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Economic Analysis of Production of a Little Gourd (*Coccinia grandis*) in Central Gujarat

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ABSTRACT

Background: Little gourd is important vegetable crop that provide a considerable amount of income to farm families in Central Gujarat. The present investigation was undertaken with the goal to study the cost and return in cultivation of little gourd in central Gujarat.

Methods: For this purpose, primary data was collected from 120 little guard farmers from three districts namely Anand, Kheda and Vadodara and categorized according to size of holding as marginal, small, medium and large farms. To arrive at conclusion the data was analyzed with cost concepts and relevant income measures.

Result: The study found that the average per hectare cost of cultivation, gross income and net income of little gourd followed an increasing pattern from marginal to large farm sizes. The input output ratio was found decreasing as the farm size increased. The study suggested that there is enough scope of enhancing net returns through increasing the scale of operations at farm level that may be achieved by organizing small and medium farmers into producer organizations. Over and above this, the farmers should be encouraged for production of export-oriented quality to further increase the farm income.

Key words: Cost of cultivation per hectare, Cost of production per quintal, Gross Income, Input-output ratio, Net income.

INTRODUCTION

India is considered as basket of fruits and vegetables in the world. Diversified climate of India assures availability of wide range of fresh fruits and vegetables. India ranks second in fruits and vegetables production in the world next to China. As per National Horticulture Database-2019-20, India produced 191.77 million metric tons of vegetables accounting for 8.6 per cent of the world vegetable production. In India, the growth in agricultural and horticultural sector needs to be accelerated to generate more surpluses for export in order to earn foreign exchange. Vegetable now-a-days, are considered as most profitable cash crop and can play important role in raising economic status to small and marginal farmers as well as it provides source of many nutrients. Among the various families of vegetables, the family cucurbitaceous consists of five species grown worldwide for their edible fruit, variously known as summer squash, winter squash, pumpkins and gourds like bottle gourd, bitter gourd, pointed gourd, little gourd, *etc.* Among them, little gourd (*Coccinia grandis*) is a perennial tropical vine belonging to Cucurbitaceae family. It is also known as Ivy gourd or baby watermelon. In India, it is called by different names like Giloda, Tindora, Tondli, Kundru, Kovakka, Tonde kai *etc.* Little gourd is one of the most valuable vegetable crop among the different cucurbits because of its nutritional value. Apart from being a profitable crop, it possesses varied medicinal properties (especially for diabetic patient) and also finds its importance in export markets. Little gourd is mainly planted in rainy season (June-July) or in spring (Feb-March) through cuttings method (35 to 40 cm long containing 2 to 3 nodes) or using tissue cultured planting materials. (Acharya and Patel, 2017). Such creeper vegetables require support system like bower(mandap) which is made up of pillars and wires. It is established using Bamboo, Nilgiri or Cacia as wooden pillars, iron pillars and cement pillars. The galvanized wires of 16 gauge and 8 gauge are also utilized to make a net like structure. Sherif (2012) reported that creeper vegetables grown using trellis prevent root decaying caused normally due to water logging conditions.

Balaji *et al.* (2016) reported that because of high initial investment of pandal erection, which could not be afforded by marginal and small farmers, only majority of large farmers cultivated pandal vegetables which led marginal and small farmers to approach for getting pandal subsidy from government. Nevertheless, the knowledge regarding cost, return and profitability of little gourd cultivation are useful to the farmers in making various production related decisions. The findings of the study will help to increase the area under

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little gourd by knowing the profitability of crop and also serve as a useful tool to the government for addressing policy related issues for increasing the area and production of little gourd. Considering the importance of cultivation of little gourd, the present investigation was undertaken with following specific objectives:

1. To estimate cost of cultivation and returns per hectare for little gourd crop.
2. To estimate the cost of production per quintal and input-output ratio of little gourd.

MATERIALS AND METHODS

To satisfy the objectives of the study, multi stage technique was adopted. The study was carried out during the year 2017-18. Three districts namely Anand, Kheda and Vadodara were purposively selected from nine district of central Gujarat based on highest area under the crop. At the second stage, 2 talukas from each district were selected purposively on the basis of crop area under little gourd. In the third stage, two villages from each taluka were selected randomly. In the final stage, a separate list of little gourd growers of selected twelve villages was prepared along with their size of holdings *i.e.* marginal (below 1.0 hectare), small (1.0 to 2.0 ha.), medium (2.0 to 4.0 ha.) and large (above 4.0 ha.). Thereafter a sample of 20 little gourd growers was selected randomly from each of the selected talukas ensuring representation of the four strata. The study covered 6 talukas, 12 villages and 120 little gourd growers (55 marginal, 28 small, 22 medium and 15 large) from Anand, Kheda and Vadodara districts (Table 1).

Cost concepts

The costs and returns of little gourd were analyzed to examine the economics of crop production. The cost concepts used for estimating costs, gross returns and net returns are given below:

Cost A (operating cost or paid out cost) The following items are included in Cost A:

(i) Cost of hired human labour.
(ii) Cost of owned and hired bullock labour.
(iii) Cost of planting material (purchased).
(iv) Cost of manures (owned and purchased).
(v) Cost of fertilizers.
(vi) Cost of plant protection chemicals.
(vii) Irrigation charges.
(viii) Charges for machineries (owned and hired).
(ix) Depreciation on farm building and implements and bower.
(x) Interest on working capitals.
(xi) Other paid out expenses.

Cost B: Cost A + Imputed rental value of owned land + Imputed interest on owned fixed capital assets (excluding land).

Cost C_1: Cost B + Imputed value of family labour.

Cost C_2 (total cost): Cost C_1 + 10 per cent of the Cost C_1 as managerial charges.

Weighted average price (Rs/q)

Weighted average price = {(yield of Grade A*price of Grade A) + (yield of Grade B*price of Grade B) + (yield of Grade C*price of Grade C)}/sum of yield (Grade A+Grade B+Grade C).
*Here, Grade A, Grade B and Grade C are different varieties of little gourd observed in the market during survey.

Gross income (Rs) = Yield(q/ha) * weighted average price (Rs/q).

Income measures =

(I) Value of gross output (Gross income) = It is calculated by considering the total production of little gourd in quintal and price prevailing of product per quintal.
(II) Farm business income = Gross Income - Cost A
(III) Family labour income = Gross Income -Cost B.
(IV) Farm investment income = Net Income + Rental value of owned land + Interest on owned fixed Capital.
(V) Net income (profit or loss) = Gross income - Cost C_2 .

Cost of production over different costs (Rs/q)

(I) Cost of production over Cost A = Cost A/yield
(II) Cost of production over Cost B = Cost B/yield
(III) Cost of production over Cost C_1 = Cost C_1/yield
(IV) Cost of production over Cost C_2 = Cost C_2/yield

RESULTS AND DISCUSSION

Break up of total cost of cultivation for little gourd (Rs/ha)

On an overall basis, per hectare total cost (cost c_2) of cultivation of little gourd was worked out to be Rs. 241916. The per hectare total cost of cultivation was found highest in case of large farms (Rs 275507) followed by medium (Rs 262865), small (Rs 242292) and marginal farms (Rs 224184). Increasing trend in total cost was observed due to the intensive use of planting materials, manure, fertilizers, irrigation and plant protection chemicals as compared to other categories of farms. The highest cost in case of large farmers was also reported by Sankhe *et al*. (2008). Among the different costs incurred in cultivation of little gourd, maximum share was that of cost of human labour (11.09 per cent) followed by fertilizer (10.21 per cent), planting material (9.21 per cent), depreciation on bower and farm implements (6.84 per cent), manure (3.22 per cent), picking cost (2.77 per cent), tractor charges (2.43 per cent), irrigation (1.89 per cent), plant protection chemicals (1.09 per cent) and miscellaneous cost (0.11 per cent). The highest cost not payable in cash but accounted as expenditure was rental value of owned land (30.24 per cent) followed by managerial costs (9.09 per cent), interest on fixed capital (6.74 per cent) and interest on working capital (5.08 per cent). The cost of human labour was observed highest among all expenditures because picking/harvesting and inter-culture operations were done manually. The findings were in consonance with Balaji *et al*. (2016); Rathod *et al*. (2016) and Singla *et al*. (2006). It could be also inferred from Table 2 that overall per hectare Cost A was found to be Rs 114617. The highest per hectare Cost A was Rs 134883 on large farms and lowest Rs 103924 on marginal farms. Further, the results also

Table 1: Details regarding sample villages and little gourd growers.

Districts	Talukas	Villages	Farm size groups				Total
			Marginal	Small	Medium	Large	
Anand	Anklav	Chamara	11	0	2	0	13
		Bamangam	4	0	3	0	7
	Borsad	Davol	7	3	3	0	13
		Bodal	3	0	4	0	7
Kheda	Kathlal	Bhaner	2	0	4	6	12
		Kathlal	8	0	0	0	8
	Mahemdabad	Aamsaran	10	0	0	0	10
		Nenpur	1	0	1	8	10
Vadodara	Padra	Mahuvad	7	0	2	0	9
		Vishrampura	2	9	0	0	11
	Vadodara	Sokhda	0	10	2	1	13
		Ajod	0	6	1	0	7
	Total		55	28	22	15	120

Table 2: Break up of total cost of cultivation for little gourd (Rs/ha).

Items	Category of farm				
	Marginal	Small	Medium	Large	Overall
Human labour	26739 (11.92)	27711 (11.43)	26265 (10.00)	26369 (9.57)	26833 (11.09)
(a) Family	16842 (7.51)	16893 (6.97)	13684 (5.21)	13491 (4.90)	15856 (6.55)
(b) Hired	9897 (4.41)	10818 (4.46)	12581 (4.79)	12878 (4.67)	10977 (4.54)
Planting materials	19289 (8.60)	21383 (8.83)	26421 (10.05)	28878 (10.48)	22284 (9.21)
Manure	7744 (3.45)	7923 (3.27)	7387 (2.81)	8286 (3.01)	7788 (3.22)
Fertilizers	22162 (9.89)	25788 (10.64)	26989 (10.27)	28584 (10.38)	24696 (10.21)
Irrigation	4594 (2.05)	4512 (1.86)	4593 (1.75)	4649 (1.69)	4581 (1.89)
Plant protection chemicals	2562 (1.14)	2605 (1.08)	2768 (1.05)	2803 (1.02)	2640 (1.09)
Tractor charges	5316 (2.37)	5739 (2.37)	6743 (2.57)	6909 (2.51)	5876 (2.43)
Picking cost (Rs/ha)	6032 (2.69)	7091 (2.93)	6859 (2.61)	8135 (2.95)	6694 (2.77)
Miscellaneous cost	195 (0.09)	288 (0.12)	298 (0.11)	347 (0.13)	255 (0.11)
Depreciation (bowerand farm Implements)	14998 (6.69)	16516 (6.82)	18812 (7.16)	18962 (6.79)	16547 (6.84)
Interest on working capital @ 12%	11135 (4.97)	12320 (5.08)	13614 (5.18)	14452 (5.25)	12280 (5.08)
Rental value of owned land*	68445 (30.53)	72039 (29.73)	79505 (30.25)	83181 (30.19)	73153 (30.24)
Interest on fixed capital@ 10%	14593 (6.51)	16350 (6.75)	18715 (7.12)	18905 (6.86)	16298 (6.74)
Managerial cost	20380 (9.09)	22027 (9.09)	23897 (9.09)	25046 (9.09)	21992 (9.09)
Cost A	103924 (46.36)	114983 (47.46)	127065 (48.34)	134883 (48.96)	114617 (47.38)
Cost B	186962 (83.40)	203372 (83.94)	225284 (85.70)	236969 (86.01)	204068 (84.35)
Cost C_1	203804 (90.91)	220265 (90.91)	238968 (90.91)	250461 (90.91)	219924 (90.91)
Total cost (Cost C_2)	224184 (100.00)	242292 (100.00)	262865 (100.00)	275507 (100.00)	241916 (100.00)

Note: Figure in the parenthesis are percentage to total cost (cost c_2). *Rental value of owned land calculated by 1/6th of gross return.

showed that on an overall basis, share of Cost A, Cost B and Cost C_1 accounted for about 47.38, 84.35 and 90.91 per cent of the total Cost C_2, respectively. The overall share of Cost A (47.38 per cent) were quite closer to the results reported by Shende *et al*. (2015) and Rathod *et al*. (2016).

Yield, weighted average price and gross income

A perusal of the Table 3 reveals that an average yield of little gourd was 327.09 q/ha. (Kumar and Kumar, 2020). It increased from 309.91 quintals on marginal farms to 360.72 quintals on large farms. On an average, per hectare average

Table 3: Yield, weighted average price and gross income.

Category of farm	Yield (q)	Weighted average price (Rs/q)	Gross income (Rs)
Marginal	309.91	1336	413902
Small	323.43	1341	433569
Medium	351.75	1365	480132
Large	360.72	1384	499363
Overall	327.09	1348	440982

Table 4: Income received by the little gourd growers (Rs/ha).

Particular	Category of farm				
	Marginal	Small	Medium	Large	Overall
Farm business income	309979	318586	353068	364480	326365
Family labour income	226941	230196	254848	262394	236914
Farm investment Income	272756	279667	315487	325943	288517
Net income	189718	191277	217267	223857	199066

Table 5: Cost of production per quintal on the basis of different cost concepts (Rs/q).

Category of farm	Cost of production			
	Cost A	Cost B	Cost C_1	Cost C_2
Marginal	335 (46.36)	603 (83.40)	658 (90.91)	723 (100.00)
Small	356 (47.46)	629 (83.94)	681 (90.91)	749 (100.00)
Medium	361 (48.34)	640 (85.70)	679 (90.91)	747 (100.00)
Large	374 (48.96)	657 (86.01)	694 (90.91)	764 (100.00)
Overall	350 (47.38)	624 (84.35)	672 (90.91)	740 (100.00)

Note: Figure in parenthesis indicate percentage to Cost C_2.

price (weighted average price) received was Rs 1348/q. The highest price received was found on large farm (Rs 1384) followed by medium (Rs 1365), small (Rs 1341) and marginal farm (Rs 1336). The findings on average price received was quite closer to results reported by Bala *et al*. (2011). Generally, large and medium farm growers sold their produce at relatively higher prices compared to small and marginal farms, which could be attributed to better bargaining powers due to large marketable surplus (Kulkarni *et al*. 2011). The overall average gross income per hectare on little gourd farms amounted to Rs 440982 and it increased from Rs 413902 on marginal farms to Rs 499363 on large farms. Farm size and productivity were observed to be positively associated (Maurya *et al*. 2015). This could be attributed to adequate and more efficient utilization of resources on large farms.

Income parameters

As can be observed from Table 4, the overall per hectare farm business income, family labour income and farm investment income were found to be Rs 326365, Rs 236914 and Rs 288517, respectively. The net profit per hectare (over Cost C_2) was found to be Rs 199066 for all farms. The analysis also brought to the fore that net profit per hectare increased from Rs. 189718 to Rs. 223857 in case of marginal to large farm size respectively. These findings were in conformity with Krishna *et al*. (2021); Kshirsagar *et al*. (2016); Mathew *et al*. (2019).

Cost of production per quintal

As given in Table 5, overall paid out cost (cost A) per quintal was Rs 350, which was 47.38 per cent of the total cost. The overall cost B was to Rs 624 per quintal which was 84.35 per cent of total cost. The overall total cost of production (Cost C_2) per quintal of little gourd ranged from Rs 723 to Rs 764 in case of marginal to large farm size respectively, with an average of Rs740 on sample farms.

Table 6: Input-output ratio over different costs.

Category of farm	Input-output ratio			
	Cost A	Cost B	Cost C_1	Cost C_2
Marginal	3.98	2.21	2.03	1.85
Small	3.77	2.13	1.97	1.79
Medium	3.78	2.13	2.01	1.83
Large	3.70	2.11	1.99	1.81
Overall	3.85	2.16	2.01	1.82

Input-output ratio over different costs

The input-output ratio reflects the criteria for economic viability of the crop based on return per rupee invested. It is observed from the Table 6 that the overall input-output ratio over Cost A, Cost B, Cost C_1 and Cost C_2 was found to be 3.85, 2.16, 2.01 and 1.82, respectively. An overall input-output ratio which was found to be 1:1.82 on the basis of Cost C_2 indicated that an investment worth Rs 1.00 on all the inputs used in the cultivation of little gourd yielded an output worth Rs 1.82. The input-output ratio on all types of costs concepts i.e. Cost A (paid out costs), Cost B, Cost C_1 and Cost C_2 showed a decreasing trend from marginal to large farm size. The identical results were also reported by Hile *et al*. (2012). The BCR results for bitter gourd reported by Balaji *et al*. (2016) were closer to these findings. The results of overall input-output ratio on the basis of Cost C_2 was in conformity with Daundkar *et al*. (2015), Shende *et al*. (2015) and Krishna and Chandra (2017).

CONCLUSION

It is evident that the little gourd was profitable vegetable crop in central Gujarat region that offers greater potentiality in generating income and employment at farm level. It was observed that per hectare total cost of cultivation was highest in case of large farms and lowest in marginal farms that may be attributed to the intensive use of agri. inputs in large

category farms. The increase in farm size is accompanied by higher productivity and remunerative price fetched by large farmers as compared to other categories of little guard growers. However, the input-output ratio on all types of costs decreased with increase in farm size because of judicious expenditure in marginal and small farms. Based upon the results and findings of the study, it is suggested that the farmers may be encouraged to form producer organizations that will help in increasing the scale of operations thereby strengthening bargaining power of the small and marginal farmers and can also help in improving the net returns from little guard cultivation. There is also a need to educate farmers regarding proper "package of practices" to produce exportable quality for targeted countries along with development of export oriented infrastructural and logistics facilities.

Conflict of interest: None.

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