https://doi.org/10.29321/MAJ.10.A03142

Madras agric. J. 65 (12) 809–813, Dec., 1978.

Economics of Drip Irrigation Method in Small and Marginal Farms

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The water used and yield obtained by drip method was compared to the surface irrigation and the economics of this system was also worked out. The drip irrigation gave an increase in yield and fetched about Rs. 10,000/- per year for a small farm where the available water is not sufficient to irrigate the entire area of the farm by surface method.

Drip irrigation or trickle irrigation or daily irrigation has assumed considerable importance in recent years in view of the general need for water economy. In Tamil Nadu as well as in many other states where irrigation water is a limiting factor for crop production such water saving methods are being experimented upon. In this method. water is taken by a net work of tubings and given to each plant directly, daily or alternate days to the exact requirement of crops. Therefore it is possible in this method to elimnate the conveyance losses and also to reduce the evaporation loss from the soil surface. This system has many advantages especially in arid agricultural regions characterised by poor saline soil, saline irrigation water and high evaporation rates. The following are the advantages of this system over other methods.

a) Saving of water, (b) saving of labour, (c) increased yield, (d) possibility of using high saline water, (e) shortened growing season and earlier crop, (f) less weed growth (g) increased fertilizer efficieny (h) saving pesticides and fungicides, (i) varsatality of undulating land, and (j) decreased tillage. However, there is a feeling that this system is costly. It is also noticed that under drip irrigation, plants develop shallow clustered root, since small quantity of water varying from ½ litres to 4 liters/day of water per plant only are given for different crops.

MATERIAL AND METHODS

The drip system consists of the following: a) A head unit connected to the main water supply to the field which includes filter, water meter, pressure gauge and fertiliser equipment.

b) Main and sub mains of proper diameter according to the need generally 5 cm. - 7.5 cm. P. V. C. pipes.

c) Laterals or distribution of pipes (diameter 12 mm - 18 mm). alkathene tubes with nozzles or orifices or emitters provided to draw water at the plant location.

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The system developed at the Tamil Nadu Agricultural University is very simple and cheap compared to the equipment used in other advanced countries. It works at a low pressure and sockets are provided in the laterals at the location of each plant. The equipment can be placed on the surface after the land is prepared and removed just before the harvest, for preparing the land for the next crop. Under this system, it was found that the optimum length of 12.5 mm. diameter lateral pipes can be about 15 to 20 meters under 1 to 2 metre head on garden lands.

The comparative effects of two irrigation methods namely drip and furrow (control) were tested on vegetable crops such as tomato, bhendi, brinjal, beet root, raddish, chillies, sweet potato and for fruit crops like banana and papaya and cash crops like sugarcane and cotton. The area wetted for vegetable crops in drip is only 30 cm. diameter around each plant and about 60 cm. diameter for fruit crops and other remaining areas will be always dry. The weed infection was less in drip compared to the control. The amount of water used in both the drip and control plots were measured accurately. The water used and yields obtained for the various crops are given in Table I.

TABLE I. Water used and yield obtained in drip and control methods

Crops	Water used in cm.		Yield in Kg/ha		Rainfall
	Drip	Control	Drip	Control	
Tomato	10.76	49.2	8872	6187	21.18
Bhendi	8.60	53.53	11310	10000	24.18
Beet root	17.73	85.76	887	571	...
Brinjal	24.47	69.18	12300	12400	17.18
Raddish	10.81	46.41	1186	1045	...
Chilly	41.77	109.71	6080	4233	20.75
Sweet potato	25.20	63.41	5868	4244	12.12
Banana	58.00	243.00	45930	47850	33 00
Sugarcane	72.9	131.86	75040	86000	33.50
Cotton	15.00	55.00	–	–	8.00
Papaya	73.38	228.50	70500	42000	81.65

RESULTS AND DISCUSSION

The series of experiments conducted for various crops have indicated that the water used in drip method is only about $\frac{1}{2} - \frac{1}{5}$ of the control method (furrow or basin) without affecting the yield. As the moisture content of the soil at the root zone is always near the field capacity the germination and the performance of the crop is better. The cost of the cheap design developed at the Tamil Nadu Agricultural University works out Rs. 6250/ha. Though the amount seems to be higher for small and marginal farmers, but it is very profitable when water use efficiency was compared.

4. Economics of the system:

The economics of the system is as follows:

i) Average cost of drip equipments

a) Main pipe 450 m. at Rs. 4/ metre — Rs. 1,800.00

b) Lateral pipe 1000 m. at Rs. 4/m. ... 4,000.00

c) Tee and other materials . 450.00

Total — Rs. 6,250.00

ii) Average life of drip equipments - 6 years

iii) Net cultivated area in the farm 2.00 ha.

iv) Gross area of crops irrigated (existing) 0.60 ha. by surface method from the available water.

v) Capital investment on well - Rs. 30,000/-

vi) Captial investment on pumpset and pumpshed - Rs. 5,000/-

TABLE II. Cost and return for possible crops

Name of the crop	Cost of cultivation	Yield kg/ha (average yield)	(Rupees per hectare) Gross income	Net income
Banana (I)	9,000	45,000	15,000	6,000
Cotton MCU. 5 (I)	4,450	2,000	10,000	5,550
Tomato (I)	4,330	16,000	8,150	3,820
Brinjal (I)	4,500	18,750	9,380	4,880
Bhendi (I)	3,200	15,000	6,000	2,800
Chilly (I)	6,100	1,250	12,500	6,400
Sugarcane (I)	5,150	86,000	8,600	3,450
Jowar (I)	1,250	2,000 (grain) + 5,000 (straw)	3,560	2,310
Jowar (D).	500	400 (grain) + 2,500 (straw)	1,080	580

I — Irrigated D — dry crop.

TABLE III. Planning for typical farm of 2.00 hectare. I Existing crop plan under surface irrigation

Season	Crop	Area (ha)	Net income Rs.
August-January	Cotton MCU.5 (I)	0.40	2,220
-do-	Tomato (I)	0.20	764
-do-	Jowar (D)	1.40	812
February-June	Jowar (I)	0.40	544
-do-	Tomato (I)	0.20	764
		2.60	5,104

TABLE IV. Alternate plan under drip system of irrigation*

Season	Crop	Area (ha)	Net income In Rs.
August-July	Banana (I)	0.50	3,000
August-January	Cotton MCU.5 (I)	1.20	6,660
June-January	Chilly (I)	0.30	1,920
Feb.-May	Tomato (I)	0.60	2,295
Feb.-July	Brinjal (I)	0.60	2,925
Feb.-June	Bhendi (I)	0.30	840
		3.50	17,640.00

*Drip system is suitable for row crops only and hence grain crops are not included.

IV Over head costs :

(a) Surface system of irrigation.

i) Interest at 12% on investment on well = Rs. 3,600.00

ii) -do- on pumpsets $\frac{(5000}{2} \times \frac{12}{100}$ = 300.00

iii) Annual depreciation on pumpset at 10% = 500.00

Total = Rs. 4,400.00

(b) Drip system of irrigation.

i) Fixed overheads as item III (a) = 4,400.00

ii) Interest at 12% on investment of (Rs. 6,250 x 2 ha)

= Rs. 12,500

$= \frac{12,500 \times 12}{2 \times 100}$ = 750.00

iii) Depreciation on drip equipment (entire value apportioned among 6 years of its servicing period) = 2,084.00

Total = Rs. 7,234.00

Therefore additional overhead due to drip system 7,234.00 – 4,400.00 = 2,834.00

TABLE V. Partial budget and economics of drip system of irrigation

Debit		Credit	
Increase in cost		Decrease in cost	
i) Additional overhead cost in drip system	2834	i) Reduction in weeding crops	300
ii) Decrease in return due to income foregone by not adopting existing crop plan	5104	ii) Increase in return gross income from alternative crop plan	17640
Total	7938		17940

VI Net increase in income/year by introducing drip irrigation = 17940 − 7938

= 10,002.00