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Farmers' Awareness towards Drip Irrigation System and Flood Irrigation System in Coimbatore District

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Abstract: ***Agriculture is the backbone of Indian Economy and a key sector in India. Agriculture is the largest user of water which consumes more than 80 per cent of the country's exploitable water resources. The conventional methods of water conveyance and irrigation are highly inefficient due to wastage of water and other clogging problems. In this context, the use of modern irrigation methods like drip irrigation and sprinkler irrigation are the only alternative for efficient use of surface as well as ground water resources. Hence, in this chapter, the meaning, Significance, components, scope of Drip Irrigation are discussed, apart from describing the origin, need, types of irrigation.***

Keywords: Agriculture

1. Drip Irrigation

Drip irrigation method (DIM) is a technical measure introduced about to decades back to increase the water use efficiency in Indian Agriculture. The increasing demand for irrigation water coupled with a rapid decline in net potential of water available in the recent years has forced adoption of new methods of irrigation for crop cultivation all over the world. In this method water will be supplied constantly or at regular interval at the root zone of crops through a network of pipes with the help of emitters. It is well known fact that the DMI is mainly used for water saving. The consumption of water is less when it is applied by pipe network as it is completely stops the evaporation and distribution losses of water[1].

2. Drip Irrigation in India

In India, it was introduced in the early seventies, and during the last few years this system has started gaining momentum. The adoption of the drip system started in areas having water scarcity, poor quality water, and undulating terrains. The Indian National Commission on Irrigation and Drainage, in its report (INCID, 1994.) has reported that in India, 70,859 ha area are under drip irrigation, which is 3.97 per cent of the area irrigated by drip irrigation systems worldwide.

The scientists at the Tamil Nadu Agricultural University (TNAU), Coimbatore, who are considered to be the pioneers in drip irrigation research in India, have conducted large-scale demonstration in the farmers' field for various crops, which received encouraging response from the farmers (INCID, 1994). However, the adoption of drip method of irrigation was very slow till mid-eighties mainly because of lack of promotional activities from the State and Central governments. The formation of the National Committee on the Use of Plastics in Agriculture (NCPA) by the Ministry of Petroleum, Chemicals and Fertilisers, Government of India, during 1981 under the Chairmanship of Dr. G. V. K. Rao is termed as the first milestone for the development of micro-irrigation in India (GOI, 2004). With the establishment of 17 different Plasticulture Development Centers (PDCs) across different agro-climatic regions in the country, the NCPA has played a crucial role in the technological development of micro-irrigation in India. Besides recommending policy measures to the government, the NCPA also played an important role in promoting drip method of irrigation through conducting seminars focusing on micro-irrigation (GOI, 2004).

3. Profile of the Study Area – Coimbatore District

Tamil Nadu, in India, has been divided into five agricultural zones based on the agro climatic conditions and soil profile. Coimbatore district falls under Zone II. where Coimbatore is the third largest city in the state, and is popularly known as textile capital of south India. It is situated on the banks of the river Noyyal.

Objectives of the study

1) To evaluate the crop yield between surface irrigation and drip irrigation.
2) To study drip irrigation system controls pests and diseases.

Hypotheses of the study

Ho1:**Agricultural Profile and Opinion that Drip Irrigation Increases Yield**

Ho2:**Agricultural Profile and Opinion that Drip Irrigatio System controls Pests**

4. Methodology

Sources of Data

The study is mainly based on primary data, which are collected from farmers through Interview Schedule consisting of 42 questions, of which, 11 questions were related to the personal profile of the respondents, 8 questions were related to Agricultural Profile and the rest were related to Irrigation Profile of the respondents .The secondary data needed for the study were collected from the Department of Agriculture, Government of Tamil Nadu, Suppliers of drippers and online sources, apart from the related journals, articles, and books.

Sample Design

The primary data were collected from 395 farmers in Coimbatore, District, in Tamil Nadu. Coimbatore District was chosen for the study due to the fact that drip irrigation is adopted by the farmers to cultivate both perennial and orchard crops such as coconut, arecanut, banana, grapes, etc. According to the report of Department of Agriculture, Government of Tamil Nadu, A sample size of 400 (approximately 10 percent) of the population was taken into consideration for this study.

Framework of Analysis

The primary data collected were analyzed by using the following statistical tools.Apart from the descriptive statistical analysis, the tools like Chi-Square Test, Five - Point Scaling, Average Score Analysis, Regression Analysis ANOVA, Paired t-Test, and Crosstab Analysis have been used in the present study.

Limitations of the Study

The necessary precautions were taken by the researcher to prevent shortcomings. In spite of that, the present study is subject to the following limitations. First, the results of the present study may not be applicable to other blocks having different socio – economic conditions.

5. Review of Literature

Gupta A.J, et al., (2010), in their study, capsicum var. Nishat-1 was grown under drip irrigation with fertigation. Surface irrigation and manual fertilizer application were treated as control. The results revealed that there was significant improvement in yield, quality, water and fertilizer use efficiencies of capsicum under drip irrigation and fertigation. However, the combined effect of drip irrigation and fertigation was found superior than their individual effects. The treatment combination of 80 per cent ET through drip and 80 per cent recommended NPK through fertigation registered maximum fruit yield (366.48 q/ha). The highest water use efficiency (29.40 q/ha -cm) was observed with the treatment combination of 60 per cent ET through drip + 80 per cent recommended NPK through fertigation.

Suresh Kumara,P. D. and Palanisami, K. (2010)have revealed that adoption of drip irrigation technology has increased the net sown area, net irrigated area and thereby has helped in achieving higher cropping intensity and irrigation intensity. It has been found that there is a significant shift towards crops such as coconut, grapes and banana from annual crops like vegetables, sugarcane and the like. The main reasons have been found as scarcity of human labour and water. As the cropping pattern decides the adoption and suitability of drip irrigation, widespread adoption of micro - irrigation could be promoted in the regions where shift towards crops like coconut, banana and grapes are common. The analysis of economics of crop cultivation under drip and control has revealed that the drip method of irrigation has a significant impact on resources saving, cost of cultivation, yield of crops and farm profitability. The physical water and energy productivity is significantly high in drip over the flood method of irrigation. One could conclude that the drip has a significant bearing on the private costs and benefits and hence on profit of farmers. Thus, our policy focus may be tilted towards the promotion of drip irrigation in those regions where scarcity of water and labour is alarming and where shift towards wider - spaced crops is taking place.

6. Analysis and Findings

Table 1: Drip Irrigation Increases Yield

No. of Family Members					
None	10 -66.7	5 -33.3	0 0	0 0	15 -100
One	260 -75.4	73 -21.2	10 -2.9	2 -0.6	345 -100
Two	21 -72.4	7 -24.1	0 0	1 -3.4	29 -100
More than two	5 -83.3	1 -16.7	0 0	0 0	6 -100
Total	**296 -74.9**	**86 -21.8**	**10 -2.5**	**3 -0.8**	**395 -100**
No. of Electric Service					
One	269 -74.5	80 -22.2	10 -2.8	2 -0.6	361 -100
Two	23 -85.2	4 -14.8	0 0	0 0	27 -100
More than two	4 -57.1	2 -28.6	0 0	1 -14.3	7 -100
Total	**296 -74.9**	**86 -21.8**	**10 -2.5**	**3 -0.8**	**395 -100**
Type of Crop Cultivated					
Standard Crops	32 -71.1	13 -28.9	0 0	0 0	45 -100
Seasonal Crops	87 -73.7	25 -21.2	5 -4.2	1 -0.8	118 -100
Regular Crops	44 -86.3	6 -11.8	0 0	1 -2	51 -100
Standard & Regular Crops	75 -80.6	17 -18.3	0 0	1 -1.1	93 -100
Standard & Seasonal Crops	58 -65.9	25 -28.4	5 -5.7	0 0	88 -100
Total	**296 -74.9**	**86 -21.8**	**10 -2.5**	**3 -0.8**	**395 -100**

From the results, it is clear that, the farmers strongly agree on the fact that drip irrigation increases crop yield after its adoption. However, they have strongly disagreed on the fact that drip irrigation controls pests and diseases.

Table 2: Chi – Square Analysis: Agricultural Profile and Opinion that Drip Irrigation Increases Yield

Factors	Chi-square Value	df	p-value
Farmers Involvement in Agriculture	10.790[a]	9	.290
Type of Farmers	6.783[a]	6	.341
Experience in Agriculture	12.640[a]	6	.049
Number of Family Members Involved in Agriculture	5.869[a]	9	.753
Number of Electric Service	19.667[a]	6	.003*
Type of Crop Cultivated	19.763[a]	12	.072

Note1: a. 10 cells (50.0)) have expected count less than 5.
Note2: * indicates significant at five per cent level.
Note3: The minimum expected count is .34.

However, the chi – square results reveal that, except the number of electric service used, all other agricultural variables have significant influence the on opinion that drip irrigation increases crop yield.

Table 3: Drip Irrigation Controls Pests and Diseases

Involvement in Agriculture	**Drip Controls Pests and Diseases**					**Total**
	SA	**A**	**N**	**DA**	**SDA**	
By tradition	24 -9.5	44 -17.5	25 -9.9	150 -59.5	9 -3.6	252 -100
Nature of job	1 -5.6	17 -94.4	0 0	0 0	0 0	18 -100
Self Interest	4 -7.7	17 -32.7	3 -5.8	25 -48.1	3 -5.8	52 -100
Income potential	9 -12.3	25 -34.2	8 -11	26 -35.6	5 -6.8	73 -100
Total	**38 -9.6**	**103 -26.1**	**36 -9.1**	**201 -50.9**	**17 -4.3**	**395 -100**
Type of Farmers	**Drip Controls Pests& Diseases**					**Total**
	SA	**A**	**N**	**DA**	**SDA**	
Marginal farmers	17 -17.3	31 -31.6	8 -8.2	40 -40.8	2 -2	98 -100
Small farmers	10 -5.8	31 -17.9	17 -9.8	108 -62.4	7 -4	173 -100
Big farmers	11 -8.9	41 -33.1	11 -8.9	53 -42.7	8 -6.5	124 -100
Total	**38 -9.6**	**103 -26.1**	**36 -9.1**	**201 -50.9**	**17 -4.3**	**395 -100**
Experience in Agriculture	**Drip Controls Pests& Diseases**					**Total**
	SA	**A**	**N**	**DA**	**SDA**	
Less than 5 yrs.	2 -25	2 -25	0 0	3 -37.5	1 -12.5	8 -100
5 - 10 yrs.	12 -6.1	38 -19.4	11 -5.6	128 -65.3	7 -3.6	196 -100
More than 10 yrs.	24 -12.6	63 -33	25 -13.1	70 -36.6	9 -4.7	191 -100
Total	**38 -9.6**	**103 -26.1**	**36 -9.1**	**201 -50.9**	**17 -4.3**	**395 -100**
No. of family members	**Drip Increases Yield**					**Total**
	SA	**A**	**N**	**DA**	**SDA**	
None	1 -6.7	13 -86.7	1 -6.7	0 0	0 0	15 -100
One	30 -8.7	78 -22.6	31 -9	191 -55.4	15 -4.3	345 -100
Two	4 -13.8	9 -31	4 -13.8	10 -34.5	2 -6.9	29 -100
More than two	3 -50	3 -50	0 0	0 0	0 0	6 -100
Total	**38 -9.6**	**103 -26.1**	**36 -9.1**	**201 -50.9**	**17 -4.3**	**395 -100**
Number of Electric Service	**Drip Controls Pests and Diseases**					**Total**
	SA	**A**	**N**	**DA**	**SDA**	
One	26 -7.2	91 -25.2	35 -9.7	192 -53.2	17 -4.7	361 -100
Two	9 -33.3	9 -33.3	1 -3.7	8 -29.6	0 0	27 -100
More than Two	3 -42.9	3 -42.9	0 0	1 -14.3	0 0	7 -100
Total	**38 -42.9**	**103 -26.1**	**36 -9.1**	**201 -50.9**	**17 -4.3**	**395 -100**
Type of Crop Cultivated	**Drip Controls Pests and Diseases**					**Total**
	SA	**A**	**N**	**DA**	**SDA**	
Standard Crops	4 -8.9	4 -8.9	2 -4.4	34 -75.6	1 -2.2	45 -100
Seasonal Crops	7 -5.9	27 -22.9	13 -11	66 -55.9	5 -4.2	118 -100
Regular Crops	7 -13.7	18 -35.3	4 -7.8	20 -39.2	2 -3.9	51 -100
Standard & Regular Crops	15 -16.1	36 -38.7	8 -8.6	32 -34.4	2 -2.2	93 -100
Standard & Seasonal Crops	5 -5.7	18 -20.5	9 -10.2	49 -55.7	7 -8	88 -100
Total	**38 -9.6**	**103 -26.1**	**36 -9.1**	**201 -50.9**	**17 -4.3**	**395 -100**

From the results, it is clear that, the farmers strongly agree on the fact that drip irrigation controls pests and diseases after its adoption.

Table 4: Chi – Square Analysis: Agricultural Profile and Opinion that Drip Irrigation System controls Pests and Diseases

Factors	*Chi-square Value*	*df*	*p-value*
Farmers Involvement in Agriculture	64.709[a]	12	.000*
Type of Farmers	27.524[a]	8	.001*
Experience in Agriculture	37.187[a]	8	.000*
Number of family members involved in Agriculture	51.721[a]	12	.000*
Number of Electric Service	35.275[a]	8	.000*
Type of crop cultivate	40.760[a]	16	.001*

Note1: a. 10 cells (50.0)) have expected count less than 5.
Note2: * indicates significant at five per cent level.
Note3: The minimum expected count is .34.

Moreover, the chi-square results of another statement reveal that the respondents involved in agriculture, type of farmers, experience in agriculture, Number of family members in agriculture, Number of electric services used, Type of crop cultivate have significant influence on their opinion that drip irrigation controls the pests and diseases

Paired t-test

The paired t test provides a hypothesis test of the difference between population means for a pair of random samples whose differences are approximately normally distributed. A pair of samples, each of which are not from normal a distribution, often yields differences that are normally distributed. The simplest way to carry out a paired t-test is to compute the difference (using Transform, Compute) and then carrying out a one-sample t-test as follows:

— Analyze
— Compare Means
— One-Sample T Test
— Choose the difference variable as the Test Variable

Crop Yield between Surface and Drip Irrigation

In Table5.the paired t-test has been performed between crop yield through surface irrigation and crop yield through drip irrigation. In order to predict the effectiveness of drip irrigation, the yield is considered to be a mandatory field.

Table 5: Paired t-test – Crop Yield between Surface and Drip Irrigation

Crop	Irrigation	Mean	t value	df	p-value
Coconut	Surface Irrigation	97.30	17.17	154	0.000*
	Drip Irrigation	109.35			
Arecanut	Surface Irrigation	6.24	22.213	65	0.000*
	Drip Irrigation	8.52			
Grapes	Surface Irrigation	5.85	16.845	44	0.000*
	Drip Irrigation	7.73			
Banana	Surface Irrigation	851.61	29.676	117	0.000*
	Drip Irrigation	964.25			
Turmeric	Surface Irrigation	8.06	15.133	114	0.000*
	Drip Irrigation	10.59			
Sugarcane	Surface Irrigation	6.75	4.013	3	0.028*
	Drip Irrigation	9.08			
Onion	Surface Irrigation	5.65	42.293	110	0.000*
	Drip Irrigation	7.48			
Other Crops	Surface Irrigation	7.55	20.163	83	0.000*
	Drip Irrigation	9.0964			

Source: computed from data

The above table shows the actual yield obtained in one acre of land. Coconut crop obtains mean yield of 97.3 coconuts through surface irrigation and obtains 109.35 coconuts through drip irrigation. Similarly, while noticing for all other crops drip irrigation yield is better than surface irrigation. Further, this objective tries to measure the significant impact on crop. The table shows the paired mean difference and its corresponding mean value and p-value. The statistical significance is tested at 5 per cent level and it is also observed that all p-values are significant at 5 per cent level.

Hence, it is justified that significant difference is found between surface irrigation and drip irrigation. It is also found that the drip irrigation system is more effective than surface irrigation in all eight crops considered for this study. Thus this analysis confirms that the drip irrigation system may be considered for better yield.

7. Conclusion

The results of the study reveal that the drip irrigation system, besides having water saving potential, have other advantages also like increase in crop yield, controls pests and dieses requiring less labour, requiring no personal attention, facility in application of fertilizers, etc. Thus, the drip system is very much agreeable to the farmers in the study area and hence it may be recommended to the farmers in other areas too.

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