Research Article

Indian Journal of Extension Education
Vol. 58, No. 1 (January–March), 2022, (151-156)

ISSN 0537-1996 (Print)
ISSN 2454-552X (Online)

Knowledge and Adoption of Drip Irrigation in Citrus Crops among Farmers of Western Haryana

Vinod Kumari[1]*, Subhash Chander[2] and Sushil Sharma[3]

[1]Professor & Head, [2]Assistant Professor, Department of Sociology, [3]Assistant Scientist, Department of Horticulture, CCS Haryana Agricultural University, Hisar-125004, Haryana, India
**Corresponding author email id: vinodkumari2000@yahoo.com

ARTICLE INFO

Keywords: Adoption, Drip irrigation, Knowledge, Socio-economic factors

http://doi.org/10.48165/IJEE.2022.58141

ABSTRACT

Water is becoming increasing scare which limits agricultural development not only in India but also in many parts of the world. Drip irrigation is an incredibly efficient watering method that slowly delivers water directly to plant root system. The present study was undertaken to assess the knowledge and adoption level of drip irrigation in citrus crops among farmers of Haryana state. Majority of respondents belonged to middle age group (51.67%), general castes (96.67%), joint families (68.33%) and having land between 4-10 hectares (45.00%). It was found that majority of sampled farmers (61.67%) had high level of knowledge while 31.67 per cent had moderate level of knowledge of drip irrigation. More number of farmers had high level of adoption (40.00%) whereas 35.00 per cent had medium and 25.00 per cent had low level of adoption of drip irrigation. Socio-economic factors like income, landholding, mass media exposure, education and socio-economic status of farmers were found significantly associated with the level of knowledge and adoption of drip irrigation. It is concluded that more efforts are required to increase the knowledge of farmers about drip irrigation for wider adoption of micro-irrigation technologies.

INTRODUCTION

In India, water use is increasing and its demand for agriculture, industry, and personal usage is expected to rise in the future decades. Water scarcity is becoming more prevalent, limiting agricultural development not only in India but throughout the world. Water use efficiency is critical for the survival of a growing population as well as the nation's vertical development. Drip irrigation is an effective way to deliver water directly to the root zone of the soil. The value of drip irrigation can be demonstrated by the fact that it reduces water wastage and is considered a feasible alternative for crops that require a lot of water. The drip irrigation technology is particularly well suited to saline and alkaline soils, with a water consumption efficiency of 80 to 90 per cent. (Verma & Sharma, 2017). In India, the area under drip irrigation has increased dramatically during the previous 15 years. Rajasthan (1.68 mh), Maharashtra (1.27 mh), Andhra Pradesh (1.16 mh), Gujarat (0.83 mh), and Haryana (0.57mh) are the states that use micro irrigation the most. Although there have been many technological developments in the Drip Irrigation System in the country, the system is not fully employed by farmers in water-scarce areas. It is becoming increasingly necessary for us to consider the different elements that influence farmers who use drip irrigation. Micro-irrigation technology adoption knowledge has significant physical, biological and social repercussions. In order of quantitative importance, socio-economic variables such as age, caste group, poverty index, and percentage of income from off-farm and non-farm activities had a substantial impact on decisions to adopt micro-irrigation technology (Neil & Lee, 2001; Ragassa et al., 2005).

Research has been done on various elements of micro irrigation in different crops (Barse et al., 2010; Kumar & Pallanisami, 2010; Shantaram, 2014; Hakkin et al., 2016; Moinand Kamil, 2018), but there has been no critical assessment of knowledge and adoption of drip irrigation in citrus crops. Furthermore, studies from one

Received 24-11-2021; Accepted 13-12-2021

region cannot be extrapolated to another to determine the reasons behind a technique's limited acceptance. According to Ragassa et al., (2005), there is a significant disparity in the timing of micro-irrigation technology adoption in Maharashtra and Gujarat. With these facts in mind, the current study was conducted to determine the level of knowledge and adoption of drip irrigation in citrus crops among farmers in Haryana.

METHODOLOGY

The study was conducted in Haryana state in two districts namely Sirsa and Fatehabad which are the major citrus growing districts. From each district, thirty respondents were selected randomly from different villages. In Fatehabad district villages selected randomly were Khara Kheri, Kumharia, Bigher, Jhallania, Mehuwala, Sulikhera, Haroli, Lehrian, Tibbi, Jandlikalan, DhaniChanan and GillanKhera villages. Similarly from Sirsadistrict villages namely Jamal, Rampura Dhilon, Darbi, Jorian, Jhiri, Santor Mandori, Teja Khera, Chhatria, Jodhpuria, Dariawala, Kheowli, Munnawali, Nuhianwali, AbubSahar and Burkwala were surveyed.

For assessing the knowledge and adoption of drip irrigation in citrus crops, data were collected by personal interview with the respondents at their home/farm. The interview of every individual was taken separately so that the others did not influence the answer.in order to measure the knowledge level of farmers and adoption of drip irrigation they were asked a set of questions on drip irrigation in citrus crops. To assess the knowledge about DIS a total 19 questions were asked like increase in yield than conventional method, water saving, knowledge of subsidy, water requirement, use of chemical fertilizers, checking of flirters, minimum wastage of water and use of saline water, application of liquid fertilizer, decrease the problem of weed, run by computer, improvement in soil health, etc. The options of reply were full knowledge, partial knowledge and no knowledge. Three points were given to full knowledge, 2 points to partial knowledge and 1 point to no knowledge. In this way total score for each respondent was calculated by summing up total points and knowledge about drip irrigation was categorised as low, moderate and high. To measure the level of adoption of drip irrigation of the farmers, an index was developed by taking into account following parameters (i) maximum number of years of adoption of drip irrigation (ii) Crop intensity (iii) area under drip irrigation adopted by farmers (iv) high income (v) high yield (vi) less weed (vii) less labour, etc. Scores were assigned and categorised as low, moderate and high level of adoption. The information so collected through the responses of the respondents, was suitably coded, tabulated and analysed to draw meaningful inferences by using statistical tools such as frequency distribution, percentages, chi-square and coefficient of contingency analysis.

RESULTS AND DISCUSSION

Contextual matrix of the respondents with respect to age, caste, education, marital status, family type and size, landholding, income, mass media exposure, social participation and SES was analysed. Personal profile of respondents revealed that majority of farmers belonged to middle age group (51.67%) and upper middle group (28.33%). Regarding the caste, overwhelming majority hailed from general castes (96.67%) and only 3.33 per cent from backward castes. More than two fifth of respondents (43.33%) were educated up to senior secondary level followed by 31.67 per cent educated as graduate and above. Overwhelming majority (98.33%) were married and having no membership of social organization (95.00%). Majority of respondents were having land between 4-10 hectares (45.00%), belonging to joint families (68.33%), having high income (46.67%) and having medium family size (40.00%). Half of the respondents were having medium level of mass media exposure and 60.00 per cent were having medium socio-economic status whereas 40.00% were having high SES. A total of 57 respondents were cultivating Kinnow whereas only 3 respondents were growing lemon crop.

Knowledge level of farmers about drip irrigation and socio-economic factors

Knowledge level of farmers about drip irrigation system was assessed. To judge the different aspects of knowledge about DIS, questions were framed with the help of literature and Collaborator from Horticulture department. Majority of sampled farmers had high (61.67%) and moderate (31.67%) level of knowledge of drip irrigation (Table 1). Only 6.67 per cent had it low. Swetha et al., (2019) found medium to low level of knowledge which led to medium extent of use and maintenance of drip irrigation system. Mohan et al., (2012) elucidated that benefits of drip irrigation must be extended through proper extension services so that farmers can get higher crop productivity. The present findings are in conformation with the findings of Jitarwal (2007); Modi et al., (2008); Ghanshas et al., (2015). Kaarthikeyan & Suresh (2019) reported that all the farmers who adopted DIS were aware about most of the benefits of drip irrigation.

Knowledge level was found associated with age, education, land holding, income mass media exposure, type and size of family and SES of farmers as indicated by Chi-square results (Table 2). It was found that respondents belonging to upper middle age group (94.11%), high mass media exposure (90.90%), high SES (87.50%), high income (87.72%), education up to senior secondary (84.63%), large family (84.22%), medium land holding (70.37%), belonging to joint family (63.43%) and general caste (62.07%) were having high level of knowledge about drip irrigation. Kaarthikeyan & Suresh (2019) reported that awareness was not at all a problem for non-adoption of this technology. Government need to support farmers in terms of providing subsidy and encouragement to farmers which will finally reduce the wastage of water. Swetha et al., (2019) also reported that education, age, innovativeness, aspirations, social participation and extension contacts have impact on knowledge level of farmers. Sharma et al., (2018); Mishra & Kaur (2019) reported that age, education and owned area were found associated with awareness parameters.

Table 1. Knowledge level of respondents about drip irrigation

Level of Knowledge	
Low (30-38)	04 (06.67)
Moderate (39-47)	19 (31.67)
High (48-57)	37 (61.67)

Table 2. Association of socio-economic variables with knowledge level about drip irrigation.

Age (years)	Low	Moderate	High	Total
Young	03(25.00)	02(16.67)	07(58.33)	12(20.00)
Middle	01(03.23)	16(51.61)	14(45.16)	31(51.67)
Upper middle	00(00.00)	01(05.89)	16(94.11)	17(28.33)
Total	04(06.67)	19(31.66)	37(61.67)	60(100)
				χ^2=14.29**; C=0.43
Caste				
General	04(06.90)	18(31.03)	36(62.07)	58(96.67
Backward	00(00.00)	01(50.00)	01(50.00)	02(03.33)
				χ^2=0.058; C=0.03
Size of land holding (hac)				
1 to 2.00	01(50.00)	00(00)	01(50.00)	02(03.34)
2.01 to 4	00(00)	07(87.50)	01(12.50)	08(13.33)
4.1 to 10.00	02(07.41)	06(22.22)	19(70.37)	27(45.00)
Above 10	01(04.35)	06(26.09)	16(69.57)	23(38.33)
				χ^2=12.81*; C =0.42
Type of family				
Nuclear	04(21.05)	04(21.05)	11(57.90)	19(31.67)
Joint	00(00.00)	15(36.57)	26(63.43)	41(68.33)
				χ^2=09.68**; C =0.37
Size of family (members)				
Small (upto 4)	02(11.77)	03(17.64)	12(70.59)	17(28.33)
Medium (5-8)	01(04.17)	14(58.33)	09(37.50)	24(40.00)
Large (above 8)	01(05.26)	02(10.52)	16(84.22)	19(31.67)
				χ^2=14.12**; C=0.43
Education level of the respondents				
Primary	01(50.00)	01(50.00)	00(00.00)	02(03.33)
Middle	02(15.38)	09(69.24)	02(15.38)	13(21.67)
Senior secondary	01(03.84)	03(11.53)	22(84.63)	26(43.33)
Graduation and above	00(00.00)	06(31.58)	13(68.42)	19(31.67)
				χ^2=18.80**; C=0.48
Income of the family (Rs.)				
Low	02(20.00)	00(00.00)	08(80.00)	10(16.67)
Medium	01(04.55)	16(73.73)	05(22.72)	22(36.67)
High	01(03.57)	03(10.71)	24(85.72)	28(46.67)
				χ^2= 27.89**; C=0.56
Social participation				
Nil (0)	04(07.02)	17(29.82)	36(63.16)	57(95.00)
Low (1)	00(00.00)	02(66.67)	01(33.33)	03(05.00)
				χ^2=0.48; C= 0.08
Mass media exposure				
Low (upto 9)	01(12.50)	04(50.00)	03(37.50)	08(13.33)
Medium (10-17)	03(10.00)	13(43.33)	14(46.67)	30(50.00)
High (above 17)	00(00.00)	02(09.10)	20(90.90)	22(36.67)
				χ^2=12.54**; C =0.41
Socio economic status				
Medium	03(08.33)	17(47.22)	16(44.45)	36(60.00)
High	01(04.17)	02(08.33)	21(87.50)	24(40.00)
				χ^2=11.51**; C= 0.40

Adoption level of drip irrigation and socio-economic factors

Regarding the level of adoption of drip irrigation more number of farmers had high level of adoption (40.00%) while 35.00 per cent and 25.00 per cent had medium and low level of adoption of drip irrigation, respectively (Table 3). Shaik and Mistry (2018) found that before adoption of drip irrigation system, majority of drip owners spent money more than Rs. 10001 for purchasing fertilisers. But after adoption of drip irrigation system, most of drip owners spent money between Rs. 1001 to 5000 in purchasing fertilisers. It was revealed that before adoption of drip irrigation system, majority of drip owners spent money for labours between Rs. 5001 to 10000 but after adoption of drip irrigation system, most of drip owners spent money for labourers in between Rs. 1001 to 5000. Prajapati et al., (2016) reported that the knowledge about drip irrigation system was found to be moderate to high (60.83%) and majority of respondents (58.33%) were having moderate to high level of adoption of management practices of drip irrigation system. Swadia (2017); Gupta & Rao (2019) found that more than 60 per cent respondents had medium and high adoption level of drip irrigation system, respectively. Yadav et al., (2019) also found that 48.96 per cent farmers had medium extent of adoption of drip irrigation system.

Table 3. Adoption level of respondents about drip irrigation

Level of adoption	
Low (12-14)	21(35.00)
Moderate (15-17)	15(25.00)
High (18-21)	24(40.00)

Table 4. Association of socio-economic variables with adoption level of drip irrigation

Age (years)	Low	Moderate	High	Total
Young	09(75.00)	02(16.67)	01(08.33)	12(20.00)
Middle	06(19.35)	12(38.71)	13(41.94)	31(51.67)
Upper middle	06(35.29)	01(05.88)	10(58.82)	17(28.33)
Total	21(35.00)	15(25.00)	24(40.00)	60(100)
				χ^2=17.34**; C=0.47
Caste				
General	21(36.21)	13(22.41)	24(41.38)	58(96.67
Backward	00(00)	02(100)	00(00)	02(03.33)
				χ^2=0.20; C=0.05
Size of land holding (hac)				
1 to 2.00	02(100)	00(00)	00(00)	02(03.34)
2.01 to 4	01(12.50)	07(87.50)	00(00)	08(13.33)
4.1 to 10.00	12(44.44)	07(25.93)	08(29.63)	27(45.00)
Above 10	06(26.09)	08(34.78)	09(39.13)	23(38.33)
				χ^2=12.01*; C =0.41
Type of family				
Nuclear	10(52.63)	01(05.26)	08(42.11)	19(31.67)
Joint	11(26.83)	14(34.15)	16(39.02)	41(68.33)
				χ^2=06.83*; C=0.32
Size of family (members)				
Small (upto 4)	11(64.71)	01(05.88)	05(29.41)	17(28.33)
Medium (5-8)	09(34.50)	10(41.67)	15(62.50)	24(40.00)
Large (above 8)	01(05.26)	04(21.05)	14(73.68)	19(31.67)
				χ^2=22.47**; C=0.52
Level of education of the respondents				
Primary	02(100)	00(00)	00(00)	02(03.33)
Middle	02(15.38)	10(76.92)	01(07.69)	13(21.67)
Senior secondary	05(19.23)	03(11.54)	18(69.23)	26(43.33)
Graduation and above	12(63.16)	02(10.53)	05(26.32)	19(31.67)
				χ^2=34.91**; C=0.60
Income of the family (Rs.)				
Low	06(60.00)	01(10.00)	03(30.00)	10(16.67)
Medium	07(31.82)	10(45.45)	05(22.73)	22(36.67)
High	08(28.57)	04(14.29)	16(57.14)	28(46.67)
				χ^2=11.99**; C=0.40
Social participation				
Nil (0)	20(35.09)	14(24.56)	23(40.35)	57(95.00)
Low (1)	01(33.33)	01(33.33)	01(33.33)	03(05.00)
				χ^2=0.04; C= 0.02
Mass media exposure				
Low (upto 9)	04(50.00)	02(25.00)	02(25.00)	08(13.33)
Medium (10-17)	10(33.33)	12(40.00)	08(26.67)	30(50.00)
High (above 17)	07(31.82)	01(04.55)	14(63.64)	22(36.67)
				χ^2=12.32**; C =0.41
Socio economic status				
Medium	13(36.11)	13(36.11)	10(27.78)	36(60.00)
High	08(33.33)	02(08.33)	14(58.33)	24(40.00)
				χ^2=07.83**; C= 0.34

Level of adoption of drip irrigation on citrus crops was found affected by multiple socio-economic factors (Table 4). Age of the farmers was found significantly associated with level of adoption. Majority of farmers from upper middle age group (58.82%) and middle age group (41.94%) had high level of adoption of drip irrigation. However, caste of the respondents and level of adoption of drip irrigation was found non-significantly associated. Adoption level of drip irrigation was relatively high among general castes (41.38%) than other backward caste groups.

Size of the landholdings was found highly significantly associated with the adoption level of drip irrigation of the farmers. Two fifth majorities of large farmers (39.13%) had high level of adoption of drip irrigation on citrus crops. Likewise 29.63 per cent medium land holders had high level of adoption. In contrast, 87.50 per cent small farmers had moderate level of adoption. On the whole, as the size of landholding of the farmers increased, level of adoption of drip irrigation also increased simultaneously. So size of landholding also facilitated the adoption level of drip irrigation of the farmers.

Size of family also affected the level of adoption of drip irrigation. It was found highly significantly associated with level of drip irrigation. The respondents from large family size were having high level of adoption (73.68%). Level of mass media exposure of the farmers also influenced the level of adoption of drip irrigation of the farmers, as both were found highly significantly associated. Majority of farmers (63.64%) had relatively high level of adoption of drip irrigation that had high level of mass media exposure. Those having low mass media exposure were having low

level of adoption of drip irrigation (50.00%). Kaarthikeyan & Suresh (2019) reported that cost, land size and water source were the major factors for adoption of drip irrigation technology.

Socio-economic status of the farmers affected the adoption of drip irrigation on citrus crops. Analysis clearly revealed that farmers who had high level of adoption of drip irrigation were from high socio-economic status (58.83%) and vice-versa. Significant association was also found between these two variables. Mohan et al., (2012) reported that farmers' income, size of land holding, education and kissan credit card were having statistically significant and positive impact on drip irrigation and improved their socioeconomic conditions. Jumanne (2016) reported that technology adoption was influenced by farmer's age, education and other socio-economic factors. It is recommended that policy makers and private sector should consider socio-economic factors when mainstreaming small holding farmers in horticulture industry production and productivity. Verma & Sharma (2017) also reported that variables like knowledge, education, social participation, annual income, economic motivation and mass media exposure were found positively and significantly associated with the adoption of drip irrigation by the farmers. While, size of land holding, experience in farming and irrigation potentiality were found non-significantly associated with the adoption of drip irrigation by the farmers. Yadav et al., (2019a) found that subsidy, motivation, demonstration and training were the main prioritized strategies.

On the whole, it can be concluded that factors like age, general caste status, senior secondary level of education, large size of landholdings, mass-media exposure and socio-economic status played an important role in the adoption of drip irrigation in citrus crops. Therefore, there is a need to improve, mass-media exposure, extension contacts and trainings and education, etc. in rural areas to improve the adoption level of drip irrigation among farmers. Mohan et al., (2012) also concluded that water saving technology must be expended to other regions to elucidate the benefit of drip irrigation through proper extension service so that farmers can get higher crop productivity using limited resources of water and also benefit economically. Low level of adoption was mainly due to low level of education, small size of landholdings, low mass-media exposure and socio-economic status and lack of knowledge.

CONCLUSION

It was concluded that the knowledge level of majority of farmers in western Haryana about the drip irrigation system was high (61.67%) followed by moderate (31.67%) level of knowledge. The results further revealed that 40.00% respondents were having high level of adoption of drip irrigation followed by low (35.00%) and moderate level of adoption (25.00%). Various socio- economic factors like income, landholding, mass media exposure, education and socio-economic status were found significantly associated with the level of knowledge and adoption of drip irrigation. There is a need to improve these indicators in rural areas to improve the adoption level of drip irrigation among farmers.

REFERENCES

Barse, K. N., Gohad, V. U., & Lunge, M. R. (2010). Adoption of drip irrigation system by orange growers in Amravati taluka, *Agriculture Update*, *5*(3&4), 346-348.

Ghanghas, B. S., Shehrawat, P. S., & Nain, M. S. (2015). Knowledge of extension professionals regarding impact of climate change in agriculture, *Indian Journal of Extension Education, 51*(3&4), 125-129.

Gorain, S. (2018). Socio-economic impact of drip irrigation in northern Maharashtra. *M.Sc. Thesis*, ICAR-IARI New Delhi.

Gupta, S. K., & Rao, G. M. (2019). Extent of adoption of selected contemporary water management innovations by farmers in dry land agro ecosystem, *Indian Journal of Extension Education, 55*(2), 139-143.

Hakkim, V. A., Joseph, E. A., Gokul, A. A., & Mufeedha, K. (2016). Precision farming: the future of Indian agriculture, *Journal of Applied Biology & Biotechnology, 4*(6), 68-72.

Jitarwal, R. C., & Sharam, N. K. (2007). Impact of drip irrigation technology among farmers in Jaipur region of Rajasthan, *Indian Research Journal of Extension Education, 7*(2&3), 88-89.

Jumanne, B. S. (2016). Applicability of drip irrigation for small holding farmers- A case study of horticultural industry in Tanzania. *M.Sc. Thesis*, The Ohio State University, USA.

Kaarthikeyan, G. M., & Suresh, A. (2019). A study on understanding the adoption of water saving technology – a case study of drip irrigation, *International journal of Recent Technology and Engineering, 7*(6), 1123-1130.

Kumar, S., & Pallanisami (2010). Impact of drip irrigation on farming system, *Agricultural Economic Research Review, 23*(2), 265-272.

Misra, A., & Kaur, M. (2019). Adoption of drip irrigation technique by sugarcane growers of Rajasthan, *Indian Journal of Extension Education, 55*(2), 74-79.

Modi, V. M., Patel, S. H., & Patel, J. K. (2008). Association between attributes of the farmers and their knowledge and adoption of micro irrigation system, *Gujarat Journal of Extension Education, 18-19*, 102-105.

Mohan, G., Mishra, R., Fukushi, K., Besse, R. A., Perarapu, L. N., Chapagain, S. K., & Sudarma, I. N. (2012). Factors affecting and farmers perception of adoption of water saving irrigation technologies in semi-arid states of India. http:://collections.unu.edu.IIT Madras.

Moin, K., & Kamil, A. (2018). Drip irrigation in India: prospects, potential and challenges, *Journal of Geography, Environment and Earth Science International*, *17*(4), 1-14.

Neil, S., & Lee, D. (2001). Explaining the adoption and dis-adoption of sustainable agriculture: the case of cover crops in Northern Honduras, *Economic Development and Cultural Change, 49*(4), 793-820.

Prajapati, V. V., Kaid, S. V., Prajapati, R. C., & Thakkar, K. A. (2016). Adoption behaviour of drip irrigation technology among the pomegranate growers of north Gujarat, *International Journal of Agriculture Sciences, 8*(22), 1443-1447.

Regassa, N. E., Upadhyay, B., & Nagar, R. (2005). Adoption and impacts of micro irrigation technologies: empirical results from selected localities of Maharashtra and Gujarat, *International Water Management Institute Research Report, 93*, 1-51.

Shaik, M. S. R., & Mistry, J. J. (2018). Socio economic impact of adoption of drip irrigation system on drip owners of Aravalli district, *International Journal of Current Microbiology and Applied Sciences, 6*, 2174-2180.

Shantaram, B. D. (2014). Impact of drip irrigation on socioeconomic development of farmers. *M.Sc. Thesis*, Mahatama Phule Krishi Vidhya Peeth, Rahuri.

Sharma, P., Kaur, P., Mittal, L. R., Kaur, S., & Kaur, S. (2018). Relationship of socio-economic characteristics with level of

farmers' awareness about climate change effect on water resources, *Indian Journal of Extension Education, 54*(2), 26-31.

Swadia, B. U. (2017). Study of adoption behaviour of drip irrigation system on chilli crop in Ahmedabad district of Gujarat India, *Recent Trends, 4*(1), 15-20.

Swetha, M., Sudha Rani, V. & Sreenivasa Rao, I. (2019). Influence of profile characteristics on knowledge level about drip irrigation system, *Indian Journal of Extension Education, 55*(4), 51-54.

Verma, H., & Sharma, S. (2017). Factors associated with adoption of drip irrigation system by the farmers in Bikaner district of Rajasthan, *Asian Journal of Agricultural Extension, Economics and Sociology, 18*(1), 1-8.

Yadav, K., Yadav, J. P. & Bijarniya, S. (2019). Adoption of drip irrigation system by the farmers in Jjhotwara panchayat samiti of district Jaipur, Rajasthan Indian, *Indian Journal of Extension Education, 55*(1), 142-144.

Yadav, K., Yadav, J. P., Kumawat, P., & Yadav, S. (2019a). Strategy to overcome the constraints of drip irrigation system: a study of panchayat samiti, Jhotwara, district Jaipur (Rajasthan), *Indian Journal of Extension Education, 55*(3), 5-8.