation on machinery and equipment which accounted to Rs.166666.67, building and other structures to Rs.66666.67, office furniture to Rs.8333.33 and insurance i.e. Rs.33333.33. Thus, the total fixed cost came to Rs. 566500.00 per unit per season.

Table 8. Average Fixed cost of Tur dal Mills for the year 2019-2020 (Rs/ unit)

Sr. No.	Items of cost	Value/ season (Rs.)
1	Rent on land	240000.00
2	Depreciation on buildings and other structures	66666.67
3	Depreciation on machineries and equipment	166666.67
4	Depreciation on office furniture	8333.33
5	Insurance	33333.33
6	Interest on fixed capital	51500.00
Total Fixed Cost (TFC)		566500.00

Table 9. Average Variable cost of Tur dal Mills for the year 2019-2020

Sr. No.	Items of cost	Value/ season (Rs.)
1	Cost of empty bags (25 kg bag)	768000
2	Salaries of employees	200000
3	Labour charges	1200000
4	Electricity charges	320000
5	Maintenance charges	150000
6	Water, telephone and stationery charges	250000
7	License fee	12000
8	Interest on working capital	116000
Total working capital		2900000
Total variable cost (TVC)		3016000

Table 10. Average Returns of Tur dal Mills for the year 2019-2020 (Per Qtl)

Sr. No.	Particulars	Rate (Rs/kg)	Value (Rs)
1	50 kg Grade A dal	80	4000
2	15 kg Grade B and C dal	70	1050
3	7 kg Broken dal	60	420
4	28 kg Chala (Cover)/ Chuni/ Deadseed	16	448
Total Returns (per quintal)			5918
Net Returns (per quintal)			619.46

$$\begin{aligned}
 \text{Total Cost/ Season (2019-20)} &= \text{TFC} + \text{TVC} \\
 &= \text{Rs. } (566500.00+3016000) \\
 &= \text{Rs. } 3582500 \\
 \text{Total Cost/ qtl (2019-20)} &= 3582500/ 12000 \\
 &= \text{Rs. } 298.54
 \end{aligned}$$

3.4.2 Variable costs or operating cost of dal mills

The variable resources used during the year 2019-2020 were estimated on the basis of pulses processed per dal mill. The results in this regard are presented in Table 09. The total working capital of the processing unit was Rs.2900000. It can be seen from the table that out of this, the cost of empty bags accounted to Rs.768000. Other important items were salaries of employees which amounted to Rs.200000, labour charges of Rs.1200000, electricity charges, water, telephone and stationery charges as well as maintenance charges which accounted for Rs.320000, Rs.250000 and Rs.150000, respectively. Interest on working capital was charged at the rate of 12 per cent per annum. Thus, the total variable cost came to Rs. 3016000 per unit per season.

3.4.3 Cost of processing of tur per season

The total quantity of tur processed during the season was 12000 quintals and total cost (Rs. 566500.00 as fixed cost + Rs.3016000 as variable cost) was Rs. 3582500.

3.4.4 Cost of processing per quintal of tur dal

The total quantity of tur processed during the year was 12000 quintals. Therefore, the cost of processing of tur dal per quintal was Rs. 298.54 per quintal.

3.4.5 Recovery in processing of tur

As seen in Table 10, the average content of tur dal and by- products was in the proportion of 72 per cent and 28 per cent respectively, by weight. The recovery in one quintal of tur was 65 kg of tur dal, 7 kg of broken dal and 28 kg of chala/chuni/ dead seed.

3.4.6 Prices of tur grains, tur dal and by-products

The actual prices at which tur grains was purchased and product and by-products of tur

were disposed off by the processors were as follows. Tur was purchased at a price of Rs. 5000 per quintal. The selling price of tur dal varied with the grade of the dal. The average selling price of dal was Rs. 7769 per quintal. Broken dal was sold at a price of Rs. 6000 per quintal and chala/chuni/dead seed was sold at a price of Rs. 1600 per quintal mainly as a cattle feed. The net returns per quintal on processing of tur dal was Rs. 619.46. (Rs (5918- (5000+298.54) = 619.46)).

Perusal of Table 11 shows that, the three years Average Fixed Cost incurred in processing one quintal of tur dal during the period 2017-18 to 2019-20 was Rs. 46.10, i.e. the proportionate share of fixed cost in the total cost of tur dal processing was 84.19 per cent. The three years average variable cost per quintal was found to be Rs.245.46 which accounted for 84.19 per cent of the total cost. Thus, the three years average cost of processing one quintal of tur dal was worked out to be Rs. 291.56 Tur was purchased at an average price of Rs. 4883.33 per quintal and was sold at different prices depending upon the grade. Average Selling Prices per quintal of tur dal (Grade A, B, and C), broken dal as well as Chala (Cover)/ Chuni/ Deadseed were Rs. 7573.33, Rs.

5816.67 and Rs. 1516.67, respectively. Moreover, the three years average net returns/ profit in processing of tur dal was found to be Rs. 579.61 per quintal.

It can be revealed from Table 12 that inadequate supply of raw material for processing especially during off season was the major problem faced by 100.00 per cent of dal mill owners; this was due to seasonal variation, location specificity, price variation of raw material and the dependence on imports during off season. (Wagh et.al., 2014) [1] also found that inadequate supply of raw material for processing was the major problem faced by 90.00 per cent PKV Dal mill owners. Furthermore, the units were not running on full capacity utilization especially during off season due to dependence on imports which is highly government regulated. (Bhagwat and Shelke 2013) [2] was also reported that units are not running on full capacity utilization and power shortage were the major constraints faced by 100 per cent dal mill owners in Marathwada region of Maharashtra state.

Table 11. Three years average costs and returns per quintal for the period 2017-18 to 2019-20

Sr No.	Average Costs (Rs/qrtl)	Value (Rs)	Per cent
1.	Average fixed cost (AFC/qrtl)	46.10	15.81
2.	Average variable cost (AVC/qrtl)	245.46	84.19
3.	Average processing cost per quintal	291.56	100.00
4.	Average purchase price of tur per quintal	4883.33	-
5.	Average total cost per quintal (ATC/qrtl)	5174.89	-
Average Returns (Rs/qrtl)			
1.	Average Selling Price of tur dal per quintal (Grade A, B, and C)	7573.33	-
2.	Average Selling Price of broken dal per quintal	5816.67	-
3.	Average Selling Price of Chala (Cover)/ Chuni/ Deadseed per quintal	1516.67	-
4.	Average Total Returns per quintal	5754.50	-
5.	Average Net returns per quintal	579.61	-

Table 12. Processing constraints faced by Dal Mill owners

Sr. No.	Problems	Frequency (n=3)	Percentage
1.	Inadequate supply of raw materials	3	100
2.	Units not running on full capacity utilization (off season)	3	100
3.	Power supply	2	66.67
4.	Technical skills for operating machinery	2	66.67
5.	High cost of processing	2	66.67
6.	Use of improved technology in processing	1	33.33
7.	Quality control measures	1	33.33

Irregular electricity supply was another problem faced by 66.67 per cent dal mill owners of Bharuch district of Gujarat. (Shende 2013) [4] also found the inadequate supply of electricity was the major problem faced at the time of operating PKV dal mill, which can be due to the heavy load-shedding in villages during day time. Another major problem was lack of technical knowledge and skills about operating of machinery and it was expressed by 66.67 per cent dal mill owners. Similarly, 66.67 per cent dal mill owners found the cost of processing to be high. Moreover, use of improved technology in processing and adoption of quality control measures were constraints faced by 33.33 per cent of mill owners.

4. CONCLUSION

The economic analysis was done by different cost concepts i.e. fixed cost, variable cost, total cost etc, which revealed that the average capital investment for a dal mill per unit was Rs. 7, 10, 00,000. The average fixed cost per quintal of Rs. 46.10 while the average variable cost per quintal of Rs. 245.46. Hence, average processing cost

per quintal was worked out to be Rs. 291.56. The gross return per quintal of processed tur dal was Rs. 5754.50. The average content of tur dal and by-products was in the proportion of 72 per cent and 28 per cent respectively, by weight. The recovery in one quintal of tur was 65 kg of tur dal, 7 kg of broken dal and 28 kg of chala/chuni/ dead seed. The net returns per quintal after processing was found to be Rs. 579.61. The dal mill owners faced major constraints like inadequate supply of raw material for processing, units not running on full capacity utilization during off season, inadequate supply of electricity to run the unit, etc.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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