IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Role And Awareness Of Micro Irrigation In Modern Agriculture In Coimbatore City - A Review Of Sustainable Ground Water Management Through Micro Irrigation System

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Abstract: Groundwater is essential to worldwide water resources, underpinning agricultural, industrial, and home water supply systems. Nonetheless, the long-term viability of groundwater is progressively jeopardized by the extensive use of irrigation systems, particularly micro irrigation. Micro irrigation is a prevalent agricultural method that entails the application of water to crops using drip irrigation and sprinkler systems. This technology has achieved extensive utilization owing to its capacity to provide water effectively to crops. Micro irrigation is essential in contemporary agriculture since it improves water efficiency and fosters sustainable groundwater management. This technique, encompassing drip and sprinkler systems, supplies water directly to the root zone of plants, thereby reducing evaporation and runoff. The principal advantages of micro irrigation are enhanced crop productivity, as plants obtain constant and accurate water distribution, resulting in healthier growth and increased yields. The Government of India has been executing a government-sponsored program on Micro Irrigation aimed at improving water use efficiency in agriculture by promoting suitable technological interventions such as drip and sprinkler irrigation systems, and encouraging farmers to adopt water-saving and conservation technologies. This study assesses farmers' awareness with micro irrigation systems. The study utilizes both primary and secondary data to comprehensively evaluate farmers' awareness regarding the Micro Irrigation System. A questionnaire method was devised to ensure the sample and collect data. The chosen population consisted of farmers who had implemented Micro-Irrigation systems in the Coimbatore city, with a total of 220 farmers selected for the study using a random selection technique. Percentage Analysis, Mean Ranking Technique, Chi-Square analysis and Likert Scale Analysis are employed to assess data dependability.

Index Terms **- Irrigation, Farmers, Agriculture, Micro Irrigation, Water Management.**

Introduction

GROUNDWATER IS ESSENTIAL TO WORLDWIDE WATER RESOURCES, UNDERPINNING AGRICULTURAL, INDUSTRIAL, AND HOME WATER SUPPLY SYSTEMS. NONETHELESS, THE LONG-TERM VIABILITY OF GROUNDWATER IS PROGRESSIVELY JEOPARDIZED BY THE EXTENSIVE USE OF IRRIGATION SYSTEMS, PARTICULARLY MICRO IRRIGATION. MICRO IRRIGATION IS A PREVALENT AGRICULTURAL METHOD THAT ENTAILS THE APPLICATION OF WATER TO CROPS USING DRIP IRRIGATION AND SPRINKLER SYSTEMS. THIS TECHNOLOGY HAS ACHIEVED EXTENSIVE UTILIZATION OWING TO ITS CAPACITY TO PROVIDE WATER

EFFECTIVELY TO CROPS. WATER SCARCITY HAS EMERGED AS A SIGNIFICANT ISSUE, PARTICULARLY DUE TO ITS VITAL IMPORTANCE IN AGRICULTURE. THE ACCESSIBILITY OF WATER RESOURCES HAS DIMINISHED DUE TO REASONS INCLUDING CLIMATE CHANGE, POPULATION EXPANSION, AND URBANIZATION. THIS HAS PROFOUNDLY AFFECTED THE AGRICULTURE INDUSTRY, WHICH RELIES EXTENSIVELY ON WATER FOR IRRIGATION AND VARIOUS OTHER FUNCTIONS. WATER SCARCITY HAS DIMINISHED CROP YIELDS, ESCALATED PRODUCTION COSTS, AND LOWERED FARMER PROFITABILITY. THE AVAILABILITY OF WATER IS INFLUENCED BY SEVERAL HYDRO-METEOROLOGICAL FACTORS; THUS, GUARANTEEING A RELIABLE WATER SUPPLY FOR IRRIGATION IS VITAL. THE SITUATION, AS PREVIOUSLY SAID, PRESENTS A CONSIDERABLE IMPEDIMENT. THE URGENT ISSUE IN AGRICULTURE IS THE NECESSITY TO IMPROVE PRODUCTION TO SUPPORT THE GROWING POPULATION OF THE NATION. THIS DEMOGRAPHIC TRANSITION PRESENTS A CONSIDERABLE DIFFICULTY AS LAND HOLDINGS DIMINISH, COMPLICATING THE FULFILLMENT OF THE FOOD REQUIREMENTS OF THE POPULATION. IRRIGATION PLAYS A VITAL AND ESSENTIAL PART IN ACHIEVING THE SPECIFIED OBJECTIVES. THE PRADHAN MANTRI KRISHI YOJANA (PMKSY) WAS DESIGNED TO ENHANCE WATER USAGE EFFICIENCY IN AGRICULTURE IN 1995. THE INITIATIVE PRIMARILY EMPHASIZES THE PROMOTION OF MICRO IRRIGATION METHODS, INCLUDING DRIP AND SPRINKLER IRRIGATION, TO OPTIMIZE WATER RESOURCE UTILIZATION AND AUGMENT AGRICULTURAL YIELD. MICRO-IRRIGATION IS AN EFFICIENT AND SUSTAINABLE TECHNIQUE FOR IRRIGATING CROPS, INCREASINGLY FAVORED BY FARMERS AIMING TO MAXIMIZE WATER UTILIZATION, MINIMIZE WASTE, AND ENHANCE CROP YIELDS.

Role of Micro Irrigation in Modern Agriculture

Micro irrigation is essential in contemporary agriculture since it improves water efficiency and fosters sustainable groundwater management. This technique, encompassing drip and sprinkler systems, supplies water directly to the root zone of plants, thereby reducing evaporation and runoff. The principal advantages of micro irrigation are enhanced crop productivity, as plants obtain constant and accurate water distribution, resulting in healthier growth and increased yields. Moreover, micro irrigation systems enhance nutrient efficiency through fertigation, which involves the integration of fertilizers with water for direct application to plant roots. This minimizes waste and enhances nutrition absorption. Micro irrigation aids in alleviating the excessive extraction of groundwater, a rising issue in several areas. These technologies mitigate water loss, diminish the demand for groundwater, avert aquifer depletion, and facilitate groundwater recharging by effective water application that penetrates deeper into the soil. Notwithstanding these benefits, the extensive implementation of micro irrigation is obstructed by obstacles like elevated startup expenses, insufficient technical expertise, and poor upkeep. Enhancing awareness among farmers, granting subsidies, and delivering training programs are crucial for surmounting these obstacles. Success narratives from nations such as Israel, India, and the United States illustrate the efficacy of micro irrigation in mitigating water constraint and enhancing agricultural productivity. Nevertheless, additional study, technological advancements, and cohesive water management strategies are essential for ensuring its wider and more effective application.

I. NEED FOR THE STUDY

Irrigation enhances agricultural output; yet, it also presents environmental challenges. Excessive groundwater extraction can result in exhaustion and land degradation. Poor water management techniques can lead to soil salinization and diminished biodiversity. Effective irrigation can elevate income levels, empower farmers, and bolster food security in the socio-economic sphere. Nevertheless, inequitable access to irrigation supplies can intensify socio-economic inequalities. The Government of India has been executing a government-sponsored program on Micro Irrigation aimed at improving water use efficiency in agriculture by promoting suitable technological interventions such as drip and sprinkler irrigation systems, and encouraging farmers to adopt water-saving and conservation technologies. This study assesses farmers' awareness with micro irrigation systems.

II. OBJECTIVES OF THE STUDY

The objectives of the study are given below:

- To assess the role of micro irrigation system in modern agriculture in Coimbatore city.
- To examine the farmers awareness on Micro Irrigation System in the study.

III. RESEARCH METHODOLOGY

The study utilizes both primary and secondary data to comprehensively evaluate farmers' awareness regarding the Micro Irrigation System. A questionnaire method was devised to ensure the sample and collect data. The chosen population consisted of farmers who had implemented Micro-Irrigation systems in the Coimbatore city, with a total of 220 farmers selected for the study using a random selection technique. Percentage Analysis, Mean Ranking Technique, Chi-Square analysis and Likert Scale Analysis are employed to assess data dependability.

IV. ANALYSIS AND DISCUSSIONS

The statistical analysis results are given below:

5.1 Socio-economic Profile of Farmers

The present study has offered that socio-economic profile of farmers as follows:

Table-1 Socio-economic Profile of Farmers

Factors	Particulars	Frequency	Percent (%)
Age	Below 25 years	34	15.00
	26 years – 35 years	66	30.00
	36 years – 45 years	44	20.00
	Above 45 years	76	35.00
Monthly Income	Below Rs. 20000	54	25.00
	Rs. 21000 – Rs. 40000	89	40.00
	Rs.41000 – Rs. 60000	51	23.00
	Above Rs. 60000	26	12.00
Ownership on Land	Own Land	120	55.00
	Rented	26	12.00
	Leased Land	74	34.00
Category of Farmers Based on Land Extent	Small	56	25.00
	Marginal	93	42.00
	Large	71	32.00
Farming Experience	Below 5 years	48	22.00
	6 years – 10 years	59	27.00
	11 years – 15 years	78	35.00
	16 years – 20 years	13	6.00
	Above 20 years	22	10.00
	Total	**220**	**100.00**

Source: Computed

The table indicates that 76% of the farmers are over 45 years old. 89% of farmers earn between Rs. 21,000 and Rs. 40,000 per month. Fifty-five percent of respondents utilize their own property for agricultural purposes, whereas forty-two percent of farmers qualify as marginal farmers based on the area of their landholdings. Approximately 78% of farmers possess 11 to 15 years of agricultural experience, whilst 13% have 16 to 20 years of experience in the field.

5.2 Type of Micro Irrigation Used by Farmers

The type of micro irrigation used by farmers as follows:

Table-1 Type of Micro Irrigation Used by Farmers

	Particulars	Frequency	Percent
Types of Micro Irrigation	Drip Irrigation	138	63
	Sprinkler Irrigation	52	24
	Subsurface Drip Irrigation	30	14
	Total	**220**	**100**

The data indicates that 63% of farmers utilize drip irrigation, 24% employ sprinkler irrigation, and 14% implement subsurface drip irrigation systems for their agricultural practices.

5.3 Benefits of Micro Irrigation System

Table-3 Benefits of Micro Irrigation System

Statements	N	Mean	Std. Dev.
Precise Water Delivery	220	2.11	1.29
Improved Crop health	220	2.15	1.28
Reduced weed growth	220	1.84	1.11
Improved crop growth and yield	220	1.96	1.25
Water use efficiency	220	1.88	1.14
Reduced labour costs	220	1.78	1.05

Source: Computed

The table above elucidates the five-point Likert scale, indicating that the majority of farmers express satisfaction or great satisfaction regarding the factors of the micro irrigation system, as reflected in their responses to the six assertions. The average scores for the majority of categories range from 1.78 to 2.15, indicating that farmers typically convey satisfaction. The reduction in labor costs received a mean score of 1.78, suggesting a high degree of satisfaction among farmers in the research area. The data indicated that the advantageous aspects are especially esteemed by the farmers.

Table-4 Awareness Level of Farmers on Micro Irrigation System

Awareness Level	No. of Respondents	Percent (%)
High	**102**	**46.36**
Medium	68	30.91
Low	50	22.73
Total	**220**	**100.00**

This study revealed that the farmers highly aware about the micro irrigation system followed by the farmers medium level awareness and low level awareness about micro irrigation system in Coimbatore. The study has measured the significant association between the farmer's awareness and the independent variable in this study as given below:

Table-5 Chi-Square Test

	Value	df	Sig.
Pearson Chi-Square	9.352[a]	2	.043
Likelihood Ratio	7..562	2	.076
Linear-by-Linear Association	3.987	1	.029
N of Valid Cases	**220**		

Note: Table value at 5% Level

Table-5 mentioned that the significant association (0.043) between the awareness level of farmers on micro irrigation system and independent variables at 5 percent significant level.

VI. CONCLUSION

The micro irrigation systems provide an excellent solution for regions facing water scarcity and for farmers seeking to maximize their land's productivity with minimal environmental impact. The sample consists of male farmers with significant experience in farming and relatively high numbers of farmers are aged above 45 years which indicate majority of the farmers with experience are engaging in agriculture. Income levels are moderate with Rs.21000 to Rs. 40000 and most of the farmers own their land although they tend have marginal landholdings. Further most of the farmers are using drip irrigation system in their land. The current study found that water saving and labor cost reduction were the most influencing factors for the adoption of micro irrigation system among the farmers. The government should provide the subsidiary for installation of irrigation facility in the farmers land. Hence, the study concluded that the farmers have higher awareness level on micro irrigation system and significantly associated with other socio-economic profile of the respondents in the study.

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