Indian Journal of Ecology (2023) 50(5) (SI): 1722-1726
DOI: https://doi.org/10.55362/IJE/2023/4125

Manuscript Number: 4125
NAAS Rating: 5.79

Adoption of Natural Farming Practices and Perception of Farmers towards its Economic and Ecological Impacts

Komal Sharma, Manoj Gupta, Rajesh Kumar Thakur and Nisha Devi

Department of Agricultural Economics, Extension Education & Rural Sociology,
College of Agriculture, CSKHPKV, Palampur-176 062, India
E-mail: komalsharma002@yahoo.com

***Abstract*:** Natural farming is a climate resilient farming system that enhances soil conditions, reduces water requirements, enhances biomass recycling, biodiversity and biological interactions. The study evaluated the extent of adoption and farmers' perception of the ecological impacts of natural farming on the basis of primary data collected from 120 farmers. The majority of farmers have observed that intercropping to be more advantageous than mono-cropping along with improvement in soil health, declined pest attacks and cost of cultivation. Farmers were also convinced about the impact of natural farming on mitigating climate change and health benefits of natural farm products. The study has concluded that natural farming promotion efforts must be sustained further to strengthen its adoption process and to change farmers' perception of natural farming by educating them about the environmental and economic benefits of natural farming.

Keywords: Natural farming, Adoption, Perception, Environment, Health & Intercropping

In India, the agriculture sector is very important as it is indispensable for the sustenance and growth of the Indian economy. More than half of the population relies directly or indirectly on agriculture (Chand and Singh 2022). Nowadays, the green revolution's exuberance is disappearing and it is becoming clear that the entire technology has left a negative impact on the environment. Extensive use of chemicals has led to many health and environmental issues (Iqbal et al 2001, Kotschi 2015). Due to a number of factors, modern chemical-based agriculture has increased production costs or decreased crop yield. (Ayansina and Oso 2006, Sreenivasa et al 2010, Singh et al 2011). The biological function of the soil was seriously harmed. Over 1 billion people in developing countries already have their livelihoods, financial security and nutritional health in danger as a result of land degradation (FAO 2016). Sustainability in agricultural production has emerged as one of the most significant concerns of the present and the need was felt to introduce a farming system that can ensure enhanced farm income and reduces dependence on external inputs. There is an increased emphasis on promoting such farming practices that provide ecosystem services and greater economic benefits on a sustainable basis. The introduction of natural farming is a viable and sustainable option to achieve the objectives mentioned above (Palekar 2006). Natural Farming is being implemented by the Government of Himachal Pradesh as the 'Prakritik Kheti Khushhal Kisan Yojana' (PK3Y) since 2018 and is based on a holistic system built upon principles of Natural Farming. This system improves ecology by enhancing soil health through bio-inoculation, continuous vegetation cover on the farms, and reduced tillage resulting in increased sequestration of carbon in soils. The purpose of this study is to highlight the adoption level of various natural farming practices, spotlight the perceptions of farmers regarding various ecological and economic benefits of natural farming practices on fields, and suggest actions that might reduce chemical input use on farms.

MATERIAL AND METHODS

Kangra and Solan districts of Himachal Pradesh were purposively selected for the present study. Multiple stage random sampling design was adopted to select the natural farming practicing farmers. In the first stage two blocks from each district namely Kangra and Indora blocks from district Kangra and Solan and Kandaghat blocks from district Solan were randomly selected. Six villages were randomly selected from each block, where natural farming was being practiced by the farmers. In the next stage, a list of farmers practicing natural farming was procured from concerned officials and five farmers from each village were selected randomly. Thus a sample of 120 farmers was selected for the study and they were further categorized into two categories *viz* small (having holding size less than 1 ha) and large (having holding size more than or equal to 1 ha) (Table 1).

Nature and source of data: Primary data were collected to

meet the objectives of the present study from the farmers practicing natural farming by personal interview method using a well-structured and pretested schedule. The tabular techniques, percentages and suitable analytical tools like Adoption Index and Chi-square test have been employed for the analysis of the data.

Adoption index: The extent of adoption was calculated by selecting application of indigenous agricultural practices i.e. *Beejamrit*, *Jeevamrit Ghanjeevamrit, Neemastra/ Agnistra/ Brahmastra*, *Khatti* lassi, mixed cropping, *Achhadana*/ green mulching and *Wapasa*. Adoption index was measured on three-point continuum as full adoption, partial adoption and non-adoption by assigning the score of 2, 1 and 0, respectively. The scores obtained for all the practices were summed up for each respondent and the adoption score was calculated by applying following formula (Wadekar et al 2017);

$$\text{Adoption Index} = \frac{\text{Obtained Adoption score}}{\text{Maximum obtainable adoption score}}$$

According to adoption index, respondents were categorized into three categories i.e. poorly adopted (0-0.25), partially adopted (0.25-0.75) and highly adopted (0.75-1).

Chi-square test: To test whether there was any significant difference among small and large farms of study area for the perception about natural farming. Chi-square test in (m x n) contingency table was applied where m and n are perception of farmers for different factors the farm categories. The detail of approximate Chi-square test is given as under:

$$\sum_{j=1}^{l}\sum_{i=1}^{K}\frac{(O-E)^2}{E}X^2\,(\mathrm{L}-1)(\mathrm{K}-1)\mathrm{d.f}$$

where, O = Observed values, E = Expected values, K = Number of problems, L = Number of farm size groups.

Table 1. Distribution of sampled households according to their land holdings

Category of farmers	No. of farmers	Average size of landholding (ha)
Small (<1 ha)	86 (71.67)	0.44
Large (>1ha)	34 (28.33)	1.84
Total	120 (100)	0.84

RESULTS AND DISCUSSION

Adoption pattern: In order to study the adoption pattern and extent of adoption, adoption index was calculated in which eight components of natural farming were selected (Table 2). There was a gap in the adoption of natural farming. Therefore, farmers were categorized in three categories fully adopted, partially adopted and no adoption category on the basis of their adoption pattern. A few questions were asked from farmers like for *Beejamrit*, they were asked whether they had treated the seeds with it or not? And for *Jeevamrit*, whether it was sprayed after 21 days or not? Similar questions were asked for *Ghanjeevamrit*. For plant protection solutions, farmers were categorized on the basis of time of application i.e., before or after emergence of insect/pest. In case of *Achhadana*/green mulching and *Wapasa*, farmers were categorized on the basis of direct observation on their farm. From the table it can be observed that 91.67 per cent of farmers have treated the seeds with *Beejamrit,* 45 per cent of farmers have made channels for *Wapasa* and 70 per cent of farmers were using *Khatti lassi* as fungicide. 60.83 per cent of farmers have fully adopted the application practices of *Jeevamrit*. However, in case *Ghanjeevamrit* (46.67 & 53.33%) and plant protection solution (41.67 & 58.33%) the farmers completely following natural farming practices were found at par with those

Table 2. Percentage of the farmers using different components of SPNF in the study area

(Per cent)

Particulars	Full adopted	Partial adopted	No adoption
Beejamrit	91.67	-	8.33
Jeevamrit	60.83	39.17	-
Ghanjeevamrit	46.67	53.33	-
Neemastra/Agnistra/Brahmastra	41.67	58.33	-
Khatti Lassi	70.00	30.00	-
Mixed cropping	76.67	14.17	9.17
Achhadana/Green mulching	53.33	25.00	21.67
Wapasa	45.00	15.00	40.00
Total number of farmers	120	120	120

following it partially. In case of mixed cropping, only 76.67 per cent of farmers were actually following the pattern of intercropping while 9.17 per cent of farmers were still following the mono-cropping under natural farming system.

Adoption index: The majority (65.83 %) of the respondents had medium level of adoption, followed by (34.17 %) high levelof adoption and no respondent was in the category of poorly adopted (Table 3). Overall the adoption index was 0.75, indicating that majority of the farmers have partially adopted the SPNF practices. The medium level of adoption can be attributed to unawareness regarding the complete package of SPNF system coupled with the laborious work needed for its proper implementation.

Table 3. Adoption index

Adoption category	No. of farmers	Adoption index
Poorly adopted	0 0.00	0 to 0.25
Partially Adopted	79 (65.83)	0.25 to 0.75
Highly Adopted	41 (34.17)	0.75 to 1
Overall Adoption Index	120 (100.00)	0.75

Figures in parentheses represent the percent of total

Perception of farmers towards natural farming: Among different factors perception of crop diversification, perceived benefits of intercropping, change in the cost of cultivation, climate change impacts and labour intensive methods were statistically significant (Table 4). There was significant difference between the different farm categories, whereas the rest of the factors were found statistically insignificant which indicated that they were independent to farm categories.

Table 4. Perception of farmers towards natural farming

Factors		Small (n=86)	Large (n=34)	Overall (n=120)	X^2
Crop diversification	Yes	61.63	88.24	69.17	8.089**
	No	38.37	11.76	30.83	
Perceived benefits of intercropping	Agree	62.79	82.35	68.33	5.042*
	Disagree	10.47	8.82	10.00	
	Neutral	26.74	8.82	21.67	
Impact on crop health (Pest attack)	Increased	15.12	8.82	13.33	0.891
	Decreased	67.44	70.59	68.33	
	Neutral	17.44	20.59	18.33	
Impact on land (Soil health increased)	Agree	83.72	79.41	82.50	0.313
	Disagree	6.98	8.82	7.50	
	Neutral	9.30	11.76	10.00	
NF inputs are better than chemical inputs	Agree	79.07	85.29	80.83	1.432
	Disagree	9.30	2.94	7.50	
	Neutral	11.63	11.76	11.67	
Change in cost of cultivation	Increased	8.14	5.88	7.50	70.415***
	Decreased	81.40	79.41	80.83	
	Neutral	10.47	14.71	11.67	
It can mitigate climate change impacts	Agree	73.26	88.24	77.50	8.972**
	Disagree	5.81	11.76	7.50	
	Neutral	20.93	0.00	15.00	
The method is labour intensive	Agree	70.93	91.18	76.67	5.583**
	Disagree	29.07	8.82	23.33	
Provides health benefits to the consumers	Agree	95.35	91.18	94.17	0.772
	Disagree	0.00	0.00	0.00	
	Neutral	4.65	8.82	5.83	
Adoption of SPNF on large scale is possible	Agree	30.23	20.59	27.50	2.467
	Disagree	48.84	64.71	53.33	
	Neutral	20.93	14.71	19.17	

***Significant at 10% level; **Significant at 5% level; *Significant at 1% level

Impact on crop diversification: To assess the impact on crop diversification, farmers were asked if they had started growing additional crops/plants since the adoption of SPNF. 69.17 per cent of farmers have started growing additional crop on their land since the adoption of SPNF and farm category wise it was observed as 88.24 per cent on large farm and 61.63 per cent on small farm category. Chi-square value of 8.089 denoted that the differences between the categories were statistically significant with the land holding which indicated that there was a direct relationship between the land size owned by the farmer and their propensity to adopt crop diversification

Perceived benefits of intercropping: Farmers' perceptions on benefits of intercropping were documented and it was observed that 68.33 per cent of farmers were of the opinion that intercropping was more advantageous than mono-cropping. Chi-square results (5.042) also indicated that the differences between the categories have a high statistical significance. After adopting the SPNF practices, 68.33 per cent of farmers reported that pest attack has decreased while13.33 per cent of the farmers reported an increase and 18.33 per cent of farmers were of the neutral opinion.

Impact on pest incidence: For insect and pest management, ZBNF encourages the use of various *kashayams* (decoctions) made with cow dung, cow urine, lilac and green chilies. In this context farmers were asked whether they have observed change in the incidence of pest since the adoption of SPNF. The 68.33 % of farmers reported a decline in pest attack, 13.33 % reported an increase, while 18.33 % of farmers were of the neutral opinion. Farm category wise 70.59 % of large and 67.44 % of small farm category were of the opinion that the pest attack has decreased.

Impact on land degradation: The 82.50 % of farmers agreed that the overall health of the soil has increased along with a decrease in soil erosion. The 80 % of farmers across different categories have realized the impact of SPNF in checking the menace of land erosion and have also observed that reduction or no-tillage practices leads to undisturbed soil with lesser chances of soil erosion which also helped them to improve the soil health.

Impact on farmers' perception of natural farm inputs: In the studied area, 80.83 % of farmers found natural farm inputs better than chemical inputs, while 11.67 % remained in ambiguity about the same. The 79.07 % of small farmers and 85.29 % of large farmers had a positive shift towards the preference for natural farm inputs.

Change in cost of cultivation: After adopting natural farming, farmers were using inputs which were available on their farms and was observed that 80.83 % of the farmers reported that the cost of cultivation had decreased, while 7.50 % felt that it has increased and 11.67 % of farmers paused in perplexity. The Chi-square value (70.415) indicated that the differences between the categories are statistically significant which means the cost of cultivation varies significantly from small farm to large farm category.

Climate resilient farming: Farmers' response regarding climate change impact indicated that 77.50 % of farmers agreed that natural farming can mitigate climate change impact, while 7.50 % of farmers disagreed and 15 % of farmers remained in ambiguity about the same. The Chi-square value of 8.972 showed that the differences between the farm categories are statistically significant which indicated that opinion of farmers towards climate change impact varied significantly according to the landholding of the farmers.

Labour intensive practice: The 76.67 % of farmers agreed that natural farming is labour intensive, while 23.33 % of farmers did not find this practice laborious. At farm category wise, 91.18 % of large farmers and 70.93 % of small farmers agreed that natural farming is labour intensive technique. For this factor also, Chi-square value of 5.583 indicated that the differences between the categories are statistically significant with land holding.

Impact on consumer's health: It is well known that natural farming does not require any synthetic chemical inputs on the farm and the perception of farmers in this context have also been recorded. The 94.17 % of farmers have agreed that natural farm products have high health benefits and 5.83 % of farmers were paused in perplexity. It also revealed that none of the farmers were of opinion that natural farm products did have any side effects on health.

Upscaling of natural farming: Most of the farmers (53.33 %) believed that it is not possible to adopt natural farming at large scale due the many factors and one of which may be it being labour intensive. Only 27.50 % of farmers agreed that SPNF can be adopted on large scale. However, 19.17% were of neutral opinion and were not sure about it.

CONCLUSION

Natural farming, a call for the adoption is a paradigmatic shift in crop production practices. Overall adoption index indicated that majority of the farmers have partially adopted the SPNF practices followed by high level of adoption and no respondent was found in the no adoption category. Perception based results indicated that majority of the farmers have started growing additional crop on their land since the adoption of SPNF and they have also reported a decline in pest attack. Almost all the farmers agreed that overall health of soil has increased including decrease in soil

erosion and it was evident from the results that farmers had noticed a sharp decrease in the cost of production. Additionally, majority of the farmers have also agreed that natural farming can mitigate climate change impact. From this study it can be concluded that there is vast scope for coverage of natural farming in the state and the government should undertake policy measures by regular handholding of the SPNF farmers for restoring soil health, protect human health and minimize loss of biodiversity to save the livelihoods of farmers.

ACKNOWLEDGEMENT

Author would like to thanks Directorate of Agriculture, Shimla for providing fellowship for promotion of research on natural framing under PK3Y.

REFERENCES

Ayansina ADV and Oso BA 2006. Effect of two commonly used herbicides on soil microflora at two different concentrations. *African Journal of Biotechnology* **5:** 129-132.

Chand R and Singh J 2022. *Workforce changes and employment*. Some findings from PLFS data series. NITI Aayog discussion paper, Government of India, p14.

FAO 2016. Climate change and food security: Risks and responses. Rome. (Available at https://www.fao.org/3/i5188e/I5188E.pdf)

Francis CA, Flora CB and King LD 1990. *Sustainable Agriculture in Temperate Zones*, Wiley, New York, USA, p 512.

Iqbal Z, Hussain A, Latif A, Asi MR and Chaudhary JA 2001. Impact of pesticide applications in cotton agroecosystem and soil bioactivity studies I: microbial population. *Journal of Biological Sciences* **1:** 640-644.

Khanam R, Bhaduri D and Nayak AK 2018. Crop diversification: an important way-out for doubling farmers' income (Indian Farming). *Indian farming* **68:** 31-32.

Kotschi J 2015. *A soiled reputation: Adverse impacts of mineral fertilizers in tropical agriculture.* Heinrich Ball Stiftung, Germany, p 58.

Palekar S 2006. *The principles of spiritual farming II. 2nd ed*. Amravati: Zero Budget Natural Farming Research, Development & Extension Movement, Amravati, Maharashtra, India, p 632.

Singh JS, Pandey VC and Singh DP 2011. Efficient soil microorganisms: A new dimension for sustainable agriculture and environmental development. *Agriculture, Ecosystems and Environment* **140:** 339-353.

Sreenivasa MN, Naik NM and Bhat SN 2010. Beejamruth: A source for beneficial bacteria. *Journal of Farm Sciences* **17:** 72-77.

Wadekar RP, Mardane RG, Dhenge SA and Holkar SC 2017. Adoption level of selected agricultural technologies of rice crop by tribal farmers. *International Journal of Agriculture Sciences* **9**: 4841-4843.

Received 21 May, 2023; Accepted 30 October, 2023