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## Economics analysis of tuberose flower production in Akola district, Maharashtra

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### Abstract

The present investigation was intended to depict the picture of Tuberose cultivation in Akola district of Maharashtra. The present study was carried out to study cost structure, returns of tuberose flower during the year 2018-2019 based on primary data. A sample of 90 tuberose growers was selected based on random sampling. It was observed that, the overall level the cost of production was Rs. 3,38,386.06 i.e., Cost C<sub>3</sub> while the cost A<sub>1</sub> was about 47.57 percent and cost B<sub>2</sub> was about 74.41 percent. The major items of cultivation were Human labour, planting material, manures and fertilizers and imputed rental value of land. The per hectare gross income received from tuberose was 5,20,999.98 at overall level. The output-input ratio which indicate that the profitability of investment was observed to be 1.62 at Cost C<sub>3</sub> at the overall level. This indicated that the growing of tuberose crop is a profitable proposition.

**Keywords:** Economics analysis, tuberose flower production, human labour

### Introduction

Tuberose (*Polianthes tuberosa* L.), native to Mexico and a relative of the century plant (Agave), has long been cherished for the aromatic oils extracted from its fragrant white flowers. It is also a popular cut flower, not only for use in arrangements, but also for the individual florets that can provide fragrance to bouquets and boutonnières. Because of this popularity, a number of countries including Kenya, India, and Mexico are growing tuberose commercially for export markets in the USA, Europe and Japan (Michael, 1996) [9].

In India, single flowered type of the tuberose (White) is used for commercial cultivation. The major states producing tuberose are West Bengal, Karnataka, Tamil Nadu, and Maharashtra. The area under tuberose in India was 1.49 lakh hectares and production of loose flower was 106.49 mt and cut flower was 89.82 lakh no. (Ministry of Agriculture and Farmers Welfare. Govt. Of India 2016-17). Maharashtra is one of the progressive state cultivation of tuberose in India. Maharashtra occupies important place in floriculture industry. In Maharashtra tuberose is mainly concentrated in the districts of Pune, Nashik, Akola, Ahmednagar etc, having the total area of about 1850 ha. With a total production of about 29.12 mt in the state. (Director of Horticulture, Pune 2016-17).

### Materials and Methods

The present study was conducted in Akola district of Maharashtra state for the period 2018-19. Out of seven tahsils, five tahsils were selected for the study i.e., Akola, Patur, Barshitakali, Balapur and Murtijapur respectively on the basis of higher area under cultivation. From each tahsil three villages was selected i.e., total fifteen villages were selected. From each village six tuberose farmers were selected randomly for the study. Overall, 90 tuberose growers were selected based on random sampling. The selected farmers were personally interviewed and required data was collected from them by survey method through a specially designed schedule.

### Cost Concepts

The standard cost concept i.e., Cost A1, Cost A2, Cost B1, Cost B2, Cost C1, Cost C2 and Cost C3 was used in present analysis.

**Cost A1:** All variable cost excluding family labour cost and including depreciation

**Cost A2:** Cost A1+ Rent paid for leased-in land.

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**Cost B1:** Cost A1 + interest value of owned fixed capital assets (excluding land).

**Cost B2:** Cost B1 + Rental value of owned land (net of land revenue) and rent paid for leased in land.

**Cost C1:** Cost B1 + imputed value of family labour.

**Cost C2:** Cost B2 + Imputed value of family labour.

**Cost C3:** Cost C2 + marketing costs and transportation report.

### Benefit-cost ratio

It was calculated at cost A1, cost A2, cost B1, cost B2, cost C1, cost C2 and cost C3 by dividing gross income by respective cost.

### Results and Discussions

Table 1 it is revealed that, the average size of holding, 90 tuberose cultivators were categorized in to small, medium, large size of holding. The average size of holding of small 1.47 hectares, medium size group 2.87 and large size group was 5.77 hectares respectively. The average size is of holding was 3.37 hectares at overall level.

**Table 1:** Distribution of farmers according to size of holding

Sr. No.	Size of holding	No. of farmer selected	Average size of holdings
1	Small (Up to 2 Ha.)	45(50.00)	1.47
2	Medium (2.01 to 4.00 Ha.)	30(33.33)	2.87
3	Large (4.01 & above)	15(16.67)	5.77
	Total	90(100.00)	3.37

(Figures in parentheses indicates the percentage to total)

### Estimate the cost and returns of tuberose flowers

The cost of cultivation is helpful for crop planning therefore in order to know the cost and profitability, the cost of cultivation of turmeric for small, medium and large farmer was worked out.

### Per hectare cost of cultivation of Tuberose for small farmers

The per hectare cost of cultivation of Tuberose flower grown by the small farmers is presented in Table 2

**Table 2:** Per hectare cost of cultivation of Tuberose for small farmers (Rs)

Sr. No	Item	Unit/ha	Input	Cost / Input (Rs.)	Total Cost	Percentage to total cost	
1	Hired Human Labour	Male	Days	45.82	218.12	9994.79	3.16
		Female	Days	149.97	156.62	23487.70	7.42
	Subtotal			195.79	33482.49	10.58	
2	Bullock Labour		Days	15.47	511.34	7910.41	2.50
3	Machine charges		Hrs	10.56	303.29	3202.72	1.01
4	Seeds(corms)		Qtl.	24.20	1954.80	47304.70	14.95
5	Manures		carts	14.75	518.93	7654.15	2.42
6	Fertilizer	N	Kg.	171.51	19.26	3302.57	1.04
		P	Kg.	268.48	28.13	7553.16	2.39
		K	Kg.	169.66	20.35	3453.42	1.09
7	Irrigation charges	(Rs.)			5454.33	1.72	
8	Insecticide (Plant Protection)	(Rs.)		13	1037.33	13485.25	4.26
9	Incidental charges	(Rs.)			288.44	0.09	
10	Repairing Charges	(Rs.)			395.51	0.13	
11	Working Capital (1 to 10)	(Rs.)			133487.15	42.20	
12	Int.on wor.Cap. @ 6% /annum	(Rs.)			8009.23	2.53	
13	Depreciation	(Rs.)			2429.41	0.77	
14	Land Rev. cess & other taxes	(Rs.)			198.60	0.06	
15	COST "A1" (Items 11 to 14)				144124.39	45.56	
16	Rental Value Leased in land	(Rs.)			0	0.00	
17	COST "A2" (Items 15 to 16)				144124.39	45.56	
18	Int. on Fix.Cap. @ 10%/annum	(Rs.)			3785.93	1.20	
19	COST "B1" (Items 17 + 18)				147910.32	46.76	
20	Rental Value of Land	(Rs.)			79221.34	25.04	
21	COST "B2" (Items 19 to 20)	(Rs.)			227131.66	71.80	
22	Family Human Labour	Male	Days	77.72	217.98	16940.89	5.36
		Female	Days	275.96	157.68	43514.14	13.76
	Subtotal			353.68	60455.03	19.11	
23	Cost " C1 " (Items 19+22)	(Rs.)			208365.35	65.87	
24	Cost " C2 " (Items 21+22)	(Rs.)			287586.70	90.91	
25	cost "C2*"				28758.67	9.09	
26	Cost C3				316345.37	100.00	
27	Yield per hectare	(Rs.)	Qtl	100.35	4748.49	476519.65	
28	Per qtl. cost of main produce at Cost C3	(Rs.)			3152.36		

(Figures in parentheses indicates the percentage to cost C<sub>3</sub>)

It is revealed from the Table 2 that, the per hectare cost of production cost 'A<sub>1</sub>, A<sub>2</sub>, B<sub>1</sub>, B<sub>2</sub>, C<sub>1</sub>, C<sub>2</sub> and C<sub>3</sub>' were Rs 144124.39, Rs 144124.39, Rs 147910.32, Rs 227131.66, Rs 208365.35, Rs 287586.70 and Rs 316345.37, respectively. Cost C<sub>2</sub> contributes to 90.91 percent. The share of family labour was 19.11 percent. The per hectare yield obtained by small farmers was 100.35 quintals with gross returns of Rs

476519.65. In case of small size group, the per quintal cost of production was Rs. 3152.36.

#### Per hectare cost of cultivation of tuberose for medium farmers

The per hectare cost of cultivation of tuberose for medium farmers was worked out and presented in Table 3

**Table 3:** Per hectare cost of cultivation of tuberose for medium farmers (Rs)

Sr. No	Item	Unit/ha		Input	Cost / Input (Rs.)	Total Cost	Percentage to total cost
1	Hired Human Labour	Male	Days	49.87	215.54	10748.95	3.08
		Female	Days	211.08	159.98	33768.92	9.66
	Subtotal			260.95		44517.87	12.74
2	Bullock Labour		Days	13.93	510.08	7107.27	2.03
3	Machine charges		Hours	15.70	305.07	4788.27	1.37
4	Seeds		Qtl	25.90	2013.68	52158.99	14.92
5	Manures		carts	17.06	513.07	8753.02	2.50
6	Fertilizer	N	Kg.	212.14	21.56	4573.63	1.31
		P	Kg.	296.61	28.37	8415.12	2.41
		K	Kg.	155.23	20.52	3185.79	0.91
7	Irrigation charges	(Rs.)				6496.03	1.86
8	Plant Protection	(Rs.)				15130.20	4.33
9	Incidental charges	(Rs.)				314.74	0.09
10	Repairing Charges	(Rs.)				415.52	0.12
11	Working Capital (1 to 10)	(Rs.)				155856.45	44.60
12	Int. on wor. Cap. @ 6% /annum	(Rs.)				9351.39	2.68
13	Depreciation	(Rs.)				2704.71	0.77
14	Land Rev. cess & other taxes	(Rs.)				214.56	0.06
15	COST "A1" (Items 11 to 14)					168127.11	48.11
16	Rental Value Leased in land	(Rs.)				0	0.00
17	COST "A2" (Items 15 to 16)					168127.11	48.11
18	Int. on Fix.Cap. @ 10%/annum	(Rs.)				4447.82	1.27
19	COST "B1" (Items 17 + 18)					172574.93	49.38
20	Rental Value of Land	(Rs.)				90427.61	25.87
21	COST "B2" (Items 19 to 20)	(Rs.)				263002.54	75.25
22	Family Human Labour	Male	Days	92.93	221.08	20544.90	5.88
		Female	Days	220.36	155.06	34168.34	9.78
	Subtotal			313.29		54713.25	15.66
23	Cost " C1 " (Items 19+22)	(Rs.)				227288.18	65.03
24	Cost " C2 " (Items 21+22)	(Rs.)				317715.79	90.91
25	Cost "C2*"					31771.58	9.09
26	Cost "C3"					349487.36	100.00
27	Yield per hectare	(Rs.)	Qtl	108.87	4995.47	543853.02	
28	Per qtl. cost of main produce at Cost C3	(Rs.)				3210.15	

(Figures in parentheses indicates the percentage to cost C<sub>3</sub>)

It is revealed from the table 3 that, the per hectare cost of cultivation cost 'A<sub>1</sub>, A<sub>2</sub>, B<sub>1</sub>, B<sub>2</sub>, C<sub>1</sub>, C<sub>2</sub> and C<sub>3</sub>' was Rs. 168127.11 Rs. 168127.11, Rs. 172574.93, Rs. 263002.54, Rs. 227288.18, Rs. 317715.79 and Rs. 349487.36, respectively. The share of family labor was 15.66 percent. The per hectare yield obtained by small farmers was 108.87 qtl. with gross returns of Rs. 543853.02. In case of medium size group, the

per quintal cost of production was Rs. 3210.15.

#### Per hectare cost of cultivation of tuberose for large farmers

The per hectare cost of cultivation of tuberose for large farmers was worked out and presented in Table 4

**Table 4:** Per hectare cost of cultivation of tuberose for Large Farmer (Rs)

Sr. No	Item	Unit/ha		Input	Cost / Input (Rs.)	Total Cost	Percentage to total cost
1	Hired Human Labour	Male	Days	56.15	216.89	12177.92	3.19
		Female	Days	297.20	149.99	44576.40	11.69
	Subtotal			353.34		56754.32	14.88
2	Bullock Labour		Days	11.85	548.59	6500.79	1.70
3	Machine charges		Hrs	19.68	299.86	5902.31	1.55
4	Seeds		Qtl	27.95	2063.07	57658.49	15.12
5	Manures		carts	21.07	497.89	10490.54	2.75
6	Fertilizer	N	Kg.	233.98	23.13	5411.96	1.42
		P	Kg.	313.19	30.87	9668.18	2.54
		K	Kg.	164.81	21.48	3540.12	0.93
7	Irrigation charges	(Rs.)				7652.14	2.01
8	Insecticide (Plant Protection)	(Rs.)				16447.12	4.31
9	Incidental charges	(Rs.)				346.76	0.09
10	Repairing Charges	(Rs.)				448.36	0.12
11	Working Capital (1 to 10)	(Rs.)				180821.08	47.41
12	Int.on wor.Cap. @ 6% /annum	(Rs.)				10849.27	2.84
13	Depreciation	(Rs.)				3262.46	0.86
14	Land Rev. cess & other taxes	(Rs.)				236.12	0.06
15	COST "A1" (Items 11 to 14)					195168.93	51.17
16	Rental Value Leased in land	(Rs.)				0	0.00
17	COST "A2" (Items 15 to 16)					195168.93	51.17
18	Int. on Fix.Cap. @10%/annum	(Rs.)				4869.62	1.28
19	COST "B1" (Items 17 + 18)					200038.55	52.45
20	Rental Value of Land	(Rs.)				102440.67	26.86
21	COST "B2" (Items 19 to 20)	(Rs.)				302479.22	79.31
22	Family Human Labour	Male	Days	96.27	224.56	21619.38	5.67
		Female	Days	139.67	161.87	22608.58	5.93
	Subtotal			235.95		44227.96	11.60
23	Cost " C1 " (Items 19+22)	(Rs.)				244266.50	64.05
24	Cost " C2 " (Items 21+22)	(Rs.)				346707.17	90.92
25	Cost "C2**"					34670.717	9.09
26	Cost "C3"					381377.89	100.00
27	Yield per hectare	(Rs.)	Qtl	116.54	5286.26	616060.74	
28	Per qtl. cost of main produce at Cost C3	(Rs.)				3272.51	

(Figures in parentheses indicates the percentage to cost C<sub>3</sub>)

It is revealed from Table 4 that, the per hectare cost of cultivation of tuberose for large farmers at cost 'A<sub>1</sub>, A<sub>2</sub>, B<sub>1</sub>, B<sub>2</sub>, C<sub>1</sub>, C<sub>2</sub> and C<sub>3</sub>' was Rs. 195168.93, Rs. 195168.93, Rs. 200038.55, Rs. 302479.22, Rs. 244266.50, Rs. 346707.17 and Rs. 381377.89, respectively. Yield of main produce obtained by large farmers was 116.54 quintals and by produce was 0.00 quintals with gross return of Rs. 616060.74. The per quintal

cost of production among the medium farmers was Rs. 3272.51.

#### Per hectare cost of cultivation of tuberose for Overall farmers

The per hectare cost of cultivation of tuberose for Overall level was workout and presented in Table 5

**Table 5:** Per hectare cost of cultivation of tuberose for Overall farmers (Rs)

Sr. No	Item	Unit/ha		Input	Cost / Input (Rs.)	Total Cost	Percentage to total cost
1	Hired Human Labour	Male	Days	48.89	216.85	10602.33	3.13
		Female	Days	194.88	155.53	30309.16	8.96
	Subtotal			243.77		40911.49	12.09
2	Bullock Labour		Days	14.35	528.45	7585.60	2.24
3	Machine charges		Hours	13.79	303.16	4180.64	1.24
4	Seeds		Qtl	25.39	1993.52	50618.94	14.96
5	Manures		carts	16.57	516.17	8555.15	2.53
6	Fertilizer	N	Kg.	195.47	21.32	4166.53	1.23
		P	Kg.	285.31	29.12	8309.57	2.46
		K	Kg.	164.05	20.79	3409.84	1.01
7	Irrigation charges	(Rs.)				6167.87	1.82
8	Plant Protection	(Rs.)				14532.98	4.29
9	Incidental charges	(Rs.)				306.93	0.09
10	Repairing Charges	(Rs.)				419.80	0.12
11	Working Capital (1 to 10)	(Rs.)				149165.34	44.08
12	Int.on wor.Cap. @ 6% /annum	(Rs.)				8949.92	2.64
13	Depreciation	(Rs.)				2660.19	0.79

14	Land Rev. cess & other taxes	(Rs.)				210.26	0.06
15	COST "A1" (Items 11 to 14)					160985.71	47.57
16	Rental Value Leased in land	(Rs.)				0	0.00
17	COST "A2" (Items 15 to 16)					160985.71	47.57
18	Int. on Fix.Cap. @ 10%/annum	(Rs.)				4187.18	1.24
19	COST "B1" (Items 17 + 18)					165172.89	48.81
20	Rental Value of Land	(Rs.)				86623.07	25.60
21	COST "B2" (Items 19 to 20)	(Rs.)				251795.96	74.41
22	Family Human Labour	Male	Days	85.88	220.68	18952.00	5.60
		Female	Days	234.71	157.11	36875.73	10.90
	Subtotal					55827.73	16.50
23	Cost " C1 " (Items 19+22)	(Rs.)				221000.62	65.31
24	Cost " C2 " (Items 21+22)	(Rs.)				307623.69	90.91
25	Cost " C2*"					30762.37	9.09
26	Cost "C3"					338386.06	100.00
27	Yield per hectare	(Rs.)	Qtl	106.14	4908.61	520999.98	
28	Per qtl. cost of main produce at Cost C3	(Rs.)				3188.11	

(Figures in parentheses indicates the percentage to cost C<sub>3</sub>)

It is revealed from Table 5 that, the per hectare cost of cultivation of tuberose for large farmers at cost 'A<sub>1</sub>, A<sub>2</sub>, B<sub>1</sub>, B<sub>2</sub>, C<sub>1</sub>, C<sub>2</sub> and C<sub>3</sub>' was Rs. 160985.71, Rs. 160985.71, Rs. 165172.89, Rs. 251795.96, Rs. 221000.62, Rs. 307623.69 and Rs. 338386.06, respectively. The share of family labor was 16.50 percent. Yield of main produce obtained by large farmers was 106.14 quintals with gross returns of Rs.

520999.98. The per quintal cost of production among the medium farmers was Rs. 3188.11.

#### Per hectare cost and returns from Tuberose

The per hectare cost and return of the tuberose was worked out for small, medium and large farmers were presented in Table 6

**Table 6:** Per hectare cost and returns from Tuberose (Rs)

Sr. No.	Particulars	Small	Medium	Large	Overall
1	Main produce (q/ha)	100.35	108.87	116.54	106.14
2	Value of Main Produce	4748.49	4995.47	5286.26	4908.61
3	Gross Returns	476519.65	543853	616060.74	520999.98
4	<b>Cost of Cultivation at</b>				
	Cost "A1"	144124.39	168127.11	195168.93	160985.71
	Cost "A2"	144124.39	168127.11	195168.93	160985.71
	Cost "B1"	147910.32	172574.93	200038.55	165172.89
	Cost "B2"	227131.66	263002.54	302479.22	251795.96
	Cost "C1"	208365.35	227288.28	244266.50	221000.62
	Cost "C2"	287586.70	317715.79	346707.17	307623.69
	Cost "C3"	316345.37	349487.36	381377.89	338386.06
5	<b>Returns at</b>				
	Cost "A1"	332395.26	375725.91	420891.81	360014.28
	Cost "A2"	332395.26	375725.91	420891.81	360014.28
	Cost "B1"	328609.33	371278.09	416022.19	355827.10
	Cost "B2"	227131.66	280850.48	313581.52	269204.03
	Cost "C1"	268154.30	316564.84	371794.24	299999.36
	Cost "C2"	188932.96	226137.23	269353.57	213376.29
	Cost "C3"	160174.29	194365.66	234682.85	182613.93
5	<b>Output input ratio at</b>				
	Cost "A1"	3.31	3.23	3.16	3.24
	Cost "A2"	3.31	3.23	3.16	3.24
	Cost "B1"	3.22	3.15	3.08	3.15
	Cost "B2"	2.10	2.07	2.04	2.07
	Cost "C1"	2.29	2.39	2.52	2.36
	Cost "C2"	1.66	1.71	1.78	1.69
	Cost "C3"	1.51	1.56	1.62	1.54

It can be seen from the table that the returns at cost C<sub>3</sub> have shown an increasing trend in accordance with an increase in the size of holdings. As noted earlier, the large sized land holders used more physical inputs of labour, manures, fertilizers and pesticides. The per hectare cost of cultivation at cost C<sub>3</sub> was worked out to Rs. 316345.37, Rs. 349487.36 and Rs. 381377.89 on small, medium and large sized groups of farms, respectively. The net returns at cost C<sub>3</sub> worked out to

Rs. 160174.29, Rs. 194365.66 and Rs. 234682.85 per hectare on small, medium and large size groups of farms, respectively. At the overall level, it worked out to Rs. 182613.93. The input-output ratio which is an indicator of economic efficiency in crop production for the crop and other discussion indicated that Tuberose registered a good input-output ratio 1.54 at overall level means Tuberose is profitable crop.

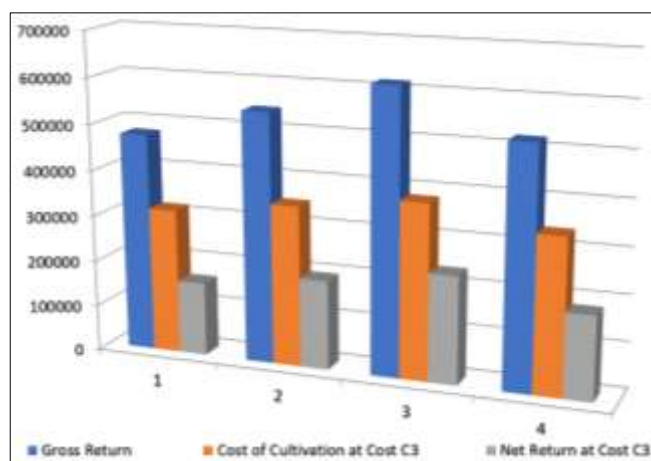


Fig 1: Per hectare cost and returns from Tuberose

### Conclusions

At the overall level the cost of production was Rs. 3,38,386.06 i.e. Cost C<sub>3</sub> while the cost A<sub>1</sub> was about 47.57 percent and cost B<sub>2</sub> was about 74.41 percent. The major items of cultivation were Human labour, planting material, manures and fertilizers and imputed rental value of land. Cost of production was highest in large sized farms followed by medium and small size groups of holdings. The profit at cost A<sub>1</sub>, cost A<sub>2</sub>, cost B<sub>1</sub>, cost B<sub>2</sub>, cost C<sub>1</sub>, cost C<sub>2</sub>, and cost C<sub>3</sub> was highest in large size groups of holding followed by medium and small size groups of holdings. Thus, the net profit increased with the increase in the size of holdings. It is greater than 1, therefore tuberose is a profitable crop. The output-input ratio at cost C<sub>3</sub> was highest in large size groups followed by medium and small size groups of holdings.

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