

Adoption Pattern and Perception Levels of Farmers towards Micro Irrigation in Ranga Reddy District of Telangana

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Abstract: A study on adoption pattern and farmers' behavior towards micro irrigation was conducted in Ranga Reddy district of Telangana state in the year 2019 - 20. In the study, 120 farmers and 10 dealers from the study area were interviewed to know their awareness, adoption pattern, knowledge level and preferences towards micro irrigation systems. The study revealed that the farmers' awareness and knowledge level about the micro irrigation technology was high. Regarding the perception and adoption patterns, farmers felt that the installation cost and operational cost for micro irrigation systems was high compared to other traditional methods. Farmers were aware of branded and local materials and purchase decision influenced by the quality material and post sales services. The major problem faced by farmers after micro irrigation system installation were emitters clogging, pipe leakage, pipe blockage, fertigation problem, post installation service by company, motor burning, salt sedimentation on upper layer of soil, improper installation leads frequent repair and maintenance. Labor shortage is the major determinant for adopting micro irrigation system followed by water scarcity, education level, access to loans and small family size. The study suggested that the awareness, perception, knowledge level and availing subsidy regarding micro irrigation can be converted into purchase decision only by making them economically available to the farmers.

Keywords: Micro irrigation, Installation, Subsidy, Drip and Sprinkler

1. Introduction

Water is a vital input for agriculture. The availability of adequate, timely and assured supply of water is an important determinant of agricultural productivity. Irrigation raises cropping intensity and crop yields besides facilitating changes in cropping patterns. The Green revolution in the country has come mainly from increase in land productivity. Of the inputs viz. irrigation, high yielding varieties, seeds and fertilizer nutrients, irrigation alone is said to have contributed 60 per cent to growth in agricultural productivity (Directorate of Economics and Statistics, 2013). High level of investment in major and minor irrigation projects has reduced agriculture from the dependence on monsoon. On the other hand, creation of intensive surface water irrigation facilities and excessive use of canal water has resulted in the problems of water - logging, soil salinity, etc. Also, ground water is declining very fast due to over - exploitation of water resources through increased bore wells and inefficient use of water due to adoption of flood irrigation system. Poor management of water as a resource has lead to scarcity of water and at times when it is most needed.

Water is a relatively scarce resource in India since we have 17 per cent of the world's population and only four per cent of the usable fresh water. Irrigation is the sector that uses water the most. Nearly 80 per cent of the world's water resources are used for irrigation. In India also irrigation uses more than 80 per cent of the available water. The water resources in India are estimated at 4000 cubic kilometer given the geographical area of 3.29 million hectares and an average annual rainfall of 1170 mm and nearly 50 per cent of this water is lost due to evaporation, percolation, and sub

- surface flows to oceans and only 1953 billion cubic meter of water is available (Global AgriSystem, 2014).

To increase area under micro irrigation, Government of India launched the Pradhana Mantri Krushi Sinchayi Yojana (PMKSY) in 2015 - 16 by combining ongoing schemes. Under the more crops per drop component of the PMKSY, small farmers get paid to the tune of 55 per cent of cost of micro - irrigation systems; other farmers get 45 per cent of the unit cost. The task force on micro irrigation, 2004 had estimated a potential of 69.5 million hectare under micro irrigation. Presently, area under micro irrigation in India is 7.73 million hectare (Drip - 3.37 million hectares and Sprinkler - 4.36 million hectares). Hence of the 69.5 million hectares potential irrigation area in India, still 61.8 million hectares of land is untapped potential (Global AgriSystem, 2014).

In India, 58 per cent of the gross area under irrigation in India utilizes the groundwater. Since 1970, the ground water has been increasingly contributing to agricultural production and income. The contribution of groundwater to agricultural income increased from Rs 2200 crores in 1970 to Rs 13200 crores in 1993 while surface water increased from Rs 7700 crores to Rs 11500 crores. Tube wells are now the largest source of irrigation in the country and their share has increased from one per cent in 1960 - 61 to 37 per cent in 1999 - 2000. Since this sector has almost no dependence on the government, it is growing at a rapid rate and it is estimated that one million wells are added every year (Directorate of Economics and statistics, 2013). Although the crop yields under the ground water irrigation were found to be one to three times higher than the surface

irrigation due to greater control over the management of resource unlike the surface irrigation through canal irrigation, there is an urgent need to improve the efficiency of ground water use. Over exploitation of ground water as pointed out above will be disastrous in the long term. Therefore, increasing water use productivity in agriculture is important so that the resultant savings could be made available to the other high priority or economically more efficient sectors.

At present, Telangana Micro Irrigation Project, a unique and comprehensive project is being implemented in 33 districts of Telangana state, and area covered under micro - irrigation is 7.42 lakh hectares. (Micro irrigation projects, Telangana state, 2019) Technological interventions like the drip and sprinkler method of irrigation can aid significantly in achieving higher water use efficiency there by aiding in bringing more area under irrigation. Higher yields will results because of the efficient and timely use of water by the crop. The micro irrigation technology can also be effectively used under different gradients. Apart from water savings, weed management will be easier, soil and water pollution is reduced along with the savings in labor cost.

2. Materials and Methods

Ranga Reddy district was selected purposively as micro irrigation technologies are gaining importance in recent times in this district because Ranga Reddy district is adjacent to Hyderabad city and farmers in this district are major suppliers of vegetables and flowers to the city of Hyderabad. Two mandals with the highest micro irrigation area from Ranaga Reddy district was selected purposively. From each mandal three villages with the highest micro irrigation area were selected. The lists of farmers who are adopting micro irrigation technologies were prepared from the selected villages and 20 farmers for each village were selected randomly. 120 micro irrigation farmers and 10 micro irrigation dealers were selected for which data was collected for analyzing the present study. Thus, total sample size for the present study was 130. Survey method was used to collect the required data from the selected respondents with the help of a well - structured pre - tested - questionnaire for the agricultural year 2019 - 20.

3. Results and Discussions

Adoption pattern and perception levels of farmers towards micro irrigation in Ranga Reddy district of Telangana state

The results show that out of 120 respondents in the sample, all the respondents (100 percent) were aware of micro irrigation systems.

Area under micro irrigation (acres) of the respondents in the study area

Data about the land under micro irrigation for respondents was collected and the results shown in table 1. About 15 per cent of the farmers have less than one acre, 65 per cent of farmers have one to three acre, 10 per cent of farmers have three to five acre, 8.3 per cent farmers have five to ten acres and 1.7 per cent farmers have more than ten acres of land. Thus, the sample respondents were mostly of one to three acre land holders.

Table 1: Area under micro irrigation (acres) of the respondents in the study area

S No.	Land size	Frequency	Per cent
1	Less than 1	18	15
2	1 to 3	78	65
3	3 to 5	12	10
4	5 to 10	10	8.3
5	More than 10	2	1.7
	Total	120	100

Season of micro irrigation usage by respondents in the study area

The micro irrigation usage by farmers is presented in table 2. About 80.8 per cent of the farmers are using micro irrigation in both *kharif* and *rabi* season and 19.2 per cent of farmers are using micro irrigation only in *rabi* season.

Table 2: Season of micro irrigation usage by respondents in the study area

S No.	Season	Frequency	Per cent
1	Only <i>Kharif</i>	0	0
2	Only <i>Rabi</i>	23	19.2
3	Both <i>Kharif and Rabi</i>	97	80.8
	Total	120	100

Source of irrigation

The source of micro irrigation for agriculture and horticultural produce in study area is presented in the figure1. About 99.2 per cent of farmers mainly depend on rain fed as well as tube well for irrigation. Further, 27.5 per cent of farmers have open well in their field and 2.5 per cent of farmers depend on other sources of irrigation. Thus most common water source was tube well.

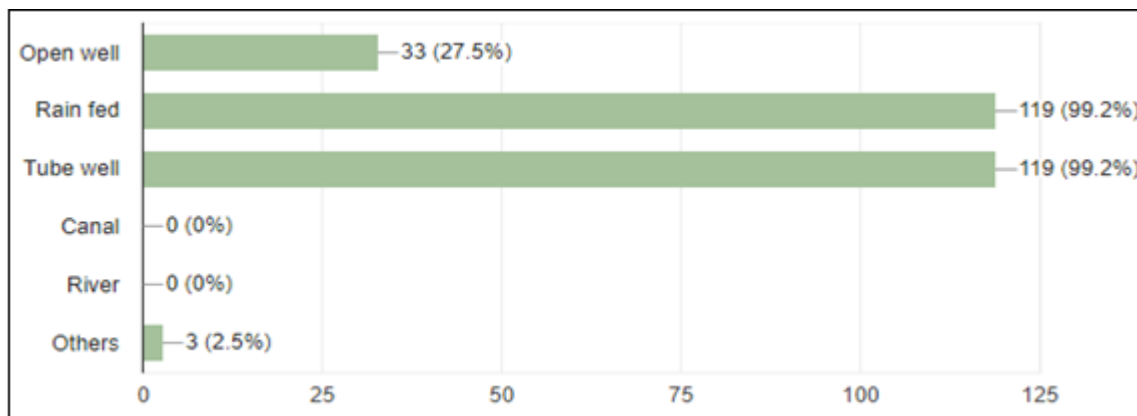


Figure 1: Source of irrigation

Availability of water for Micro Irrigation

The availability of water for micro irrigation is presented in table 3. About 41.7 per cent of the farmers were having continuous supply and 15.8 per cent of farmers were getting water only during rainy season., Further, it is observed that 39.2 per cent of farmers were getting intermittent and 3.3 per cent farmer’s water availability for micro irrigation depends on rainfall in that particular season. Thus, the majority of sample respondent farmers was getting continuous water for micro irrigation and for almost an equal percentage of farmers’ availability of water for micro irrigation is intermittent.

Table 3: Availability of water

S No.	Category	Frequency	Percent
1	Continuous	50	41.7
2	Seasonal (only during rainy season)	19	15.8
3	Intermittent	47	39.2
4	Depends on rainfall	4	3.3
	Total	120	100

Source of finance for installation of micro irrigation system

The source of finance for installation of micro irrigation system is presented in table 4. From the table 4 it is observed that 4.2 per cent of farmers were obtaining finance from money lenders as a credit and an equal percentage were obtaining from organized institutions for installation of micro irrigation system. Further, it is noticed that 80 per cent of farmers have obtained government subsidy and 11.6 per cent of farmers installed micro irrigation system with their own money. Thus, majority of the respondent farmers were getting benefitted from government subsidy for installation of micro irrigation.

Table 4: Source of finance for installation of micro irrigation system

S No.	Source of finance	Frequency	Per cent
1	Credit from money lenders	5	4.2
2	Organized Institutions	5	4.2
3	Government subsidy	96	80.0
4	Own money	14	11.6
	Total	120	100

Future plan for extension of area under micro irrigation systems (acres)

In the present study was also observe the interest of the farmers regarding further expansion of area under micro irrigation and the results are depicted in the table 5. The study indicates that 46.7 per cent of farmers were not interested to expand area under micro irrigation and 53.3 per cent of the farmers were willing to expand area under micro irrigation. It is further noticed that 31.7 per cent farmers are willing to expand in less than one acre and 14.2 per cent farmers are willing to expand in one to three acres. It is also observed that 5.8 per cent of farmers willing to expand in three to five acres and only 1.7 per cent farmers were willing to expand in the range of five to ten acre of land under micro irrigation, whereas, no farmer is interested in area expansion under micro irrigation in the range of more than 10 acres in the study area. Thus it can be concluded that at overall level, more than half of the sample respondents (about 53 per cent) were ready to expand their area under micro irrigation.

Table 5: Future plan for extension of area under micro irrigation systems (acres)

S No.	Land size	Frequency	Per cent
1	0 (No)	56	46.7
2	Less than 1	38	31.7
3	1 to 3	17	14.2
4	3 to 5	7	5.8
5	5 to 10	2	1.7
6	More than 10	0	0
	Total	120	100

Operational cost of conventional irrigation (Rs. /acres)

Details regarding operational cost of conventional irrigation by respondent farmers are depicted in Table 6. It can be noticed from the table 6 that all the farmers are spending above Rs.1000 per acre as an operational cost on conventional irrigation method in the study area. Further, 0.8 per cent, 10.8 per cent, 30.0 per cent and 33.33 per cent of total sample farmers opined that they are spending Rs.1000 to Rs.2000, Rs.2001 to Rs.3000, Rs.3001 to Rs.4000 and Rs.4001 to Rs.5000 as an operational cost on conventional irrigation per acre, respectively, whereas, 25 per cent of farmers opined that they are spending more than Rs.5000 per acre towards operational cost for conventional irrigation method. It can be concluded that majority of the farmers (about 58 per cent) are spending above Rs.4000 per acre towards operational cost per acre on conventional irrigation method.

Table 6: Operational cost of conventional irrigation (Rs. /acres)

S No.	Operational cost	Frequency	Per cent
1	0 to 1000	0	0
2	1001 to 2000	1	0.8
3	2001 to 3000	13	10.8
4	3001 to 4000	36	30
5	4001 to 5000	40	33.3
6	More than 5000	30	25
	Total	120	100

Operational cost of micro irrigation systems (Rs. /acres)

Details regarding operational cost of micro irrigation by respondent farmers are depicted in table 7. It can be noticed from the table 7 that 0.8 per cent, 11.7 per cent, 15.8 per cent, 16.7 per cent, 20.8 per cent, and 9.2 per cent of total sample farmers opined that they are spending Rs.0 to Rs.500, Rs.501 to Rs.1000, Rs.1001 to Rs.1500, Rs.1501 to Rs.2000, Rs.2001 to Rs.2500 and more than Rs.3000 as an operational cost on micro irrigation per acres, respectively. Whereas, 25 per cent of farmers opined that they are spending Rs.2501 to Rs.3000 per acre towards operational cost for micro irrigation method. It can be concluded that majority of the farmers (about 55 per cent) are spending above Rs.2000 per acre towards operational cost per acre on micro irrigation method.

Table 7: Operational cost of micro irrigation systems (Rs. /acres)

S No.	Operational cost	Frequency	Per cent
1	0 to 500	1	0.8
2	501 to 1000	14	11.7
3	1001 to 1500	19	15.8
4	1501 to 2000	20	16.7
5	2001 to 2500	25	20.8
6	2501 to 3000	30	25
6	More than 3000	11	9.2
	Total	120	100

Micro irrigation installation cost (Rs/acres)

Details regarding installation cost of micro irrigation by respondent farmers are depicted in table 8. It can be noticed from the table 8 that 22.5 per cent, 34.2 per cent, 12.5 per cent, 5 per cent and 0.8 per cent of total sample farmers opined that they are spending less than Rs.40000, Rs.40001 to Rs.50000, Rs.50001 to Rs.60000, Rs.60001 to Rs.70000, Rs.70001 to Rs.80000 and more than Rs.80000 as installation cost on micro irrigation per acre, respectively. Whereas, 34.2 per cent of farmers opined that they are spending Rs.40001 to Rs.50000 per acre installation cost for micro irrigation method. It can be concluded that majority of the farmers (about 77.5 per cent) are spending above Rs.40000 per acre as installation cost per acre on micro irrigation method.

Table 8: Micro irrigation installation cost (Rs. /acres)

S No.	Installation cost	Frequency	Per cent
1	Less than 40000	27	22.5
2	40001 to 50000	41	34.2
3	50001 to 60000	30	25
4	60001 to 70000	15	12.5
5	70001 to 80000	6	5
6	More than 80000	1	0.8
	Total	120	100

Percentage of farmers benefitted from subsidy

Farmers in the study area are asked about the details of subsidy they got for micro irrigation and results are presented in the table 9. It can be noticed from table 9 that 81.7 per cent of the farmers are availing subsidy facility for installing micro irrigation system, whereas 18.3 per cent of farmers are not getting subsidy provision from the government. Data is further analyzed regarding sources of subsidy and the results are depicted in the table 10. It can be noticed from the table 10 that farmers got the subsidy from National Horticulture Mission (NHM), National Horticulture Board (NHB) and Pradhan Manthri Krishi Sincjai Yojana (PMKSY) and the proportion of farmers obtaining subsidy under each scheme was 12.50 per cent, 31.25 per cent and 50.00 per cent respectively to has beneficiaries under the various schemes (80 per cent farmers), whereas, 6.25 per cent of the total subsidy beneficiaries under the study were getting subsidy from other sources. It can be concluded that majority of the subsidy beneficiaries are getting the subsidy facility under PMKSY.

Table 9: Percentage of farmers benefitted from subsidy

S No.	Particulars	Frequency	Per cent
1	Yes	96	81.7
2	No	24	18.3
	Total	120	100

Table 10: Type of subsidy

S No.	Name of the scheme	Frequency	Percent
1	National Horticulture Mission	12	12.5
2	National Horticulture Board	30	31.25
3	Pradhan Manthri Krishi Sincjai Yojana	48	50
4	Others	6	6.25
	Total	96	100

Type of micro irrigation system adopted by farmers

The type of micro irrigation system adopted by farmers for agriculture and horticultural produce in the study area is presented in the figure 2. About 99.2 per cent of farmers mainly adopted drip irrigation technology. Further, 61.7 per cent of farmers have adopted sprinkler irrigation technology in their field and 8.3 per cent of farmers adopted others types of micro irrigation technology. Thus most commonly adopted micro irrigation technology was drip irrigation.

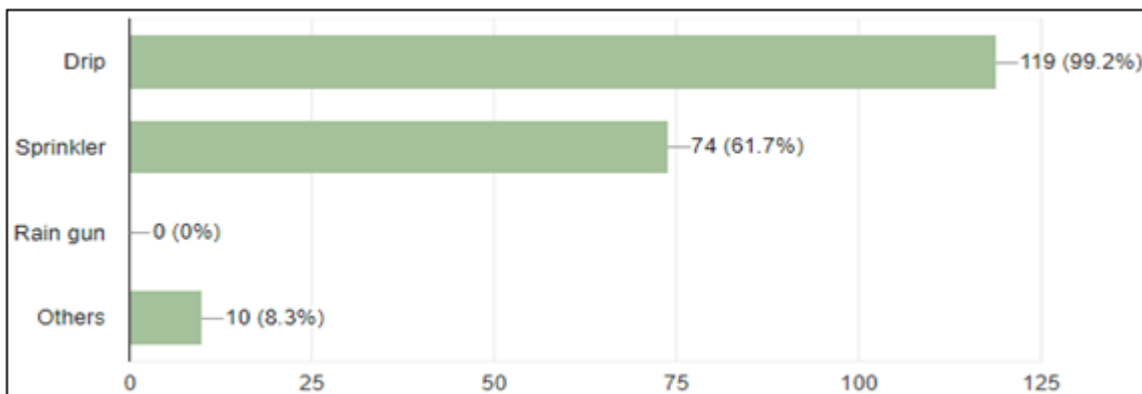


Figure 2: Type of micro irrigation system

Awareness about automated irrigation technology

In the present study data about awareness levels of the farmers about the automated system of the micro irrigation system was collected and the results are depicted in figure 3 (a) and 3 (b). The study indicates that 58.3 per cent farmers are aware about the automated irrigation technology and 41.7 per cent farmers are unaware about it. Further, opinion of the farmers was also captured regarding which type of automated system they feel is the best. From the figure 4.3 (b) it can be observed that 48.6 farmers opined that fully automated system is the best, followed by manual automated system (36.1 per cent) and centralized automated system (15.3 per cent).

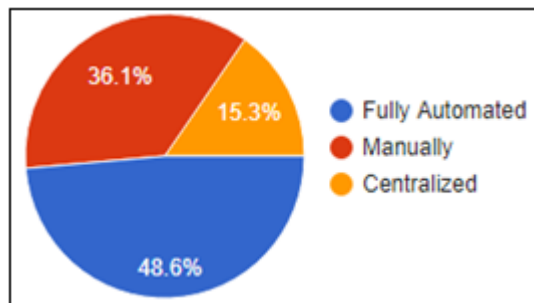


Figure 3 (b): Type of automation

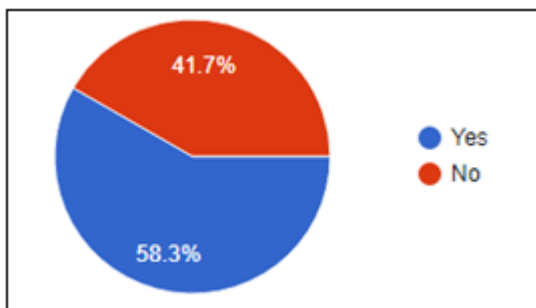


Figure 3 (a): Awareness of automated irrigation

Source of information about micro irrigation system

The source of information about micro irrigation systems in the study area were presented in the figure 4. About 79.2 per cent of farmers got information about micro irrigation system from private company. Further, 75 per cent of farmers got information about micro irrigation system from agriculture department, 62.5 per cent of farmers got information about micro irrigation system from micro irrigation adopted farmers and 18.3 per cent of farmers got information about micro irrigation system from other sources. Thus most common source of information about micro irrigation system was private company.

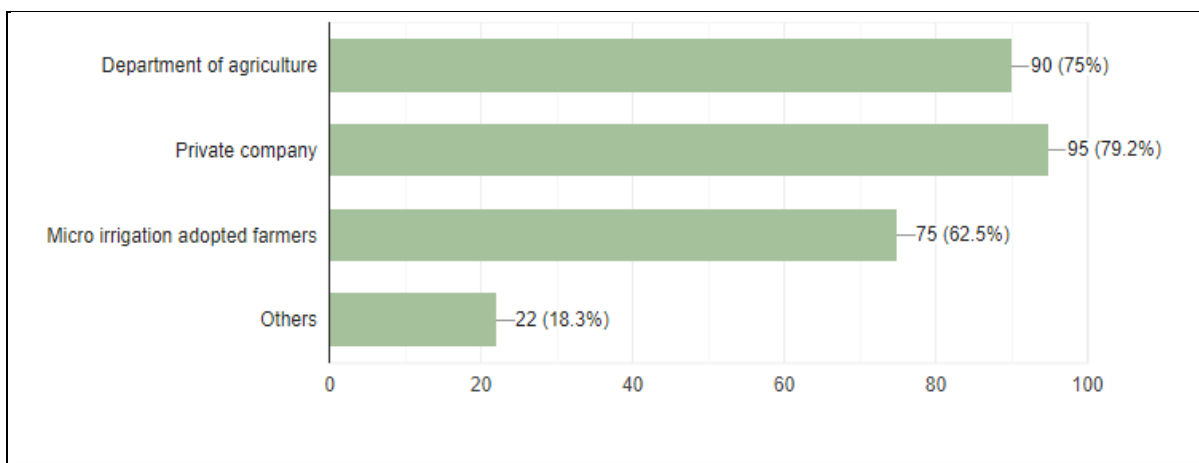


Figure 4: Awareness factors of micro irrigation system

Awareness of micro irrigation system through private company

The Awareness of micro irrigation system through private company in the study area was presented in the figure 5. About 84.1 per cent of farmers got awareness of micro

irrigation system through Jain Irrigation Company. Further, 62.6 per cent, 61.7 per cent, 26.2 per cent, 22.4 per cent, 21.5 per cent, 16.8 per cent, 13.1 per cent and 7.5 per cent of farmers got awareness of micro irrigation system through Netafim, Finolex, Sudhakar, Kothari, Kumar, Signet,

Mahindra EPC and Kisan, respectively. Further, about 27.1 per cent of farmers got awareness of micro irrigation system through others micro Irrigation Company. Thus most

common source of information about awareness of micro irrigation systems was Jain Irrigation Company.

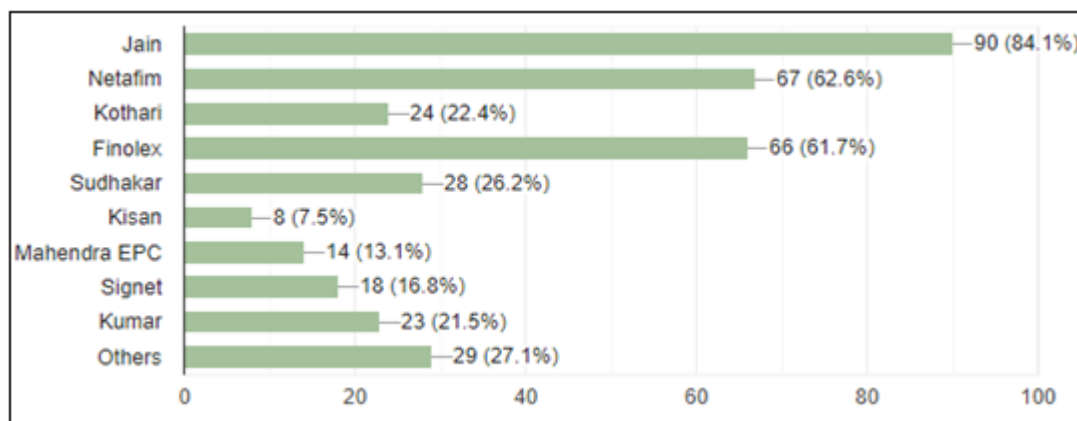


Figure 5: Awareness of micro irrigation system through private company

Determinants for adopting micro irrigation system

The major determinants of adoption of micro irrigation system are studied in the present study and results are presented in the table 11. Ranking is given for major identified determinants by calculating total score and mean score. It can be concluded from the table 11 that labor shortage is the major determinant for adopting micro irrigation system followed by water scarcity, education level, access to loans and small family size.

Perception of framers on micro irrigation system by using five point Likerts scale

A Likert Scale is a type of rating scale used to measure attitudes or opinions. With this scale, respondents are asked to rate items on a level of agreement regarding their perception on micro irrigation. It is measured on five point Likert scale having items like strongly disagree =1, Disagree = 2, Neutral = 3, Agree = 4 and strongly agree = 5.

Table 11: Determinants for adopting micro irrigation system

S No.	Particulars	Total score	Mean Score	Rank
1	Labor shortage	7080	59	I
2	Water scarcity	6945	57.87	II
3	Education	5715	47.62	III
4	Access to loans	5450	45.41	IV
5	Small family size	4810	40.08	V

Perception of farmers on the statement MIS Generates more yield

The bar graph depicted in figure 6 indicates that 24.2 per cent of farmers strongly agree that adoption of micro irrigation can generate more yields. Further, 54.2 per cent of farmers agree that adoption of micro irrigation can generate more yield, whereas, 19.5 per cent of farmers expressed neutral opinion. 2.5 per cent of farmers disagree with the statement. None of the farmers strongly disagree with statement. It can be observed that majority of the farmers (about 78 per cent) either strongly agreed or agreed with the statement micro irrigation can generate more yields.

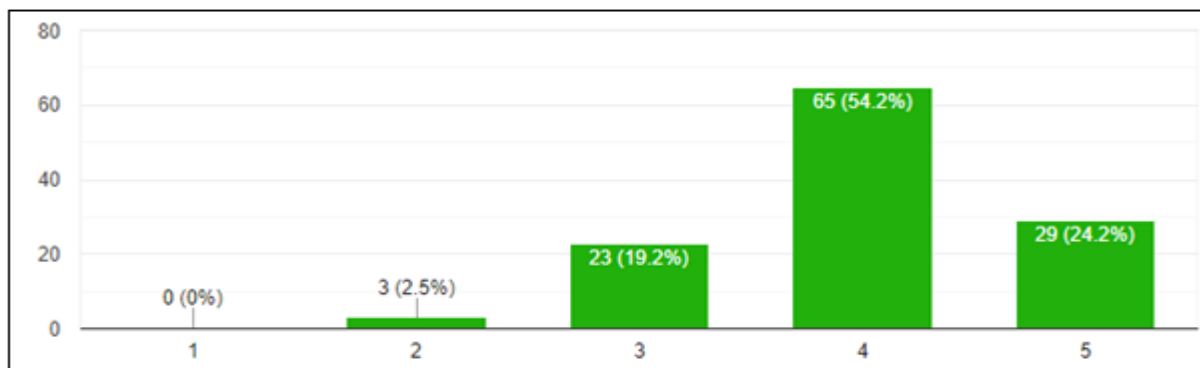


Figure 6: MIS Generates more yield

Perception of farmers on the statement credit or subsidy needed for adoption of MIS

The bar graph depicted in figure 7 indicates that 16.7 per cent of farmers strongly agree that credit or subsidy is needed for installation of micro irrigation. Further, 34.2 per cent of farmers agreed that credit or subsidy is needed for installation of micro irrigation, whereas 40.8 per cent of

farmers are expressed neutral opinion. 5.8 per cent of farmers disagree with the statement and only 2.5 per cent of farmers strongly disagree with the statement. It can be observed that majority of the farmers (about 51 per cent) either strongly agreed or agreed with the statement of credit or subsidy is needed for installation of micro irrigation system.

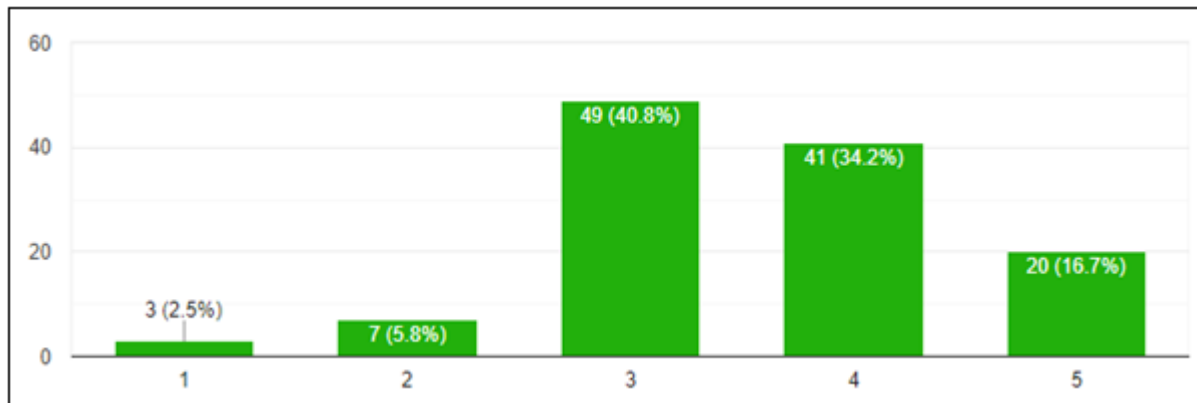


Figure 7: Credit or subsidy needed for adoption of MIS

Perception of farmers on the statement MIS supplies less water to crop

The bar graph depicted in figure 8 indicates that 11.7 per cent of farmers strongly agree that adoption of micro irrigation system supplies less water to crop. Further, 33.3 per cent of farmers agree with the statement, whereas 20.8

per cent of farmers are expressed neutral opinion. 12.5 per cent of farmers disagree with statement and 21.7 per cent farmers strongly disagree with statement. It can be observed that majority of the farmers (about 45 per cent) either strongly agreed or agreed with the statement of micro irrigation system supplies less water to crop.

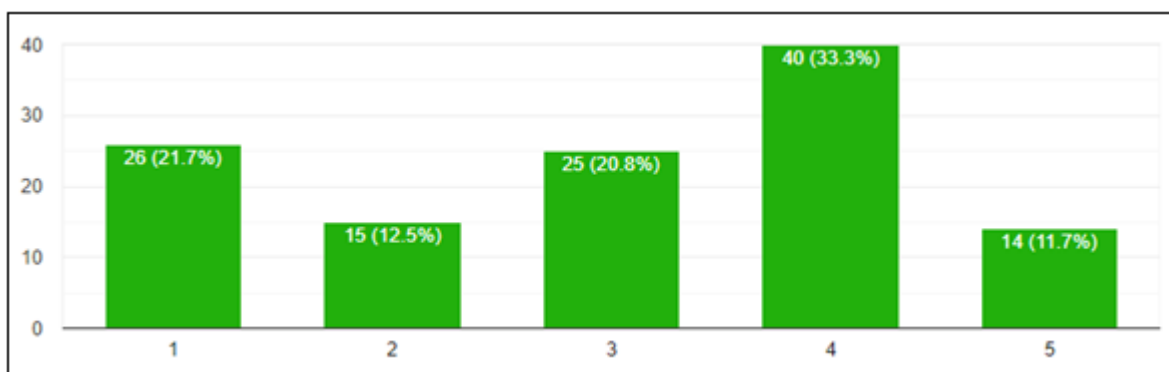


Figure 8: MIS supplies less water to crop

Perception of farmers on the statement MIS saves labor cost

The bar graph depicted in figure 9 indicates that 13.3 per cent of farmers strongly agree that adoption of micro irrigation system saves labor cost. Further, 53.3 per cent of farmers agree with statement, whereas, 25 per cent of

farmers are expressed neutral opinion. 6.7 per cent of farmers disagree with statement and only 1.7 per cent farmers strongly disagree with the statement. It can be observed that majority of the farmers (about 66.6 per cent) either strongly agreed or agreed with the statement of micro irrigation system saves labor cost.

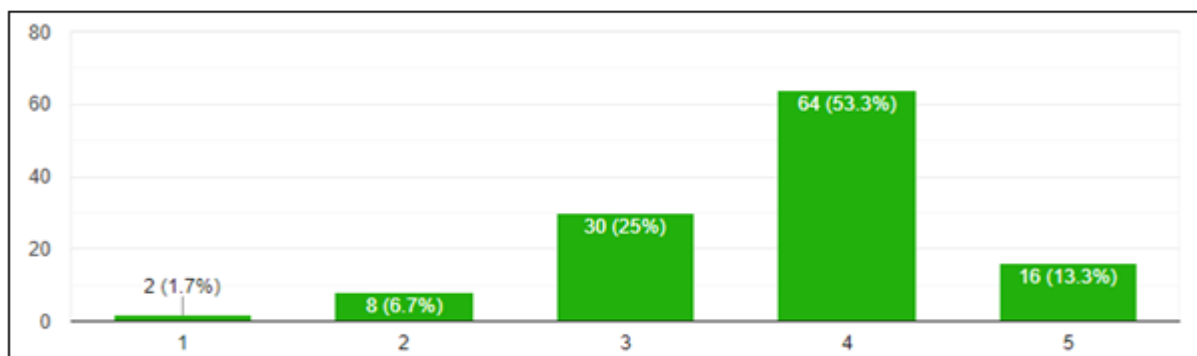


Figure 9: MIS saves labor cost

Perception of farmers on the statement cost of repair of MIS and maintenance is high

The bar graph depicted in figure 10 indicates that 8.3 per cent of farmers strongly agree that cost of repair of micro irrigation system and maintenance is high. Further, 30.8 per cent of farmers agree with statement, whereas, 23.3 per cent

of farmers are expressed neutral opinion. 26.7 per cent of farmers disagree with statement and only 10.3 per cent farmers strongly disagree with the statement. It can be observed that majority of the farmers (about 39 per cent) either strongly agreed or agreed with the statement of cost of repair of micro irrigation system and maintenance is high

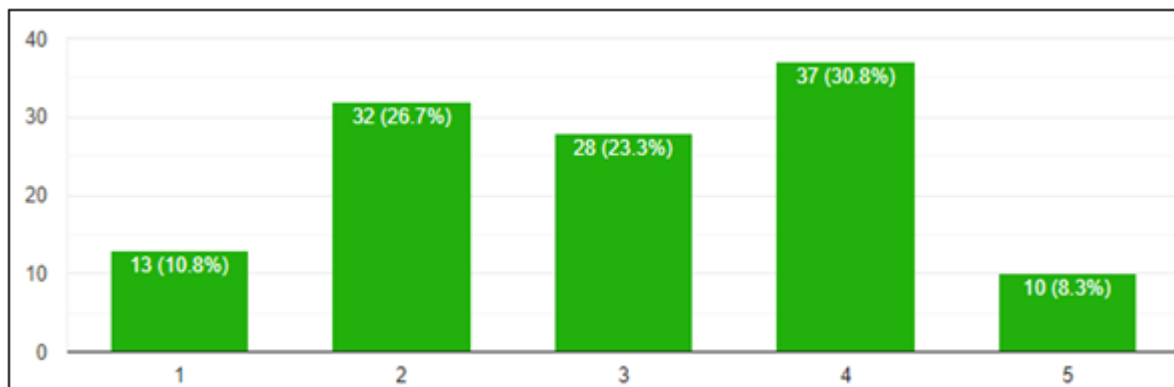


Figure 10: MIS repair and maintenance more

Perception of farmers on the statement MIS is useful for water saving

The bar graph depicted in figure 11 indicates that 48.3 per cent of farmers strongly agree that adoption of micro irrigation system is useful for water saving. Further, 42.5 per cent of farmers agree with statement, whereas, 8.3 per cent

of farmers are expressed neutral opinion. 0.8 per cent of farmers disagree with the statement. None of the farmers strongly disagree with the statement. It can be observed that majority of the farmers (about 90.8 per cent) either strongly agreed or agreed with the statement of micro irrigation system is useful for water saving.

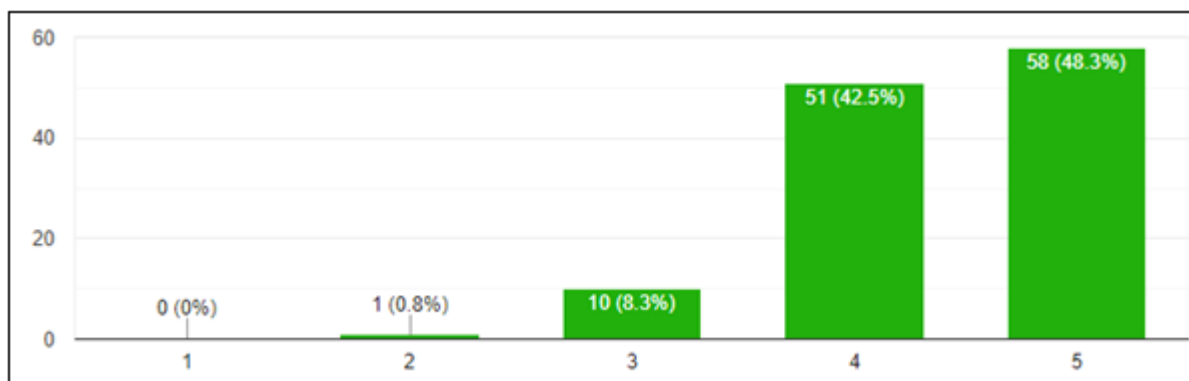


Figure 11: MIS is useful for water saving

Perception of farmers on the statement MIS is useful for increase of cultivation area

The bar graph depicted in figure 12 indicates that 50.0 per cent of farmers strongly agree that adoption of micro irrigation system is useful for increase of cultivation area. Further, 25.8 per cent of farmers agree with the statement, whereas, 12.5 per cent of farmers are expressed neutral

opinion. 6.7 per cent of farmers disagree with the statement and only 5 per cent farmers strongly disagree with statement. It can be observed that majority of the farmers (about 62.5 per cent) either strongly agreed or agreed with the statement of micro irrigation system useful for increase of cultivation area.

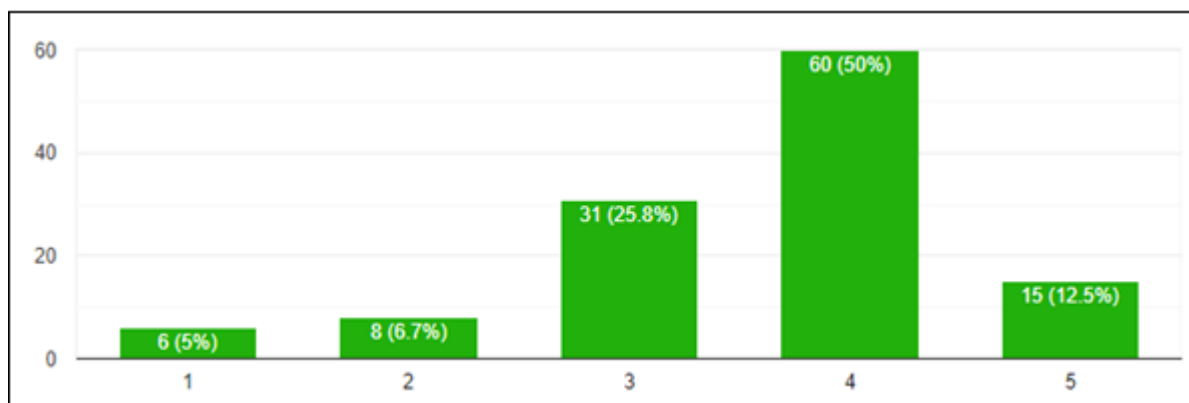


Figure 12: MIS is useful for increase of cultivation area

Factors that influence farmers purchase decision of MIS

The major factors that influence purchase decision of micro irrigation system is analyzed in the present section and results are presented in the table; 12. Ranking is given for

major identified determinants by calculating total score and mean score. It can be concluded from the table 12 that post sales services is the major determinant that influences farmers purchase decision on micro irrigation system

followed by quality of materials, friends/ relatives/ progressive farmers opinion, information from agriculture department, installation cost, level of water conservation, dealers patronage and labor cost reduction.

Table 12: Factors that influence your purchase decision of MIS

S No.	Particulars	Total score	Mean Score	Rank
1	Post sales services	5649	57.07	I
2	Quality of materials	6245	52.04	II
3	Friends/Relatives/Progressive farmers opinion	6123	51.02	III
4	Agriculture Department	6097	50.8	IV
5	Installation Cost	6091	50.75	V
6	Water conservation	6042	50.35	VI
7	Dealer patronage	5996	49.96	VII
8	Labor cost reduction	5877	48.97	VIII

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