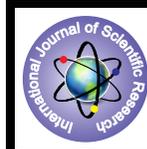


## Effect on Crop Yield And Perceptions of Farmers on Drip Fertigation: Study From Kerala State, India



### Agriculture

**KEYWORDS :** Drip fertigation, Perceptions, Adoption

\* **K. Madhava Chandran**

Scientist, Centre for Water Resources Development and Management (CWRDM), Kozhikode, Kerala, India. \* corresponding Author

**U. Surendran**

Scientist, Centre for Water Resources Development and Management (CWRDM), Kozhikode, Kerala, India

### ABSTRACT

*Field level demonstrations have created a favourable attitude on drip fertigation among farmers seeing them in Kerala. Factors such as labour saving, fertilizer saving, subsidy, water scarcity etc. motivate farmers to adopt drip irrigation and fertigation. However, they have apprehensions on the high cost of the system, difficulty in getting subsidy etc. The influence of drip fertigation on yield improvement of crops is evident from the experience of farmers. The problems in adoption should be addressed by the Government, along with improving the outreach of technologies through suitable extension programs for increasing their adoption by farmers. Factors influencing adoption can be studied by the Agriculture Dept., in collaboration with research institutions for formulating suitable schemes to improve adoption*

### Introduction

Kerala State is located between 8°18' and 12°48' N latitude and 74°52' and 77°22'E longitude, receiving high rainfall of about 3000mm per year during June to December. Perennial crops such as coconut, arecanut, rubber, tea, coffee, cardamom black pepper etc. occupy about 85% of the cultivated area. The upland cropping system in the State is mainly under coconut, which occupies 39% of the cultivated area.

The productivity of many crops in Kerala is low, when compared to the national average (Govt. of India, 2009). Lack of irrigation is an important reason for this. Only 16% of the gross cropped area in the State is irrigated (State Planning Board, 2011). Even with subsidy provided by the Agriculture Dept., the area under micro irrigation is very low in Kerala, when compared to the other States (Rane, 2011). Shifting the emphasis from promotion of drip irrigation to drip fertigation, which gives high yield per unit quantity of water and nutrients will be more productive. Reports on the advantages of drip fertigation for improving crop yield, quality of produce and saving water and nutrients are available (Aashish Velkar, 2008; Alva et al, 2003; Ravi Bhat et al, 2007). However, drip fertigation has not become popular among farmers in Kerala. In this context, CWRDM, a research institute under the Govt. of Kerala, in collaboration with the State Agriculture Dept. implemented a project funded by DST, Govt. of India on demonstration of drip fertigation in farmers' plots in Kerala for various crops. Seminars and field visits were organized for about 800 farmers in the demonstration plots.

This paper reports the results of a study carried out under the project on yield increase through drip fertigation in various crops and perceptions of farmers towards the technique.

### Materials and Methods

According to the Agriculture Dept., Palakkad is the only district where a significant number of farmers have adopted drip fertigation mainly due to severe water scarcity. 50 drip fertigrating farmers and 50 farmers adopting drip irrigation in the district were interviewed using a questionnaire. The questionnaire contained variables such as age, experience, land holding size, non-farm income etc. and the dependant variable, drip irrigation adoption index. This index was worked out as a summated score of the parameters, namely, year of drip adoption, whether utilized subsidy for adoption, number of components installed under drip irrigation, type of emitters used and whether adopted drip fertigation. The opinion on drip fertigation of farmers, who attended the seminars and field visits organized in the demonstration plots was also collected.

Multiple linear regression analysis between the independent variables and drip adoption index was carried out. The reasons and constraints in adopting drip irrigation/drip fertigation of farmers were ranked through weighted scores, as suggested by Alen Manyevere *et al* (2014)

### Results and Discussion

#### Reasons and constraints in drip irrigation adoption

The ranked reasons of farmers for adopting drip irrigation and their weighted scores are shown in Table 1. The main reason is traditional irrigation requiring more labour, which is costly. Labour in Kerala is costly (Rs. 700 to 800 per day). The next important reason is subsidy of the Dept., which will be necessary, since farmers in Kerala are finding it difficult to break even in farming due to high cultivation costs and low market value. The notion that drip will give comparable yield as traditional irrigation has also contributed to adoption (Table 1).

**Table 1. Reasons for adopting drip irrigation**

Reason	Weighted score
Traditional irrigation requires more labour, which is costly	2.88
Subsidy provided by the Agriculture Dept.	2.07
Yield comparable to traditional irrigation can be obtained through drip irrigation	1.92
Unable to adopt traditional irrigation due to water scarcity	1.52
High productivity and income from cultivation acted as an incentive to adopt drip irrigation	1.34
Since water is applied to the active root zone	1.13
Difficulty to practice traditional irrigation due to slope of land	1.00

The most important reason for adopting drip fertigation is also labour saving. Saving cost on fertilizers and achieving good yield are the other reasons (Table 2). The main constraints in adopting drip and fertigation in the order of rank include high cost of the system, emitter clogging by fertilizers and difficulty in getting subsidy (Table 3). The apprehension of clogging by water soluble fertilizers under fertigation shows an awareness by farmers, which may be attributed to deficiencies in awareness creation by the Dept. The amount of subsidy for farmers is calculated based on earlier cost estimates of drip irrigation system, without timely revision. This is an important bottleneck reported by farmers under an earlier study of CWRDM also (CWRDM,

2012).

**Table 2. Reasons for adopting drip fertigation**

Reason	Weighted score
To save labor involved in conventional fertilizer application	1.36
To save cost on fertilizers	1.00
Will result in significant yield increase of crops	1.00

**Table 3. Constraints in adoption of drip irrigation and drip fertigation**

Constraint	Weighted score
High installation cost	1.97
Fertilizers will clog emitters	1.70
Difficulty in getting subsidy from the Agriculture Dept.	1.53
Difficulty to do inter cultivation	1.50
Conservative farmers hesitate to change from traditional irrigation	1.50
Inadequate subsidy offered by the Dept.	1.00
Low crop production from the presently cultivated area	1.00

**Factors influencing drip irrigation adoption**

Farming experience, landholding size and area under drip irrigation significantly influence adoption index of farmers, with R<sup>2</sup> value of 0.84 (Table 4). Adoption index mostly decreases with increase in farming experience (Table 5), implying that younger farmers are more innovative in adoption. Mean adoption index increases with landholding size (Table 6), indicating that big farmers are in a better position to adopt a costly system like drip irrigation than small farmers. This is logical in Kerala, where farming is mostly uneconomical, and hence, big farmers will be more innovative in technology adoption. Further, since many farmers have mentioned that they are not able to get drip subsidy due to administrative shortcomings of the Agriculture Dept., the big farmers would be more capable of adopting costly techniques like drip irrigation. It is interesting to note that adoption index decreases with increase in non-farm income of farmers (Table 7). The probable reason for this is that under a non-profitable system of farming existing, many farmers in the State look for alternate income sources, which, they may not necessarily invest in agriculture as such due to the risks involved.

**Table 4. Multiple regression analysis of variables influencing drip irrigation adoption index**

Variable	Regression coefficient
Age	-0.110
Education	0.871
Farming experience	-0.127**
Landholding size	1.360**
Non-farm income	-19.249*
Area under drip irrigation	-1.354

R<sup>2</sup> = 0.84 F= 12.29\* Significant at 1% level \*\* Significant at 10% level

**Table 5. Drip irrigation adoption index of farmers based on farming experience**

Experience (Years)	Mean adoption index
15-20	17.5
21-25	16.0
26-30	15.7
31-35	16.5
40-50	14.3

**Table 6. Drip irrigation adoption index of farmers based on landholding size**

Landholding size (ha)	Mean adoption index
< 0.4 ha	15.8
0.4 to 1.0 ha	16.6
> 1 ha	20.0

**Table 7. Drip irrigation adoption index of farmers based on non-farm income**

Non-farm income as % of total income	Mean adoption index
<25	17.8
25-50	16.5
>50	15.2

While about only 60 % of the farmers, who attended seminars and field visits organized under the project were aware of drip fertigation, after exposure to the demonstration plots, about 92% farmers expressed good opinion about the technology and 82% showed interested in adopting it using Govt. subsidy. This highlights the usefulness of extension programs such as demonstrations, seminars etc. for improving adoption of agricultural technology by farmers. In this context, the Agriculture Dept. in Kerala should consider improvements in the content, methodology and number of existing extension activities to be undertaken for facilitating more transfer of technology.

Table 8 gives yield data reported by 50 farmers who adopted drip fertigation in Palakkad district. For all the crops, majority of the farmers have been able to realize more than 50% yield increase through drip fertigation, compared to conventional irrigation methods.

**Table 8. Yield increase of crops reported by farmers adopting drip fertigation**

Crop	Yield increase (%) over conventional irrigation	Farmers (%)
Coconut	33.3	9.1
	50-60	54.5
	60-70	27.3
	80	9.1
	Total	100.0
Banana	30-40	20.0
	40-50	20.0
	50-60	20.0
	67	10.0
	71.4	10.0
	112	10.0
	200	10.0
Total	100.0	
Tomato	50	7.7
	60-70	15.4
	70-80	23.0
	93.3	7.7
	100	23.1
	120	7.7
	166	7.7
	180	7.7
Total	100.0	
Bitter gourd	40	7.7
	50-60	15.4
	70-80	30.7
	87.5	7.7
	100	15.4
	113	7.7
	125	7.7
185	7.7	
Total	100.0	
Snake gourd	87.50	50.0
	133.0	50.0
Total	100.0	
Chillies	55.5	33.3
	66.7	66.7
Total	100.0	

Crop	Yield increase (%) over conventional irrigation	Farmers (%)
Peas	100	100
Brinjal	117	100

Transfer of such results to other farmers would go a long way in motivating them to adopt comparatively costly techniques like drip irrigation and fertigation, since the income obtained from such yield improvements would be helpful for them to recover the cost involved in laying out the system, provided they continue its adoption for some period of time.

### Conclusions

The study revealed the influence of extension programs like field level demonstrations and seminars in creating favorable attitude and orientation towards adoption of relatively costly techniques like drip fertigation among farmers. The effect of drip fertigation on yield improvement of crops through combined application of required quantity of water and nutrients is experienced by farmers. Constraints in adoption such as unawareness, access to subsidies, low subsidy etc. have to be addressed by the Government, while also improving outreach of technology through relevant extension programs for increasing their adoption. Factors influencing micro irrigation adoption can be studied by the Dept., in collaboration with research institutions for formulating suitable schemes to improve adoption.

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