



Research Article

ECONOMIC ANALYSIS OF PROFITABILITY IN TOMATO PRODUCTION AT DIFFERENT SEASONS AND MARKET PRICES: A STUDY IN KOLAR DISTRICT OF KARNATAKA

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Abstract: This study was conducted during 2015-16 in 3 taluks/blocks of Kolar district, Karnataka. The total sample size was 150 tomato growers, 50 from each taluks. Farmers grew hybrids in Malur taluk, high yielding varieties (HYVs) in Mulbagal and both in case of Srinivaspura taluk. Since there was high volatility in tomato prices, most of the farmers cultivated tomato in 3 seasons depending upon the availability of irrigation in anticipation of good profits in any one season of the crop. Hence, an attempt was made to study the cost of cultivation, marketing costs and returns per rupee expenditure (RRE) of growing tomato at different price levels and seasons. Results showed that, around 31 to 37 percent of the total cost of cultivation comprised of labour cost. Total labour cost was highest in Malur taluk (Rs. 60592 per acre) for hybrids compared to HYVs grown in Srinivaspura (Rs. 55271 per acre) and Mulbagal taluks (Rs. 43164 per acre). The total cost of cultivation was lowest for all the three seasons for HYVs in Mulbagal taluk compared to hybrids grown in Malur and Srinivaspura taluks, respectively. Net profit earned per acre of tomato cultivated was highest for hybrids (Rs. 114707) than HYVs (Rs. 84287) of tomatoes. The highest RRE for tomato cultivation was in Malur taluk (1.70) followed by Srinivaspura taluk (1.64) and Mulbagal taluk (1.60) at average prices. The cost of producing one kg of tomato ranged from Rs 12 to 13 and the average price received by farmers ranged from Rs 14 to 15 per kg of tomato. This narrow margin of profit for the farmers can be increased by decreasing the cost of cultivation. Hence, further research has to be conducted on cost effective production and protection technologies in tomato production.

Keywords: Tomato production, Cost of cultivation, Prices, Profit, Net returns, Season

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Introduction

Tomato (*Solanum lycopersicum* L.) is one of the most versatile vegetables as it is widely used in Indian culinary preparations which can be consumed either as raw, cooked or in processed forms. It is the third most widely grown vegetable in India after potato and onion with year round production and consumption. Indian tomatoes are usually produced and harvested by small farmers. Fresh tomato and tomato products are economically important as they are not only a source of income generation for households but also create employment opportunities with access to small farmers to participate in the market. The outbreak of pests and diseases play a major role in reducing the yield of tomato and the profit margin to the farmers [1]. A study in Ethiopia also showed that the small farmers were interested in tomato production more than any other vegetable crops for its multiple harvests and high profit per unit area [2]. However, sometimes the surplus production of tomato causes glut in the market, leading to distress sale and low profit to the growers. There are many factors which significantly influence the profit margin in tomato cultivation and marketing. Factors which affected profit of the tomato at wholesale level were formal education status, cost of labour for wholesaling activities, purchase price, cost of transportation and the selling price [3]. Hybrid tomato cultivation was observed to be a profitable crop; but there were several constraints to its higher yield production [4]. Tomato prices were exhibited to high volatility due to variation in arrivals which many a times resulted in making good profits /incurring losses [5]. Hence, this study was taken up with an objective of analysing costs and returns from tomato cultivation and the varying returns to investment at different prices, seasons and the type of cultivars of tomato grown at different taluks in Kolar district of Karnataka state.

Methodology

Primary data was collected from 150 tomato growers from 3 taluks of Kolar District, Karnataka. Purposive sampling of tomato growers were carried out selecting 50 from each taluks namely Malur, Mulbagal and Srinivaspura taluk. Data was also collected on wholesale prices, arrivals and transportation costs from exclusive tomato markets at Mulbagal and Kolar. The study was conducted during the year 2015-16. Tomato growers at Malur taluk were cultivating hybrid tomatoes whereas, high yielding varieties were cultivated in Mulbagal taluk and both were grown in Srinivaspura taluk. Many farmers cultivated tomato in all the 3 seasons (*kharif*, *rabi* and summer) of the year to fetch higher prices in any of the season in anticipation to make good profits. Again this depended on the availability of irrigation water for cultivation; which made few farmers to take up the crop in 2 seasons and rest of them grew in any single season along with other crops to leverage risk of volatility in its market prices. Primary data pertaining to various farm inputs and labour used for tomato cultivation were collected both in terms of quantity and value; their respective costs involved in production and marketing of tomato were analysed separately as variable costs, fixed costs and marketing costs. The returns were calculated based on the prevailing market prices and the return per rupee investment was calculated using the following formula

$$\text{Return per rupee of expenditure} = \frac{\text{Gross returns}}{\text{Total cost}}$$

Table-1 Variable input cost and fixed cost of tomato (Rs/farm)

Particulars	Malur taluk (Hybrids) (n = 50)			Mulbagal taluk (HYV) (n = 50)			Srinivaspura taluk (Both) (n = 50)		
	Quantity	Value	% to Total	Quantity	Value	% to Total	Quantity	Value	% to Total
Average area per farm	2.0 acre			2.0 acre			3.1 acre		
Variable input cost									
Manure (Tractor load)	12	38800	11.76	8	17130	6.10	12	30160	5.79
Seedlings (No.)	11360	9700	2.94	15105	7730	2.75	22430	18104	3.47
Fertilizers		18950	5.74		27070	9.64		52700	10.11
Sticks (No.)	3053	11130	3.37	4240	16721	5.95	6915	28087	5.39
Wire (kg)	65	4577	1.39	40	3015	1.07	86	5571	1.07
Thread (kg)	128	8020	2.43	110	9125	3.25	235	15511	2.98
Plastic mulch (kg)	96	18550	5.62	96	17055	6.07	210	31265	6.00
Weedicide		5430	1.65		4895	1.74		6425	1.23
Plant Protection Chemicals		49460	14.99		46212	16.45		88318	16.95
Human Labour		121185	36.72		86328	30.73		171339	32.87
Machine Labour		6193	1.88		6038	2.15		14726	2.83
Irrigation charges		4178	1.27		4178	1.49		6475.9	1.24
Interest on working capital (8% pa)		5923	1.79		4910	1.75		9374	1.80
TVC (Rs/farm)	302096			250407			478056		
TVC per acre	151048			125203			154211		
Fixed cost									
Depreciation	3563			3563			4725		
Interest on fixed capital (8%)	4377			6945			7396		
Rental value of land	20000			20000			31000		
Land revenue	16.66			16.66			25.82		
TFC (Rs./farm)	27957			30525			43147		
Total cost of cultivation (Rs./farm)	330053			280932			521202		
Total cost of cultivation (Rs./acre)	165027			140466			168130		
Total Marketing cost	84278			63842			132460		
Total cost	414331			344774			653662		

Table-2 Labour man-days and labour cost in tomato (Value in Rs/farm)

Particulars	Malur taluk (Hybrid) (n = 50)						Mulbagal taluk (HYV) (n = 50)						Srinivaspura taluk (Both) (n = 50)					
	Hired Labour			Family Labour			Hired Labour			Family Labour			Hired Labour			Family Labour		
	M	F	V	M	F	V	M	F	V	M	F	V	M	F	V	M	F	V
Average area (acre)	2 ac						2 ac						3.1 ac					
Wage rate (Rs./day)	360	179					258	141					294	150				
Land preparation	8		4250	2		720	6		3120	2		516	12		10440	3		882
Manure application	6		3560	4		1440	4		2178	4		1032	10		4524	6		1764
Transplanting		15	2426		4	716		10	1822		4	564		20	3027		6	900
Fertilizer application	8		2644	4		1440	8		2350	4		1032	12		3201	10		2940
Bed preparation /Intercultivation	15		6246	6		2160	12		5032	8		2064	15		8568	15		4410
Wiring	10		4792	4		1440	10		3000	6		1548	12		4671	10		2940
Threading		80	18538	6	4	2876		50	9992	4	4	1596		120	25227	6	6	2664
Mulching	20		13990				15		9452				15		15444			
Weeding		35	5018					45	5756					50	10371			
PPC application	6		2200	6		2160	10		3200	4		1032	10		3900	10		2940
Harvesting and grading		150	32894	20	25	11675		150	20362	25	30	10680		300	48456	30	35	14070
Total	73	280	96558	52	33	24627	65	255	66264	57	38	20064	86	490	137829	90	47	33510
Total per acre	37	140	48279	26	17	12314	33	128	33132	29	19	10032	28	158	44461	29	15	10810
Total male labour						125						122						176
Total male labour per acre						63						62						57
Total female labour						313						293						537
Total female labour per acre						157						147						173
Percent of family labour per acre						19.55						22.97						19.13
Total labour cost (Rs./farm)						121185						86328						171339
Total labour cost (Rs/acre)						60592						43164						55271

Note: M indicate male worker, F indicates female worker and V is the value of labour cost

Results & Discussion

The major cost component in total cost of cultivation in tomato was the labour cost which formed around 37, 31 and 33 percent in Malur, Mulbagal and Srinivaspura taluks. Farmers of Srinivaspura taluk incurred highest cost of cultivation per acre (Rs.168130) and also higher proportion of variable cost in total cost followed by Malur and Mulbagal taluks. The cost of cultivating hybrids was more than that of HYVs. A study conducted in Kolar district observed that cost of raising hybrid tomato was very high at Rs. 22500 per ha as against Rs. 9200 per ha in the case of local or improved variety [9]. The highest number of labours was used for harvesting and grading. Tomato is harvested in several pickings, 4 to 6 weeks in regular intervals. Harvested tomatoes were graded in the same field usually up to 3 grades and transported to markets on the same day. Total labour cost was

highest in Malur taluk (Rs. 60592 per acre) for hybrids compared to HYVs grown in Srinivaspura (Rs. 55271 per acre) and Mulbagal taluks (Rs. 43164 per acre). Graded tomatoes were packed into plastic boxes of 15 kg each and transported to the tomato market. These crates were available for rent at Rs. 2 per crate in case of Malur and Srinivaspura taluks and they are taken to Kolar market. It costs around Re. 1 per crate in case of Mulbagal taluk where tomato was taken to Vaddahalli market. The cost of plastic crates was based on the distance travelled to the market. The loading and unloading charge paid was Re. 1 per crate. One of the major marketing costs incurred by tomato farmers was the commission paid at the market where the traders charged 9 to 10 percent commission charges from the growers. Income from tomato was worked out at three price levels received by farmers; as prices of tomato fluctuate on daily and weekly basis affecting both-

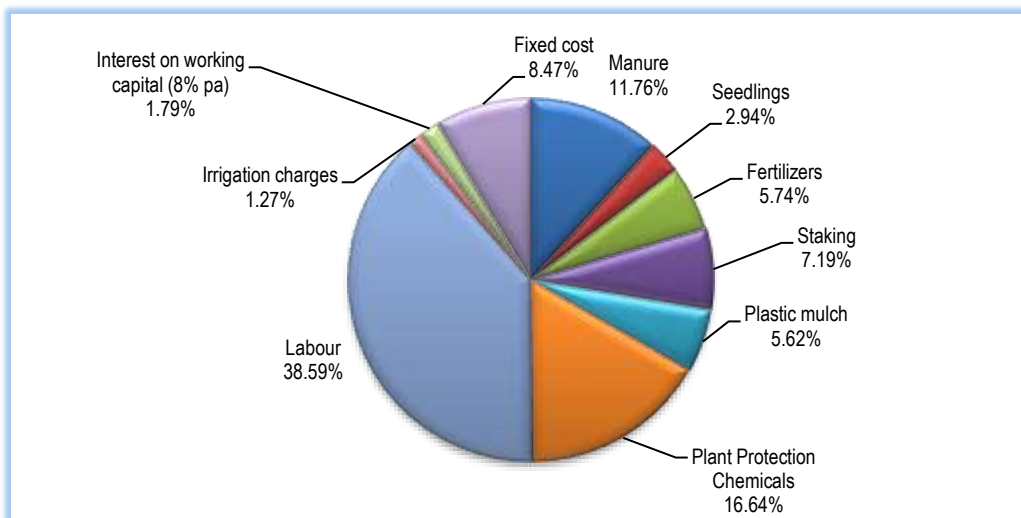


Fig-1 Percentage share of variable and fixed costs in cultivation

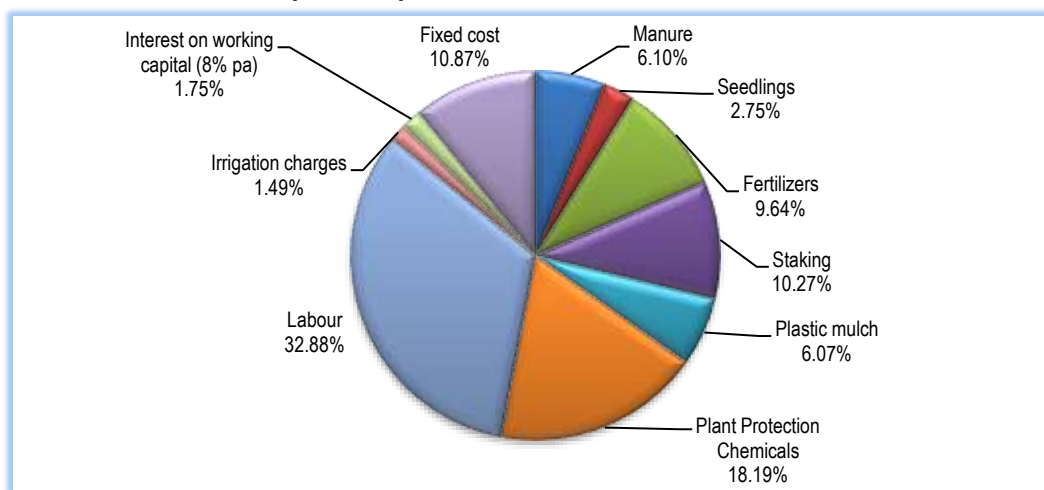


Fig-2 Percentage share of variable and fixed in of hybrid tomatoes in Malur taluk cultivation of HYVs of tomatoes in Mulbagal taluk

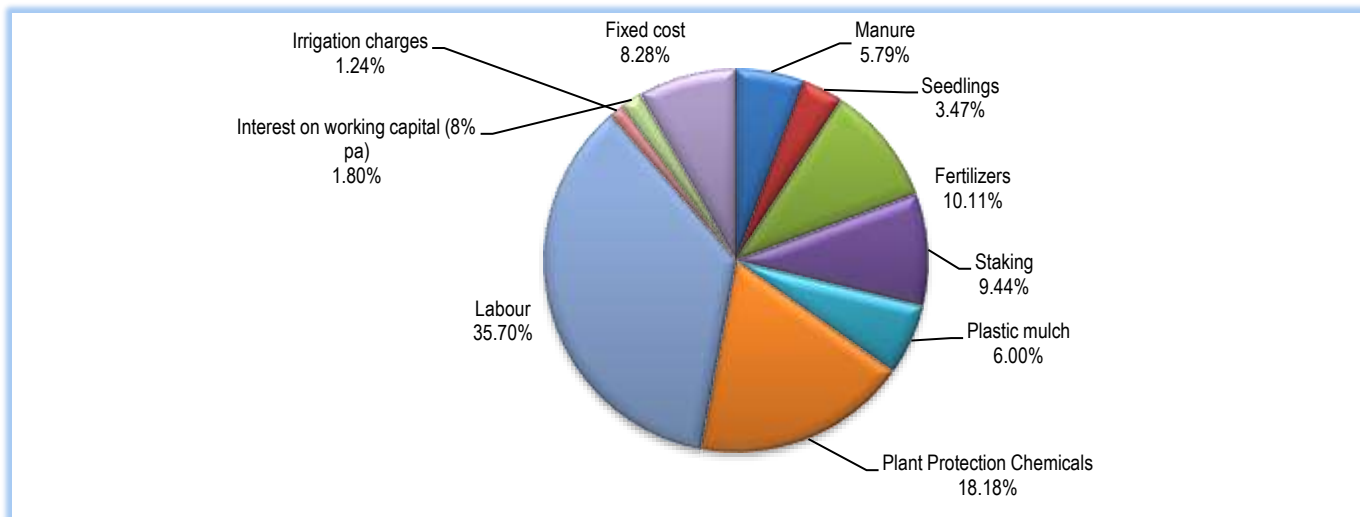


Fig-3 Percentage share of variable and fixed costs in cultivation of both hybrids and HYVs of tomatoes in Srinivaspura taluk

Table-3 Marketing cost of tomato

Particulars	Malur taluk (Hybrids)			Mulbagal taluk (HYV)			Srinivaspura taluk (Both)		
	Quantity	Value	% to total	Quantity	Value	% to total	Quantity	Value	% to total
Plastic crate (No.)	2513	5026	5.96	2099	2099	3.29	3900	7800	5.89
Transportation cost	2513	25130	29.82	2099	14693	23.01	3900	42900	32.39
Loading & unloading	2513	3770	4.47	2099	2099	3.29	3900	4680	3.53
Commission	9%	50352	59.75	10%	44951	70.41	9%	77080	58.19
Total marketing cost (Rs.)		84278	100		63842	100		132460	100
Total marketing cost (Rs./q)			224			203			226

Note: TC - Total cost, TCOC - Total cost of cultivation, VC - Variable cost

Table-4 Cost and returns analysis of tomato at Max. Min. and Modal prices

Particulars	Malur taluk (Hybrids)	Mulbagal taluk (HYV)	Srinivaspura taluk (Both)
Avg. farm size tomato cultivation (acres)	2.0	2.0	3.1
Avg. yield (quintals/farm)	377	315	585
Avg. yield (quintals/acre)	188.5	157.5	188.7
Total variable cost (Rs./farm)	302096	250407	478056
Total cost of cultivation (Rs./farm)	330053	280932	521202
Total cost of cultivation (Rs./acre)	165027	140466	168130
Total cost of production (Rs./quintal)	1099	1095	1117
Total cost (Rs./farm)	414331	344774	653662
Avg. modal price (Rs./quintal)	1484	1427	1464
Gross returns (Rs./farm)	559468	449505	856440
Returns over VC (Rs./farm)	257372	199098	378384
Returns over TC (Rs./farm)	229415	168573	335238
Gross returns (Rs./acre)	279734	224753	276271
Returns over TC (Rs./acre)	114707	84287	108141
Returns per re. expenditure (TCOC)	1.70	1.60	1.64
Returns per re. expenditure (TC)	1.35	1.30	1.31
Net profit (Rs./quintal)	385.00	332.00	347.00
Avg. Min. price (Rs./quintal)	1178	807	1087
Gross returns (Rs./farm)	444106	254205	635895
Returns over VC (Rs./farm)	142010	3798	157839
Returns over TC (Rs./farm)	114053	-26727	114693
Gross returns (Rs./acre)	222053	127103	205127
Returns over TC (Rs./acre)	57026	-13363	36997
Returns per re. expenditure (TCOC)	1.35	0.90	1.22
Returns per re. expenditure (TC)	1.07	0.74	0.97
Net profit (Rs./quintal)	79.00	-288.00	-30.00
Avg. Max. price (Rs./q)	1840	2046	1841
Gross returns (Rs./farm)	693680	644490	1076985
Returns over VC (Rs./farm)	391584	394083	598929
Returns over TC (Rs./farm)	363627	363558	555783
Gross returns (Rs./acre)	346840	322245	347415
Returns over TC (Rs./acre)	181813	181779	179285
Returns per re. expenditure (TCOC)	2.10	2.29	2.07
Returns per re. expenditure (TC)	1.67	1.87	1.65
Net profit (Rs./quintal)	741	951	724

Note: TC - Total cost, TCOC - Total cost of cultivation, VC - Variable cost

Table-5 Season wise variable input, fixed and marketing cost of tomato (Rs./farm)

Particulars	Malur taluk (Hybrid) (n = 50)			Mulbagal taluk (HYV) (n = 50)			Srinivaspura taluk (Both) (n = 50)		
	Kharif	Rabi	Summer	Kharif	Rabi	Summer	Kharif	Rabi	Summer
Avg. area per farm (acres)	1.95	1.16	1.73	1.14	1.10	1.42	1.70	1.63	2.01
Variable input costs									
Manure	36860	23280	32980	9422	9422	11991	16539	15566	19458
Seedlings	9215	5820	8245	4252	4252	5411	9928	9344	11680
Fertilizers	18003	11370	16108	14889	14889	18949	28900	27200	34000
Sticks	10574	6678	9461	9197	9197	11705	15403	14497	18121
Wire	4348	2746	3890	1658	1658	2111	3055	2875	3594
Thread	7619	4812	6817	5019	5019	6388	8506	8006	10007
Plastic mulch	17623	11130	15768	9380	9380	11939	17145	16137	20171
Weedicide	5159	3258	4616	2692	2692	3427	3523	3316	4145
PPC	46987	29676	42041	25417	25417	32348	48432	45583	56979
Human labour	115126	72711	103007	47480	47480	60430	93960	88433	110541
Machine labour	5456	3985	5022	3870	3840	4080	5390	4980	6235
Irrigation charges	3969	2507	3551	2298	2298	2925	3551	3342	4178
Interest on working capital (8 %)	5619	3559	5030	2711	2711	3434	5087	4786	5982
Total variable cost (Rs./farm)	286557	181532	256536	138285	138254	175138	259418	244064	305091
Total variable cost (Rs./acre)	146952	156494	148286	121303	125686	123336	152599	149733	151786
Fixed costs									
Depreciation	3474	2067	3082	2031	1960	2530	3029	2904	3581
Interest on fixed capital (8 %)	4267	2538	3786	3959	3820	4931	4056	3889	4796
Rental value of land	19500	11600	17300	11400	11000	14200	17000	16300	20100
Land revenue	16	10	14	9	9	12	14	13	17
Total fixed cost (Rs./farm)	27257	16215	24182	17399	16789	21672	24099	23106	28493
Total cost of cultivation (Rs./farm)	313814	197747	280717	155684	155043	196810	283517	267170	333584
Total cost of cultivation (Rs./acre)	160930	170472	162264	136565	140948	138599	166775	163908	165962
Marketing cost									
Plastic crate	3986	2734	4493	933	1613	1520	4307	4000	5814
Transportation cost	19930	13667	22467	6531	11293	10640	23683	22000	31977
Loading and unloading charges	2990	2050	3370	933	1613	1520	2584	2400	3488
Commission	44671	32472	40855	18046	27540	26129	31890	27729	54544
Total marketing cost	71577	50923	71185	26443	42059	39809	62464	56129	95823

Table-6 Season wise costs and returns from tomato

Particulars	Malur taluk (Hybrid) (n = 50)			Mulbagal taluk (HYV) (n = 50)			Srinivaspura taluk (Both) (n = 50)		
	Kharif	Rabi	Summer	Kharif	Rabi	Summer	Kharif	Rabi	Summer
Avg. area per farm (acres)	1.95	1.16	1.73	1.14	1.10	1.42	1.70	1.63	2.01
No. of farmers	20	9	32	24	8	44	11	11	59
Avg. production (q/farm)	299	205	337	140	242	228	323	300	436
Avg. production (q/acre)	157.4	170.8	198.2	127.3	220.0	162.9	190.0	187.5	218.0
Avg. price (Rs./q)	1660	1760	1347	1289	1138	1146	1097	1027	1390
Gross returns (Rs./farm)	496340	360800	453939	180460	275396	261288	354331	308100	606040
Gross returns (Rs./acre)	261232	300667	267023	164055	250360	186634	208430	192563	303020
Total variable cost (Rs./farm)	286557	181532	256536	138285	138254	175138	259418	244064	305091
Total fixed cost (Rs./farm)	27257	16215	24182	17399	16789	21672	24099	23106	28493
Total marketing cost (Rs./farm)	71577	50923	71185	26443	42059	39809	62464	56129	95823
Cost of cultivation (Rs./farm)	313814	197747	280717	155684	155043	196810	283517	267170	333584
Cost of cultivation (Rs./acre)	160930	170472	162264	136565	140948	138599	166775	163908	165962
Total cost of production (Rs./q)	1289	1213	1044	1301	814	1038	1071	1078	985
Total cost (Rs./farm)	385391	248670	351902	182127	197102	236619	345981	323299	429407
Returns over VC (Rs./farm)	209783	179268	197403	42175	137142	86150	94913	64036	300949
Returns over TCOC (Rs./farm)	182526	163053	173222	24776	120353	64478	70814	40930	272456
Returns over TC (Rs./farm)	110949	112130	102037	-1667	78294	24669	8350	-15199	176633
Return on Re. expenditure (TCOC)	1.58	1.82	1.62	1.16	1.78	1.33	1.25	1.15	1.82
Return on Re. expenditure (TC)	1.29	1.45	1.29	0.99	1.40	1.10	1.02	0.95	1.41
Net profit per quintal (Rs./q)	371	547	303	-12	324	108	26	-51	405

Note: TC - Total cost, TCOC - Total cost of cultivation, VC - Variable cost

-producers and consumers. Average yield per acre was highest at 189 quintals per acre in Malur taluk and Srinivaspura taluk for hybrids and 158 quintals per acre in Mulbagal taluk for HYVs of tomato. Due to fluctuation in prices of tomato [6], three price situations in the market were considered [7] and the returns were calculated accordingly. When average modal price was considered, highest net returns and Returns on rupee expenditure (RRE) were observed in Malur taluk followed by Srinivaspura taluk for hybrids and Mulbagal taluk for HYVs. At the average minimum price, farmers realized profit only in Malur taluk for hybrids and farmers incurred loss in the case of Mulbagal taluk and Srinivaspura taluk for HYVs. This showed that growing hybrids was more profitable to the farmers than HYVs. Similar results were reported in Bangladesh that growing tomato hybrids was more profitable than HYVs [4]. The costs and returns of tomato production were also analyzed for different seasons and found that the highest cost of cultivation of tomato per acre was incurred during *rabi* season in Malur taluk (Rs. 170472) and lowest (Rs. 136565) was in *kharif* season for HYVs in Mulbagal taluk. The cost of cultivation was lowest for all the three seasons for HYVs in Mulbagal taluk followed by Malur and Srinivaspura taluks, respectively. This showed that cultivation of HYVs of tomato was cheaper in all the three seasons compared to hybrids of tomato. Yield per acre was highest in Mulbagal taluk for HYVs in *rabi* season followed by Srinivaspura and Malur taluks in summer seasons. The average price per quintal was higher for hybrids than for HYVs for all the three seasons. Growing hybrid tomatoes was profitable in all the three seasons in case of Malur taluk (Table 6). Growing HYVs of tomato was profitable in *rabi* and summer seasons than, *kharif*. In Srinivaspura taluk, it was profitable to cultivate in *kharif* and summer seasons where the farmers went for cultivation of both hybrids and HYVs in the same land during summer to reduce the risk of price variation and in anticipation that they would gain profit from either of them. This result was in line with the results of a study in Nigeria [8] which showed that dry season tomato cultivation was more profitable earning them higher returns than cultivating the crop in any other season. Farmers of Srinivaspura taluk had highest cost of cultivation per acre of tomato (Rs 168130) followed by Malur (Rs 165027) and Mulbagal (Rs 140466) taluks, respectively. Net profit earned per acre of tomato cultivated was highest for hybrids (Rs. 114707) than HYVs (Rs. 84287) of tomatoes. The highest RRE for tomato cultivation was in Malur taluk (1.70) followed by Srinivaspura taluk (1.64) and Mulbagal taluk (1.60) at average prices. Only hybrid cultivation in Malur taluk (1.35) and Srinivaspura taluk (1.22) was profitable at minimum prices. Highest RRE was in Mulbagal taluk (2.29) followed

by Malur taluk (2.10) and Srinivaspura taluk (2.07) when maximum prices for tomato were considered. The highest cost of cultivation per acre was incurred during *rabi* season in Malur (Rs.170472) and lowest was in *kharif* season for HYVs in Mulbagal taluk (Rs.136565).

Conclusion

Tomato was grown by the farmers in study area with an anticipation of good profits due to higher yields in short duration and its volatility in prices. Thus many farmers grew tomatoes in all the 3 seasons of the year to fetch good price in any of the season in a year to make good profits. Accordingly, the study analysed costs, returns and profits of tomato cultivation at different seasons, market prices separately for HYVs and hybrids. Results showed that growing hybrid tomatoes was profitable in all the three seasons in case of Malur. Growing HYVs of tomato was profitable in *rabi* and summer seasons in Mulbagal and it was profitable to grow tomato only in summer season in Srinivaspura taluk. Farmers should be advised to go for staggered and early planting of tomato crop especially during summer, splitting the area into different seasons along with growing of other crops. The cost of producing one kg of tomato ranged from Rs 12 to 13 and the average price received by farmers ranged from Rs 14 to 15 per kg of tomato. This narrow margin of profit for the farmers can be increased by decreasing the cost of cultivation. Hence, further research has to be conducted on cost effective production and protection technologies in tomato production. Proper monitoring mechanism should be in place for preventing commission charges at Kolar, Vaddahalli and Srinivaspura markets charged by commission agents and stringent measures need to be taken up according to the rules and regulations of regulated market and they have to be strictly enforced.

Application of research: This study was been useful in providing suitable policy recommendations in case of marketing of perishables such as tomato and awareness to farmers through extension services.

Research Category: Agricultural economics, cost and returns analysis, agriculture marketing

Abbreviations:

HYV High Yielding Varieties

RRE Return on Rupee Expenditure

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