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## Gopal W Khorne

Assistant Professor,  
 Department of Agriculture  
 Economics and Statistics,  
 College of Agriculture,  
 Badnapur, Maharashtra, India

## Rakesh D Ahire

Associate Dean and Principal,  
 College of Agriculture,  
 Badnapur, Maharashtra, India

## Mahesh U Tanpure

Assistant Professor, College of  
 Agriculture, Badnapur,  
 Maharashtra, India

## Corresponding Author:

### Gopal W Khorne

Assistant Professor,  
 Department of Agriculture  
 Economics and Statistics,  
 College of Agriculture,  
 Badnapur, Maharashtra, India

## Economic analysis of processing of green gram mill's in Maharashtra

Gopal W Khorne, Rakesh D Ahire and Mahesh U Tanpure

### Abstract

Agriculture and industry have traditionally been viewed as two separate sectors both in terms of their characteristics and their role in economic growth. The agro-processing industries place a huge demand on agricultural raw materials. The primary data was collected by personal interviewing processor. Therefore the attempt was done to estimate per unit cost and returns of processing unit. An attempt, also been done to determine the break-even point of agro processing unit and optimum size of value addition in green gram. In the light of the empirical evidences brought out from the study, the following result are drawn. In almost all size groups of green gram mills, the investment in land constituted the main items of investment followed by machinery and factory building. Per quintal total cost was decrease with increase in size of green gram mills. The net return per quintal for green gram processing was found to be higher in case of large size mills as compared to medium and small mills. Benefit cost ratio was also found to be higher in large sized mills. Benefit cost ratio of agriculture industry is less because of huge initial investment in the processing industry but actual profit is more because of bulk quantity of production. To estimated break – even quantity was increase with the increase in the size of processing mills. Value addition in processing of green gram was higher in large sized followed medium and small green gram mills.

**Keywords:** Green gram, capacity utilization, cost and returns, break-even point, value addition

### Introduction

India is the major producer of green gram in the world and grown in almost all the States. It is grown in about 36 lakh hectares with the total production of about 17 lakh tonnes of grain with a productivity of about 500 kg/ha. Green gram is important pulse crop. It is very rich source of high quality protein. It is quite common in India and Central Asia. Green gram is an excellent source of high quality protein with easy digestibility, consumed as whole grains, dal and sprouted in variety of ways.

Agriculture and industry have traditionally been viewed as two separate sectors both in terms of their characteristics and their role in economic growth. Agriculture has been considered the hallmark of the first stage of development, while the degree of industrialization has been taken to be the most relevant indicator of a country's progress along the development path. The agro-processing industries place a huge demand on agricultural raw materials. Thus, advancement in agro-processing industries also promotes agricultural development in India. In Maharashtra, specifically in green gram producing district like Akola, Latur, Amravati and Buldhana, some agro-processing industries are playing vital role in processing of green gram and contributing into the economy of Maharashtra.

It was therefore, felt necessary to have information on area, production, productivity, cost of cultivation, cost involved in processing, economics of scale, optimal size of processing unit, marketing practices involved, price spread and the problems involved if any in processing of green gram in Maharashtra.

### Objectives

1. To estimate per unit cost and returns of green gram processing unit.
2. To work out Break- Even point of green gram processing unit.
3. To study the value addition in green gram.

### Methodology

The Akola, Latur, Amravati and Buldhana district was randomly selected. The data was collected by survey method by conducting personal interviews of processors using specially designed schedules prepared for the purpose.

The primary data in respect of cost of processing by processors in production was collected. Small processing unit with a capacity 5-30 q/day.

Medium processing unit with a capacity 30 to 60 q/day and large processing unit with a capacity 60-120q/day. Ten processing units were selected randomly from the available processing units.

### Techniques of Data Analysis

The cost and return of processing unit was worked out by using simple tabular analysis and benefit-cost ratio. The financial test ratio viz. operating ratio, fixed ratio, gross ratio and capital turn-over ratio. The break- even volume of output is determined with the help of following formula.

$$Q = \frac{\text{TFC}}{\text{(P-AVC)}}$$

Where

Q = Quantity of processed green gram in quintals required for break-even.

TFC = Total fixed cost

P = Price (Processing charges) per quintal

AVC = Average variable cost of processing per quintal

Value addition is a difference between price for which a processing industry sold its green gram product and the cost incurred on the purchased inputs by it. This difference represented the value addition by the productive activities of the processing unit. Value addition is calculated with the help of following formula.

Value addition = Selling price of the product – Cost of the total inputs.

### Result Discussion

The present study was undertaken with a view to workout costs and returns, break-even point and value addition in green gram.

### Economics of processing of green gram

Industries require huge capital investment, the ownership reflects the availability of capital to install the industry. The capacity and ownership structure plays vital role in processing of green gram as it has direct impact on cost and quantity involved in processing of green gram. Therefore an attempt was made to study the capacities and ownership structure of green gram dal processing mills and results are presented in table 1.

**Table 1:** Capacity utilization of green gram dal mills and recovery of green gram (May 2015 to April 2016)

Sr. No	Particulars	Size groups		
		Small	Medium	Large
1.	Capacity of green gram mill (qtl/day)	20.42	49.63	108.84
2.	<b>No. of mills according to ownership</b>			
	Individual	3	3	2
	Family / Partnership		1	1
3.	Number of working days	251.67	250	266.67
4.	Quantity of green gram actually milled (qtl)	5138.19	12406.25	29024.00
5.	<b>Quantity of main product obtained (qtl)</b>			
	Main product (Dal No 1)	3636.58 (55.21)	9105.00 (56.03)	21353.78 (56.86)
	Main product (Dal No 2)	1501.61 (22.80)	3301.25 (20.32)	7670.22 (20.42)
6.	<b>Quantity of by product obtained (qtl)</b>			
	Broken dal	91.02 (1.38)	303.75 (1.87)	753.78 (2.01)
	Churri	1273.43 (19.33)	3377.50 (20.78)	7534.22 (20.06)
	Waste/ losses	83.89 (1.27)	162.50 (1.00)	244.44 (0.65)
	TOTAL	6586.54 (100.00)	16250.00 (100.00)	37556.44 (100.00)

### Figures in parentheses are percentage to the total quantity processed

From the table, it was revealed that the capacity of green gram dal mills under study was 20.42 quintals, 49.63 quintals and 108.84 quintals per day respectively, in small, medium and large sized green gram dal mills under study. The total numbers of working days in the year was 251.67 days, 250 days and 266.67 days, respectively, in small, medium and large sized green gram dal mills. The actual quantity of green gram processed by these mills was 5138.58 quintals, 12406.25 quintals and 29024.00 quintals, respectively, in small, medium and large sized green gram dal mills. The per cent of actual quantity of green gram processed with respect to the installed capacity was 78.01, 76.35 and 77.28 per cent, respectively, in small, medium and large sized green gram dal mills. Form the forging discussion; it is revealed that the mills were using their capacity in the range of 65 to 80 per cent, which was due to inadequate and seasonal availability of green gram for milling.

The result indicated that the capacity utilization in small

sized green gram mills was less than the medium and large sized green gram dal mills. The quantity of dal no 1 produced was 3636.58 quintals, 9105.00 quintals and 21353.78 quintals respectively in small, medium and large sized green gram dal mills. The quantity of dal no 1 received from green gram milling was found to be higher percentage in large size group followed by medium size group and small size group, which worked out to be 56.86 percent of the total quantity of tur processed, while for medium and small sized group of dal mills it was 56.03 percent and 55.21 per cent respectively of the quantity of green gram processed. While dal no 2 produced was 1501.61 quintals, 3301.25 quintals and 7670.22 quintals respectively in small, medium and large size dal mills.

The quantity of byproduct viz; broken dal was 91.02 quintals, 303.75 quintals and 753.78 quintals, quintals respectively and that of churi was 1273.43 quintals, 3377.50 quintals and 7534.22 quintals in small, medium and large sized dal mills. The wastage or losses was 83.89 quintals, 162.50 quintals and 244.44 quintals, respectively, in small, medium and large sized green gram dal mills.

**Capital investment in green gram mills:** The basic requirements such as land, building, machinery for establishing an industry require large capital investment. In

this context, the information on average capital investment on those capital items, in different size groups of dal mill is presented in table 2.

**Table 2:** Capital investment in green gram mill (Rs./unit.)

Sr. No.	Capital items	Size group		
		Small	Medium	Large
1.	Land	2500000.00 (53.53)	3700000.00 (54.19)	6000000.00 (41.48)
2.	Factory building	967666.67 (20.72)	1426287.50 (20.89)	3004833.33 (20.77)
3.	Machinery and other accessories	1090166.67 (23.34)	1535625.00 (22.49)	5255833.33 (36.33)
4.	Electrification	53666.67 (1.15)	73750.00 (1.08)	110666.67 (0.76)
5.	Furniture and fixtures	10616.67 (0.23)	20975.00 (0.31)	22683.33 (0.16)
6.	Vehicle	48500.00 (1.04)	71675.00 (1.05)	72333.33 (0.50)
	Total	4670616.67 (100.00)	6828312.50 (100.00)	14466350.00 (100.00)

It is revealed from the table 2, that in small sized green gram dal mills, investment in land, machinery and factory building contributed 53.53, 23.34 and 20.72 per cent respectively, while electrification, vehicle and furniture contributed 1.15, 1.04 and 0.23 per cent of the total investment in capital assets. In medium sized dal mills land was the major item contributed 54.19 per cent while investment on machinery and factory building contributed 22.49 per cent and 20.89 per cent. The contribution of electrification, vehicle and furniture contributed 1.08 per cent, 1.05 percent and 0.31 percent in the total investment in capital assets. In case of large sized green gram dal mills the major capital cost items was land contributing 41.48 per cent with the investment of 36.33 per cent and 20.77 per cent in machinery and factory building, respectively. The capital investment done on electrification, vehicle and furniture was 0.76, 0.50 and 0.16 per cent. The study revealed that on an average, the capital investment was

46.71 lakh, 68.28 lakh and 1.45 crore, respectively, in small, medium and large sizes green gram dal mills, which observed to be increasing over the size group ascertains that investment in capital assets had direct relationship with the size group of green gram dal mills.

#### Annual cost structure of green gram mills

Table 3, presents the item wise annual cost structure of the average green gram dal mills belonging to different size groups. The examination of the annual cost structure of the average green gram dal mill over the size group revealed that the per dal mill absolute amount of cost on account of almost all the items of cost increased with the increase in size of dal mills, so also, the relative share of individual items of cost in the total cost, also found to be increase except the depreciation on building and cost of water and storage charges.

**Table 3:** Annual operating cost of green gram mill (Rs./unit.)

Sr. No.	Item of cost	Fixed Cost		
		Size groups		
		Small	Medium	Large
1.	Opportunity cost of land	250000.00 (15.82)	370000.00 (12.99)	600000.00 (11.65)
2.	Depreciation on buildings @ 5%	48383.33 (3.06)	71314.38 (2.50)	150241.67 (2.92)
3.	Depreciation on machineries @ 10%	109016.67 (6.90)	153562.50 (5.39)	525583.33 (10.21)
4.	Electrification	5366.67 (0.34)	7375.00 (0.26)	11066.67 (0.21)
5.	Depreciation on furniture @ 10%	1061.67 (0.06)	2097.50 (0.07)	2268.33 (0.04)
6.	Vehicle	4850.00 (0.31)	7167.50 (0.25)	7233.33 (0.14)
7.	Interest on fixed capital @ 10%	467061.67 (29.55)	682831.25 (23.98)	1446635.00 (28.09)
8.	Expenditure on permanent labour	140705.56 (8.90)	440750.00 (15.48)	632777.78 (12.29)
9.	Taxes, Insurance and License fee	19816.67 (1.25)	43680.00 (1.53)	61333.33 (1.19)
	Total fixed cost	1046262.22 (66.21)	1778778.13 (62.48)	3437139.44 (66.75)
Variable Cost				
1.	Casual labour charges	313388.89 (19.83)	519400.00 (18.24)	860555.56 (16.71)
2.	Repair and maintenance	20972.22 (1.33)	37812.50 (1.33)	116444.44 (2.26)
3.	Telephone and telegraphs	8333.33 (0.53)	9875.00 (0.35)	14333.33 (0.28)
4.	Miscellaneous	46666.67 (2.95)	95593.75 (3.36)	126666.67 (2.46)
5.	Water charges	8808.33 (0.56)	21562.50 (0.76)	28000.00 (0.54)
6.	Electricity	72983.33 (4.62)	260416.25 (9.15)	362962.67 (7.04)
7.	Storage charges	1761.67 (0.11)	2829.38 (0.09)	8368.00 (0.16)
8.	Office expenses	3933.33 (0.25)	6225.00 (0.22)	11666.67 (0.22)
9.	Interest on working capital @ 12 percent	57221.73 (3.62)	114445.73 (4.01)	183479.68 (3.56)
	Total Variable Cost	534069.51 (33.79)	1068160.10 (37.52)	1712477.01 (33.25)
	Total operating cost	1580331.73 (100.00)	2846938.23 (100.00)	5149616.46 (100.00)

**Figures in parentheses are percentage to the total operating cost:** It is observed from table 3, the per green gram dal mill total cost of green gram dal milling was Rs. 15.80 lakh, 28.47 lakh and 51.49 lakh per annum for small, medium and large size of dal mills, respectively, average

total cost per unit per year for all size group revealed the share of total fixed cost was 62.48 to 66.75 percent and 33.25 to 37.52 percent share total variable cost of total incurred dal mill owners in processing of dal mills. Out of

which the total fixed cost was Rs. 10.46 lakh, 17.79 lakh and 34.37 lakh per annum.

While the total variable cost was Rs. 5.34 lakh, 10.68 lakh and 17.12 lakh per annum for small, medium and large size group of green gram dal mill. It is, thus quite evident that the proportionate share of fixed cost in the total cost of green gram dal milling showed the increasing trend over the size group.

The interest on fixed capital formed major part i.e. 23.98 to 29.55 per cent total fixed cost followed by expenditure on permanent labour, opportunity cost of land, Depreciation on machinery, building and taxes, insurance and license fee. Furniture, electrification and vehicle account less than one per cent in all size groups.

Average variable cost per unit per year for all size group revealed that casual labour charges formed major share in total variable cost. It showed that casual labour charges Rs. 313388.89, 519400.00, 860555.56 in small, medium and large size units respectively. It formed major per cent contribution i.e. 16.71 to 19.83 per cent to total variable cost, followed by energy charges which include electricity, water, phone and miscellaneous etc. formed second major percent in total variable cost. Repair and maintenance charges were directly proportional to the all size of group and contributes least compared to other variable cost items. Interest on working capital to total variable cost was 3.62 per cent, 4.01 per cent and 3.56 in all three groups of green gram dal mills.

It is thus quite evident that the proportionate share of fixed cost in the total cost of green gram milling showed the increasing trend, while that of variable cost showed the decreasing trend. This could be related to the actual quantity processed by the mills over the size group. As the quantity processed over the size group found to be increasing so as the total fixed cost found to be increasing. The increased quantum of green gram processed over the size group lowered the total variable cost over the size group indicated the cost-efficiency in variable cost which was quite obvious.

### Financial viability of green gram mills

The performance of the processing industry can be accessed through the income analysis by gainfully using two important parameters viz; costs and returns. Still, the financial test ratios help processors in developing standard norms of investment and expenditure and also indicate the viability of the processing unit. Therefore, an attempt was made to compute some of the financial test ratios viz; operating ratio, fixed ratio, gross ratio and capital turn over ratio, respectively for different sized green gram dal mills processing and the result thereof are given in table 4.

**Table 4:** Financial test ratio's in green gram mills

Sr. No	Particulars	Size group		
		Small	Medium	Large
1.	Operating ratio	0.90	0.89	0.89
2.	Fixed ratio	0.032	0.023	0.019
3.	Gross ratio	0.97	0.97	0.96
4.	Capital turnover ratio	1.030	1.032	1.036

From the results, it was revealed that the operating ratio of green gram milling was for the small, medium and large size group; it was 0.90, 0.89 and 0.89 respectively. The fixed ratio of green gram dal processing in small, medium and large size group of green gram mills was 0.032, 0.023 and 0.019, respectively. The gross ratio in small, medium and large size group was 0.97, 0.97 and 0.96, respectively. From the gross ratio, it was revealed that the large sized green gram dal mills are financially more viable in processing green gram, followed by the medium and small sized green gram dal mills while milling green gram. All the three ratios, in all the size groups, were less than one indicated that green gram milling into green gram dal was a profitable activity to the miller. The capital turnover ratio was the least (1.030) in small sized dal mills and was the highest (1.036) in the large sized dal mills processing green gram, this confirmed the fact that the large sized dal mills are efficient to turn their investments into income to the larger extent.

**Table 5:** Cost of green gram processing (Rupees)

Sr. No.	Particulars	Small	Medium	Large
1.	Total fixed cost per unit	1046262.22	1778778.13	3437139.44
2.	Total variable cost per unit	534069.51	1068160.10	1712477.01
3.	Total operating cost	1580331.73	2846938.23	5149616.46
4.	Quantity Processed/day in qtls	20.42	49.63	108.84
5.	No. of working days in a year	251.67	250	266.67
6.	Quantity Gram processed per unit (qtls)	5138.19	12406.25	29024.00
7.	Fixed cost per quintal	203.62 (66.21)	143.38 (62.48)	118.42 (66.75)
8.	Variable cost per quintal	103.94 (33.79)	86.10 (37.52)	59.00 (33.25)
9.	Processing cost per quintal (7+8)	307.57 (4.99)	229.48 (3.86)	177.43 (3.00)
10.	Marketing cost per quintal	262.31 (4.26)	283.89 (4.78)	330.13 (5.58)
11.	Cost of raw material per quintal	5586.84 (90.74)	5420.00 (91.34)	5405.78 (91.41)
12.	Total cost incurred by dal mill owner (9+10+11) per quintal	6156.72 (100.00)	5933.37 (100.00)	5913.34 (100.00)

It is seen from the table 5, that the per quintal fixed cost was Rs. 203.62, Rs. 143.38 and Rs. 118.42, respectively, while per quintal variable cost was Rs. 103.94, Rs. 86.10 and Rs. 59.00, respectively in small, medium and large sized green gram dal mills. From the results, it was revealed that the per quintal total cost of green gram processing was decreasing with increase in installed capacity of dal processing.

Economics of green gram dal processing showed that total quantity processed per unit was 5138.19, 12406.25 and 29024.00 quintals respectively in small, medium and large

group. Processing cost varies according to the size group and total quantity processed. Cost of raw material is taken at the market rates at the time to which data pertain. Total cost incurred by green gram dal mill owner is calculated by adding processing cost, marketing cost and cost of raw material. It was Rs. 6156.72, 5933.37 and 5913.34 per quintal in small, medium and large unit respectively. The cost of processing was highest for small sized units, i.e. Rs. 307.57 per quintal and lowest for large sized units i.e. Rs. 177.43.



**Table 6:** Economics of green gram processing

Sr. No	Main & by product	Small			Medium			Large		
		Qt. in kg	Rs./ kg	Total (Rs.)	Qt. in kg	Rs./ kg	Total (Rs.)	Qt. in kg	Rs./ kg	Total (Rs.)
A) 1.	Dal No. 1	54.87	78.60	4313.05	55.74	76.95	4289.57	56.66	75.50	4277.68
2.	Dal No. 2	22.66	71.00	1608.73	20.21	68.50	1384.50	20.35	69.17	1407.64
3.	Broken dal	1.37	55.67	76.45	1.86	50.50	93.91	2.00	51.67	103.33
4.	Churi & chilka	19.22	18.00	345.87	20.68	17.38	359.29	19.99	17.17	343.17
5.	Waste	1.27	0.00	0.00	0.99	0.00	0.00	0.65	0.00	0.00
B)	Gross Returns			6344.11			6127.28			6131.82
C)	Total cost			6156.72			5933.37			5913.34
D)	Net Returns			187.40			193.91			218.49
E)	Benefit Cost Ratio			1.030			1.033			1.037

It could be revealed from the table 6, estimated income per quintal is calculated by adding returns received from main and by products after processing of raw material. In case of small, size group amount of dal no. 1 obtained was 54.87 kg and 22.66 kg dal no. 2, broken dal 1.37 kg, churi and chilka was 19.22 kg and waste material 1.27 kg. Prices of main and by-product were taken at the market rates at the time to which data pertain. In case of medium and large size groups amount dal no. 1 obtained was 55.74 and 20.21 kg respectively, while large size groups amount dal no. 1 obtained 56.66 and dal no 2 obtained 20.35 kg. Gross returns received were Rs. 6344.11, 6127.28, 6131.82 per quintal in small, medium and large units respectively. Net returns received were calculated by subtracting total cost incurred by dal mill owner from gross returns. The per quintal net returns over per quintal total cost of green gram

milling were Rs. 187.40, Rs. 193.91 and Rs. 218.49, respectively, in small, medium and large sized dal mills. The estimates over total cost thus confirm that the large sized dal mills are relatively more efficient than the small and medium sized dal mills in economizing the cost of milling. The benefit cost ratio was 1.030, 1.033, and 1.037 in small, medium and large units respectively. The benefit cost ratio was the highest in large size dal mills followed by medium and small size dal mills.

#### Break even analysis of green gram mills

The break-even quantity of green gram for dal mills was estimated to justify the feasibility of green gram dal mills in green gram milling for different size groups of green gram dal mills. The results on this behalf are presented in table 7.

**Table 7:** Break even analysis of green gram (qtl./unit.)

Group	Total fixed cost (Afc)	Selling price (Ps)	Variable cost (Vc)	Actual quantity of processed	Break even quantity
Small	1046262.22	6344.11	5953.09	5138.19	2675.72 (52.08)
Medium	1778778.13	6127.28	5789.99	12406.25	5273.77 (42.51)
Large	3437139.44	6131.82	5794.91	29024.00	10201.90 (35.15)

#### Figures in parentheses are percentage to the actual quantity of processed.

It is revealed from the table 7, that the per mill break-even quantity of green gram was less than the actual quantity of green gram milled by all size groups of green gram dal mills. For small, medium and large sized dal mills the break-even quantity of green gram was 52.08, 42.51 and 35.18 per cent, respectively of the actual quantity of green gram milled by those mills. The estimated break-even volume of green gram dal mills was 2675.72 quintals, 5273.77 quintals and 10201.90 quintals, respectively in small, medium and large sized green gram dal mills to achieve break-even point.

From the above discussion it quite evident that the per cent break-even quantity is decreasing over the size group, which could obviously related to the increased installed capacities of dal mills over the size group.

The foregoing discussion thus reveals that in the entire size group, the green gram dal mills operate at a level higher than their break even volume but still at a lower level than their intake capacity. This might be due to less availability of raw material.

**Value addition in green gram:** It is obtained by subtracting cost of raw material and processing cost from returns obtained from main and by – products per quintal.

**Table 8:** Value addition in green gram (Rs./quintal.)

Sr. No	Particulars	Small	Medium	Large
1	Cost of raw material	5586.84	5420.00	5405.78
2	Processing cost	307.57	229.48	177.43
3	Gross returns	6344.11	6127.28	6131.82
4	Value addition	449.71 (8.04)	477.80 (8.82)	548.62 (10.15)

#### Figures in parenthesis shows percent of value addition in cost of raw material

It is observed from the table 8, that in small size group the selling price of green gram dal was Rs. 6344.11, while the value added was Rs. 449.71. In medium size group, the selling price was Rs. 6127.28, with the value addition of Rs. 477.80. The per quintal selling price of green gram dal and

extent of value addition was Rs. 6131.82 and Rs. 548.62, respectively, in large size group of dal mills. The value addition indicated that the substantial benefit was received by the processors through processing of green gram to dal. The study of performance of green gram crop in Maharashtra reveals that the area and production of green gram was decreasing, it is because the area under soybean

cultivation is increasing day by day replacing area under other pulses such as gram, red gram, black gram and green gram, etc. The per cent capacity utilization in green gram milling was very less and was attributed to the seasonal and less availability of green gram for processing. The increased quantum of green gram over the size group provided the cost efficiency to the green gram mills. The per quintal total cost was decreasing with increase in installed capacity of dal mills in green gram milling underlined the economies of scale in green gram milling.

### Conclusions

Per quintal total cost was decrease with increase in size of green gram mills. The net return per quintal for green gram processing was found to be higher in case of large size mills as compared to medium and small size mills. Benefit cost ratio was also found to be higher in large sized green gram mills. Benefit cost ratio of agriculture industry is less because of huge initial investment in the processing industry but actual profit is more because of bulk quantity of production. To estimated break – even quantity was increase with the increase in the size of processing green gram mills. Break-even point decrease based on green gram mills growth. Value addition in processing of green gram was higher in large sized followed medium and small green gram mills.

### Policy Implication

There is need to increase the production of green gram through using high yielding variety. Government should provide subsidies to some extent for purchasing of processing machineries and equipment. The Government should focus on increasing infrastructure facility to improve the financial condition of processor.

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