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Research Article

IMPACT OF MICROIRRIGATION TECHNOLOGY ON PRODUCTIVITY AND INCOME OF POTATO GROWERS

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Abstract: The research was carried out in Banaskantha district of Gujarat state in 2019. The multistage sampling technique was used for selection of taluka, villages and potato growers. A Deesa, Palanpur and Dantiwada were purposively selected from Banaskantha district on the basis of largest potato crop cultivation area. Five villages were selected from each certain taluka on the basis of highest availability of potato growers. Thus, total 15 villages having highest number of potato growers were selected. A list of farmers who have adopted micro irrigation technology on their field was obtained from taluka panchayat office. Ten potato growers from each village were selected by using random sampling techniques making a sample of 150 potato growers. The result consisted of the changes that occurred after adoption of micro irrigation technology *viz*., change in self-sufficiency, change in social status, saving in water, saving fertilizer cost, saving plant protection cost, weed control expenses, saving in labour cost, saving energy cost, increase in crop production, improving quality of produce and early maturity of crop. It was found that more than half of the potato growers (60.00 per cent) were having medium level of overall impact, followed by 22.67 per cent and 17.33 per cent of them had high and low level of overall impact, respectively.

Keywords: *Impact, Micro irrigation, Potato Growers*

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Introduction

The water is needed for diverse purposes *viz*., agriculture, industry, domestic use, energy sector *etc*. On average, farms around the world account for 70% of all water that is consumed annually. Of that 70% used by farmers, 40% is lost to the environment due to poor irrigation systems, evaporation, and overall poor water management [1]."Micro-irrigation" was developed based on objective of water use efficiency and also defines as it is the advanced water saving irrigation technology that slow application of continuous water drop and miniature sprays of water in field through small devices. These devices apply the water onto the soil surface at very near the plant or below the soil surface directly into the plant root zone. The micro irrigation technology was classified into certain two categories like drip and sprinkler irrigation system.

Drip irrigation means the slow application of water from the drippers like drop by drop with minimize the water losses in agriculture. Sprinkler irrigation means apply the water into field by spraying or sprinkling or raining the water through the air on to the soil surface. Potato (*Solanum tuberosum*), annual plant in the Solanaceae family, grown for its starchy edible tubers. Taking this in view, the present research entitled as "Impact of micro irrigation technology on productivity and income of potato growers of Banaskantha district of Gujarat state" was planned with the following objectives.

Objectives of study

To study the impact of micro irrigation technology on productivity and income of potato growers

Material and Methods

The present investigation was carried out in Banaskantha district of Gujarat state during 2019. The present study was confirmed to "Ex-Post Facto" research design as the independent variables were already operated in the study area [2]. The multistage sampling technique was used for selection of taluka, villages and potato growers. A Deesa, Palanpur and Dantiwada were purposively selected from Banaskantha district on the basis of largest potato crop cultivation area. Five villages were selected from each certain taluka on the basis of highest availability of potato growers.

Thus, total 15 villages having highest number of potato growers were selected. A list of farmers who have adopted micro irrigation technology on their field was obtained from taluka panchayat office. Ten potato growers from each village were selected by using random sampling techniques making a sample of 150 potato growers.

Results and Discussion

Impact is the major component in this study which is the resultant changes occurred among the potato growers due to adoption of micro irrigation technology. It is assessment of changes in terms of socio-economic aspects of potato growers. The resultant changes that occurred after adoption of micro irrigation technology *viz*., change in self-sufficiency, change in social status and saving in different research aspects that considered in impact like water, fertilizer cost, plant protection cost, weed control expenses, labour cost, energy cost, increase in crop production, improving quality of produce and early maturity of crop.

Aspect wise impact of MIT

Further aspect wise impact was also studied and the findings are presented a under.

Change in self-sufficiency

The data in [Table-1] shows the changes in self-sufficiency of potato growers after adoption of micro irrigation technology. Exact two third of potato growers (66.00 per cent) are found in high level of change in self-sufficiency, followed by 29.33 per cent and 4.67 per cent of potato growers are found in medium and low level of change in self-sufficiency, respectively.

Table-1 Distribution of potato growers according to change in self-sufficiency after adoption of MIT

SN	Change in self-sufficiency	Frequency	Per cent
1.	Very low (0-2 score)	00	00.00
2.	Low (3-4 score)	07	04.67
3.	Medium (5-6 score)	44	29.33
4.	High (7-8 score)	99	66.00
Total		150	100.00

Change in social status

The data in [Table-2] shows the changes in social status of potato growers after adoption of micro irrigation technology. By adopting the micro irrigation technology, 34.66 per cent of potato growers have medium social status, followed by 32.67 per cent, 24.67 per cent, 6.67 per cent and 1.33 per cent of potato growers have low, high, very high and very low social status, respectively.

Table-2 Distribution of potato growers according to change in social status after adoption of MIT

Sr. No.	Change in social status	Frequency	Per cent
1.	Very low (0-2 score)	02	01.33
2.	Low (3-4score)	49	32.67
3.	Medium (5-6 score)	52	34.66
4.	High (7-8score)	37	24.67
5.	Very high (9-10 score)	10	06.67
Total		150	100.00

Saving in water

The information regarding utilization of irrigation water before adoption of MIT was collected from the potato growers. The comparison of saving of water was calculated in terms of per cent from the area covered under MIT. The saving in water after adoption of MIT was calculated. The results are depicted in [Table-3].

Before adoption of micro irrigation technology, 53.33 per cent of potato growers saved 26 to 50 per cent of irrigation water, followed by 34.67 per cent of potato growers saved up to 25 per cent. While 10.00 per cent of potato growers saved 51 to75 per cent irrigation water and 2.00 per cent of the potato growers saved irrigation water above 76 per cent. After adoption of micro irrigation technology, 48.67 per cent of potato growers save irrigation water above 76 per cent, followed by 32.00per cent of potato growers save irrigation water 51 to 75 per cent, while 10.67 per cent of the potato growers save irrigation water up to 25 per cent and 8.66 per cent of the potato growers save irrigation water 26 to 50 per cent.

Table-3 Distribution of potato growers according to saving of water after adoption of MIT

Saving of water	Before adoption		After adoption	
	Frequency	Per cent	Frequency	Per cent
Up to 25 per cent	52	34.67	16	10.67
26 to 50 per cent	80	53.33	13	08.66
51 to 75 per cent	15	10.00	48	32.00
Above 76 per cent	03	02.00	73	48.67
Total	150	100.00	150	100.00

Saving in fertilizer cost

The information regarding utilisation of fertilizers before adoption of MIT was collected from the potato growers. The comparison of saving in fertilizer cost was calculated in terms of per cent from the area covered under MIT. The saving in fertilizer cost after adoption of MIT was calculated. The results are depicted in [Table-4]. Before adoption of micro irrigation technology, 81.33 per cent of potato growers saved money between ₹1 to₹1500, followed by 16.67 per cent and 2.00 per cent of potato growers saved money between₹1501 to₹3000 and ₹3001 to ₹4500, respectively. After adoption of micro irrigation technology, 68.00 per cent of potato growers save money between ₹3001 to ₹4500, followed by 18.67 per cent of potato growers save money between₹4501 to ₹6000.While 11.33 per cent and 2.00 per cent of potato growers save money in ₹1501 to ₹3000 and money ₹ 1- ₹1500, respectively.

Table-4 Distribution of potato growers according to saving in fertilizer cost after adoption of MIT

Saving in fertilizer cost	Before adoption		After adoption	
	Frequency	Per cent	Frequency	Per cent
₹1 to ₹1500	122	81.33	003	02.00
₹1501 to ₹3000	025	16.67	017	11.33
₹3001 to ₹4500	003	02.00	102	68.00
₹4501 to ₹6000	000	00.00	028	18.67
Total	150	100.00	150	100.00

Saving in plant protection cost

The information regarding utilisation of plant protection chemicals before adoption of micro irrigation technology was collected from the potato growers. The comparison of saving in plant protection chemicals cost was calculated in terms of per cent from the area covered under MIT. The saving in plant protection cost after adoption of MIT was calculated. The results are depicted in [Table-5].

Before adoption of micro irrigation technology, 55.33 per cent of potato growers saved money between ₹76 to₹150, followed by 32.00 per cent and 12.67 per cent of potato growers saved money between₹1 to ₹75 and ₹151 to ₹225, respectively. After adoption of micro irrigation technology, 65.33 per cent of potato growers save money between ₹151 to ₹225, followed by 32.00 per cent and 2.67 per cent of potato growers save money between ₹76 to ₹150 and ₹226 to ₹300, respectively.

Table-5 Distribution of potato growers according to saving in plant protection cost after adoption of MIT

Saving in plant protection cost	Before adoption		After adoption	
	Frequency	Per cent	Frequency	Per cent
₹1 to ₹75	48	32.00	00	00.00
₹76 to ₹150	83	55.33	48	32.00
₹151 to ₹225	19	12.67	98	65.33
₹226 to ₹300	00	00.00	04	02.67
Total	150	100.00	150	100.00

Saving in weed control expenses

The information regarding utilization of weedicides before adoption of MIT was collected from the potato growers. The comparison of saving in weedicides cost was calculated in terms of per cent from the area covered under MIT. The saving in weedicides cost after adoption of MIT was calculated.

The results are depicted in [Table-6]. Before adoption of micro irrigation technology, 73.34 per cent of potato growers saved money between ₹1 to ₹50, followed by 21.33 per cent and 5.33 per cent of potato growers saved money between₹51 to ₹100 and ₹101 to ₹150, respectively. After adoption of micro irrigation technology, 80.66 per cent of potato growers save money between ₹101 to ₹150, followed by 15.34 per cent and 4.00 per cent of potato growers save money between ₹151 to ₹200 and ₹51 to ₹100, respectively.

Table-6 Distribution of potato growers according to saving in weed control expenses after adoption of MIT

Saving in weed control expenses	Before adoption		After adoption	
	Frequency	Per cent	Frequency	Per cent
₹1 to ₹50	110	73.34	000	00.00
₹51 to ₹100	032	21.33	006	04.00
₹101 to ₹150	008	05.33	121	80.66
₹151 to 200	000	00.00	023	15.34
Total	150	100.00	150	100.00

Saving in labours cost

The information regarding utilization of labours before adoption of micro irrigation technology was collected from the potato growers. The comparison of saving in labours cost was calculated in terms of per cent from the area covered under MIT. The saving in labour cost after adoption of MIT was calculated.

The results are depicted in [Table-7]. Before adoption of micro irrigation technology, 68.64 per cent of potato growers saved money between ₹1 to ₹1000, followed by 31.33 per cent of potato growers saved money between ₹1001 to ₹2000. After adoption of micro irrigation technology, 78.64 per cent of potato growers save money between ₹3001 to ₹4000, followed by 20.00 per cent and 1.33 per cent of potato growers save money between ₹2001 to ₹3000 and ₹1001 to ₹2000, respectively.

Table-7 Distribution of potato growers according to saving in labours cost after adoption of MIT

Saving in labours cost	Before adoption		After adoption	
	Frequency	Per cent	Frequency	Per cent
₹1 to ₹1000	103	68.64	000	00.00
₹1001 to ₹2000	047	31.33	002	01.33
₹2001 to ₹3000	000	00.00	030	20.00
₹3001 to ₹4000	000	00.00	118	78.64
Total	150	100.00	150	100.00

Saving in energy cost

The information regarding utilisation of energy before adoption of micro irrigation technology was collected from the potato growers. The comparison of saving in energy cost was calculated in terms of per cent from the area covered under MIT. The saving in energy cost after adoption of MIT was calculated. The results are depicted in [Table-8]. Before adoption of micro irrigation technology, 87.33 per cent of potato growers saved money between ₹1 to ₹250, followed by 12.67 per cent of potato growers saved money between ₹251 to ₹500. After adoption of micro irrigation technology, 70.00 per cent of potato growers save money between ₹251 to ₹500, followed by 28.00 per cent and 2.00 per cent of potato growers save money between ₹501 to ₹750 and ₹1 to ₹250, respectively.

Table-8 Distribution of potato growers according to saving in energy cost after adoption of MIT

Saving in energy cost	Before adoption		After adoption	
	Frequency	Per cent	Frequency	Per cent
₹1 to ₹250	131	87.33	003	02.00
₹251 to ₹500	019	12.67	105	70.00
₹501 to ₹750	000	00.00	042	28.00
₹750 to ₹1000	000	00.00	000	00.00
Total	150	100.00	150	100.00

Increase in crop production

The data presented in [Table-9] shows the increase in crop production of potato growers after adoption of micro irrigation technology. Majority of potato growers (52.00 per cent) increased crop production between 21 to 30 per cent, followed by 39.33 per cent and 8.66 per cent of potato growers increased their crop production above 30 per cent and up to 20 per cent, respectively.

Table-9 Distribution of potato growers according to increase in crop production after adoption of MIT

Sr. No.	Per cent increase in crop production	Frequency	Per cent
1.	Up to 20 per cent	13	08.66
2.	21 to 30per cent	78	52.00
3.	above 30 per cent	59	39.33
	Total	150	100.00

Quality of produce as compared to conventional irrigated produce

The data presented in [Table-10] shows the quality of produce as compared to conventional irrigated produce of potato growers after adoption of micro irrigation technology.

Great majority (84.67 per cent) of the potato growers obtained that quality of potato was improved in terms of size, colour, and shining before adoption of micro irrigation technology and after adoption of micro irrigation technology.

Table-10 Distribution of potato growers according to quality of produce as compared to conventional irrigated produce after adoption of MIT

Quality of produce as compared to conventional irrigated produce		
	Frequency	Per cent
Yes	127	84.67
No	023	15.33
Total	150	100.00

Early maturity of the crop

The data in [Table-11] indicate that early maturity of the crop of potato growers was observed after adoption of micro irrigation technology.

More than one half (57.34 per cent) of the potato growers get up to 10 days maturity of the crop, while 35.33 per cent and 7.33per cent of the potato growers get 10 to 15 days and more than 15 days maturity of crop after adoption of micro irrigation technology, respectively.

Table-11 Distribution of potato growers according to early maturity of the crop after adoption of MIT

Early maturity of the crop	Frequency	Per cent
Up to 10 days	86	57.34
10 to 15 days	53	35.33
Above 15 days	11	07.33
Total	150	100.00

The data in [Table-12] indicate that more than half of the potato growers (60.00 per cent) are having medium level of impact, followed by 22.67 per cent and 17.33 per cent of them have high and low level of impact, respectively. Thus, it can be concluded that more than half of the potato growers (60.00 per cent) had medium level of impact. The probable reason may be due to the fact that potato growers were adopt the micro irrigation only in cropping field rather than entire field. The finding is in line with the findings of Safi (2017) [3] and Barbade (2014) [4].

Table-12 Distribution of potato growers according to overall impact of MIT

SN	Overall Impact of MIT	Frequency	Per cent
1.	Low (up to 19.88 score)	26	17.33
2.	Medium (in between 19.88 to 24.96 score)	90	60.00
3.	High (above 24.96 score)	34	22.67
	Total	150	100.00

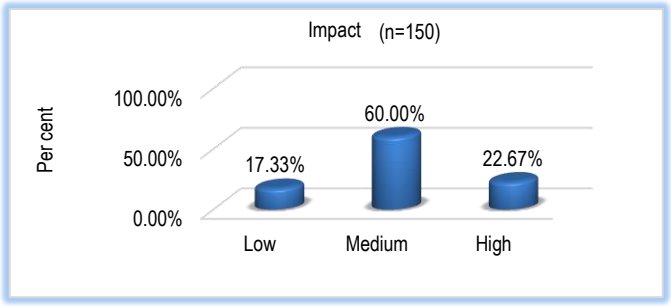

Fig-1 Distribution of the potato growers according to overall impact of MIT

Conclusion

In light of the above findings, following conclusions can be drawn. Micro irrigation technology occurs several impact on different aspect like as change in self-sufficiency, change in social status, saving in water, fertilizer cost, plant protection cost, weed control expenses, saving in labour cost, energy cost, increase in crop production, improving quality of produce and early maturity of crop in potato crop, while a more than half of the potato growers (60.00 per cent) were having medium level of overall impact, followed by 22.67 per cent and 17.33 per cent of them had high and low level of overall impact, respectively.

Application of research: Study the impact of micro irrigation technology on productivity and income of potato growers

Research Category: Microirrigation Technology, Agricultural Extension

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Study area / Sample Collection: Banaskantha district, Gujarat

Cultivar / Variety / Breed name: Potato (*Solanum tuberosum*)

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.
Ethical Committee Approval Number: Nil

References

[1] Balsom P. (2020) Report- "Water Usage in The Agricultural Industry"; High Tide Technologies, LLC, USA.
[2] Kerlinger F.N. (1976) Foundation of behavioral research. Surjeet publication, New Delhi.
[3] Shafi M. (2017) M.Sc. (Agri.) Thesis, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, 385506, Gujarat, India
[4] Barbade D.S. (2014) M.Sc. (Agri.). Thesis, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India.