The Journal of Sri Krishna Research & Educational Consortium
ECONSPEAK: A JOURNAL OF ADVANCES IN MANAGEMENT, IT & SOCIAL SCIENCES
International, Indexed & Refereed e-Journal

EFFICIENCY OF MICRO IRRIGATION SYSTEM – A CASE STUDY

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ABSTRACT

The threat of climate change and global warming which has aggravated the problem of water shortage is of particular concern to India as we are largely dependent on glaciers and rainfall for water supply. Water is becoming increasingly scarce worldwide and more than one-third of the world population would face absolute water scarcity by the year 2025. Water scarcity in India is predominantly a manmade problem; therefore if India makes significant changes in the way it thinks about water and manages its recourses soon, it could ward off, or at least mollify, the impending crisis. A two stage stratified random sampling technique was used for the study. Micro irrigators from Kodumudi block and non-micro irrigators from Vellakoil block were purposively selected. 50 farm households from each block were taken as sample for the purpose of the study. Appropriate mathematical and statistical methods were employed for the study. The finding of the study implies that the farmers who adopt micro irrigation system for irrigation have realised increase their crop production, their incomes, and their household food security. The study also concluded that the micro irrigation system had most significant role to achieve not only higher productivity and water use efficiency but also to develop rural livelihood security.

INTRODUCTION

Water is a prime natural resource and a basic necessity for sustaining life on earth. Supplying adequate amount of potable water to the global population is a gigantic task in the wake of

growing industrial and domestic needs. The threat of climate change and global warming which has aggravated the problem of water shortage is of particular concern to India as we are largely dependent on glaciers and rainfall for water supply. India is facing a looming water crisis that has implications not only for its 1.2 billion people, but for the entire globe. India's demand for water is growing even as it stretches its supplies. Water is becoming increasingly scarce worldwide and more than one-third of the world population would face absolute water scarcity by the year 2025. The worst affected areas would be the semi-arid regions of Asia, the Middle-East and sub-Saharan Africa, all of which are already having a heavy concentration of population living below poverty line. The situation in India is also critical, where absolute water scarcity is already affecting a substantial part of the population and this proportion is increasing rapidly. Water infrastructure is crumbling preventing the government from being able to supply drinking water to its citizens. Pollution is ramped due to unfettered economic growth, poor waste management laws and practices. Although many analysts believe that demand will outstrip supply by 2020, there is still hope for India. Water scarcity in India is predominantly a manmade problem; therefore if India makes significant changes in the way it thinks about water and manages its recourses soon, it could ward off, or at least mollify, the impending crisis.

BACKGROUND OF THE STUDY

Water crisis is a situation when the supply of water is less than the demand. This term basically refers to the world's water resources relative to human demand. The earth has a finite supply of fresh water. Sometimes people consider the ocean as a source of fresh water. But it is not true as the ocean water is saline and heavy expenditure is required to convert this saline water tape. According to the UNICEF report, 2011 on water, there will be constant competition over water, between urban dwellers, farmers and industrialists (Shivashankar et.al 2011). The drip irrigation was water saving and yield increasing potential raises the prospect of increasing the productivity and incomes of some of the poorest sectors of the rural population. Given the scare water resources, drip irrigation be used to bring additional areas were under cultivation, better utilization of resources leading to increase in rural incomes (Amitabha Sadangi et.al 2007). Suggestion to increase the area under drip method of irrigation in crops like sugarcane it was saving capacity and productivity gains have to be demonstrated clearly and effectively through a quality extension network, credit facility drip set, essential to find out ways and means to reduce the capital cost and service facility with quantity were essential for the successful operation of drip irrigation system. The drip irrigation method of irrigation was essentially viable even without subsidy in water-intensive crops like sugarcane (Narayanamoorthy, 2005). According to the Ministry of Water Resources (2010), industrial water use in India stands at about 50 billion cubic meters or nearly 6 per cent of total freshwater abstraction. This demand is expected to increase dramatically in the next decade, given the enormous forecasts of 9 per cent growth for 2007 alone. This water is also primarily drawn from the land. However, we Indians are not still ready to accept the reality of depleting groundwater reserves. This condition has caused a major water crisis (Chaudhari et.al 2010). The disadvantages of drip irrigation system was high initial cost, frequent clogging of emitters, drip system requires frequent maintenance, lack of trained and skilled man power, pilferage of components, damage from rodents and astray animals, lack of timely and after sale service, frequent failure of power supply, and non-availability of quantity materials (Singh et.al 2009). With this background in Erode district micro irrigated farmers and non-micro irrigated farmers were selected. The study was undertaken to estimate the usage of

inputs and to compare the cropping pattern, productivity of different crops and problems under the micro irrigation system.

GEOGRAPHICIAL INFORMATION

Erode District lies on the extreme north of Tamil Nadu. Erode District situated at between 10 36" and 11 58" North Latitude and between 76 49" and 77 58" East Longitude. The total geographical area of the district is 816,191 hectares. Of this, 3,09,252 hectares have brought under cultivation as net area sown. This accounts for 37.8 per cent of the total area of the district. Area sown more than once is 47,255 hectares i.e. 4 per cent of the total net area sown. Total cropped area is 3,56,507 hectares i.e. 43.6 per cent of the total area sown in the district. Forests account for 2,28,750 hectares i.e. 28 per cent of the total area. Cultivable waste has been reduced to mere 0.5 per cent or 1330 hectares in the district. Less than 8.6 per cent of the total area is put to non-agricultural use 70,729 hectares. However, 18.1 per cent is accounted for by fallow lands 1,48,802 hectares. Trees, crops, groves, Orchards etc. together account for about 0.6 per cent of the total area in the district. Of the 3,09,252 hectares brought under cultivation, 47,255 hectares are sown more than once, thus enhancing the total area cropped to 3,56,507 hectares.

METHODOLOY

A two stage stratified random sampling technique was used for the study. Micro irrigators from Kodumudi block and non-micro irrigators from Vellakoil block were purposively selected. Primary data were collected through personal interview method from the sample farmers. Interview schedules were used to collect details related to the study from the sample farmers. A pilot study was conducted to identify the gaps in the interview schedule. The survey was conducted between July and December 2010. In the second stage, a complete enumeration of the size of holding in each sample block was made. The holding were then stratified into 3 size groups i.e., small (0-3 hectares), medium (3.1-6 hectares) and large (6.1 and above hectares). 50 farm households from each block were taken as sample for the purpose of the study. Appropriate mathematical and statistical methods were employed for the study.

RESULTS AND DISCUSSION

IMPACT ON IRRIGATION

In sample farmers worked very less amount of irrigation hours for all crops under micro irrigation. The table 1 explained for instance in small farmers group 40 per cent irrigated area 6-8 hours per day only 20 per cent irrigated area 4-6 hours. In case of medium farmer group 48 per cent 6-8 hours and only 12 per cent irrigated area 4-6 hours per day. 34-42 per cent of the large farmers irrigated area 8-10 and 6-8 hours per day. In the irrigated area 70 per cent of small farmer irrigated area 0-2 hectare and in medium farmer irrigated area 2-4 hectare per day's irrigation area.

TABLE 1

IMPACT ON IRRIGATION UNDER MICRO IRRIGATION SYSTEM

Particulars	Micro Irrigators			
	SF	MF	LF	All
Per day irrigation (in hours)				
4 – 6	2 (20.00)	3 (12.00)	0 (0.00)	5 (10.00)
6-8	4 (40.00)	12 (48.00)	5 (3.33)	21 (42.00)
8 – 10	3 (30.00)	8 (32.00)	6 (40.00)	17 (34.00)
10 – 12	1 (10.00)	2 (8.00)	4 (26.67)	7 (14.00)
All	**10 (100)**	**25 (100)**	**15 (100)**	**50 (100)**
Per day irrigation area (in hectare)				
0 – 2	7 (70.00)	2 (8.00)	0 (0.00)	9 (18.00)
2 – 4	3 (30.00)	18 (72.00)	9 (60.00)	80 (60.00)
4 – 6	0 (0.00)	5 (20.00)	6 (40.00)	11 (22.00)
All	**10 (100)**	**25 (100)**	**15 (100)**	**50 (100)**

Source: Field survey, (2010) (figures in bracket represent percentage of column total)

SF – Small Farmers, MF – Medium Farmers, LF – Large Farmers

IMPACT ON FARM INPUTS

Both the micro and non- micro irrigators of the large farmers using 57.14 per cent of the bullock labour for preparatory cultivation and the 60 per cent of the micro irrigator medium farmers using bullock labour for harvesting and 57.14 per cent of non-micro irrigators of large farmers using bullock labour for preparatory cultivation and 50 per cent of the medium farmers and small farmers using bullock labour for inter cultivation and harvesting purposes. In the micro irrigator farmers 34.62 per cent medium farmers are using machine labour for preparatory cultivation and all the selected farm households of 41.51 per cent of the farmers using machine labour for harvesting purposes. In case of non-micro irrigators farmers groups 42.24 per cent of the selected farmers using machine for harvesting. The values are given in table 2

TABLE 2

IMPACT OF USAGE IN INPUTS

Particulars	Micro Irrigators				Non- Micro Irrigators			
	SF	MF	LF	All	SF	MF	LF	All
Bullock Labour (in pair days)								
Preparatory cultivation	2 (50.00)	1 (20.00)	4 (57.14)	7 (43.75)	2 (33.33)	2 (33.33)	4 (57.14)	8 (42.11)
Inter cultivation	1 (25.00)	1 (20.00)	2 (28.57)	4 (25.00)	1 (16.67)	3 (50.00)	1 (14.29)	5 (26.32)
Harvesting	1 (25.00)	3 (60.00)	1 (14.29)	5 (31.25)	3 (50.00)	1 (16.67)	2 (28.57)	6 (31.58)
All	**4 (100)**	**5 (100)**	**7 (100)**	**16 (100)**	**6 (100)**	**6 (100)**	**7 (100)**	**19 (100)**
Machine labour (in hours)								
Preparatory cultivation	10 (31.25)	18 (34.62)	23 (30.67)	51 (32.08)	12 (34.29)	17 (33.33)	24 (32.00)	53 (32.92)

Inter cultivation	9 (28.13)	13 (25.00)	20 (26.67)	42 (26.42)	8 (22.86)	14 (27.45)	18 (24.00)	40 (24.84)
Harvesting	13 (40.63)	21 (40.38)	32 (42.67)	66 (41.51)	15 (42.86)	20 (39.22)	33 (39.22)	68 (42.24)
All	**32 (100)**	**52 (100)**	**75 (100)**	**159 (100)**	**35 (100)**	**51 (100)**	**75 (100)**	**161 (100)**
Human labour (man days)								
Preparatory cultivation	32 (13.33)	54 (16.98)	87 (21.17)	173 (17.85)	34 (13.55)	53 (15.82)	89 (21.60)	176 (17.64)
Plants and planting	147 (61.25)	182 (57.23)	208 (50.61)	537 (55.42)	150 (59.76)	193 (57.61)	205 (49.76)	548 (54.91)
Fertilizers pesticides	4 (1.67)	7 (2.20)	9 (2.19)	20 (2.06)	6 (2.39)	10 (2.99)	12 (2.91)	28 (2.81)
Inter cultivation	9 (3.75)	12 (3.77)	15 (3.65)	36 (3.72)	10 (3.98)	15 (4.48)	13 (3.16)	38 (3.81)
Harvesting	48 (20.00)	63 (19.81)	92 (22.38)	203 (20.95)	51 (20.32)	64 (19.10)	93 (22.57)	208 (20.84)
All	**240 (100)**	**318 (100)**	**411 (100)**	**969 (100)**	**251 (100)**	**335 (100)**	**412 (100)**	**998 (100)**

Source: Field survey, (2010) (figures in bracket represent percentage of column total)

SF – Small Farmers, MF – Medium Farmers, LF – Large Farmers

Human labour used by large farmers of micro irrigators was nearly 21.17 per cent for preparatory cultivation and for plants and planting 57.23 to 59.76 per cent are used by micro and non-micro irrigators. For inter cultivation on an average 4 per cent of human labour used by micro irrigators and 3-4 per cent in non- micro irrigators.

TABLE – 3

TWO – WAY CLASSIFICATION MODEL (ANOVA)

F Ratio between			F Ratio between			F Ratio between		
Land Holding	Bullock Labour	Table value	Land Holding	Machine Labour	Table value	Land Holding	Human Labour	Table value
0.48	0.48	6.94	28.93	9.18	6.94	0.191	1.89	4.46

Source : Based n field survey, (2010)

Table value : At (5% level of significance)

The calculated value of 'F' test for input used and land holding was 0.48 which was less than the table value $F_{0.05}$ 6.94. Hence we accepted the Ho, so there was no significant difference between the input used and size of land holding. The calculative value of 'F' test for input used and use of bullock labour is 0.48 which was less than the table value $F_{0.05}$ 6.94. Hence we accepted the Ho, so there was no significant difference between the input used and use of bullock labour. The calculated value of 'F' test for input used and land holding was 28.93 which was greater than the table value $F_{0.05}$ 6.94. Hence we rejected the Ho, so there was a significant difference between the input used and size of land holding. The calculative value of 'F' test for input used and use of machine labour is 9.18 which was greater than the table value $F_{0.05}$ 6.94. Hence we rejected the Ho, so there was a significant difference between the input used and use of machine labour. The calculated value of 'F' test for input used and land holding was 0.191 which was less than the table value $F_{0.05}$ 4.46. Hence we accepted the Ho, so there was no significant difference between the input used and size of land holding. The calculative value of 'F' test for input used and use of human labour is 1.89 which was less than the table value $F_{0.05}$ 4.46. Hence we accepted the Ho, so there was no significant difference between the input used and use of human labour.

COST OF CULTIVATION

Table 4 explained the large and medium farmers spent amount of ` 6,420 and 9,120 for preparatory cultivation was 19 per cent in micro irrigated farmers group and 17-19 per cent by the non-micro irrigated farmers spent ` 3,055 and 6,115 amount for preparatory cultivation. All the farmers of micro irrigators spent amount of ` 30,080 for maintenance, 31 per cent and for fertilizers and pesticides 14 per cent of the total amount ` 13,712.

TABLE 4

DETAILS ABOUT THE COST OF CULTIVATION

(In Rupees)

Particular	Micro Irrigators				Non- Micro Irrigators			
	SF	MF	LF	All	SF	MF	LF	All
Prep rating cultivation	2950 (18.37)	6420 (19.80)	9120 (19.99)	18490 (19.65)	3055 (17.24)	6115 (19.25)	9795 (21.11)	18965 (19.78)
Maintenance	4610 (28.70)	9880 (30.46)	15590 (34.18)	30080 (31.96)	4775 (26.95)	10330 (32.51)	16360 (35.26)	31465 (32.82)
Fertilizer pesticide	2060 (12.83)	4792 (14.78)	6860 (15.05)	13712 (14.57)	2220 (12.53)	4770 (15.01)	6350 (13.69)	13340 (13.91)
Harvesting	6440 (40.10)	11340 (34.97)	14046 (30.79)	31826 (33.82)	7670 (43.28)	10555 (33.22)	3890 (29.94)	32115 (33.49)
All	**16060 (100)**	**32432 (100)**	**45616 (100)**	**94108 (100)**	**17720 (100)**	**31770 (100)**	**46395 (100)**	**95885 (100)**

Source: Field survey, (2010) (figures in bracket represent percentage of column total)

SF – Small Farmers, MF – Medium Farmers, LF – Large Farmers

For maintenance 35 per cent, cost of ` 16,360 spent by large farmers in non-micro irrigated farmers group and next to that 32 per cent of ` 10,330 amounts by medium farmers. Medium farmers in non-micro irrigated groups spent ` 4,770 amount, 15 per cent for pesticides and for fertilizers. For harvesting the entire farmers group spent ` 31,826 which were 33.82 per cent in micro irrigated farmers and 43.28 per cent of small farmers in non-micro irrigated farmers group spent ` 7,670 amount for harvesting.

IMPACT ON CROP PRODUCTION

The following table 5 explain the crop wise output returns analysis revealed that sugarcane, turmeric and onion of micro irrigated farms shows maximum output returns of ` 1,00,000, ` 1,20,000 and 45,000 in small farmers group and 7 and 20 per cent of output returns of ` 65,000 and ` 1 ,85,000 in banana and sugarcane crop of medium farmers and 8 per cent output returns of ` 1 ,10,000 on onion produced by micro irrigated large farmers group.

Sugarcane and turmeric was produced and its output returns was ` 2 ,70,000 and ` 3 ,10,000 of large farmers. In non-micro irrigated farmers group majority of the farmers irrigated paddy and the output returns was ` 69,000 in small farmers group. Next to small farmers ` 1, 50,000 as output returns in medium farmers and in large farmers group output returns was ` 2, 46,000 with 20.16 per cent. Next to, the paddy crops output returns of ` 1, 60,000 for sugarcane and ` 2, 00,000 for turmeric in medium farmers group. Large farmers show ` 82,000 for banana and 6.72 per cent in overall crop production of large farmers. Black gram and gingelly also shows highest crop production of ` 76,000 and 68,000 respectively.

TABLE 5

IMPACT ON CROP PRODUCTION

(IN RUPEES)

Particulars	Micro Irrigators				Non- Micro Irrigators			
	SF	MF	LF	All	SF	MF	LF	All
Paddy	72000 (15.86)	160000 (17.70)	255000 (19.86)	487000 (18.44)	69000 (17.04)	155000 (19.07)	246000 (20.16)	470000 (19.28)
Sugarcane	100000 (22.03)	185000 (20.46)	270000 (21.04)	555000 (21.01)	85000 (20.99)	160000 (19.68)	250000 (20.49)	495000 (20.30)
Banana	30000 (6.61)	65000 (7.19)	80000 (6.24)	175000 (6.63)	25000 (6.17)	57000 (7.01)	82000 (6.72)	164000 (6.73)
Maize	15000 (3.30)	35000 (3.87)	60000 (4.68)	110000 (4.17)	18000 (4.44)	32000 (3.94)	66000 (5.41)	116000 (4.76)
Turmeric	120000 (26.43)	235000 (26.00)	310000 (24.16)	665000 (25.18)	100000 (24.69)	200000 (24.60)	285000 (23.36)	585000 (24.00)
Onion	45000 (9.91)	88000 (9.73)	110000 (8.57)	243000 (9.20)	43000 (10.62)	82000 (10.09)	100000 (8.20)	225000 (9.23)
Black gram	25000 (5.51)	48000 (4.31)	72000 (5.61)	145000 (5.49)	22000 (5.43)	45000 (5.54)	76000 (6.23)	143000 (5.87)

Gingelly	27000 (5.95)	50000 (5.53)	74000 (5.77)	151000 (5.72)	28000 (6.91)	51000 (6.27)	68000 (5.57)	147000 (6.03)
Coconut	20000 (4.41)	38000 (4.20)	52000 (4.05)	110000 (4.17)	15000 (3.70)	31000 (3.81)	47000 (3.85)	93000 (3.81)
All	**454000 (100)**	**904000 (100)**	**1283000 (100)**	**2641000 (100)**	**405000 (100)**	**813000 (100)**	**1220000 (100)**	**2438000 (100)**

Source: Field survey, (2010) (figures in bracket represent percentage of column total)

SF – Small Farmers, MF – Medium Farmers, LF – Large Farmers

For the micro irrigated and non- micro irrigated farmer groups't' value was calculated for the inputs used and the output produced in the irrigated farm. In the small farmers group the calculated value 1.917 was less than the table value $t_{0.05}$ 1.96, hence we accept Ho. So, there was no significant difference between the inputs used and output produced in the micro irrigated farm. This was due to that small farmers cannot easily afford micro irrigation system. The calculated value for medium and large farmers of micro irrigator was 2.235 and 3.735 which was greater than table value $t_{0.05}$ 1.96, hence reject Ho. So, there was a significant difference between the inputs used and output produced in the micro irrigated farm. In case of medium and large farmers the output was high when compared with inputs used due to the easy adoption of micro irrigation system.

TABLE 6

INPUT – OUTPUT ANALYSIS OF RERESSION MODEL

Particulars	Micro Irrigators			Non- Micro Irrigators		
	SF	MF	LF	SF	MF	LF
t	22.722	19.773	56.153	26.020	22.009	29.395
't' constant	**1.917**	**2.235**	**3.735**	**1.087**	**1.795**	**2.404**
R^2	0.996	0.995	0.999	0.997	0.996	0.998
R^2 change	0.996	0.995	0.999	0.997	0.996	0.998
β	0.998	0.997	1.000	0.999	0.998	0.999

Source : Based on field survey(2010)

Table value: 1.96 at (5% level of significance)

The calculated value for small and medium farmers of non-micro irrigator was 1.087 and 1.795 which was less than the table value $t_{0.05}$ 1.96, hence we accept Ho. So, there was a significant difference between input used and output produced in the non-micro irrigated farm. This was due to the high input used and less output from the farm. The calculated value for large farmers of non-micro irrigator was 2.404 which were greater than the table value $t_{0.05}$ 1.96, hence we reject Ho. So, there was a significant difference between the inputs used and output produced in the non-micro irrigated farm.

IMPACT ON CONSUMPTION PATTERN

Before adopting micro irrigation the monthly food expenditure was on an average of ` 3,667 amounts and non-food expenditure was ` 2,386 amounts. After adopting micro irrigation system food expenditure amount was increased ` 500 and it was now ` 3,624 and non-food expenditure it was increased by ` 700 and now they spent ` 3,167. Before adoption ` 191 and after it was ` 383 in food expenditure and in non-food expenditure they mostly start spending for children's education it was ` 1,168 from ` 976. The total expenditure of food and non-food items was ` 5,553 before adoption and after it increased by ` 6,791 respectively.

TABLE 7

IMPACT ON CONSUMPTION PATTERN OF MICRO IRRIATORS

(N=50)

S No	Particulars	Before adoption	After adoption
	Food Expenditure		
1	**Rice**	1,095	1,107
2	**Wheat**	I62	166
3	**Oil**	145	154
4	**Egg, Milk**	735	821
5	**Non-Vegetarian**	303	360
6	**Fruits**	191	383
7	**Vegetables**	382	431
8	**Pulses, Grains**	154	202
9	**Total**	3,167	3,624

Non-Food Expenditure			
10	**Vehicle**	220	392
11	**Fuel**	543	703
12	**Education**	976	1,168
13	**Clothing**	276	341
14	**Electricity**	201	210
15	**Social activity**	170	353
16	**Total**	2,386	3,167
17	**FE+NFE (9+16)**	5553	6791

Source: Field survey, 2010 (values given are on an average of all the sample respondent)

FE: Food Expenditure, NFE: Non-Food Expenditure

PROBLEMS AND MICRO IRRIGATION SYSTEM

The major constraints experienced by the farmers are initial cost of system was very high, small and medium farmers cannot afford micro system. Fifty per cent subsidy offered by the government was difficult to obtain due to procedural difficulties. Difficulties were faced in intercultural operation. During harvest, it was difficult to take out laterals resulting in leakage (Batta and Singh, 1998). The data was presented in table – 8

TABLE- 8

PROBLEMS AND MICRO IRRIGATION SYSTEM

S No	Particulars	Micro Irrigators			
		SF	MF	LF	ALL
1	**Initial Investment**	9 (90.00)	20 (80.00)	13 (86.67)	42 (15.44)
2	**Operation and Maintenance Problem**	7 (70.00)	18 (72.00)	9 (60.00)	34 (12.50)
3	**Poor Technical Knowledge**	8	21	11	40

		(80.00)	(84.00)	(73.33)	(14.71)
4	**Frequent Power Cut**	9 (90.00)	22 (92.00)	14 (93.33)	45 (16.54)
5	**Availability of Micro irrigation Set**	6 (60.00)	17 (68.00)	10 (66.67)	33 (12.13)
6	**Long Time for Sanction of Loan and Subsidy**	8 (80.00)	19 (76.00)	12 (80.00)	39 (14.34)
7	**Frequent Choking and Other Problems With the System**	9 (90.00)	18 (72.00)	12 (80.00)	39 (14.34)
	Total no of respondent	**10** **(100)**	**25** **(100)**	**15** **(100)**	**272** **(100)**

Source: Field survey, (2010) (figures in bracket represent percentage of column total)

SF – Small Farmers, MF – Medium Farmers, LF – Large Farmers

Table - 8 revealed that all farmers using micro technology faced frequent load shedding and hence felt handicapped in efficient utilization of various inputs. In small farmers 90 per cent reported that initial investment was high when compared with medium and large farmers. 72 per cent of medium farmers faced operation and maintenance problem and next to that 70 per cent in small farmers group. Poor technical knowledge among the farmers was 80-84 per cent in small and medium farmers. 90-93 per cent of all the farmers groups having frequent power cut problem. Long time for sanction of loan and subsidy also one problem the per cent are 76-80 in all the groups. 90 per cent of the small farmers are facing frequent choking and other problems with the system respectively.

PROBLEMS FACED BY MICRO IRRIGATION SYSTEM ADOPTERS

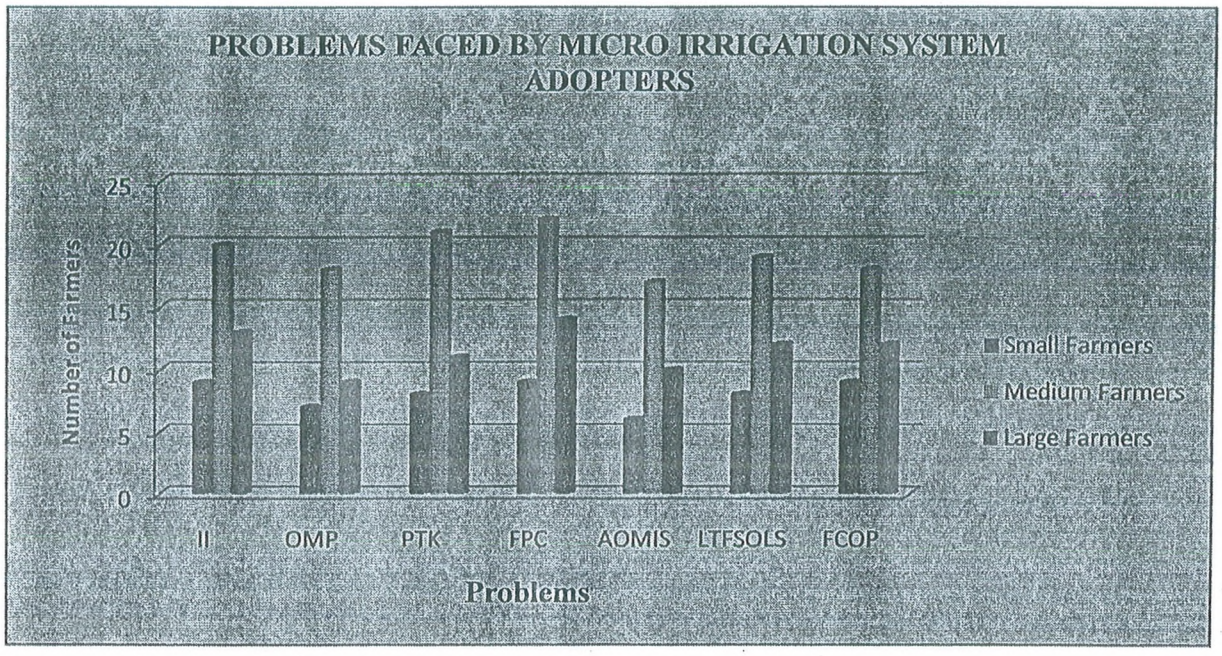

FIG : 1

II - Initial Investment, OMP - Operation and Maintenance Problem, PTK - Poor Technical Knowledge, FPC - Frequent Power Cut, AOMIS - Availability of Micro irrigation Set, LTFSOLS - Long Time for Sanction of Loan and Subsidy, FCOP - Frequent Choking and Other Problems With the System.

CONCLUSION

The finding of the study implies that the farmers who adopt micro irrigation system for irrigation have realised increase their crop production, their incomes, and their household food security. Ironically, a technology typically associated with wealthy farmers, micro irrigation, may hold the key to alleviating a significant share of rural hunger and poverty. Micro irrigation had proved to be success in terms of water saving and increased yield in a wide range of horticulture, commercial and vegetable crops. The proper periodic care and maintenance of the micro system was important for its efficient operation. India had the largest irrigation network in the world; its irrigation efficiency had not been more than 40 per cent. Micro irrigation system had the greatest potential for the efficient use of water and fertilizers. Bring more area under drip irrigation system will largely depend upon efficient use of water. The study also concluded that the micro irrigation system had most significant role to achieve not only higher productivity and water use efficiency but also to develop rural livelihood security.

THE SUGGESTIONS

- Availability of cheap and effective weedicides
- Supply of electricity regularly
- Subsidization of diesel price for reducing the cost of tractor services
- Provision of loan with low interest from financial agency
- Subsidies should be made available easily and timely to the non-Micro irrigated farmers
- The spare parts such as micro tubes, Micro pits etc should be made readily available on reasonable rates to both the type of farmers and
- Extension workers and company officers' should arrange demonstration regarding maintenance of Micro irrigation system

THE RECOMMENDATIONS

- State wise potential and required investment for micro method of irrigation need to be estimated.
- Measures need to be introduced to reduce the capital cost.
- Structured subsidy schemes followed in Maharashtra should be introduced in other states.
- Better awareness about the micro method of irrigation should be created among the farmers through quality extension network.
- Differential subsidy rate should be followed: higher subsidy rate for water intensive crops and vice-versa.
- Cultivation of sugarcane should be promoted using micro method of irrigation with the help of sugar factories and
- Micro set manufactures should be asked to involve in providing training to the farmers who are ready to adopt it.

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