



ISSN: 0975-833X

Available online at <http://www.journalcra.com>

INTERNATIONAL JOURNAL
OF CURRENT RESEARCH

International Journal of Current Research
Vol. 13, Issue, 11, pp.19734-19738, November, 2021

DOI: <https://doi.org/10.24941/ijcr.42714.11.2021>

RESEARCH ARTICLE

EXPLORATIVE STUDY FOR ASSESSMENT OF GREENHOUSE CULTIVATION PROBLEMS IN KERALA

Deepthi S Nair¹, Jinu A. ² and Sathian K. K. ^{3,*}

¹PG Scholar, Department of Soil and Water Conservation Engineering, Kelappaji College of Agricultural Engineering and Technology, Kerala 679573, India

²Assistant professor, Department of Soil and water conservation Engineering, Kelappaji College of Agricultural Engineering and Technology, Kerala 679573, India

³ Professor, Department of Soil and water conservation Engineering, Kelappaji College of Agricultural Engineering and Technology, Kerala 679573, India

ARTICLE INFO

Article History:

Received 15th August, 2021

Received in revised form

29th September, 2021

Accepted 18th October, 2021

Published online 30th November, 2021

Keywords:

Survey, Greenhouse,
Cladding Material.

*Corresponding author:

Sathian K. K.

ABSTRACT

A survey was conducted across 14 districts of Kerala based on structured questionnaire with an objective of performance of greenhouses maintained by Kerala farmers. Using stratified random sampling 11 farmers were selected randomly from each district and collected the details regarding the problems of greenhouse cultivation, cleaning interval of cladding material, variation of yield with increasing age of cladding material, cost required for cleaning etc. by personal interview method. Details were analyzed using spss 16.0 software. Failure of greenhouses in Kerala is due to aging of cladding material (44.16%), both aging of cladding material and decrease of soil fertility (28.57%), both aging of cladding material and fungal/insect attack (12.34%), aging of cladding material and maintenance problems (9.74%), both aging of cladding material and structural problems like shape, apron length (3.25%). Remedial measures to improve the crop performance inside the greenhouse are intermittent cleaning of cladding material to reduce aging effect of cladding sheet, adopt soil management practices like soil fumigation to improve the soil fertility inside the greenhouse, along with rectifying structural problems design elements have to modify.

Copyright © 2021. Deepthi S Nair et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Citation: Deepthi S Nair, Jinu A. and Sathian K. K. "Explorative study for assessment of greenhouse cultivation problems in Kerala", 2021. International Journal of Current Research, 13, (11), 19734-19738.

INTRODUCTION

Greenhouses are framed or inflated structures covered with transparent or translucent material large enough to grow crops under partially or fully controlled environmental conditions to get optimum growth and productivity. Advantages of greenhouse cultivations are off-season production of vegetable and fruit crops, high quality disease free products, income from small land holding to be improved, less water requirement of crop etc. This technology is having some constraints also (Kumar et al., 2018). The property of cladding material and its aging have wide influences on the crop performance under the greenhouse. Dust accumulation and whitening have a detrimental effect on microclimate and crop yield under greenhouse (Mashonjowa et al., 2009).

As the aging of greenhouses reduces the entry of visible spectrum of solar radiation in to the greenhouse and as a result photosynthesis reduces which leads to reduction in yield from greenhouses and thereby farmers' efforts became meaningless. In addition to that inadequate marketing facility of greenhouse products (Umarov et al., 2019), lack of demand of greenhouse products, insect/fungal attack of greenhouse crops (Shipp et al., 2003) etc. are the main constraints faced by greenhouse farmers. Because of these many farmers are reluctant to take-up greenhouse cultivation citing crop failures after the initial phase. Under these circumstances, this study has been taken up to explore the reasons of failures of greenhouse cultivation under the hands of Kerala farmers.

REVIEW OF LITERATURE

Some of the important previous research works related to the paper are given below.

Hena *et al.*, (2017) conducted a study on factors determining the adoption of greenhouse farming and problems faced by farmers. They reported that the important factor that determined the adoption of greenhouse farming was farmer's awareness about the greenhouse farming practices and economic benefit. Furthermore they also reported that the chances of declining yield due to insect attack and short life of cladding material. Likewise, Ghanghas *et al.*, (2018) conducted a research study on problems and prospects of vegetable production under greenhouse technology in Haryana. They found that farmers were faced many problems like attack of insect and white flies, frequent occurrence of windstorms, lack of cold storage facilities. Furthermore they reported that good quality cladding material can control nematode infestations and proper marketing can overcome the problems of greenhouse farmers. In the same year itself Kumar *et al.*, conducted a study on status and constraint in vegetable cultivation under greenhouse in Haryana. The study revealed that major problems faced by greenhouse farmers were short life span of polyethylene sheet (92.5%), infestation of insect-pest (90%), high price fluctuation (87.5%) and lack of market information (75%). Ozen *et al.*, (2018) conducted a survey on insurance claims and insurance intentions of greenhouse farmers and to determine the influencing factors affecting the insurance process. They analyzed that greenhouse farmers faced problems to continue their agricultural activities and suffer the damages due to natural conditions. So that insurance system is important to overcome the losses due to such damages.

Furthermore they concluded that insurance system provide market stability in the food sector. Umarov *et al.*, (2019) reported that lack of an effective vegetable marketing strategy and undiversified sales markets were major challenges of greenhouse farmers. Chandel *et al.*, (2010) conducted a qualitative and quantitative analysis of major plant parasitic nematodes in 214 greenhouses in Himachal Pradesh. They reported that *Meloidogyne incognita* was most alarming and threatening nematode which results in 11.31% yield losses in greenhouse. Lenin *et al.*, (2015) conducted a survey of mite pests and their natural enemies associated with vegetables cultivated under greenhouse in Kerala. They observed that Cucumber and Amaranthus were attacked by *Tetranychustruncates* while *T. macfarlanei* on French bean and cowpea. Likewise, Patil *et al.*, (2017) conducted a survey of greenhouses in different districts of Haryana during 2015-2016 to determine the incidence of plant parasitic nematodes on vegetables crop family.

MATERIALS AND METHODS

The survey was conducted across fourteen districts of Kerala. Greenhouse farmers' contact details were collected from State Horticultural Mission and District Horticultural Mission. Stratified random sampling was used for the selection of farmers from each district of Kerala and 11 farmers from each district were selected by random sampling using lots. A structured questionnaire regarding details of vegetable cultivation inside the greenhouse, profit obtained, problems faced by farmers during cultivation, etc. was prepared as shown in fig: 3.1. Details from farmers were collected based on the personal interview method and were analyzed using SPSS 16.0 using non parametric Friedman test. The total sample size comprised of 154 farmers.

QUESTIONNAIRE FOR FARMERS

District : _____ Date of survey : _____
 Place : _____ Questionnaire No _____

• Farmer's name : _____
 • Address : _____

1. Area of Greenhouse cultivated :
 100-500 m²
 500-1000 m²
 1000-2000 m²
 Above 2000 m²

2. Year of Establishment of Greenhouse :
 Below 1990
 1990-2010
 2010-2021

3. Total expenditure for Greenhouse establishment (initial cost) :
 1 lakh - 10 lakh
 10 lakh - 20 lakh
 20 lakh - 50 lakh
 Above 50 lakh

4. Which are the crops cultivated in Greenhouse :
 Vegetable/Fruit crops
 Flower crops
 Nursery

5. Maximum how many crops per year :
 1-3 3-5 More than 5

6. Variation of Yield:
 No variation
 10-20% decrease
 20-30% decrease
 30-50% decrease
 > 50% decrease

7. What is your conclusion for decreasing yield :
 Due to ageing of cladding material(Formation of mosses)

Decrease of soil fertility
 Lack of maintenance and Inspection
 Fungal/insect attack
 Others

8. When mosses starts to grow in greenhouse cladding material :
 Within 1 month
 1-6 months
 6 months – 2 years
 2- 5 years
 More than 5 years

9. How often Greenhouse cleaning is required (cleaning interval) :
 6 months
 1 year
 2-3 years
 No cleaning
 More than 3 years

10. Cost required for Greenhouse cleaning :
 Below 5000
 5000 – 10000
 More than 10000
 No charge

11. Are you satisfied with this Greenhouse :
 Yes No

12. What are the other problems faced by Greenhouse farmers :
 Marketing facility of agricultural products
 No demand for the product
 Decrease of yield due to insect/pest attach
 Others

Fig 3.1 Questionnaire survey for farmers

RESULTS AND DISCUSSION

Data collected from 154 greenhouse farmers were analyzed using SPSS 16.0 software. From the district-wise analysis of greenhouse farmers, it is clear that in Kerala around 77.27% of farmers are not satisfied with greenhouse cultivation because of the crop failure after the initial phase.



Fig 3.2 Collecting details from greenhouse farmer



Fig 3.3. Greenhouse at Malappuram district

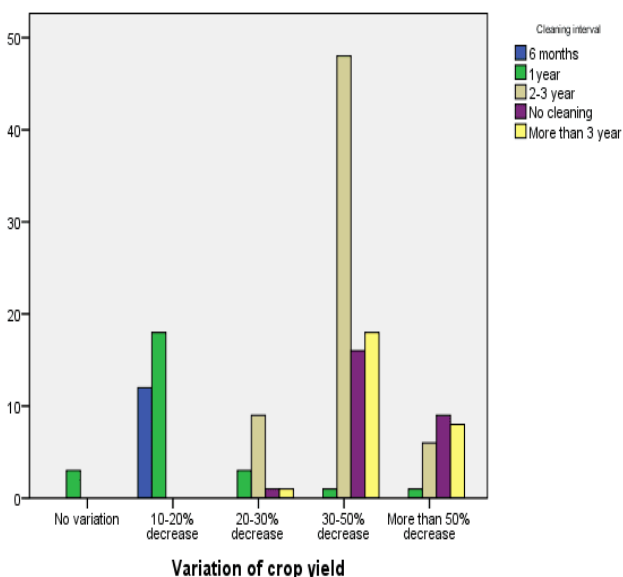


Fig 4.1 Variation of crop yield with cleaning interval of greenhouse cladding material

In Alappuzha, Idukki, Palakkad, Malappuram, and Kasaragod districts around 90% of farmers are not satisfied with greenhouse while in Kozhikode and Kannur around 81% of farmers are dissatisfied with greenhouse and 72% of farmers are not satisfied in Kollam, Pathanamthitta, Ernakulam, and

Wayanad districts. But in the Kottayam and Thrissur districts around 63% of farmers are facing crop failure after the initial phase. Comparatively more farmers (55%) are satisfied with greenhouse in the Trivandrum district. Major reasons for crop failure in a greenhouse are due to the aging of cladding material. As the increase in the age of cladding material, there is a deposition of dust particles over the sheet, and fungal growth also which reduces the transparency of the sheet which affects the crop microclimate and it leads to a reduction in yield. Moreover, other issues faced by farmers include decrease of soil fertility, which arises due to the continuous crop cultivation inside the greenhouse and the other issue is the insect or fungal attack. In addition to that inadequate marketing facility of agricultural products, lack of proper demand of greenhouse products, and some faulty constructional issues and other personal issues. From table 4.1 it is clear that most of the farmers concluded that the main reason for decreasing crop yield is due to the aging of cladding material. In Trivandrum district, 36% farmers have faced problems of aging of cladding material along with 9% farmer facing both the problems like decrease of soil fertility and aging of cladding material and 45% farmers were faced problems of aging of cladding material and lack of maintenance problems. In addition to that around 9% of a farmer is facing structural problems also. In the case of the Kollam district, 54% of farmers have faced problems of aging of cladding material while 27% of farmers were faced the problems of both aging of cladding material and fungal infection due to high relative humidity inside the greenhouse. Furthermore, around 10% of the farmer was facing the problems of a decrease in soil fertility due to continuous use of soil and aging of cladding material. And 9% of a farmer was facing the problems of lack of proper design of greenhouse and aging of the sheet.

Whereas in the Pathanamthitta district, 45% of farmers were faced crop failure due to the aging of cladding material and 45% of farmers were faced the problems of both decrease in soil fertility and aging of cladding material. And remaining 9% of farmers faced the problems of lack of maintenance and aging. In the Alappuzha district, 63% of farmers have faced crop failure due to the aging of cladding material and 18% of farmers were faced with the problems of both cladding material and lack of maintenance. And in the Kottayam, Ernakulam, and Malappuram districts 45% of farmers have faced problems with cladding material while in Idukki, Palakkad, Kozhikode, and Kannur districts 36% of farmers were faced crop failure due to this aging of the sheet. In Wayanad and Thrissur districts, 54% of farmers have faced the problems of cladding material whereas in Kasargod district 27% of farmers were faced the same problem.

Along with the aging of cladding material, farmers have faced the problems of decrease of soil fertility, in Kozhikkode and Pathanamthitta district 45% of farmers have faced the problems of both aging of cladding material and soil fertility problems. From this analysis, we observed that most of the farmers were faced crop failure due to the aging of cladding material. Due to this issue, light transmission through the cladding material is reduced and which adversely affects the microclimate inside the greenhouse and crop yield. From the analysis of survey details, it was found that the main reason for decreasing crop yield is due to the aging of cladding material, which is around 44.16% and 28.57% of farmers are facing both the problems of aging of cladding material and decrease in soil fertility.

Table 4.1 District and reasons for decreasing yield cross tabulation

District	Count							Total
	What is your conclusion for decreasing yield							
	Due to ageing of cladding material	Decrease of soil fertility	Others (Structural problems)	Both 1 and 2	Both 1 and 3	Both 1 and 4	Both 1 and 5	
Trivandrum	4	0	1	1	5	0	0	11
Kollam	6	0	0	1	0	3	1	11
Pathanamthitta	5	0	0	5	1	0	0	11
Alappuzha	7	0	0	1	2	1	0	11
Kottayam	5	0	1	2	0	2	1	11
Idukki	4	0	0	4	0	3	0	11
Ernakulam	5	0	0	2	1	2	1	11
Thrissur	6	0	0	3	0	2	0	11
Palakkad	4	0	0	7	0	0	0	11
Malappuram	5	1	0	4	0	1	0	11
Kozhikode	4	0	0	5	1	1	0	11
Wayanad	6	0	0	1	2	2	0	11
Kannur	4	0	0	3	1	2	1	11
Kasaragod	3	0	0	5	2	0	1	11
Total	68	1	2	44	15	19	5	154

Table 4.2 Variation of crop yield and cleaning interval Cross tabulation

Variation of crop yield	Cleaning interval					Total
	6 months	1 year	2-3 year	No cleaning	More than 3 year	
No variation	0	3	0	0	0	3
10-20% decrease	12	18	0	0	0	30
20-30% decrease	0	3	9	1	1	14
30-50% decrease	0	1	48	16	18	83
More than 50% decrease	0	1	6	9	8	24
Total	12	26	63	26	27	154

Moreover, 12.34% of farmers are facing the problems of both aging of cladding material and fungal/insect attack while 9.74% of farmers are facing the problems of aging of cladding material and maintenance problems. 3.25% of farmers are facing the problems of both aging of cladding material and design problems like shape, apron length, etc. From the above Fig 4.1, it was clear that decrease in yield is more when the cleaning interval of greenhouse is more. 30-50% reduction in yield was reported around 50% farmers whose greenhouses were washed rarely (2-3 year cleaning interval, more than 3 year or no cleaning) whereas more than 50% decrease in yield was reported around 15% farmers whose greenhouses didn't washed yet. Moreover 11% farmers washed their greenhouse with one or two year interval, they got comparatively more yield around 10-20% decrease in yield only. The data were analyzed using non parametric Friedman test, and then the p value is 0.0001 which should be less than 0.05. Hence there is significant difference between the yield and cleaning interval of greenhouse. From the farmers' response, it is clear that intermittent cleaning of cladding material can reduce the aging effect of cladding material, and thereby maintaining the crop yield inside the greenhouse.

CONCLUSION

From the statistical analysis of the survey, it is clear that most of the greenhouse farmers in Kerala are not satisfied with the greenhouse. They are facing crop failure after two or three years and one of the main reason for crop failure is due to the aging of cladding material. Because of fungal growth and deposition dust particles on the polyethylene sheet due to the high humidity inside the greenhouse reduces the light transmission and it leads to the negative effect on crop growth.

In addition to that, another problem faced by farmers is decrease in soil fertility. Due to the continuous crop cultivation soil fertility inside the greenhouse decreases which results in a reduction in yield. And one another problem faced by the farmer was the structural problems like the shape of the greenhouse, length of apron, construction criteria, etc. Along with fungal infection/insect attack is another threatening issue inside the greenhouse. Lack of proper inspection and maintenance destroys the entire crop inside the greenhouse.

REFERENCES

- Kumar, P., Chauhan, A. S., Tanwar, N., and Grover, R.K. 2018. Status and constraints in vegetable cultivation under greenhouse in Haryana. *Adv. Biores.* 9(2) : 61-66.
- Umarov, S. R., Durmanov, A.S., Kilicheva, B. V., Murodov, S. M., and Sattorov, O. B. 2019. Greenhouse vegetable market development based on the supply chain strategy in the public of Uzbekistan. *Int. J. Sup. Chain. Mgt.* 8(5): 2051-3771.
- Mashonjowa, E., Ronsse, F., Mhizha, T., Milford, J. R., Lemeur, R., and Pieters, J. G. 2009. The effects of whitening and dust accumulation on the microclimate and canopy behavior of rose plants in a greenhouse in Zimbabwe. *Solar energy.* 84 : 10-23.
- Shipp, J. L., Zhang, Y., and Ferguson, G. 2003. Influence of humidity and greenhouse microclimate on the efficacy of *beauveria bassiana* (balsamo) for control of greenhouse arthropod pests. *Environ. Entomol.* 32 (5) : 1154-1163.
- Hena, M. 2017. Factors determining the adoption of greenhouse farming in Thrissur district. *International Journal of Social Science.* 6(4) : 253-256.
- Ghanghas, B. S., Malik, J. S., and Yadav, V. P. S. 2018. Sustainable vegetable and flowers production technology :

- problems and prospects in Haryana. *Indian Res. J. Ext. Edu.* 18 (2) : 12-16.
- Ozen, E., and Grima, S. 2018. Analysis of the Influencing Factors on the Farmers' Take-up of Greenhouse Agricultural Insurance Cover: A Case Study. *International Journal of Economics and Business Administration.* 6(4) : 14-33.
- Chandel, Y. S., Kumar, S., Jain, R.K., and Vashisth, S. 2010. An analysis of nematode problems in Green house cultivation in Himachal Pradesh and avoidable losses due to *Meloidogyne incognita* in tomato. *Indian Journal of Nematology.* 40(2) : 198-203.
- Lenin, N., and Bhaskar, H. 2015. Efficacy of *Neoseiulus longispinosus* for the management of *Tetranychus urticae* Koch on cucumber under protected cultivation. *Journal of Biological Control.* 33(1): 48-52.
- Patil, J., Kumar, A., and Goel, S. R. 2017. Incidence of plant-parasitic nematodes associated with greenhouses under protected cultivated in Haryana. *Environment & ecology.* 35(3): 1870-1873.
