

A Study on Environmental Sustainability Index of Vegetable Farming in Himachal Pradesh

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ABSTRACT

Vegetable farming has paved new path of economic development in hilly states like Himachal Pradesh. Now farmers are capable of harvesting more monetary value per unit of land. Most of the farmers in the state have marginal land holding and traditional agriculture could not sustain farming community in geographically isolated hills. New dimensions added to hill agriculture has also brought new challenges and now it become concern whether these changes are ecologically viable? what is the level of environmental sustainability, and how it can be improved? To answer all these questions present study was conducted in Himachal Pradesh with the objectives of; developing sustainability index for vegetable farming; to establish relationship between various socio-economic variables with environmental sustainability of vegetable farms and to find effect of group action on environmental sustainability. Study reveal that majority of farms of SHG members were moderately sustainable to sustainable and of non-member majority of vegetable farms found in least sustainable to moderately sustainable. Thus, group action in the form of SHGs can be considered as a holistic approach to increase environmental sustainability of vegetable farming in the state. Education status and extension contacts of the farmers found to have positive impact on environmental sustainability of vegetable farming in the state.

Highlights

- Introduction of new dimensions is threat to sustainability of hill agriculture.
- Group activity at farm level improves sustainability of hill vegetable farms.

Keywords: Environmental sustainability, SHG, vegetable farming, Himachal Pradesh

Vegetable farming has paved new path of economic development in hilly states like Himachal Pradesh. Now farmers are capable of harvesting more monetary value per unit of land. Most of the farmers in the state have marginal land holding and traditional agriculture could not sustain farming community in geographically isolated hills. Poverty and unemployment are the major problems faced by the rural community (Singh *et al.* 2017). New dimensions added to hill agriculture has also brought new challenges and now it become concern whether these changes are ecologically viable or not. With the introduction of hybrid seeds, pesticides and fertilizers for vegetable production

ecological balance of hill agriculture is threatened. To contain the degraded environment a centrally planned and strategic change in farm practices considering natural resource management, recycling and environmental protection had been increasingly felt essential (Paul *et al.* 2015). The hazardous environmental effect, non-selectivity with non-target toxicity and longer residual persistence of conventional synthetic pesticides leads to resistance development and secondary pest outbreak opened the new modern era of bio-rational eco-friendly chemicals having novel mode of action with higher bio-efficacy on insects (Sarkar *et al.* 2016). This necessitate to make a balance approach in vegetable



production so that there is no loss of ecological resources for the future generation while meeting the present needs. Self-help groups has emerged as a new approach for collective production action in marginal land holdings of the state. In SHG approach members put a joint effort to gain knowledge on production technology, savings and marketing their produce to fetch better market price along with social help to the members. Self-help group members reported with improved socio-economic status of the members which positively influence knowledge and technologies in the farms (Singh and Hansra 2018). Present study was conducted to answer questions like; what is the level of vegetable farming sustainability; is group action helps to improve sustainability of hill farms and to find the factors which affect environmental sustainability.

Objectives of the study

1. To develop environmental sustainability index for vegetable farmers in Himachal Pradesh.
2. Comparative analysis of environmental sustainability index for self-help group members and non-members
3. To study relationship of various socio-economic variable with environmental sustainability of vegetable farms.

MATERIALS AND METHODS

The study was conducted during 2014-2017 in the state of Himachal Pradesh covering six districts viz Kangra, Chamba, Mandi, Kullu, Solan and Shimla which were randomly selected from three divisions of the state. In each district 5 vegetable farming based Self-Help Groups (SHG) were selected covering a total 30 SHGs in six districts. From each selected self-help group five members were selected randomly. Thus a total 150 group members were selected and interviewed. To make comparison on environmental sustainability, 150 non-members vegetable grower were selected randomly from the adjoining village. Thus, data was collected from 300 farmers in the state. Data on various sustainability indicators finalised after consulting 40 judges in the field of vegetable production, economics, agricultural extension was collected through direct interview and was analysed using various statistical

tools. Environmental Sustainability Index was prepared considering relative weightage of selected indicators and was scaled as per scale developed by Leishangthem *et al.* (2017). The suitable statistical analysis was applied to find relation between various independent variables and environmental sustainability index.

RESULTS AND DISCUSSION

Environmental sustainability of vegetable farms was examined by considering Soil health, toxicity, water management and preparedness to drought which provide uncertainty and impose new constraints on product.

(I) Indicators of environmental sustainability

(a) Soil health

Soil act as a medium of biological and physical activity for growth in farms. Imbalance of soil nutrients and micro flora can play negative role in sustainability of vegetable farms. Table 1 depicts results of soil health measured as a proportion of farms maintaining soil health requirements. Data in Table 1 reveal significant difference between soil health practices adopted by members and non-members. 55.33% SHG members were found having satisfactory approach towards soil health whereas majority of non-member respondents (74.67 per cent) found in not-satisfactory category. An explanation towards this phenomenon might be higher exposure of SHG members to vegetable farming trainings, media exposure and extension contacts.

(b) Toxicity

Vegetable farm produce are mostly marketed directly from the farms and reaches the consumers without any processing, so toxic practices at farm level have direct bearing on the health of consumers. Check on toxicity at farm level directly checks toxicity of produce for consumer. Various pre-harvest and post-harvest practices adopted by the vegetable growers decides toxicity level of the farm and farm produce. The mean value for practices to check toxicity at farm level was found non-significant for members and non-members and majority of the respondent members as well as non-members were not found applying proper



Table 1: Comparison of Environmental Sustainability Indicators for SHG members and Non-members farmers in Himachal Pradesh

Indicator of social sustainability	SHG Member (n=150)	Mean value	Non-member (n=150)	Mean value	Z value
(a) Soil health					
Not satisfactory (0-3)	64 (44.67)		112 (74.67)		
Satisfactory (>3)	83 (55.33)	3.43	38 (25.33)	2.77	5.65**
(b) Toxicity					
Not satisfactory (0-3)	103 (68.67)		108 (72.00)		
Satisfactory (>3)	47 (31.33)	3.09	42 (28.00)	2.84	1.81 ^{NS}
(c) Water management					
Not satisfactory (0-3)	96 (64.00)		114 (76.00)		
Satisfactory (>3)	54 (36.00)	2.18	36 (24.00)	1.95	2.20*
(d) Preparedness to drought					
Not satisfactory (0-2)	121 (80.67)		136 (90.67)		
Satisfactory (>2)	29 (19.33)	1.95	14 (9.33)	1.65	3.56**

Figures in the parentheses indicate per cent

** significant at 1 per cent; *significant at 5 per cent

NS: non-significant

toxicity management practices in their farms. Only 31.33 percent members and 28.00 percent non-members were found in satisfactory category to check level of toxicity. Explanation to this might be non-availability of sufficient bio-fertilizers/less toxic chemicals, labour scarcity for manual weed check and lack of separate space in farm for chemical and fertilizer storage etc.

(c) Water Management

Proper water management in vegetable farms is important to prevent pollution of water from fertilizers, pesticides etc. The water management conditions of vegetable farms of the respondents are depicted in Table 1. Water management in farms of SHG members found to be significantly higher than non-members. Majority of the farmers were not having satisfactory water management approach both by members and non-members. 36.00 percent of SHG members found with satisfactory water management as compared to 24.00 percent of non-members. Similar trends were reported by Rahman (2011).

(d) Preparedness to drought

Irrigation water is crucial for vegetable farming. Vegetable farming is an intensive agriculture with

requirement of water to sustain farm potential. Rainfall in Himachal Pradesh varies from low to high hills. Under varying degree of precipitation, vegetable farming is practiced on steep hill farms. It is very much required for the vegetable farms to be prepared for irregular rainfall. Data in Table 1 reveal that majority of the respondent members (80.67 per cent) and of non-members (90.67 percent) were not prepared for drought while 19.33 percent members and 9.33 percent non-members were prepared for drought. Higher percentage of farmers from SHG members as well as non-members might be due to the fact that vegetable cultivation is done on steep hill slopes where measures to retain water are difficult. SHG group members are significantly more exposed to extension contacts with higher training by development department might be a reason for significantly higher preparedness as compared to non-members. Rehman (2011) observed similar trends for preparedness of flood in a research conducted in Assam.

(II) Environmental sustainability of vegetable farms of the respondents

To find out Environmental Sustainability Index (EnSI) of the farms, the above discussed indicators were used. The EnSI of SHG members' vegetables

**Table 2:** Environmental sustainability Index (EnSI) of the respondents' farms

Respondents	Level of sustainability				Mean value	SD	Members Vs Non-members (Z- stat)
	Least Sustainable (0-0.25)	Moderately Sustainable (0.26-0.50)	Sustainable (0.51-0.75)	Highly sustainable (0.76-1.00)			
Members (n=150)	4(2.67)	67(49.33)	67(44.67)	5(3.33)	0.50	0.13	4.67**
Non-Members (n=150)	12 (18.67)	84 (56.00)	35 (23.33)	3 (2.00)	0.43	0.15	

Figure in parenthesis indicate per cent; ** Significant at 1 per cent.

farms range from 0.18 to 0.84 and to that of non-members found between from 0.11 to 0.80.

Significantly higher EnSI was observed for member farms when compared to non-members. Majority of the members (49.33 percent) farm were found moderately sustainable followed by sustainable farm (44.67 %). For non-members majority of farms (56.00 per cent) found moderately sustainable followed by sustainable farm (23.33 percent). Considerable number i.e. 28 farms (18.67 percent) of non-member were found least sustainable. Leishangthem *et al.* (2017) also reported majority of farms in moderate category of sustainability and similar trend of results reported by Rehman (2011) for dairy farming studies

(III) Relation of independent variables with Environmental sustainability index

The relationship of various independent variables with environmental sustainability index (EnSI) is presented in Table 3.

Table 3: Relation of Independent Variables with Environmental Sustainability Index

Sl. No.	Variable	Correlation coefficient "r"
1	Age	-0.05187 ^{NS}
2	Education	0.39673**
3	Experience	-0.05506 ^{NS}
4	Operational land holding	-0.01041 ^{NS}
5	Number of trainings	0.08962 ^{NS}
6	Vegetable production (tonnes/year)	-0.07224 ^{NS}
7	Media exposure	0.13962 ^{NS}
8	Extension contacts	0.39764**

** Significant at 1 per cent; NS: Non-significant.

Data of correlation depicted in the table reveal that only two characteristics i.e. education and extension contacts were having positive and significant association with EnSI at one per cent level of probability. Other characteristics like age, experience, operational land holding, and number of trainings, vegetable production and media exposure were not having association with EnSI. The positive and significant correlation of environmental sustainability index of vegetable farms with level of education and extension contacts implied that higher education and extension contacts helped farmers in adopting improved practices, better utilisation of resources for water and soil conservation management.

CONCLUSION

Self-help group approach found to be helpful in increasing environmental sustainability of vegetable farming in Himachal Pradesh. As SHG group members are more exposed to extension contacts with higher training by development department might be a reason for significantly better soil health practices, water management and preparedness as compared to non-members. Toxicity is a complex phenomenon and even SHG approach could not address the issue of toxicity. Though the EnSI for SHG member farms was significantly higher than non-members but in terms of EnSI, the overall vegetable farming is lagging so behind as only few vegetable farmers found in highly sustainability category. Education status and extension contacts found to have significant relation with EnSI means more awareness, training is required for the farmers to increase overall environmental sustainability of vegetable farming.



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