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Comparative economics of tomato cultivation under drip over conventional irrigation systems in North Karnataka

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Abstract

India is in dire need of new and effective technologies. In this context, Drip irrigation is becoming the most demanded technology. Tomato is rich source of vitamins, Minerals and Fibbers. To study the sustainability of drip over conventional irrigation system, sample farmers were selected in 2:1 basis *i.e.*, 40 drip and 20 Conventional farmers were selected and thus the total sample size was 60. The primary data were collected for year 2016-17. Initial investment on installation of drip irrigation system for tomato was found to be Rs. 122688. On an average cost of cultivation per hectare of tomato was found to be Rs. 153926/ha and Rs. 169814/ha for drip and conventional irrigation systems respectively. The per acre average yield of tomato on conventional irrigation method (44.03 tonnes) was comparatively lower than that of drip irrigation method (46.72 tonnes).

Keywords: Drip irrigation, conventional irrigation, cost of cultivation of tomato

Introduction

The present Indian agricultural scenario is a mix of outstanding achievements and missed opportunities. To emerge as an economic power in the world, our agricultural productivity needs to be equal on par with economic powers of the world. Hence, India is in dire need of new and effective technologies which can continuously improve the productivity, profitability and sustainability of our farming systems. In this context, the one of the most important segment is Micro irrigation technique *i.e.*, Drip irrigation Technologies.

Drip irrigation is becoming the most demanded technology. The drip irrigation system (DIS) has its advantages and limitations. Its advantages are in terms of savings of water over flow irrigation, effective use of fertilizer, less labour. The limitation for adopting this method is its high initial cost, which is beyond the purchasing capacity of small and marginal farmers and emerges one of the reasons of its adoption mainly by large farmers.

Tomato is one of the most important protective food crops of India. It is grown in 8.796 lakh ha area with 182.266 lakh tonnes production. The major tomato producing States in India are Bihar, Karnataka, Odisha, Andhra Pradesh, Maharashtra, Madhya Pradesh, Chhattisgarh, and West Bengal. Tomato is rich source of vitamins A, C, Potassium, Minerals and Fibbers. Tomatoes are used in the preparation of soup, salad, pickles, ketchup, puree, and sauces and also consumed as a vegetable in many other ways Vinod kumar (2016) [6]. Keeping this in mind a study was conducted to empirically evaluate the comparative economics of tomato cultivation under drip over conventional irrigation systems in North Karnataka.

Materials and methods

The present study was conducted in northern Karnataka and multistage sampling technique was adopted for the selection of districts, talukas and villages based on the highest area under drip irrigation. Further, the tomato growing sample farmers were selected randomly for the study. To study the sustainability of drip irrigation system over conventional irrigation method, sample farmers were selected in 2:1 basis *i.e.*, 40 drip irrigated farmers and 20 Conventional farmers were selected and thus the total sample size for the study was 60. The data thus collected were analysed by a tubular method. The cost of cultivation was estimated by using the budgeting technique.

Results and discussions

Initial investment on installation of drip irrigation system (Table 1) for tomato was found to be Rs. 1,22,688. Nearly 49 per cent of the cost accounted by bore well (Rs. 37,563) and pump set (Rs. 22,343), whereas sub-main line pipes (Rs. 14,740), laterals (Rs. 13,760) and main line

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pipes (Rs. 8,555) constituted 30.20 per cent. The electric connection (Rs. 5,214), drip system installation charges (Rs. 3,600) constituted 4.35 per cent and 2.93 per cent respectively, to the total cost of installation. Even though items like flush valves, connectors, by-pass assembly, T-joints and end caps contributed meager per cent to the total cost but they have major importance in installation of drip system. Per unit cost of main line pipes, sub line pipes, screen filter, complete venture assembly was high, whereas it was low in drippers, connectors. Cost of installation of drip irrigation

system was high because of higher prices of each component of the system. The laterals are the PVC tubes which run all along the rows of the lines, which receive water from sub-main pipe and supply it to the plants through emitters. Hence, major portion of the money had to be spent on the laterals. On the whole, it could be observed that the investment cost of drip irrigation structure was very high. These results were in agreement with the results obtained by Mane (1993) ^[1] and Sivanappan (1994) ^[4] who reported that the major portion of the cost in drip irrigation system was for PVC tube laterals

Table 1: Installation cost of drip irrigation system for tomato (Rs./ha)

Sl. No.	Particulars	Quantity	Cost	Percentage
1	Bore well		37563	30.62
	Pumpset		22343	18.21
	Electric connection		5343	4.35
2	PVC pipes			
	a. Main line pipes (75mm)	37	8555	6.97
	b. Sub-main line pipes (63mm)	61	14740	12.01
3	Laterals (bundles)	8	13760	11.22
4	Drippers	1863	4248	3.46
5	Screen filter	1	2864	2.33
6	Control valves	10	2090	1.70
7	Flush valves	10	320	0.26
8	Complete venture assembly	1	2370	1.93
9	Connectors	34	89	0.07
10	By-pass assembly	1	914	0.74
11	GTO set	251	1441	1.17
12	T-joints	8	584	0.48
13	L-bow	48	1248	1.02
14	End caps	9	279	0.23
15	Accessories	-	337	0.27
16	Labour charges for Installation	-	3600	2.93
	Total cost		122688	100

The total cost of installation of conventional irrigation system was calculated at Rs. 88,956 per hectare (Table 2). The cost of bore well (Rs. 38,635) contributed to a major share of the total investment of drip irrigation system (43.43 %). The next single large item contributing to the total investment cost was the cost on pump set (Rs. 21,354), accounting for 24.01 per

cent. Average 32.45 pipes, 6.50 T- Joint, 5.22 L-bow, 6.88 control valve, 3.74 flush valve and 5.14 end cap were used to install irrigation system under conventional method. The electric connection (Rs. 5,238), drip system installation charges (Rs. 4,187) constituted 5.89 per cent and 4.71 per cent respectively, to the total cost of installation

Table 2: Installation cost of conventional system for tomato orchard (Rs./ha)

Sl. No.	Particulars	Quantity	Cost	Percentage
1	Bore well		38635	43.43
2	Pumpset		21354	24.01
3	Electric connection		5238	5.89
4	Pipe line	32.45	16451	18.49
5	T- Joint	6.50	572	0.64
6	L-bow	5.22	183	0.21
7	Control valve	6.88	1961	2.20
8	Flush valve	3.74	168	0.19
9	End cap	5.14	206	0.23
10	Labour charges for Installation		4187	4.71
	Total cost		88956	100

Perusal of the Table 3 indicated that the total cost of cultivation of tomato was Rs. 1,53,926 share of variable cost (Rs 1,20,242) was 78.12 per cent and fixed cost (Rs. 33,684) was 21.88 per cent in total cost. In tomato production, labour costs formed a major part in total variable costs. Utilization of human labour was highest (83.67 man days) in harvesting followed by marking and planting (21.22 man days), application of plant protection chemicals (15.99 man days), erecting stacking roll/sticks (15.45 man days) and weeding (14.23 man days), where as in land preparation about 12.66 man days, 1.56 pair days, 8.12 hours of human labour,

bullock labour and machine labour, respectively were used. In input cost, seedlings (Rs. 13,828), fertilizers (Rs. 11,340), stacking roll/sticks (Rs. 6,916), plant protection chemicals (Rs. 6,624) and jute (Rs. 3,581) accounted 34.30 per cent to the total cost. Among the items of fixed cost, the apportioned cost and rental value of the land had a maximum share. The interest on working capital has been taken as seven per cent per annum, while interest on fixed capital has been taken to be 14.00 per cent per annum. Similar results were also reported by Vinod kumar *et al.* (2016) ^[6]

Table 3: Cost of cultivation of tomato under drip irrigation (Rs/ha)

Sl. No.	Particulars	Unit	Quantity	Cost	Per cent
I.	Variable cost				
	Labour cost				
1	Land preparation	Mandays	12.66	3823	2.48
		BP days	1.56	1509	0.98
		Hours	8.12	4352	2.83
2	Marking and planting	Mandays	21.22	6168	4.01
3	Intercultivation	BP days	1.85	1729	1.12
4	Application of manures	Man days	10.22	2594	1.69
5	Application of fertilizers	Man days	4.64	1230	0.80
6	Application of PPC & GR	Man days	15.99	4527	2.94
7	Erecting Stacking roll/Sticks	Man days	15.45	4241	2.76
8	Weeding	Man days	14.23	3657	2.38
9	Irrigation	Man days	6.33	1583	1.03
10	Harvesting	Man days	83.67	23120	15.02
11	Miscellaneous		4.21	1041	0.68
	Total labour cost (A)			59574	38.70
	Input cost				
1	Seedlings	Nos	17285	13828	8.98
2	Stacking roll/Sticks	Nos.	3087.51	6916	4.49
3	Jute	Kgs	88.56	3581	2.33
4	Manures	Tonnes	2.15	8663	5.63
5	Fertilizers			11340	7.37
6	Plant Protection Chemicals & GR			6624	4.30
7	Others			1850	1.20
	Total input cost (B)			52802	34.30
	Interest on working capital (C)			7866	5.11
	Total variable cost (A + B + C)			120242	78.12
II	Fixed cost				
1	Rent value of land			16673	10.83
2	Land revenue			18	0.01
3	Depreciation, repair and maintenance			2632	1.71
4	Apportioned cost			10224	6.64
5	Interest on fixed capital			4137	2.69
	Total fixed cost			33684	21.88
	Total cost (I + II)			153926	100.00

In tomato production, variable costs accounted for a major share (Table 4). The variable cost comprised of labour cost (Rs. 74,155) and input cost (Rs. 57,520) which accounting for 43.67 per cent and 33.87 per cent of the total cost of cultivation. Among the human labour used for different operations, the highest human labour was used for harvesting, weeding, marking & planting and irrigation in cultivation of tomato. It can be observed from the table that, the average per hectare utilisation of seedlings (17,345/ha), stacking roll/Sticks (3,114.32/ha), jute (90.21 kg/ha) and manures

(2.55 tonnes/ha). In fixed cost, apportioned cost of irrigation structure was highest (Rs. 7,413/ha), other components like land revenue, depreciation, repair and maintenance and interest on fixed capital on fixed cost are of minor importance. Among the two methods of irrigation, the total cost incurred in case of conventional method of irrigation was highest (Rs. 1, 69, 814/ha) as compared to cost incurred in cultivation of tomato under drip irrigation (Rs. 1, 53, 926/ha). Similar results were also reported by Manish (2003) ^[2] and Singh *et al.* (2005) ^[3].

Table 4: Cost of cultivation of tomato under conventional irrigation (Rs./ha)

Sl. No.	Particulars	Unit	Quantity	Cost	Per cent
I.	Variable cost				
	Labour cost				
1	Land preparation	Mandays	9.12	2629	1.55
		BP days	1.88	1813	1.07
		Hours	8.91	4690	2.76
2	Marking and planting	Mandays	22.31	6328	3.73
3	Intercultivation	BP days	4.32	3996	2.35
4	Application of manures	Man days	10.34	2609	1.54
5	Application of fertilizers	Man days	14.34	3590	2.11
6	Application of PPC & GR	Man days	17.65	5476	3.22
7	Erecting Stacking roll/Sticks	Man days	16.33	4859	2.86
8	Weeding	Man days	39.62	9918	5.84
9	Irrigation	Man days	21.45	5363	3.16
10	Harvesting	Man days	78.22	21745	12.81
11	Miscellaneous		4.65	1139	0.67
	Total labour cost (A)			74155	43.67

	Input cost				
1	Seedlings	Nos	17345	13876	8.17
2	Stacking roll/Sticks	Nos.	3114.32	6976	4.11
3	Jute	Kgs	90.21	3644	2.15
4	Manures	Tonnes	2.55	8113	4.78
5	Fertilizers			14356	8.45
6	Plant Protection Chemicals & GR			8625	5.08
7	Others			1930	1.14
	Total input cost (B)			57520	33.87
	Interest on working capital (C)			9217	5.43
	Total variable cost (A + B + C)			140892	82.97
II	Fixed cost				
1	Rental value of land			16673	9.82
2	Land revenue			18	0.01
3	Depreciation, repair and maintenance			1266	0.75
4	Apportioned cost			7413	4.37
5	Interest on fixed capital			3552	2.09
	Total fixed cost			28922	17.03
	Total cost (I + II)			169814	100.00

The per acre average yield of tomato (Table 5) on conventional irrigation method (44.03 tonnes) was comparatively lower than that of drip irrigation method (46.72 tonnes). The irrigation method wise analysis of gross returns indicated that the gross returns obtained per hectare in case of drip irrigated farms (Rs. 3,48,204) was high compared to conventional method of irrigated farms (Rs. 3,27,671). With

respect to net returns also per hectare obtained under drip irrigation method was high (Rs. 1,81,588). Additional returns obtained from cultivation of tomato under drip irrigation was Rs. 32,014 than conventional irrigation system. The findings of the study are also in conformity with the findings of the Thirumalaikumar *et al.* (2014)^[5].

Table 5: Profitability of tomato cultivation under drip and conventional irrigation methods

Sl. No.	Particulars	Method of Irrigation		Incremental benefits
		Drip	Conventional	
1	Average yield (t/ha)	46.72	44.03	2.69
2	Total returns (Rs./ha)	348204	327671	20533
3	Total cost (Rs./ha)	153926	169814	-15888
4	Net returns (Rs./ha)	194278	157857	36421

Among the different operations in conventional method, the use of human labour was highest for application of manures, application of PPC and weeding during maintenance of tomato, it was mainly due to disease and weed growth in conventional irrigated method was more. Similarly there was a saving in usage of human labour for various operations like irrigation and application of fertilizer under drip irrigation over the conventional method of irrigation in the study area. Fertigation reduces the labour costs on fertilizer application in drip irrigated system.

Reference

1. Mane KM. Economic analysis of different methods of irrigation in grape in Marathwada region of Maharashtra. M. Sc. (Agri.) Thesis, Univ. Agril. Sci., Dharwad, Karnataka, India, 1993.
2. Manish LM. Comparative economics of drip vis-à-vis conventional method of irrigation for grape cultivation in Osmanabad district of Maharashtra. M. Sc. (Agri.) Thesis, Mahatma Phule Agric. Univ., Rahuri, India, 2003.
3. Singh A, Singh CS. Drip irrigation - A promising approach for water scarcity areas. *Agro India*, 2005, 36-38p.
4. Sivanappan RK. Drip and sprinkler irrigation in India. *Kissan World*. 1994; 21(2):11-13.
5. Thirumalaikumar R, Rafi AM, Surendar KK, Babu R. Effect of various irrigation practices on yield of bhendi (*Abesmoschus esculentus* L.) cv arkaanamika. *Int. J. of Horti*. 2014; 4(16):1-6.

6. Vinod Kumar AK, Koshta1, Choudhary VK. Cost of cultivation and disposal pattern of tomato in Raipur district of Chhattisgarh, India., *Plant Archives*, 2016; 16(1):464-468.