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Mamidi Venkatesh
School of Agribusiness
Management, College of
Agriculture, Professor
Jayashankar Telangana State
Agricultural University
(PJ TSAU), Hyderabad,
Telangana, India

P Radhika
Professor and Head, School of
Agri Business Management,
College of Agriculture, Professor
Jayashankar Telangana State
Agricultural University
(PJ TSAU), Hyderabad,
Telangana, India

Ch Srilatha
Assistant Professor, School of
Agri Business Management,
College of Agriculture, Professor
Jayashankar Telangana State
Agricultural University
(PJ TSAU), Hyderabad,
Telangana, India

A Meena
Assistant Professor, Department
of Statistics and Mathematics,
College of Agriculture, Professor
Jayashankar Telangana State
Agricultural University
(PJ TSAU), Hyderabad,
Telangana, India

Corresponding Author:
Mamidi Venkatesh
School of Agribusiness
Management, College of
Agriculture, Professor
Jayashankar Telangana State
Agricultural University
(PJ TSAU), Hyderabad,
Telangana, India

An analysis of factors influencing farmers buying behaviour of micro irrigation equipment in Kadapa district of Andhra Pradesh

Mamidi Venkatesh, P Radhika, Ch Srilatha and A Meena

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Abstract

The two most crucial natural resources for the growth of agriculture are land and water. In India, agriculture is the predominant user of water resources. Low level of water use efficiency in agriculture is another serious challenge for sustainable management of water resources. Micro irrigation which allows application of water to root zone of the crops through emitters, has already been adopted by many countries for transforming their agriculture. To carry out the study with the above objectives, Kadapa district of Andhra was taken up as study area. In Kadapa district almost all of the micro irrigation area is occupied by horticultural crops, in which a little above 60 per cent of area is occupied by fruit crops. The average area under micro irrigation for marginal farmers is around 1.47 acres, whereas for small farmers it is 3.96 acres and for semi medium farmers it is 6.95 acres. Around half of the respondent farmers showed their willingness to increase the area under micro irrigation in their land holding. The major factors influencing the farmers for the installation of micro irrigation system in their fields are; subsidy given by the Government, availability of water, peer influence and improvement of crop yield. The constraints encountered by farmers in the adaptation of drip irrigation technology are poor post installation services, difficulty in availability of spare parts and damages to the micro irrigation system because of inter cultivation operations. The benefits accrued by respondent farmers as a result of installation of micro irrigation system, included efficiency of water usage, reduced labour cost, reduced use of fertilizers, control of weeds and enhanced crop yield and quality.

Keywords: Micro irrigation, adoption, factors influencing, constraints, Kadapa, Andhra Pradesh

1. Introduction

In many developing economies, especially in the arid and semi-arid tropical nations like India, constructing infrastructure for the management of water resources has been a frequent governmental objective. According to a research by the International Water Management Institute (IWMI), improving irrigation efficiency can help meet around 50 per cent of the projected increase in water demand by the year 2025 (Seckler *et al.*, 1998) ^[20].

There is an issue in the world's management of water. The supply of usable water and its wildly unequal spatial distribution are key factors in the dilemma. The dynamic nature of the resource and its varied uses make it difficult to increase water availability, make it usable, and manage distribution. The analysis of earlier studies clearly demonstrates that there are two ways to address the issue of chronic groundwater resource degradation across regions and developing groundwater scarcity. The first category includes strategies for supply-side management, such as creating watersheds and developing water resources through large, medium-sized, and small irrigation projects. The second is managing demand by making effective use of the water that is available from both short- and long-term perspectives.

Examining India's water resources is important given its expanding population and desire to be recognized as a developed country. By 2050, it's anticipated that India's population will stabilize at roughly 1640 million people. Gross per capita water availability will thus decrease from - 1820 m³/yr in 2001 to as low as 1140 m³/yr in 2050. The estimated total water needed by the nation for various purposes in the year 2050 is 1450 km³/yr.

This is a huge increase over the estimated present annual water resource potential through conventional development options of 1122 km³/yr. Therefore, the water availability in 2050 needs to roughly triple from the current availability of 500 km³/year.

The Indian economy includes a sizable portion of the agricultural sector. More over 47 per cent of India's land area is devoted to agriculture. More than 47 per cent of rural households depend on agriculture for their livelihood. A total of 56 crore people lived in India in 2019–21, and 40.6 per cent of them had moderate or severe food insecurity (SOFI, 2022) [21].

India is the world's leading or second-largest producer of many agricultural products, including rice, wheat, pulses, groundnuts, sugarcane, cotton, jute, milk, fruits, and vegetables. In India's rural areas, 263 million people are employed in agriculture as farmers or agricultural workers who till an average of 1.15 hectares (ha) per household. According to the 2011 census, women make up slightly more than one-third (34.9 per cent) of the working population in rural areas.

Crops can receive water through irrigation, which can help them grow. Additionally, it prevents soil compaction, increases yields, preserves crops, and controls weed development. India's total geographic area is 329 million hectares, of which 71.55 million hectares are net irrigated. Increasing the gross irrigated area is essential because of India's huge size, uneven rainfall distribution, differing water requirements of the crops grown, and a tropical environment with high evaporation rates. (PMKSY, 2022) [17].

2. Methodology

The present study was carried out in the year 2023, considering Kadapa district of Andhra Pradesh in India as the study area. Kadapa district was purposively selected for the study as the firm was keen on knowing the micro irrigation scenario in this district as the district has large area under horticulture crops. It is also noticed that during the last 10 years in this district number of farmers adopting micro irrigation has seen an increasing trend.

The study was conducted by compiling the secondary data for a 7 year period of 2016 to 2022 about adoption of micro irrigation from Indianstat and APMIP. The same data was analyzed for trends in adoption of micro irrigation by using Garrett ranking and tabular analysis.

2.1 Garrett's Ranking Technique

Garrett's ranking technique will be used to rank the preference indicated by the respondents on different factors. As per this method, respondents will be asked to assign the rank for all factors and the outcomes of such ranking will be converted into score value with the help of the following formula:

Percent position - $100 (R_{ij} - 0.5) / N_j$

Where R_{ij} - Rank given for the i th variable by j th respondents

N_j = Number of variables ranked by i th respondent.

3. Results and Discussions

3.1 Present Status of Micro Irrigation in Kadapa District

In Kadapa district the total area under micro irrigation as of 2022-2023 data of APMIP is 8641.31 Ha. In the total micro irrigated area, 62.07 per cent of the area is under fruit crops like banana, mango, sweet orange and acid lime and around 32.25 per cent is for vegetables, 5.16 per cent is for spices and 0.5 per cent is for flowers.

Table 1: Status of micro irrigation in Kadapa district.

S. No.	Type of crop	Percent of total Micro Irrigated area
1	Fruit crops	62.07
2	Vegetables	32.25
3	Spices	5.16
4	Flowers	0.5
	Total	100

(APMIP, 2023) [19]

Hence, it can be noticed that micro irrigation systems are mostly adopted in the study area by farmers cultivating fruit crops and vegetables.

3.2 Area Under Micro Irrigation (Acres) of the Respondent Farmers

Data with regard to the area under micro irrigation for respondent farmers has been collected and the average area for each category of farmers according to land holding size is shown in the table 2.

Table 2: Area under micro irrigation (acres) of the respondent farmers. n=84

S No.	Land holding size (Ha)	Frequency	Average area under micro irrigation in acres
1	Marginal farmers (up to 1)	47	1.47
2	Small farmers (above 1 and up to 2)	27	3.96
3	Semi-medium farmers (above 2 and up to 4)	10	6.59
	Total	84	

It is noticed from the above table that the average area under micro irrigation among marginal farmers is around 1.47 acres, among small farmers it is about 3.96 acres. The average area under micro irrigation among semi-medium farmers is 6.59 acres. Hence, it is seen that farmers, go in for micro irrigation system installation in only a part of their land holding based on the crop they are cultivating.

3.3 Willingness of Farmers to Expand the Area Under Micro Irrigation

From the study conducted it is noticed that farmers have not adopted micro irrigation in the land holding they have Hence, data with regard to farmers interest in expanding the area under micro irrigation was also noted, and the findings are shown in Table 3. According to the survey, 61.90 per cent of farmers were willing to expand the area under micro irrigation, whereas 38.09 per cent of farmers were not interested in doing so. Among the farmers, who are willing to expand the area under micro irrigation i.e. 52, it is noticed that around 32 per cent of farmers and 44 per cent of farmers, respectively, were willing to expand area under micro irrigation by one to two acres and less than one acre, respectively. Around 17.30 per cent of farmers were willing to expand in the range of two to three acres, and around 5.76 farmers have shown interest to expand by three to four acres.

Table 3: Willingness of Farmers to Expand the Area under Micro Irrigation n=52

S No.	Land size (acres)	Frequency	Per cent
1	Less than 1	23	44.23
2	1 to 2	17	32.69
3	2 to 3	9	17.30
4	3 to 4	3	5.76
5	Total	52	100

3.4 Factors Influencing Buying Behavior of Farmers

Farmers while taking a decision to buy equipment related to farming, get influenced by various factors. The respondent farmers were asked as to what factors influence them in making buying decision with regard to micro irrigation systems.

According to the responses given by farmers with regard to the factors influencing them in making a buying decision, percentages have been calculated and the same is depicted in table 4.

Table 4: Factors influencing buying behavior of farmers with regard to micro irrigation equipment.

S. No	Factors	Percent of farmers				
		1	2	3	4	5
1	Availability of water	95	5	0	0	0
2	Land holding size	65.47	20	10.53	0	4
3	Crop yield	92.85	5.15	2	0	0
4	Government subsidies	100	0	0	0	0
5	Awareness and education	55.95	10	19	10.05	5
6	Climatic conditions	77.38	18.02	4.6	0	0
7	Peer influence	82.14	9.75	4.1	4.01	0
8	Technical support and after sales service	0	0	0	28	72
9	Promotions done by the company	70	30	0	0	0
10	Previous experience of using micro irrigation system	50	35	15	0	0
11	Decrease in weed growth	84	10	6	0	0

(1-most influencing factor, 2-moderate influencing factor, 3-somewhat influencing factor, 4-least influencing factor, 5-not influencing factor)

It can be noticed that subsidies given by the Government for installing micro irrigation is the most influential factor for making buying decision according to all the respondent farmers in the study area. Farmers have mentioned that, since the cost of installation is high, they are not in a position to install the micro irrigation system without the subsidies provided by the Government.

Amount of availability of water is another factor which influences majority of the farmers. Scarcity of water at the time of irrigation influences the farmers to buy micro irrigation system as it reduces the water requirement. Availability of water is mentioned as the most influential factor by 95 per cent of the farmers, whereas 5 per cent of farmers mentioned it as moderately influencing factor.

Improvement in crop yield, decrease in weed growth, peer influence, climatic conditions and land holding size were mentioned as most influencing factors by around 92 per cent, 84 per cent, 82 per cent, 77 per cent and 65 per cent of farmers respectively. Increasing awareness about micro irrigation usage and its benefits is most influencing factor for more than 50 per cent of the respondent farmers.

Though the firms mentioned that they provide after sale services, practically in the study area it is seen that any repair to the system is carried out by the farmer himself or by the locally available technicians. Hence, technical support and

after sales service is mentioned as not influencing factor by 72 per cent of the farmers and another 28 per cent mentioned it as the least influencing factor.

Hence, it can be seen that Government subsidies, availability of water, crop to be cultivated and increase in crop yield are the major influencing factors for the respondents to go for installation of micro irrigation system in their fields.

3.5 Constraints Encountered by the Farmers in the Adoption of Drip Irrigation Technology

In agriculture, technology is changing rapidly, however the adoption of technology by the farmers is not to the expected level. It may be due to lack of awareness about the benefits of technology, lack of financial resources for adoption or because of lack of technical expertise. An effort was made to identify and examine the obstacles respondents faced in using micro irrigation technology in the study area. The respondents reported being constrained by high maintenance costs, deterioration of soil quality, difficulty in obtaining spare parts, poor service after installation, less life span than what is in promised by the firm, clogging issues, damage from machines (inter-cultivation methods) and damage from mice, animals, and fire. The constraints encountered by respondent farmers are listed in decreasing order of their intensity in table 5.

Table 5: Constraints encountered by the farmers in adoption of drip irrigation system.

S No.	Constraints faced	Total score	Mean Score (M.S)	Rank
1	Poor post installation services	5638	67.11	1
2	Difficulty in the availability of spare parts	5209	62.01	2
3	Damages by machinery (inter cultivation operations)	4848	57.71	3
4	Damages by rodents, animals and fire	4195	49.94	4
5	Clogging problems	3859	45.94	5
6	High maintenance cost	3223	38.36	6
7	Degradation of soil quality	2790	33.21	7
8	Less life span	2012	23.95	8

The constraints faced by respondent farmers are analyzed using Garrett ranking method and it is seen that poor after installation service is the major problem encountered by the farmers. The firms are not focusing on providing after installation services, hence, technicians are usually not

available when farmers needs a repair or service to be carried out.

The other problems faced by farmers in order of importance are difficulty in the availability of spare parts, damages by machinery, damages by rodents, animals and fire, clogging

problems due to poor quality of water, high maintenance cost, degradation of soil quality, and less life span of the equipment than what is promised by the company at the time of installation.

3.6 Benefits of Using Micro Irrigation System

Usage of micro irrigation in the field gives many benefits to the farmers. The respondent farmers were asked to rank the benefits they derived from using micro irrigation system. The analysis of benefits will help the firms to concentrate on the aspects on which farmers place high value, while promoting their products.

Table 6: Benefits of using micro irrigation system.

S. No	Particulars	Rank
1	Efficiency of water usage	1
2	Reduce labour cost	2
3	Reduces fertilizer requirement	3
4	Helps in control of weeds	4
5	Enhanced crop yield and quality	5
6	Improved plant health	6
7	Irrigated area expansion	7
8	Reduced soil erosion	8
9	Energy saving	9

According to the data collected, it is seen that efficiency of water usage is ranked as most important benefit by the respondent farmers. The next benefit derived by farmers in order of importance is reduction in labour cost indicating that cost factors influence the farmers to go in for installing micro irrigation system. The other benefits mentioned in descending order of their rank are reduced fertilizer usage, weed control, enhanced crop yield and quality, improved plant health, irrigated area expansion, reduced soil erosion and saving of energy.

4. Conclusion

- Farmers do not install micro irrigation systems in the total land holding they have.
- In the study area micro irrigation system is installed mostly in the lands in which horticulture crops are cultivated.
- The top five players in micro irrigation market in study area, occupy 45 per cent of market share.
- All the farmers availed subsidy given for the installation of micro irrigation system and it is the major factor influencing them to go in for micro irrigation system installation in their field.
- Farmers know the benefits of micro irrigation system and more than 50 per cent are willing to increase the area under micro irrigation.
- The post purchase service of the micro irrigation firms is not up to the mark according to the farmers.
- Personal contact with farmers either through field trails, demonstrations or through company representative is the best method to create interest about the product.

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