Problems and Factors Affecting Adoption of Natural Farming in Sirmaur District of Himachal Pradesh

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Abstract: Natural farming supports agroecological principles, chemical free farming and sustainable farming. NF is also seen as the most cost effective farming and also known as "Zero Budget Natural Farming." NF focus is to reduce cost of cultivation, improve food quality, chemical free food, improve soil fertility, food and nutritional security. The present study was carried out in Sirmour district of Himachal Pradesh by taking representative samples of 60 farmers through simple random sampling technique. This study mainly focused on the constraints and factors affecting adoption of Natural Farming. The problems were analyzed by using Garrett Ranking technique. The major problems were non-availability of a specialized market (1st rank), labour intensive farming (2nd rank) and unfair price for produce in market (3rd rank). Also "disease occurrence" in the Natural Farming field was ranked lowest (15th rank) which means NF is successful in controlling diseases in the field. The multiple response percentage for various problems identified by Chi square test includes higher wage rate (70%), price fluctuation (56.67) labour intensive farming (56.60) and non availability of specialized market (58.53%). Factors affecting adoption of NF were measured by using Logistic Regression model. Significant variables for adoption of NF were increased gross returns, decreased pest attack in NF and increased soil fertility variables. They have a significant role for adoption of NF.

Keywords: Natural farming, Sustainable agriculture, Agroecology, Chemical free, Nutritional security

Agriculture is the important sector of economy in India, which accounts 18 per cent of Gross Domestic Product and provides jobs to 50 per cent of the country's workforce (Anonymous, 2019a). The most widely adopted farming system globally is a Chemical farming system, as it often produces 98 per cent of the world's food (Tal 2018). It has several hazardous effects, such as contamination of food, soil, surface water, ground water, air, turf and other vegetation. Also pesticides are harmful to birds, fishes and beneficial vegetation. The widespread use of chemicals leads to the pest genetic mutation, hence resistant to pesticides (Shetty 2009). Use of chemicals in agriculture to maximize production is vicious to food nutritional value, high cost of production and decreasing prices of agricultural produce, which leads to suicide crisis. Thousands of farmers have committed suicide across the India, at least 16,196 peasants committed suicide in India, taking the cumulative number since 1997 was 199 and 132 according to the National Crime Records Bureau (NCRB). The five states Maharashtra, Andhra Pradesh, Karnataka, Madhya Pradesh, and Chhattisgarh are also known as 'suicide belts', in 2008 these states had 66.6 per cent of the country's total farmer suicides (Mishra 2008). Cancer is widely spread in Punjab due to over usage of pesticides in agricultural practices (Kumar and Kaur 2014). Furthermore, it has also been shown that modern agriculture can't be sustainable in

the long term due to adverse environmental and ecological changes. These consequences are also experienced by declining crop yields and crop instability (Chand et al 2011). There is a need for an alternative method of agriculture that can operate in a friendly eco-system while maintaining and increasing crop productivity is now being realized. The farming system needs sustainability in order to improve the factors of production and human health or the farming system, which has no hazardous effects on the earth environment and human health. Natural Farming also known as Zero budget natural farming (ZBNF) or known as Subhash Palekar Natural Farming (SPNF) in some regions is best-known alternative to chemical farming (Munster 2016). This recommends a place as an answer to the agrarian crisis and the growing epidemic of farmers' suicides in India (Babu 2008). The Union Budget for 2019 declared that the Government had intended to give priority to Zero Budget Natural Farming. It is an extreme version, which does not shy away from suggesting that without any need of any external inputs all inputs must be locally organized from and around the village. Palekar claims that both the dung and urine of native livestock (*Bosindicus*) should be used to make *Jivamrit* as it has a superior micro culture especially in comparison to that of European breeds (Palekar 2005). ZBNF relies primarily on use of materials such as *Jivamrit, Bijamrit and Acchadana* (natural mulch) to encourage

microbial development, seed health and soil fertility. Although ZBNF appears to be hitting the right notes when it comes to environmental protection (Khadse et al 2017). The aim of natural farming is to reduce the cost of production to almost zero and to come back to the "pre-green revolution" style of agriculture (Khadse et al 2019). This would seem to lead growers out of loans by putting a stop to agricultural chemicals practices. The central government has implemented a policy to encourage farming methods throughout India. The state governments of Andhra Pradesh, Chhattisgarh, Himachal Pradesh, Uttarakhand, Kerala and Karnataka asked *Padma Shri* Subhash Palekar to educate their farmers for Natural Farming (Anonymous 2016).

Agriculture is the primary source of income for the people of Himachal Pradesh and plays a major role in the state's economy. About 12.73 percent of the total State Income (GSDP) comes from agriculture and its allied sectors. Agriculture and horticulture employ nearly 69 percent of the state's overall population. (Economic survey, Himachal Pradesh 2019-20). The average farm size in Himachal Pradesh is approximately 1.2 hectares (Anonymous, 2018). In order to promote ZBNF in Himachal Pradesh, a scheme *'Prakritik Kheti-Khushhal Kisan'* was initiated with a budget allocation of Rs. 35 crore (2019-20). Under this scheme, peasants will be supported with training, the required machinery, to achieve the objective of sustainable farming doubling farmers' incomes, improved soil fertility and low input costs. Himachal Pradesh has changed the name of ZBNF to Subhash Palekar Natural Farming (SPNF) (Anonymous 2019b). A few years ago, SPNF was adopted in Himachal Pradesh. As a result, there is no true data on problems and adoption of natural farming. In view of these factors, the a study on problems and factors affecting adoption of natural farming in Sirmour District of Himachal Pradesh is carried out to strengthen the base of natural farming.

MATERIAL AND METHODS

This chapter outlines the characteristics of the study area, the methods adopted in selection of the sample, the nature and sources of data and the various statistical tools and techniques employed in analyzing the data and have been described under the following sub-heads.

Selection of the study area: Sirmaur district of Himachal Pradesh was purposively selected for the present study. Sirmaur district a southern most district of Himachal Pradesh, is largely mountainous and rural. Total area of Sirmaur district is 2,825 Sq.km. with a population of 5,29,855. The district comprises of six development block Rajgarh, Pachhad, Nahan, Renuka, Shillai and Paonta and 4 sub-tehsils viz.

Dadahu, Kamraoo, Pajhota and Nohra.

Sampling design and sample size: Simple random sampling design was adopted to select the ultimate sample of the farmers practicing natural farming respondents. A list of farmers practicing Subhash Palekar Natural Farming was procured from the Project Director ATMA, Nahan (Simaur). Fifteen farmers each from four blocks Rajgarh, Paonta sahib, Pachhad and Nahan were selected randomly. Thus a sample of sixty farmers were selected for the study.

Distribution of sampled farmers practising natural farming according to their size of land holding: For the analysis of data the total respondents were divided according to the size of their land holdings into three classes, viz., marginal (<1 ha), small (1-2 ha), and medium (2-4 ha). The distribution of the sampled farmers is present in Table 1.

Nature and sources of data

To meet the objectives of the present study, both primary as well as secondary data were collected.

Primary data: Primary data were collected from the farmers practicing natural farming by survey method using a well-structured and pretested schedule. Data were collected to analyse Problems faced by farmers in various aspects of production and adoption of natural farming.

Secondary data: Secondary data were collected in terms of numbers of registered farmers practicing natural farming from the Project Director, ATMA, Nahan (Sirmaur)

ANALYTICAL FRAMEWORK

To fulfill the specific objectives of the study, based on the nature and extent of availability of data, the following analytical tools and techniques have been employed for the analysis of the data.

Logit model for Adoption: Mathematically, the logit model is represented as:

$L_i = \ln = \beta_1 + \beta_2 X_i + u_i$

Where;

X_i = Represents all the independent variables and β represents the effect of changes in X

L_i = Represent logit in the probability of adoption

The model will estimated by using formula:

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

Category of farmer	No. of farmers	Average land holding (ha)
Marginal (< 1 ha)	41 (68.33)	0.51
Small (1 – 2 ha)	11 (18.33)	1.09
Medium (2 – 4 ha)	8 (13.34)	2.02
Total	60 (100)	1.20

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6$

Where;

Y = If the producers have adopted Natural farming in their farms (0 if No, 1 if yes),

X_1 = Chemical fertiliser's cost

X_2 = Gross returns

X_3 = Numbers of years experience in farming

X_4 = Farm size in hectare

X_5 = A dummy variable indicating for a producer if pest attack decreasing (0 if No, 1 if yes)

X_6 = A dummy variable indicating for a producer if soil fertility increasing (0 if No, 1 if yes)

X_7 = A dummy variable indicating for a producer if production cost was low in natural farming (0 if No, 1 if yes)

Production and Marketing Problems

To study the various problems associated with the production and marketing of natural farming it was assumed that, the extent of a particular problem varies from place to place and farmer to farmer. The multiple responses of producers reporting various problems were taken into consideration for analysis.

Garret ranking technique:

The Garret ranking technique was used for examination of constraints. It is important to note here that these constraints were focused on the response of all sample farmers. The respondents were asked to rank the problems in turmeric and cotton production, processing and marketing. In the Garrett's ranking technique, these ranks were converted into percent position by using the formula

Where,

R_{ij} = Ranking given to the ith attribute by the jth individual

N_j = Number of attributes ranked by the jth individual.

By referring to the Garrett's Table, the percentage positions estimated were converted into scores. Thus for each factor, the scores of the various respondents were added and the mean values were estimated. The mean values thus obtained for each of the attributes were arranged in descending order. The attributes with the highest mean value was considered as the most important one and the others followed in that order

Chi-square test:

To test whether there was any significant difference among marginal, small and medium farms of sirmaur for the problems faced by them. Chi-square test in (m x n) contingency table was applied where m and n are the number of marketing problems faced by the farmers of natural farming in sirmaur district. O = Observed values E = Expected values K = number of problems L = number of farm size groups.

Limitations of the Study

The production and marketing of natural farming have not been documented by any institution/government in the state. Since, the data were collected by survey method; the inherent lacunae associated with this type of inquiry have crept into the study, even though the estimates were provided by the recall memory because of the non-maintenance of the farm records. Sincere efforts have been made to elicit accurate and It may however, be recognized that the finding of the study need not be generalized beyond the boundaries of the area under investigation and applicable to such other areas having similar agro-climatic and socio-economic conditions. The study was based on the data collected for one year only (2019-20), which may not necessarily hold true for other periods as well.

RESULTS AND DISCUSSION

This chapter is for research findings, which is present systematic analysis and interpretation of data. For better understanding this chapter is sub divided into following heads:

Factors affecting adoption of natural farming: Factors for adoption of natural farming technique were measured by using Logistic Regression model. The explanatory variables taken for adoption of natural farming were chemical fertilizers costs, gross returns from natural farming, experience in farming, total farm size, decrease in pest attack, increase in soil fertility, low cost of production in natural farming. The results of Logistics Regression model are present in Table 2. The significant variables for adoption were gross returns, decreased pest attack in natural farming and increased soil fertility variables have significant role for adoption of natural farming with coefficient value (0.000048), (1.60) and (1.94), respectively. Decrease in the pest attack by one per cent in crops shows there is possibility of 0.36 per cent increased in adoption of natural farming. This means adoption of natural farming influenced by lesser pest attack if pest attack increases than farmer will not adopt natural farming. Increase in one per cent in the soil fertility there is possibility of 0.45 per cent increase in the adoption of natural farming. Which means more increase in soil fertility more farmers will adopt natural farming. Gross returns, decrease in pest attack and increase in soil fertility were significant variable for adoption of natural farming.

Chemical fertilizer costs, experience and farm size were statistically non significant in the adoption of natural farming. The dummy variable representing low production cost was not statistically significant but had a positive relationship with adoption of natural farming.

Problem Faced by the Natural Farming Producer

Garret ranking technique: The Garret ranking technique

was used for examination of constraints natural farming systems. It is important to note here that these constraints were focused on the response of all sampled farmers. Table 3 points out the constraints faced by different groups of farmers in this regard. Several problems faced by farmers in the study region in the production and marketing of natural farming.

The fifteen major constraints were identified first and then farmers' were ask to gave rank to the problems according to superiority of problems between 1 to 15 in such a way that rank given by farmers to problem does not repeat. The non availability of specialized market (Organic product market) were found 1st ranked problem with the 33.59 Garret mean score followed by labour intensive problem (33.54), unfair price for produce in market (32.86), high wage rate (32.68), the knowledge of package of practices (31.59), lack of inadequate information (31.55), consumer awareness about SPNF produce (31.47), lack of extension facilities (31.25), inadequate training facilities (31.02), shortage of skilled labour (30.80), wholesalers not taking consent while selling (28.72), higher commission (26.52), irrigation facility not available (25.03), lack of transport facilities (25.03). The disease occurrence in the natural farming (21.15) system ranked last (15th) which means natural farming was successful to control diseases in field.

Chi-square test: Chi square test is used to check significance of problems faced by farmers within different category farms. Chi square test shows that a problem faced by farmers was varying between farms category. Significant problem shows that a problem faced by farmers vary in all category farms or multiple response for a particular problem is different within category of farms. Non-significant problems show that a problem occur in all farms category or problem does not depend upon size of farms. Multiple responses percentage of farmers for various problems are present in Table 4. The biggest problem faced by the growers was the higher wage rate (70%). Unfair price for natural products (60%). Non-availability of specialised market (58.35%).

Lack of information (58.10%). Price fluctuation (56.67%)

of agriculture produce, i.e. major problem in agriculture all over the country. It is very difficult to farmers getting a good price for their produce. Labour intensive farming (56.60%) because in natural farming intercultural operations require more labour, while in chemical farming due to fast reaction of chemicals, labour requirement was low. Consumer awareness about natural farming produce (50%). Knowledge of package of practices (48.33%), because natural farming was newly introduced and farmers experience in natural farming was less. Shortage of skilled labour (30%), Lack of extension facilities (26.67%) and Storage facility (26%),

a) Various significant problems such as Lack of government support (62.65%) in medium category farms which means marginal and small category farms does not faced this problem as much as compare to medium category farms. Disease problem (12.50%) in natural farming crops was maximum in medium

Table 3. Production and marketing constraints in sampled farmers

Problem Name	Garret mean score	Rank
Non availability of specialized market	33.59	I
Labour intensive	33.54	II
Unfair price for produce in market	32.86	III
Higher wages rates	32.68	IV
Knowledge of package of practices	31.59	V
Lack of inadequate information	31.55	VI
Consumer awareness about SPNF produce	31.47	VII
Lack of extension facilities	31.25	VIII
Inadequate training facilities	31.02	IX
Shortage of skilled labour	30.80	X
Wholesalers not taking consent while selling	28.72	XI
Higher commission	26.52	XII
Irrigation facility not available	25.83	XIII
Lack of transport facilities	25.03	XIV
Diseases	21.15	XV

Table 2. Logit regression model for natural farming growers

Adoption factors	Coefficient (β)	Standard Error	Wald	Significance	dy/dx
Constant	-7.64*	2.21	-3.44	0.001	
Chemical fertiliser cost	0.00082	0.0003	0.28	0.780	0.00002
Gross returns	0.000048*	0.000014	3.47	0.001	0.000012
Experience	0.059	0.042	1.42	0.155	0.014
Farm size	-0.35	0.223	-1.58	0.113	-0.09
Pest attack Decrease	1.60*	0.94	1.71	0.088	0.36
Soil fertility increase	1.94*	0.89	2.18	0.029	0.45
Low production cost	1.27	0.86	1.41	0.157	0.29

Table 4. Farm category wise problem faced by natural farming producer in natural farming

(Multiple response percent)

Problems	Farm size				
	Marginal	Small	Medium	Overall	Chi-square
No. of farmers	41	11	8	60	60
Shortage of skilled labour	34.15	18.18	25.00	30.00	4.98
Higher wages rates	68.29	72.73	75.00	70.00	0.32
Non-availability at peak operation time	7.32	18.18	12.50	10.00	4.66
Price fluctuation	56.10	54.55	62.50	56.67	0.61
Lack of government support	36.59	18.18	62.50	36.67	25.36*
Inadequate training facilities	39.02	45.45	37.50	40.00	0.87
Lack of extension facilities	26.83	27.27	25.00	26.67	0.11
Labour intensive	53.66	54.55	75.00	56.60	4.77
Inputs application on time	12.20	27.27	25.00	16.67	6.14*
Knowledge of package of practices	51.22	45.45	37.50	48.33	2.12
Disease	9.76	0.00	12.50	8.33	11.63*
Irrigation facility not available	17.07	18.18	25.00	18.33	1.83
Storage facility	21.95	36.36	37.50	26.00	4.70
Higher commission	19.51	27.27	25.00	21.67	1.33
Wholesalers not taking consent while selling	2.44	0.00	0.00	1.67	4.87
Consumer awareness about SPNF produce	51.22	45.45	50.00	50.00	0.37
Non availability of specialized market	56.10	63.64	62.50	58.35	0.55
Lack of transport facilities	7.32	18.18	12.50	10.00	4.66
Unfair price of produce in market	53.66	63.64	87.50	60.00	8.87*
Lack of information	51.22	72.73	75.00	58.10	5.19

category farms. Unfair price for natural farming produce were varies from 53.66 to 87.50 per cent in marginal to small farmers.

b) A non-significant problem means a problem is faced by all category farms. Non-significant problems such as shortage of skilled labour (30%). High wage rate (70%). Non-availability of labour at peak operation time (10%). Price fluctuation (56.67%). Inadequate training facilities (40%). Lack of agriculture extension facilities (26.67%). Knowledge of package of practices (48.33). Labour intensive farming (56.60). Irrigation facility not available at time (18.33).

CONCLUSION

The major problems were non-availability of a specialized market (1st rank), labour intensive farming (2nd rank) and unfair price for produce in market (3rd rank). Also "disease occurrence" in the Natural Farming field was ranked lowest (15th rank) which means NF is successful in controlling diseases in the field. The multiple response percentage for various problems identified by Chi square test

includes higher wage rate (70%), price fluctuation (56.67) labour intensive farming (56.60) and non availability of specialized market (58.53%). Factors affecting adoption of NF were measured by using Logistic Regression model. Significant variables for adoption of NF were increased gross returns, decreased pest attack in NF and increased soil fertility variables. They have a significant role for adoption of NF. Natural farming growers face many constraints / difficulties mostly during growing and marketing phase. In order to resolve these all problems and difficulties, farmers expect a wide range of support from government, private and cooperative societies.

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