



Economics of Drip Irrigation in Mango Cultivation- A Study in Krishna District of Andhra Pradesh

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ABSTRACT

The article aims at analysing the progress of APMIP, the economics of mango cultivation under different irrigation systems and to know the opinion of the farmers on installation and performance of drip irrigation system in mango, with a sample of 30 drip and 60 surface irrigated farmers in Krishna district of Andhra Pradesh. The total cost of cultivation was estimated to be Rs.34090.94 per hectare in drip irrigation farms and Rs.37443.37 per hectare in surface irrigation farms. The average gross and net income from surface irrigated farms were worked out to be Rs.60,000 and Rs.22556.55 per hectare respectively, when the same were Rs. 84000 and Rs.49909.77 from the drip irrigated farms. Large number of farmers had felt the advantages in drip irrigation like water saving, labour cost saving for irrigation, improved quality produce, decrease in weed growth etc.

Key words : APMIP, Economics of drip irrigation, Mango orchards.

Mango is one of the most economically important fruit crop. Mangoes are produced in 90 countries world wide in about 8.5 million acres. India being the largest producer, produces about 150 lakh tonnes of mangoes every year. Mango is the leading fruit crop of Andhra Pradesh, contributes about 18.1 per cent of total mango production in the country occupying an area of 3.93 lakh hectares which accounts for 60 per cent of the total area under fruits with an annual production of about 21.42 lakh Mt. Krishna district stands first in mango area followed by Chittoor. In Krishna district, area under mango crop is 0.62 lakh hectares. Success of mango orchards depends upon availability of irrigation during critical period of tree growth and fruit development. Majority of the farmers are following the traditional and anachronistic methods of irrigation like flood irrigation, furrow irrigation etc, which has low water use efficiency with high leaching losses. Among all irrigation systems drip irrigation system is considered as most suitable water saving technique which involves application of water only at the roots of the plant where it is required with a net work of pipes and by drip emitters. (Narayanamoorthy, 2003). The on farm use efficiency of properly designed and managed drip irrigation system is about 90 per cent, while it is about 70 per cent for sprinkler but just 45 percent for surface irrigation methods including flood method of irrigation. (Sivanappan 1994; Narayanmoorthy, 2005). The yield realized under this method of irrigation is higher with

reduction in cost of fertilizers, pesticides and power for irrigation. (Desai *et al.*, 2000)

The area covered under micro irrigation in India upto 2008 is 38.8 lakh hectares of which 14.2 lakh hectares is under drip irrigation and 24.5 lakh hectares is under sprinkler irrigation. The total area under micro irrigation in Andhra Pradesh is 5.08 lakh hectares of which 3.6 lakh hectares is under drip irrigation and 2 lakh hectares is under sprinkler irrigation. The total drip irrigated area under mango cultivation in Krishna district is 3,976 hectares. Government of India has introduced many promotional schemes including subsidy for drip adopters to increase the area under drip irrigation.

The Government of Andhra Pradesh, one of the leading state in India launched Andhra Pradesh Micro Irrigation Project (APMIP) on November 3rd 2003 with an objective of enhancing the crop productivity by improving the water use efficiency through micro irrigation system.

The project aimed at bringing 2.50 lakh ha area under micro irrigation system in 22 districts of Andhra Pradesh with financial outlay of Rs 11,763 millions. APMIP is providing subsidy for the farmers. The 50 per cent subsidy which was in initial years of the project has now increased to 90 per cent subject to a ceiling of Rs 50,000 per family in all districts for drip and sprinkler systems uniformly. Keeping this in view, an attempt is made to study the progress of Andhra Pradesh Micro Irrigation Project (APMIP) for Mango in Krishna district and to work out the economics of drip irrigation.

MATERIAL AND METHODS

The present study was carried out in Krishna district of Andhra Pradesh. Nuzvid and Vijayawada revenue divisions of Krishna district were purposively chosen for the study. Three mandals which have maximum cultivated area of mango under drip irrigation were selected from these two divisions. Two villages which adopted the two types of irrigation systems viz., drip and surface were randomly selected from each mandal. From each of selected villages, 5 drip irrigated farmers and 10 surface irrigated farmers were selected at random. Thus, 30 drip irrigated farmers and 60 surface irrigated farmers i.e. total 90 farmers constituted the sample of the study. The conventional tabular analysis is used to arrive at valid results.

Cost concepts and farm income measures was used to work out the cost of production of mango in drip and surface irrigations.

RESULTS AND DISCUSSION

Progress of APMIP for mango:

Andhra Pradesh Micro Irrigation Project, is a unique and first comprehensive project being implemented in a big way in Andhra Pradesh. From 3-11-2003 to 31-03-2009, a total area of 5.08 lakh hectares has been brought under micro irrigation in 22 districts of Andhra Pradesh. In Krishna district the area covered from 3-11-2003 to 31-03-2009 under micro irrigation is 12,879 hectares which includes 7346 member of beneficiaries. The progress of the project from inception was given in the Table 1.

Progress of the project from inception

From the inception APMIP has been completed six phases. The total area covered was 5.08 lakh ha and the total financial out lay was Rs.1560 crores out of which subsidy amount was Rs.1030 crores. Phase –I was from November' 03 to March' 04 with a total financial out lay of funds Rs.32.14 crores, of which Rs.11.34 crores was towards drip irrigation and Rs.20.80 crores for sprinkler irrigation. The total subsidy amount was Rs.16.07 crores in phase I. From phase II to phase VI the total out lay of funds was Rs.149.60, Rs.238.30, Rs.327.70, Rs. 405.98 and Rs. 406.28 crores respectively. Of these total, subsidy component amounts Rs. 74.80, Rs.119.10, Rs.203.90, Rs.295.85 and Rs.320.96 crores respectively from phase II to phase VI. The total area covered from phase II to phase VI was 0.65 lakh hectare, 0.77 lakh hectare, 0.9 lakh hectare 1.2 and 1.3 lakh hectare respectively.

Phase-wise progress report in Krishna district

The total micro irrigated area covered under six phases in Krishna district was 15,686 hectares (Table 2). Total cost was Rs.4,482 lakhs and the total subsidy amount was Rs. 3,073 lakhs. The total targeted area was 25,014 hectares and total achievement area was 10,101 hectares. From phase I to phase VI the total area covered was 568, 1240, 2367, 2914, 3003, 2762, and 2832 hectares respectively. The subsidy amount from phase I to phase VI ranges from Rs.59, to Rs.998 lakhs respectively. The targeted drip irrigated area from phase I to phase VI was 6013, 2750, 4000, 4050, 3800, 2400 and 2000 hectares respectively while the achieved area was 418, 405, 1567, 2014, 1853, 1812 and 2032 hectares respectively from phase I to phase VI.

Cost structure of bearing orchards according to cost concepts in drip and surface irrigations

Cost structure of bearing orchards according to cost concepts in drip and surface irrigations are presented in Table 3. The total cost concept Cost C is the most comprehensive one. It includes all costs both fixed and variable, hence provided a basis for comparison between drip and surface irrigated farms. It was clear from the details furnished in the table that there was no leasing activity among the selected farmers and hence Cost A₁ and Cost A₂ were the same. The Cost A₁ (Rs.23535.69) was higher on surface irrigated farms than on drip irrigated farms (Rs.20647.84) because of higher operation costs on the surface irrigated farms which was due to higher amount of human labour utilized for weeding and irrigation. The cost B per hectare was estimated as Rs. 30204.92 on drip irrigated farms and Rs. 33295.69 on surface irrigated farms. The cost estimates showed that the total cost of cultivation (Cost C) per hectare was Rs.34090.94 on drip irrigated farms and Rs. 37443.37 on surface irrigated farms.

Returns from mango orchard

The average yield of mango was 10 tonnes/ hectare in surface irrigation. The gross income was worked out to be Rs. 60000.00 per hectare @ Rs. 6,000 per tonne. So net income worked out to be Rs. 22556.55 per hectare. Where as, in drip irrigation farms the average yield of mango was 14 tonnes/ hectare. With Rs. 84000.00 and Rs. 49909.77 as gross and net income per hectare can be attributed. The higher gross and net income in drip irrigation to higher yield and lower in cultivation cost in drip irrigated orchards compare to surface irrigated orchards.

Table 1. Progress of the APMIP project from inception in Krishna district.

S. No	Period	Drip			Spinkler			Total		
		Physical Area (ha)	Financial (Rs. Crores)		Physical Area (ha)	Financial (Rs. Crores)		Physical Area (ha)	Financial (Rs. Crores)	
			Total Cost	Subsidy		Total Cost	Subsidy		Total Cost	Subsidy
1	November,03 to March,04	3780	11.34	5.67	20770	20.80	10.40	24550	32.14	16.07
2	April,04 to March,05	24905	99.60	49.80	40020	50.00	25.00	64925	149.60	74.80
3	April,05 to March'06	51811	207.00	103.50	25000	31.30	15.60	76811	238.30	119.10
4	April,06 to March'07	66258	288.90	182.90	23750	38.80	21.00	90008	327.70	203.90
5	April,07 to March'08	90000	364.40	265.70	30000	41.58	30.14	120000	405.98	295.84
6	April,08 to March'09	95641	356.29	281.47	36202	50.00	39.50	131843	406.28	320.96
	Total	332395	1327.53	889.04	175742	232.48	141.64	508137	1560.00	1030.67

Table 2. Phase-wise progress report of APMIP in Krishna district.

Phase	Target (ha)		Achievement				Total subsidy (lakhs)
	Drip	sprinkler	Drip (Ha)	Sprinkler (ha)	Total area (ha)	Total cost (lakhs)	
Phase-I (Nov'03 to july'04)	6013	150	418	150	568	120	59
Phase-I I (Aug'04 to March'05)	2750	834	405	834	1240	213	106
Phase-I I I (April'05 to March'06)	4000	800	1567	800	2367	729	408
Phase-IV (April'06 to March '07)	4050	900	2014	900	2914	764	450
Phase – V (April'07 to March '08)	3800	1150	1853	1150	3003	813	553
Phase – V I (April'08 to March '09)	2400	950	1812	950	2762	717	499
Phase – V I I (April'09 to March '10)	2000	800	2032	800	2832	1126	998
Total	25014	5584	10101	5584	15686	4482	3073

Table 3. Cost structure of bearing mango orchards according to cost concepts in drip and surface irrigations

Particulars	(Rs. / ha)	
	Drip irrigated farms	Surface irrigated farms
Hired human labour	3709.26 (10.88)	5395.67 (14.40)
Owned and hired bullock labour	1741.45 (5.10)	2038.28 (5.44)
Owned and hired machine labour	6869.67 (20.14)	7749.52 (20.69)
Owned and purchased manures and fertilizers	2667.81 (7.82)	2948.34 (7.87)
Plant protection chemicals	2663.94 (7.81)	2355.41 (6.28)
Land revenue	268.54 (0.78)	237.84 (0.63)
Depreciation	810.83 (2.37)	623.67 (1.66)
Interest on working capital	1920.91 (5.63)	2190.12 (5.84)
Cost A ₁	20647.84 (60.56)	23535.69 (62.85)
Rent paid for leased in land	-	-
Cost A ₂	20034.84 (60.56)	23535.69 (62.85)
Interest on owned fixed capital	957.57 (2.80)	825.36 (2.20)
Rental value of owned land	8600.00 (25.22)	8935.36 (23.86)
Cost B	30204.92 (88.60)	33295.69 (88.92)
Imputed value of family labour	1860.56 (5.45)	2019.64 (5.39)
Annual share of establishment cost	2026.47 (5.94)	2130.48 (5.68)
Cost C	34090.94 (100.00)	37443.37 (100.00)

Note : Figures in parentheses indicate percentages to the total.

Table 4. Farm income measures of drip and surface irrigated mango orchards.

Particulars	(Rs. / ha)	
	Drip irrigated farms	Surface irrigated farms
Gross income	84000.00	60000.00
Cost C	34,090.23	37443.45
Net income	49909.77	22556.55
Farm business income	63352.16	36464.31
Family labour income	53795.08	26704.31
Farm investment income	61491.60	34444.67

Table 5. Opinions of farmers on performance of drip system in mango orchard.

Sl.No	Type of advantage	Drip irrigation farmers	
		Number	Percentage
1	Saving of water	26	86.67
2	Saving of labour cost for irrigation	23	76.67
3	Improved quality of product	16	53.38
4	Easy method of irrigation	19	63.34
5	Decreased weed growth	17	56.65
6	Increased crop yield	12	40.00

Farm business income is a measure which indicates the returns of owned resources like land, capital and labour. Farm business income in drip irrigated farms was Rs. 63352.16, while it was Rs. 36464.31 in surface irrigated farms i.e Rs.26888 higher income in drip irrigated farms when compared to surface irrigated farms because of reduced cost of cultivation (particularly saving in labour cost). Similarly family labour income was estimated at Rs. 53795.08 for drip irrigated farms and Rs 26704.31 for surface irrigated farms. Farm investment income was estimated at Rs. 61491.60 for drip irrigated farms and Rs 34444.67 for surface irrigated farms. Higher farm investment income in drip irrigated farms may be attributed to more net income due to high yield.

Opinion of farmers on installation and performance of drip system in mango orchard

The opinion of farmers on performance of drip system in mango orchard was presented in Table 5.

Large numbers of farmers were benefited by drip irrigation. Out of total Sample farmers 86.67 per cent of sample farmers revealed saving of water, and 76.67 per cent indicated saving of labour cost towards irrigation. The improvement in quality of produce was expressed by 53.38 per cent of farmers (Shashidhara *et al.*, 2007). About 63.34 per cent of the sample farmers responded positively for the drip irrigation as easy method of irrigation. The benefit of decreased weed growth was highlighted by 56.65 per cent of farmers, while 40 per cent of farmers informed increased crop yield due to drip irrigation.

To overcome the high initial cost on drip irrigation equipment government has been providing subsidies for the farmers. Though drip irrigation has many economic and resource related advantages over surface irrigation, its growth in terms of area is

not appreciable in few states. This is not due to economic reasons but mainly due to the lack of awareness among the farmers about the real economic and resource related advantages of the new irrigation technology. Hence conducting of field demonstrations and field visits to successful drip adopting farms for the mango growers by the concerned officials in the study area may change their perspective towards drip system and in turn help them to realize more benefits. Technical knowhow should be provided by the State Agricultural Universities (SAU) / Horticultural Universities / State Department for effective utilization of the drip system to enable the farming community to realize additional returns.

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