Website : www.asthafoundation.in
Progressive Research : An International Journal
Vol 18 (2) : 106-110 (July-2023), Print ISSN : 0973-6417, Online ISSN : 2454-6003
Society for Scientific Development in Agriculture and Technology, Meerut (U.P.) India

Impact of Micro Irrigation and Challenges Faced by the Farmers in adoption of Micro Irrigation in Central India

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Abstract

The study confined to the Dhar and sagar districts of Madhya Pradesh. The primary data were collected from the respondents i.e. adopter (96) and non-adopter (24) of micro irrigation. A multi stage stratified random sampling method was used for selection of districts, blocks, villages and respondents. A list of all the adopters and non- adopters in the selected villages was prepared and 8 adopters and 2 non- adopters from each villages were selected constituting 96 adopters and 24 non-adopters from both districts (48 adopters and 12 non-adopters from each district) were selected for the study constituting total sample size of 120 farmers. 5 point likert scale (1932) was used to measures the severity of the problem perceived by the farmers in adoption of micro irrigation. The impact was found to be substantially positive in case of village as a whole, water conservation/availability and environment as reported by 41.67, 36.46 and 34.38 per cent adopters. The respondents were responded to micro irrigation facilities are advantageous and strongly advantageous for higher yields by 79.17per cent. The majority of non-adopters strongly agreed with the problems like lack of micro-irrigation equipments in the market. The more than 30 per cent of non-adopter partially agreed with the problem like no market for micro-irrigation products.

Key words : *PMKSY, micro irrigation, drip and sprinkler.*

Introduction

Micro-irrigation refers to the slow application of water on, above or below the soil by surface drip, subsurface drip, bubbler, and micro-sprinkler systems. Water is applied as discrete or continuous drips, tiny streams, or miniature spray through emitters or applicators placed along a water delivery line adjacent to the plant row (1). Micro-irrigation is proved to be an efficient method in water saving, projected additional returns from saved water should also be considered as compared to conventional surface method of irrigation. It is necessary to further evaluate and confirm the best system for local producers that will result in the highest profits so that repayment of irrigation investment loans can be achieved (2).

Drip irrigation is an irrigation method that saves water and fertilizer by allowing water to drip slowly to the roots of plants, either onto the soil surface or directly onto the root zone, through a network of valves, pipes, tubing, and emitters. It is done through narrow tubes that deliver water directly to the base of the plant (3). Adoption of drip irrigation is one of the most efficient methods of scheduling of irrigation having more than 90 percent irrigation efficiency. As water is applied very frequently and uniformly, usually there is no moisture stress in crop root zone and it results into 25 to 30 per cent increase in crop yield as compared to surface irrigated crop (4). Drip irrigation is most suitable for row crops (vegetables, soft fruit), tree and vine crops where one or more emitters can be provided for each plant. Drip irrigation is adaptable to any farmable slope and most soils (5). Drip method of irrigation helps to reduce the over-exploitation of groundwater that partly occurs because of inefficient use of water under surface method of irrigation. Water logging and salinity are also completely absent under drip method of irrigation (6).

Sprinkler irrigation is an advanced irrigation technique for water-saving and fertigation and accurately controlling irrigation time and water amount. Study on winter wheat showed that crop yield and water use efficiency in sprinkler-irrigated fields was higher than that in surface irrigated fields. Sprinkler irrigation resulted in crop transpiration reduction by more than 50% during irrigation process. Superiority of drip irrigation or micro-sprinkler irrigation over traditional irrigation methods in terms of yield and water saving, economics is well established for most of the crops (1). The successful adoption of MI requires, in addition to technical and economic efficiency, two additional preconditions, viz, technical knowledge about the technologies and accessibility of technologies through institutional support systems (7, 8). Micro-irrigation technologies are believed to be one of such innovative intervention approaches. Originally, micro-irrigation was often associated with the capital intensive, commercial farms of wealthier farmers. The systems used on large farms, however, are unaffordable for smallholders and are not available in sizes suitable for small plots. Recently, these

Received : May-2023; Revised : June-2023; Accepted : July-2023

technologies have gone through technical transformations from largely sophisticated and capital-intensive features to an almost input mode (9).

The Per Drop More Crop component of PMKSY mainly focuses on water use efficiency at farm level through Precision/ Micro Irrigation (MI) (Drip and Sprinkler Irrigation). PDMC-PMKSY, has put great emphasis on micro-irrigation technologies (drip and sprinklers), and wherein an area of 690 m ha is proposed to be brought under micro irrigation in India for achieving the target of "Har Khet Ko Paani", but the scheme looks to have hit the roadblock due to poor response to such initiatives from small and marginal farmers, who constitutes majority of workforce in agriculture (10). Looking to the above aspects in mind this study has been formulated to know the impact of MI and challenges faced by the beneficiaries and non-beneficiaries farmers adoption of micro irrigation technology in their field

Research Methodology

The study confined to the Dhar and sagar districts of Madhya Pradesh. Both primary and secondary data were collected for the study. The primary data were collected from the respondents i.e. adopter (beneficiaries) and non-adopter (Non- beneficiaries) of micro irrigation. The data were collected on various aspects viz. age, education, land use pattern, water sources for farming, water situation, type of soil, rainfall situation and year of start using micro irrigation with & without subsidy of the respondents. A multi stage stratified random sampling method was used for selection of districts, blocks, villages and respondents. In first stage, Among all districts of Madhya Pradesh Dhar and Sagar districts were selected on the basis of higher irrigated area under different system of micro irrigation. Dhar district was selected for drip irrigation system and Sagar district was selected for sprinkler irrigation system. In the second stage from the each selected districts, two blocks having maximum area under micro irrigation namely Badnawar and Manawar were selected from Dhar district and Khurai and Deori blocks were selected from Sagar district. In third stage, A list of all the MI village was prepared and 3 villages in each selected block were selected randomly from the list of micro irrigation villages. Thus, Bakhatpura, Tilgara & Jabada and Ajanda, Mandwi & Pipriman villages were selected from Badnawar and Manawar blocks, respectively from Dhar district and Silpari, Billaiya, & Khajarhar Chandra and Kushmi, Sisnghpur ganjan & Kaurasa villages were selected from Khurai and Deori blocks respectively from Sagar district for the study. In the fourth stage, a list of all the adopters and non- adopters in the selected villages was prepared and 8 adopters and 2 non-adopters from each village were selected constituting 96 adopters and 24 non-adopters from both districts (48 adopters and 12 non-adopters from each district) were selected for the study constituting total sample size of 120 farmers. 5 point likert scale (1932) was used to measures the severity of the problem perceived by the farmers in adoption of micro irrigation.

Results and Discussion

Impact of micro-irrigation, advantages and disadvantages perceived by the adopters, reasons for non-adoption and suggestion for increasing adoption of micro-irrigation were observed for the study.

Impact of Micro-Irrigation : The large impact of micro-irrigation on village as a whole, water conservation, women, upper caste, lower caste, labour, tribal, young/Youth farmers, upland farmers and low land farmers participation and environment as a whole were observed.

The impact of micro-irrigation was found to be positive in the area under study as none of the adopters reported that the impact of micro-irrigation was negative and substantially negative. The impact was found to be substantially positive in case of village as a whole, water conservation/availability and environment as reported by 41.67, 36.46 and 34.38 per cent adopters, respectively. Around 22 per cent adopters reported that there is substantially positive response by young adopters/youth, upland and low land adopters. The substantially positive impact was also observed in case of women upper caste, lower caste, labour/poor and tribal between 5 to 10 percent. The mean score of these items were found to be nearer to 4 or more than 4 hence micro-irrigation gave positive impact on village, water conservation, women, upper caste, lower caste, rural youth & farmers and upland & low land farmers with improvement of overall environment of villages in the area under study (Table-1).

Advantages and Disadvantages Perceived by the adopter : The majority of respondents reported that micro irrigation facilities are advantageous and strongly advantageous for less water need (89.58%) followed by better quality (87.5%), higher profit (83.34%), higher yields (79.17%), less weed problem (75%), less labour need (72.92%), high output price (63.54%), lower input cost (51.04%), less fertilizers need (46.87%), less pest problem (42.71%), less risk/ uncertainty (40.63%), easy marketing of output (29.17%) and employment for youth & others (17.71%). As for as the mean score of these items are concerned, it is found to be nearer to 4 or more than 4 except less pest problem (3.34) revealed that micro irrigation found to be advantageous and strongly advantageous for them as it reduces water need (4.35), provide higher yield (4.10), batter quality of product (4.06)

Table-1 : Larger Impact of Micro Irrigation (%).

S. No.	Impact on	Substantially positive	Positive	No Impact	Negative	Substantially Negative	Mean
		5	4	3	2	1	
1.	Village as a whole	41.67	41.67	16.67	0.00	0.00	4.08
2.	Water conservation/availability	36.46	57.29	6.25	0.00	0.00	4.13
3.	Women	5.21	52.08	42.71	0.00	0.00	3.48
4.	Upper Caste	9.38	52.08	38.54	0.00	0.00	3.56
5.	Lower Caste	7.29	53.13	39.58	0.00	0.00	3.53
6.	Labour/Poor	8.33	39.58	52.08	0.00	0.00	3.45
7.	Tribal	9.38	33.33	57.29	0.00	0.00	3.38
8.	Young farmers/Youth	21.88	59.38	18.75	0.00	0.00	3.87
9.	Upland farmers	20.83	36.46	42.71	0.00	0.00	3.66
10.	Lowland farmers	22.92	51.04	26.04	0.00	0.00	3.81
11.	Environment	34.38	31.25	34.38	0.00	0.00	3.85

Source : Author Calculation as per field data and observation.

Table-2 : Advantages and Disadvantages Perceived by the beneficiaries (%).

S. No.	Item	Strong Advantage	Advantage	No Difference	Disadvantage	Strong Disadvantage	Mean
		5	4	3	2	1	
1.	Higher Yields	31.25	47.92	20.83	0.00	0.00	4.10
2.	Better Quality	19.79	67.71	11.46	1.04	0.00	4.06
3.	High output price	7.29	56.25	35.42	1.04	0.00	3.70
4.	Lower input cost	7.29	43.75	36.46	12.50	0.00	3.46
5.	Less water need	45.83	43.75	10.42	0.00	0.00	4.35
6.	Less labour need	26.04	46.88	23.96	2.08	1.04	3.95
7.	Less weed problem	18.75	56.25	25.00	0.00	0.00	3.94
8.	Less pest problem	3.13	39.58	46.88	9.38	1.04	3.34
9.	Less fertilizers need	14.58	32.29	42.71	8.33	2.08	3.49
10.	Easy marketing of output	5.21	23.96	58.33	12.50	0.00	3.22
11.	Higher Profit	15.63	67.71	16.67	0.00	0.00	3.99
12.	Less risk/ Uncertainty	5.21	35.42	57.29	2.08	0.00	3.44
13.	Employment for youth	2.08	15.63	65.63	16.67	0.00	3.03
14.	Overall	14.58	63.54	21.88	0.00	0.00	3.93

Source : Author Calculation as per field data and observation.

and reduces labour (3.95) and weeds (3.94). Adopters also fetches high output price (3.70) with lower input cost in production of crops in the area under study (Table-2).

Reasons for Non-Adoption : The various reasons for non-adoption of micro-irrigation measured in scale of strongly agree to strongly disagree as reported by the non-adopter farmers were observed. The majority of non-adopters were found to be strongly agree with the problems like lack of micro-irrigation equipment's in the market (45.83%), enough information about micro irrigation is not available (41.67%), high investment cost of micro-irrigation kit (41.67%) and credit for micro-irrigation was not available (25%), high operating cost of micro-irrigation (20.83%) and lack of information of fencing protection of wild animals (20.83%), while more than 20 non-adopters were found to be agree on the problems like high operating cost of micro-irrigation (37.50%), subsidy for micro-irrigation is not available (37.50%), subsidy for micro-irrigation is not sufficient (29.17%) and fragmentation of land (25.00%).

The more than 30 per cent of non-adopters were found to be partially agree with the problem like no market for micro-irrigation products (37.50%), micro irrigation is not suitable for our land (37.50%), micro-irrigation is not suitable to crop growth (33.33%) and crop damage by the animals (37.50%). The main reason on which majority of respondents were found to be agreed for non-adoption of micro irrigation on their fields were micro irrigation equipment are not available (4.00), lack of enough information (3.75), high investment cost (3.71), high operating cost (3.50), and unavailability of credit for micro irrigation (3.50) as mean score of these reasons were found to be nearer to 4.00 or 4.00 (Table 3).

Suggestion for Increasing Adoption of Micro-Irrigation : The various suggestions given by the

Table-3 : Reasons for Non-Adoption (%).

S. No.	Item	Strongly Agree	Agree	Partially Agree/Dis agree	Disagree	Strongly Disagree	Mean
		5	4	3	2	1	
1.	Micro irrigation equipment not available	45.83	20.83	20.83	12.50	0.00	4.00
2.	High investment cost of micro irrigation	41.67	16.67	16.67	20.83	4.17	3.71
3.	High operating cost of micro irrigation	20.83	37.50	16.67	20.83	4.17	3.50
4.	Subsidy for micro irrigation not available	16.67	37.50	12.50	29.17	4.17	3.33
5.	Subsidy for micro irrigation not sufficient	16.67	25.00	12.50	29.17	16.67	2.96
6.	Credit for micro irrigation not available	25.00	29.17	20.83	20.83	4.17	3.50
7.	Not enough information about micro irrigation not available	41.67	12.50	25.00	20.83	0.00	3.75
8.	Micro irrigation is not profitable	4.17	12.50	8.33	54.17	20.83	2.25
9.	No market for micro irrigation crops	8.33	4.17	37.50	41.67	8.33	2.63
10.	Micro irrigation is not suitable to crops grown	0.00	4.17	33.33	29.17	33.33	2.08
11.	Micro irrigation is not suitable for your land	8.33	4.17	37.50	20.83	29.17	2.42
12.	You prefer traditional irrigation	8.33	29.17	16.67	25.00	20.83	2.79
13.	Inadequate water availability	0.00	0.00	8.33	70.83	20.83	1.87
14.	Fragmentation of land	4.17	25.00	29.17	25.00	16.67	2.75
15.	Crop damage by animals	12.50	8.33	37.50	37.50	4.17	2.87
16.	Lack of fencing protection	20.83	8.33	29.17	29.17	12.50	2.96
17.	Other	8.33	16.67	16.67	58.33	0.00	2.75

Source : Author Calculation as per field data and observation.

Table-4 : Suggestions for Increasing the Adoption and Impact of Micro irrigation (%).

S. No.	Item	Strongly Agree	Agree	Partially Agree/ Disagree	Disagree	Strongly Disagree	Mean
		5	4	3	2	1	
1.	Better micro irrigation technology/equipment	45.83	51.04	2.08	1.04	0.00	4.42
2.	Lower price of micro irrigation	57.29	28.13	14.58	0.00	0.00	4.43
3.	More subsidy/government assistance	55.21	30.21	13.54	1.04	0.00	4.40
4.	Easier process for getting subsidy/government assistance	47.92	33.33	16.67	2.08	0.00	4.27
5.	More loans/credit	23.96	45.83	28.13	2.08	0.00	3.92
6.	Improve water availability	28.13	44.79	25.00	2.08	0.00	3.99
7.	Improve water availability	9.38	30.21	50.00	10.42	0.00	3.39
8.	Provision/support for farm fencing	55.21	29.17	12.50	3.13	0.00	4.36
9.	Better marketing arrangements	54.17	31.25	13.54	1.04	0.00	4.39

Source : Author Calculation as per field data and observation.

respondents for increasing the adoption of micro-irrigation were measured in the scale of strongly agree to strongly disagree. The majority of adopters were found to be strongly agree and agree with the statement that there should be better micro-irrigation technology/equipments (96.87%), lower price of micro-irrigation equipments (85.42%), more subsidy/government assistance (85.42%), provision/support for farm fencing (84.38%), better market arrangement (85.42%), easier process of getting subsidy/government assistance (85.42%), improving water availability (72.92%) and more loan/credit facilities (69.79%) for micro irrigation system in the area under study. Only 50 per cent adopters were found to be partially agree and opined that there should be better training for micro-irrigation for the farmers in the area under study (Table-4).

Conclusion and Recommendations

Madhya Pradesh was found to be a compared with other State with respect to micro irrigated area under PDMC with total micro irrigation area of 39758 hectares, which was 0.31 percent of gross irrigated area of Madhya Pradesh during the year 2018. The impact of PMKSY-PDMC was found to be positive on village as a whole, water conservation, participation of women, upper caste, lower caste, rural youth, upland and low land farmers with improvement of overall environment in the area under study through optimal utilization of scare and

limited water and land resources, fertigation and water use efficiency in farmers field. Hence, overall impact of PMKSY, PDMC was found to be positive in case of water conservation and overall environment of the village. Efforts should be made to promote MI in all the districts of the State with proper awareness programme. Efforts should also be made to lower down the price of MI equipment's in order to reduce the subsidy in a gradual manner for the horizontal expansion of the technology on large scale, provision/ support for farm fencing, easier process is getting subsidy/Govt assistance for latest and improved MI technology/ equipment's and better training for MI for the farmers were found to be utmost important for increasing the rate of adoption and widening & deepening of the technology as a whole required for betterment of programme as majority of the adopters strongly agreed to expand the use of MI in future course of action.

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