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# Comparative analysis of the Socio-Economic status of Natural Farming in Himachal Pradesh

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**Abstract**
The present study focuses on a comparative analysis of the socio-economic status of farmers practicing Natural Farming (NF) and Chemical Farming (CF) in Himachal Pradesh. A multistage random sampling strategy was used to gather primary data from 200 sample farmers (100 natural and 100 chemical) in the districts of Sirmaur and Solan. The analysis focuses on demographic variables, land utilization, animal ownership, irrigation structure, farm investment patterns, and cropping patterns. The findings show that natural farming households rely more on family labor, have a somewhat higher literacy rate, and have a comparatively favorable sex ratio. Natural farmers use a bigger percentage of land for cultivation, indicating more intense land use, even if chemical farmers own comparatively larger landholdings. Larger and more varied livestock holdings as well as increased investment in livestock-related infrastructure demonstrate how important livestock is to natural farming. Irrigation and total agricultural investments are higher under chemical farming, illustrating its capital-intensive character. Due to the use of diverse cropping and legume-based systems, cropping pattern analysis reveals increased crop diversity and continuously higher cropping intensity under natural farming. According to the study's overall findings, natural farming outperforms chemical farming in terms of resource efficiency, diversity, and ecological sustainability. In order to increase the uptake and scalability of natural farming in hill regions, the results highlight the necessity of policy support in the form of training, livestock-based incentives, appropriate irrigation infrastructure, and market connections.
Keywords: Natural Farming, Chemical farming, Socio economic status, literacy, cropping pattern, Land utilization pattern.

## 1. Introduction

The "Agriculture and Allied Activities" sector has long been the backbone of the Indian economy, contributing significantly to both employment and national income. This sector accounts for approximately 16% of the country's GDP in FY24 at current prices and employs around 46.1% of the population. Moreover, the agriculture sector in India has grown at a robust average rate of 5.0% each year over the last five years since 2020, demonstrating a favourable trend in agricultural production and output (GOI, 2025).

The nation experienced its spectacular agricultural expansion after the advent of the Green Revolution in the 1960s. India ushered in a new chapter in the history of Indian agriculture. By using fertilisers and plant protection chemicals, replacing generally hardy plant varieties with high-response varieties and hybrids, irrigating more cultivated land by heavily investing in large irrigation systems, and consolidating agricultural holdings, the Green Revolution technology sought to increase agricultural production (Sebby, 2010).

Although this approach was successful in increasing food production, but it failed the test of being sustainable. As a result global irrigated area has increased by two times, agricultural machinery use has increased by two times, nitrogenous fertiliser application has increased by more than six times, phosphorus application has increased by four times, and potassium application has increased by five times (Pellegrini & Fernández, 2018; Pretty & Bharucha, 2014; Tilman, 1999). The widespread use of these pesticides in modern farming has increased production costs, decreased crop yields, and increased farmer debt (Sreenivasa et al., 2009; Singh et al., 2011; Chaudhari et al., 2015). Furthermore, according to the survey performed by the National Sample Survey Office (NSSO) in 2019, 50.2% of Indian agricultural households were in debt (PIB, 2021). Meanwhile, overuse of chemicals has been identified as a major driver of environmental damage. In 2015, 34% of global GHG emissions were attributed to the whole food system, which includes agriculture, changing land use patterns in agriculture, food processing, supply chains, and consumption (Crippa et al., 2021). The unsustainable nature of chemical-based agriculture, as well as its role to agrarian and environmental challenges, has sparked renewed interest in sustainable agricultural methods. These initiatives seek to safeguard soil health, maintain fertility and productivity, eliminate synthetic pesticides, decrease pollution, increase biodiversity, reduce dependency on expensive external inputs, and encourage farmer self-reliance by utilising local resources. Therefore, the focus has shifted to Natural farming.

Natural farming, is the practice of growing crops without the use of artificial fertilisers, pesticides, or other inputs. Since all inputs are obtained locally from the farm ecosystem itself, it increases farmers' earnings without requiring a large financial investment by promoting low production costs, chemical-free agriculture, and soil fertility (Khadse & Rosset, 2019). In the mid-1990s, Maharashtrian farmer Shri Subhash Palekar introduced the idea of Natural farming in India as a substitute for the Green Revolution's heavy irrigation, chemical fertilisers, and pesticides. By prohibiting the use of agricultural chemicals, this would appear to prevent farms from obtaining loans. As a component of the back-to-basics agrarian movement, it is currently becoming more and more popular (Korav et al., 2020). Moreover, Local farmer associations and the international peasant movement La Via Campesina (2015) are credited with helping to establish Natural farming as an agroecological movement (Khadse et al., 2018) . A policy to promote farming practices across India has been put in place by the central government. Subhash Palekar was requested to train farmers in natural farming by the state governments of Andhra Pradesh, Chhattisgarh, Himachal Pradesh, Uttarakhand, Kerala, and Karnataka (Khadse & Rosset, 2019).

A scheme called "Prakritik Kheti Khushhal Kisan" was launched with a budget of Rs 35 crore (2019–2020) to promote Natural farming in Himachal Pradesh. In order to accomplish the goal of sustainable farming that doubles farmers' incomes, improves soil fertility, and lowers input costs, this scheme will provide peasants with training and the necessary equipment (Vashishat et al., 2021). In this context, natural farming has arisen as a possible alternative, supported by a number of state and central government initiatives. However, widespread adoption and public support for natural farming necessitates a thorough empirical examination of its socioeconomic implications compared to conventional farming. Socioeconomic indicators such as family size, gender composition, literacy level, income, occupational structure, livestock inventory, and farm tools provide a complete picture of household capability, financial stability, and output efficiency. As a result, a comparative examination of the socioeconomic characteristics of natural and conventional farmers is required to determine the underlying impact of both systems on farmer welfare.

## 2. Research Methodology

For the study, the districts of Sirmaur and Solan were selected purposively. Blocks, and farmers were chosen using a multistage random sampling approach. In the initial phase, two blocks were chosen at random from the districts of Sirmaur (Nahan and Pacchhad) and Solan (Solan and Kandaghat). In the second stage, The Project Director, ATMA, provided a comprehensive list of all the villages in the chosen blocks. Five villages were chosen at random from each block, resulting in a total of twenty villages. In the last stage, Department of Agriculture officials assisted in compiling names of farmers who engaged in both chemical and natural farming. Only farmers who had been practicing natural farming for at least three years were included. Ten farmers comprising of five natural farmers and five chemical farmers were chosen at random from each village. As a result, a total of 200 farmers comprising of both natural and chemical farmers were included in the sample size.

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### 3. Analytical tools

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

A simple tabular analysis was conducted to assess the socioeconomic status, resource structure, and income patterns. A structured table was used to summarise the general characteristics of the sampled farmers. The data were compared and interpreted using simple statistical methods such as averages and percentages.

Literacy rate = $\frac{Total\ No.of\ literate\ persons}{Total\ population}$ X 100

Sex Ratio (females per thousand males) = $\frac{No.of\ females}{No.of\ males}$ X 100

Cropping intensity = $\frac{Total\ Cropped\ area}{Net\ Sown\ Area}$ X100

### 4. Results and Discussions

Farmers' socioeconomic characteristics influence farm organisation, management practices, and output levels. These features have a considerable impact on input utilisation and guide farmers' decision-making processes when selecting and allocating economic resources. As a result, a study of the sample households' current socioeconomic conditions is required to understand differences in farming practice, technological adoption, and overall farm performance. Data on socioeconomic factors, such as family size, educational attainment, land ownership, cropping pattern, etc., have been examined and displayed in the the sections below.

#### 4.1. Size and Structure of family

The family is the most important social unit in any community, especially in agrarian nations. Therefore, one of the factors impacting the production of vegetables, a family-based occupation, is the composition and structure of the family. Table 1 displays the dimensions and composition of the sampled households within the research region. According to the data, both natural and chemical farming households are dominated by joint families, although their percentage is marginally larger among chemical farmers (58.02%) than among natural farmers (52.00%). Compared to natural farmers (5.26 members), chemical farmers had slightly larger average families (5.47 members).

**Table 1. Demographic Profile of sample farmers**

| | FAMILY TYPE OF NATURAL FARMERS (NUMBERS) | | | | FAMILY TYPE OF CHEMICAL FARMERS (NUMBERS) | | | |
|---|---|---|---|---|---|---|---|---|
| **Particulars** | **Marginal** | **Small** | **Medium** | **Overall** | **Marginal** | **Small** | **Medium** | **Overall** |
| **Joint** | 34.00 (59.65) | 10.00 (34.48) | 8.00 (57.14) | 23.40 (52.00) | 34.00 (56.67) | 16.00 (69.57) | 8.00 (47.06) | 25.44 (58.02) |
| **Nuclear** | 23.00 (40.35) | 19.00 (65.52) | 6.00 (42.86) | 19.46 (48.00) | 26.00 (43.33) | 7.00 (30.43) | 9.00 (52.94) | 18.74 (42.00) |
| **Total** | 57.00 (100.00) | 29.00 (100.00) | 14.00 (100.00) | 42.86 (100.00) | 60.00 (100.00) | 23.00 (100.00) | 17.00 (100.00) | 44.18 (100.00) |
| | **Family Size of Natural Farmers (Numbers)** | | | | **Family size of Chemical Farmers (Numbers)** | | | |
| **Average No. of males** | 2.14 (40.13) | 1.89 (38.71) | 1.50 (26.09) | 1.98 (37.75) | 1.94 (39.31) | 2.27 (36.36) | 2.26 (35.86) | 2.07 (38.04) |
| **Average no. of females** | 2.12 (39.80) | 2.37 (48.39) | 2.50 (43.48) | 2.25 (42.81) | 1.83 (36.99) | 2.27 (36.36) | 2.35 (37.24) | 2.02 (36.89) |
| **Average no. of male children** | 0.61 (11.51) | 0.58 (11.83) | 1.25 (21.74) | 0.69 (13.04) | 0.63 (12.72) | 0.97 (15.51) | 0.96 (15.17) | 0.76 (13.78) |
| **Average no. of female children** | 0.46 (8.55) | 0.05 (1.08) | 0.50 (8.70) | 0.35 (6.40) | 0.54 (10.98) | 0.73 (11.76) | 0.74 (11.72) | 0.62 (11.29) |
| **Total size** | **5.33 (100.00)** | **4.89 (100.00)** | **5.75 (100.00)** | **5.26 (100.00)** | **4.94 (100.00)** | **6.23 (100.00)** | **6.30 (100.00)** | **5.47 (100.00)** |
| **Sex Ratio** | **936.31** | **978.72** | **1090.91** | **970.25** | **922.22** | **927.84** | **959.46** | **929.84** |

Figures in the parenthesis are percentages of the total

Source: Primary data collected in the year 2024

The biggest family size in both systems is that of medium farmers (5.75 in NF and 6.30 in CF), suggesting that labour is more readily available at larger farm sizes**.** The majority of families in both systems are comprised up of adults. While males (38.04%) slightly outnumber females (36.89%) in chemical farming, women constitute 42.81% of family members in natural farming and males constitute 37.75%. Households engaged in chemical farming tend to have a higher percentage of children. When farming naturally (970.25) as opposed to chemically (929.84), the sex ratio is more beneficial. Interestingly, medium-sized natural farmers have the highest sex ratio (1090.91), meaning that there are more females for every thousand males.

#### 4.2. Age-wise Distribution of the sampled farmers

Age is an important factor in agricultural decision-making. While older farmers are more averse to change, younger farmers are typically more receptive to new developments in agriculture. Table 2 shows the age distribution of head farmers in the marginal, small and medium farm size groups who practise chemical farming (CF) and natural farming (NF). The age distribution reveals that both farming systems are dominated by middle-aged farmers (41–50 years). This age group makes up the biggest share overall under natural farming (47.00%), compared to 37.00% under chemical farming, suggesting that middle-aged farmers are more likely to adopt natural farming. Nearly one-third of respondents in both systems (32.00% in chemical farming and 30.00% in natural farming) are farmers under 40, indicating a respectable level of younger farmer participation. In both systems, the percentage of farmers between the ages of 51 and 60 is moderate (20.00% in chemical farming and 17.00% in natural farming). The smallest category of farmers are those who are 61 years of age or older; they are more likely to engage in chemical farming (11.00%) than natural farming (6.00%).

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**Table 2. Age wise distribution of the sample farmers**

| Particulars | Chemical Farming | | | | Natural Farming | | | |
|---|---|---|---|---|---|---|---|---|
| | Marginal | Small | Medium | Overall | Marginal | Small | Medium | Overall |
| Up to 40 | 17.00 (28.33) | 10.00 (43.48) | 5.00 (29.41) | 13.35 (32.00) | 18.00 (31.58) | 8.00 (27.59) | 4.00 (28.57) | 13.14 (30.00) |
| 41-50 | 23.00 (38.33) | 6.00 (26.09) | 8.00 (47.06) | 16.54 (37.00) | 29.00 (50.88) | 12.00 (41.38) | 6.00 (42.86) | 20.85 (47.00) |
| 51-60 | 14.00 (23.33) | 4.00 (17.39) | 2.00 (11.76) | 9.66 (20.00) | 8.00 (14.04) | 6.00 (20.69) | 3.00 (21.43) | 6.72 (17.00) |
| 61& above | 6.00 (10.00) | 3.00 (13.04) | 2.00 (11.76) | 4.63 (11.00) | 2.00 (3.51) | 3.00 (10.34) | 1.00 (7.14) | 2.15 (6.00) |
| Total | 60.00 (100.00) | 23.00 (100.00) | 17.00 (100.00) | 44.18 (100.00) | 57.00 (100.00) | 29.00 (100.00) | 14.00 (100.00) | 42.86 (100.00) |

Figures in the parenthesis are percentages of the total
Source: Primary data collected in the year 2024

**4.3. Literacy status of the sample farmers**

The literacy rate is an effective indicator of human capital. The degree of education is critical to scientific management when it comes to implementing new, recommended technologies on farms. Strong literacy opens doors to education and employment, which helps people escape poverty and underemployment. Higher literacy rates not only increase awareness but also enhance societies' social and economic well-being. Maintaining agricultural records and using successful marketing strategies to boost revenue also require education. Data relating to the educational level of chemical and natural farmers are shown in Table 3. The data demonstrates that the majority of farmers are literate with literacy rates of 83.52% for natural farming and 82.41% for chemical farming. The percentage of illiterate farmers is comparatively low, at 12.09% for natural farmers and 13.81% for chemical farmers. High secondary education accounts for the biggest percentage of natural farmers (31.81%), followed by medium level education (23.41%), suggesting a comparatively higher level of education. Chemical farmers, on the other hand, are more concentrated at the medium education level (27.35%), followed by high secondary (27.84%).In both systems, farmers with a degree make up a small percentage, but they are more common among natural farmers (13.27%) than among chemical farmers (8.08%). Overall, the findings point to a little higher level of education among natural farmers, which could encourage increased awareness and adoption of better and sustainable farming methods.

**Table 3. Education level of the sample farmers**

| | Education level of the farmers | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Natural farmer | | | | Chemical farmer | | | |
| Particulars | Marginal | Small | Medium | Overall | Marginal | Small | Medium | Overall |
| Illiterate | 0.49 (9.21) | 0.95 (18.75) | 0.50 (10.00) | 0.62 (12.09) | 0.74 (15.12) | 0.77 (12.43) | 0.70 (11.03) | 0.74 (13.81) |
| NSG | 0.16 (2.96) | 0.11 (2.08) | 0.75 (15.00) | 0.23 (4.39) | 0.20 (4.07) | 0.23 (3.78) | 0.17 (2.76) | 0.20 (3.78) |
| Primary | 0.70 (13.16) | 0.95 (18.75) | 0.75 (15.00) | 0.78 (15.04) | 0.97 (19.77) | 1.20 (19.46) | 1.04 (16.55) | 1.04 (19.15) |
| Middle | 1.18 (22.04) | 1.16 (22.92) | 1.50 (30.00) | 1.22 (23.41) | 1.39 (28.20) | 1.63 (26.49) | 1.61 (25.52) | 1.48 (27.35) |
| High Secondary | 2.16 (40.46) | 1.16 (22.92) | 0.75 (15.00) | 1.67 (31.81) | 1.27 (25.87) | 1.67 (27.03) | 2.26 (35.86) | 1.53 (27.84) |
| Degree | 0.65 (12.17) | 0.74 (14.58) | 0.75 (15.00) | 0.69 (13.27) | 0.34 (6.98) | 0.67 (10.81) | 0.52 (8.28) | 0.45 (8.08) |
| Total | 5.33 (100.00) | 5.05 (100.00) | 5.00 (100.00) | 5.21 (100.00) | 4.91 (100.00) | 6.17 (100.00) | 6.30 (100.00) | 5.44 (100.00) |
| Literacy Rate (%) | 87.83 | 79.17 | 75.00 | 83.52 | 80.81 | 83.78 | 86.21 | 82.41 |

Figures in the parenthesis are percentages of the total
Source: Primary data collected in the year 2024

**4.4. Workforce**

The labour force represents the proportion of household members who contribute to the household economy. A family with additional working members will be much more precise about their earning strategies. People aged 15 to 60 were regarded to be actively engaged in major economic activity and hence categorised as part of the labour force. The dependency ratio is also utilised to develop policies for the region's socioeconomic growth. According to the data presented in table 4, family labour accounts for the majority of household size in both chemical and natural farming systems. Overall, Chemical farming households account for 3.84 workers (70.61%) on average, whereas natural farming households account for 3.69 workers (70.35%). This demonstrates how both systems rely similarly on family labour**.** The average number of dependents is about the same, with 1.63 people (29.39%) under chemical farming and 1.57 people (29.65%) under natural farming. With 2.25 dependents (39.13%) under natural farming and 2.22 dependents (35.17%) under chemical farming, medium farmers in both systems have a larger dependency burden. Accordingly, the dependency ratio w.r.t workers is slightly greater in natural farming (0.43) than in chemical farming (0.42). Also, the dependency ratio w.r.t family size is slightly more for natural farming (0.30) compared to chemical farming (0.29). Overall, the findings indicate that family labour is a major component of both farming systems, with only slight variations in family size and dependency structure.

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**Table 4. Distribution of workers and dependents of the sampled households**

| Particulars | Natural Farming (Number) | | | | Chemical Farming (Number) | | | |
|---|---|---|---|---|---|---|---|---|
| | Marginal | Small | Medium | Overall | Marginal | Small | Medium | Overall |
| Average no. of workers | 3.77 (70.72) | 3.63 (74.19) | 3.50 (60.87) | 3.69 (70.35) | 3.64 (73.70) | 4.17 (66.84) | 4.09 (64.83) | 3.84 (70.61) |
| Average no. of Dependents | 1.56 (29.28) | 1.26 (25.81) | 2.25 (39.13) | 1.57 (29.65) | 1.30 (26.30) | 2.07 (33.16) | 2.22 (35.17) | 1.63 (29.39) |
| Average size of Family | 5.33 (100.00) | 4.89 (100.00) | 5.75 (100.00) | 5.26 (100.00) | 4.94 (100.00) | 6.23 (100.00) | 6.30 (100.00) | 5.47 (100.00) |
| Dependency Ratio w.r.t workers | 0.41 | 0.35 | 0.64 | 0.43 | 0.36 | 0.50 | 0.54 | 0.42 |
| Dependency Ratio w.r.t Family size | 0.29 | 0.26 | 0.39 | 0.30 | 0.26 | 0.33 | 0.35 | 0.29 |

Figures in the parenthesis are percentages of the total
Source: Primary data collected in the year 2024

### 4.5. Land Utilization Pattern

Land is the scarce resource in agriculture, yet it is also the most important factor in output. When compared to other farm enterprises in a particular area, the size of the land holding affects the type and scale of farming. The data presented in table 5 shows the land utilization pattern which reveals that under both natural farming (NF) and chemical farming (CF) systems, pasture land and cultivated land together make up the majority of total landholdings across all farm sizes. Overall, Chemical farmers own a comparatively bigger area of 1.30 ha, whereas natural farmers run an average of 1.14 ha. In Natural farming, cultivated land accounts for 0.42 which is slightly higher than Chemical farming (0.41). With pasture land accounting for 51.05% of all land under NF and 48.37% under CF, it is the largest component, underscoring the significance of livestock-based activities. Across farm sizes, the % share of cultivated land decreases as farm size increases, whereas pasture land increases, particularly among medium farmers, where it accounts for more than 72% of total land under both systems. Overall, the data show that chemical farmers own comparatively bigger landholdings, whereas natural farmers employ a little higher percentage of their land for cultivation, indicating more intense land usage.

**Table 5. Land Utilization Pattern of sampled households**

| LAND UTILIZATION PATTERN (IN HECTARES) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Particulars | Marginal | | Small | | Medium | | Overall | |
| | NF | CF | NF | CF | NF | CF | NF | CF |
| Cultivated area | 0.22 (55.21) | 0.25 (56.63) | 0.57 (38.09) | 0.55 (37.55) | 0.93 (27.06) | 0.78 (19.05) | 0.42 (46.31) | 0.41 (45.85) |
| Pasture land | 0.16 (41.02) | 0.17 (37.36) | 0.90 (60.20) | 0.86 (58.61) | 2.51 (72.94) | 2.99 (73.35) | 0.70 (51.05) | 0.81 (48.37) |
| Fallow land | - | - | - | 0.01 (0.92) | - | - | - | 0.00 (0.21) |
| Leased in land | 0.01 (2.69) | 0.02 (5.09) | 0.03 (1.71) | 0.04 (2.38) | - | 0.02 (0.48) | 0.01 (2.03) | 0.02 (3.69) |
| Barren land | 0.00 (1.07) | 0.00 (0.91) | - | 0.01 (0.55) | - | 0.29 (7.00) | 0.00 (0.61) | 0.05 (1.86) |
| Leased out land | - | - | - | - | - | 0.01 (0.13) | - | 0.00 (0.02) |
| Total | 0.40 (100.00) | 0.44 (100.00) | 1.49 (100.00) | 1.47 (100.00) | 3.44 (100.00) | 4.07 (100.00) | 1.14 (100.00) | 1.30 (100.00) |

Figures in the parenthesis are percentages of the total
Source: Primary data collected in the year 2024

### 4.6. Livestock inventory of the sampled farmers

Livestock-based inputs, especially indigenous cows that provide urine and dung for preparations like Jeevamrit, Beejamrit, and Ghanjeevamrit, are strongly associated with natural farming. As a result, compared to chemical farmers, natural farmers keep larger and more varied livestock holdings. As per the data presented in table 6, natural farming household's average livestock holding is 3.90, but under chemical farming, it is 3.01. Although cows make up the majority of the livestock in both systems, their percentage is lower in natural farming (69.94%) than in chemical farming (81.92%), suggesting that natural farming is more diversified. Under natural farming, milk cows make up the majority of livestock (1.73; 47.46%), underscoring the dual function of livestock in providing inputs and generating revenue. Goats and buffaloes are notably owned by medium-sized natural farmers, who in particular maintain a diverse livestock structure.

**Table 6. Livestock inventory of the sampled farmers**

| Livestock inventory of farmers (numbers) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Natural Farming | | | | Chemical Farming | | | |
| Particulars | Marginal | Small | Medium | Overall | Marginal | Small | Medium | Overall |
| **Cows** | **2.46 (70.00)** | **2.58 (87.50)** | **2.50 (33.33)** | **2.50 (69.94)** | **2.04 (78.57)** | **3.30 (88.39)** | **2.96 (85.00)** | **2.49 (81.92)** |
| Milch | 1.58 (45.00) | 1.79 (60.71) | 2.25 (30.00) | 1.73 (47.46) | 1.40 (53.85) | 1.83 (49.11) | 1.74 (50.00) | 1.56 (52.10) |
| Dry | 0.39 (11.00) | 0.47 (16.07) | - | 0.36 (10.93) | 0.23 (8.79) | 0.63 (16.96) | 0.52 (15.00) | 0.37 (11.73) |
| Calf | 0.49 (14.00) | 0.21 (7.14) | 0.25 (3.33) | 0.38 (10.52) | 0.41 (15.93) | 0.83 (22.32) | 0.61 (17.50) | 0.54 (17.67) |
| **Buffaloes** | **0.05 (1.50)** | **0.21 (7.14)** | **1.00 (13.33)** | **0.23 (4.79)** | **0.03 (1.10)** | **0.13 (3.57)** | **0.13 (3.75)** | **0.07 (2.12)** |
| Milch | 0.04 (1.00) | 0.16 (5.36) | 0.25 (3.33) | 0.10 (2.59) | 0.01 (0.55) | 0.10 (2.68) | 0.09 (2.50) | 0.05 (1.37) |
| Dry | 0.02 (0.50) | - | 0.25 (3.33) | 0.05 (0.75) | 0.01 (0.55) | 0.03 (0.89) | 0.04 (1.25) | 0.02 (0.75) |
| Calf | - | 0.05 (1.79) | 0.50 (6.67) | 0.09 (1.45) | 0.00 (0.00) | 0.03 (0.89) | 0.00 (0.00) | 0.01 (0.21) |

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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Goats** | **0.75 (21.50)** | **0.05 (1.79)** | **3.25 (43.33)** | **0.90 (18.84)** | **0.09 (3.30)** | - | - | **0.05 (1.98)** |
| **Ox** | **0.21 (6.00)** | **0.11 (3.57)** | **0.75 (10.00)** | **0.26 (5.86)** | **0.44 (17.03)** | **0.30 (8.04)** | **0.39 (11.25)** | **0.40 (13.98)** |
| Adult | 0.21 (6.00) | 0.11 (3.57) | 0.75 (10.00) | 0.26 (5.86) | 0.43 (16.48) | 0.30 (8.04) | 0.39 (11.25) | 0.39 (13.65) |
| Calf | - | - | - | - | 0.01 (0.55) | - | - | 0.01 (0.33) |
| **Donkeys** | **0.04 (1.00)** | - | - | **0.02 (0.57)** | - | - | - | - |
| **Average No. of Livestock** | **3.51 (100.00)** | **2.95 (100.00)** | **7.50 (100.00)** | **3.90 (100.00)** | **2.60 (100.00)** | **3.73 (100.00)** | **3.48 (100.00)** | **3.01 (100.00)** |

Figures in the parenthesis are percentages of the total
Source: Primary data collected in the year 2024

### 4.7. Irrigation Structure

Irrigation is essential for crop growth in all stages, and farmers invest in various irrigation systems depending on their farming practices. Irrigation expenditures for marginal, small, and medium-sized farmers under Natural Farming (NF) and Conventional Farming (CF) are shown in Table 4.6. The overall irrigation investment for marginal farmers is nearly the same in both systems: ₹88,588.60 per farm in NF and ₹90,269.29 in CF. Tank irrigation dominates, accounting for 76.44% in NF and 87.83% in CF. In both systems, pipeline irrigation makes up about 6%. Only NF exhibits tubewell investment (9.90%), with other sources remaining below 3%. Small farmers have significantly greater irrigation expenditures under CF (₹2,01,020.00) compared to NF (₹1,19,747.37). Tank irrigation in small farmers still dominates, accounting for 82.63% under NF and 67.57% under CF. Chemical farmers spend significantly more on drip irrigation (17.41%) than natural farmers (8.35%). For medium farmers, chemical farming requires more irrigation investment (₹2,01,830.43) than natural farming (₹1,24,750.00). NF farmers spend mostly in tank (56.11%) and pipeline irrigation (38.88%), while CF farmers rely heavily on tank irrigation (80.14%). Overall, Chemical farming requires more irrigation investment (₹1,34,707.35) compared to natural farming (₹1,02,687.24). Tank irrigation is the most common method in both systems, while natural farmers use pipeline irrigation more frequently, whilst chemical farmers prefer drip irrigation.

**Table 7. Average investment in irrigation**

| Investment in Irrigation (Rupees/Farm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Particulars | MARGINAL | | SMALL | | MEDIUM | | OVERALL | |
| | NF | CF | NF | CF | NF | CF | NF | CF |
| Kuhl | 85.09 (0.10) | 124.29 (0.14) | 31.58 (0.03) | 60.00 (0.03) | - | 95.65 (0.05) | 57.66 (0.06) | 104.63 (0.10) |
| Tank | 67719.30 (76.44) | 79285.71 (87.83) | 98947.37 (82.63) | 135833.33 (67.57) | 70000.00 (56.11) | 161739.13 (80.14) | 77094.74 (75.39) | 106308.75 (81.86) |
| Pipeline | 5745.61 (6.49) | 5471.43 (6.06) | 9636.84 (8.05) | 11766.67 (5.85) | 48500.00 (38.88) | 14791.30 (7.33) | 12859.68 (11.47) | 8503.71 (6.23) |
| Drip Irrigation | 4596.49 (5.19) | 4071.43 (4.51) | 10000.00 (8.35) | 35000.00 (17.41) | 1750.00 (1.40) | 11086.96 (5.49) | 5765.00 (5.58) | 12377.64 (7.64) |
| Tubewell | 8771.93 (9.90) | – | – | – | – | – | 5000.00 (5.64) | – |
| Sprinkler | 266.67 (0.30) | 473.57 (0.52) | 342.11 (0.29) | 1026.67 (0.51) | 500.00 (0.40) | 1160.87 (0.58) | 321.21 (0.31) | 717.62 (0.53) |
| Any Other | 1403.51 (1.58) | 842.86 (0.93) | 789.47 (0.66) | 17333.33 (8.62) | 4000.00 (3.21) | 12956.52 (6.42) | 1588.95 (1.54) | 6694.99 (3.63) |
| Total | 88588.60 (100.00) | 90269.29 (100.00) | 119747.37 (100.00) | 201020.00 (100.00) | 124750.00 (100.00) | 201830.43 (100.00) | 102687.24 (100.00) | 134707.35 (100.00) |

Figures in the parenthesis are percentages of the total
Source: Primary data collected in the year 2024

### 4.8. Income structure

The primary source of income under both systems is agriculture and allied activities, but overall income from natural farming is consistently larger than that from chemical farming. The total income of marginal farmers under NF is ₹11,82,916.45, while under CF it is ₹7,51,132.29. 79.89% of total income under CF and 75.33% under NF comes from agriculture. Small farmers' overall income under NF (₹20,74,885.53) is almost twice that of CF (₹10,81,724.71). The agricultural sector makes up 80.43% of NF and 70.63% of CF, while CF has a greater salary income (23.65%) than NF (14.43%). The total income for medium farmers under NF is ₹22,45,695.12, while under CF it is ₹14,31,571.31. In contrast to salary income, which makes up 21.90% under CF but just 2.67% under NF, agriculture makes up a very high 94.88% under NF and 74.94% under CF. Overall, NF's average total income (₹15,90,376.50) is much larger than CF's (₹9,42,843.18). These results show that households that practice natural farming are less reliant on off-farm sources and have higher farm-based incomes than households that use chemical farming.

**Table 8. Sources of income of sampled households**

| Sources of income (Rupees/Farm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Marginal | | Small | | Medium | | Overall | |
| | NF | CF | NF | CF | NF | CF | NF | CF |
| Agriculture & allied activities | 891083.12 (75.33) | 600106.57 (79.89) | 1668780.27 (80.43) | 764031.38 (70.63) | 2130695.12 (94.88) | 1072858.26 (74.94) | 1290160.97 (79.54) | 718177.07 (76.92) |
| Business | 76666.67 (6.48) | 29942.86 (3.99) | 76421.05 (3.68) | 22933.33 (2.12) | 37000.00 (1.65) | 38086.96 (2.66) | 71042.11 (4.99) | 29715.16 (3.33) |
| Salary | 186387.72 (15.76) | 105714.29 (14.07) | 299368.42 (14.43) | 255800.00 (23.65) | 60000.00 (2.67) | 313565.22 (21.90) | 201457.84 (13.54) | 175568.66 (17.61) |
| Pension | 28778.95 (2.43) | 15368.57 (2.05) | 30315.79 (1.46) | 38960.00 (3.60) | 18000.00 (0.80) | 7060.87 (0.49) | 27715.58 (1.92) | 19382.29 (2.14) |
| TOTAL | 1182916.45 (100.00) | 751132.29 (100.00) | 2074885.53 (100.00) | 1081724.71 (100.00) | 2245695.12 (100.00) | 1431571.31 (100.00) | 1590376.50 (100.00) | 942843.18 (100.00) |

Figures in the parenthesis are percentages of the total :Source: Primary data collected in the year 2024

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### 4.9. Farm investment pattern

Investment in farm houses and residential buildings is a significant indicator of farmers' economic position. Farm investment trends under Natural Farming (NF) and Chemical Farming (CF) are shown in Tables. Under natural farming, small farmers reported the largest total investment (₹42.63 lakh), followed by marginal (₹36.36 lakh) and medium farmers (₹21.13 lakh). With percentages ranging from 87.28% among marginal farmers to 94.67% among medium farmers, pakka houses account for 89.61% of agricultural investment across all farm sizes. The second highest investment is in pakka sheds (5.74%), emphasizing the importance of livestock structure in natural farming. Pakka store investment makes up 2.23% of total investment, whereas kaccha structures collectively make up a very minor portion, suggesting a slow transition to permanent structures. The average farm investment (₹36.72 lakh) for chemical farming is marginally higher than NF; medium farmers invest the most (₹49.20 lakh), followed by small farmers (₹44.60 lakh) and marginal farmers (₹30.16 lakh); pakka houses again account for the majority of investment (90.38%), followed by pakka sheds (5.35%) and pakka stores (2.11%). Overall, chemical farming shows a higher total investment, especially among medium farmers.

**Table 9. Farm Investment Pattern of sampled households**

| FARM INVESTMENT PATTERN (In Rupees/ Farm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Natural Farming | | | | Chemical Farming | | | |
| Particulars | Marginal | Small | Medium | Overall | Marginal | Small | Medium | Overall |
| Kaccha house | 87017.54 (2.39) | _ | _ | 49600.00 (1.36) | 33000.00 (1.09) | 36666.67 (0.82) | 52173.91 (1.06) | 37102.90 (1.03) |
| Kaccha shed | 39210.53 (1.08) | 60526.32 (1.42) | _ | 39902.63 (1.03) | 31142.86 (1.03) | 51666.67 (1.16) | 48695.65 (0.99) | 38847.31 (1.05) |
| Kaccha Store | 877.19 (0.02) | 2631.58 (0.06) | _ | 1263.16 (0.03) | 3571.43 (0.12) | 1666.67 (0.04) | _ | 2526.19 (0.08) |
| Pakka House | 3173684.21 (87.28) | 3910526.32 (91.73) | 2000000.00 (94.67) | 3223052.63 (89.61) | 2722142.86 (90.24) | 4006666.67 (89.84) | 4508695.65 (91.62) | 3321297.31 (90.38) |
| Pakka Shed | 242280.70 (6.66) | 176315.79 (4.14) | 112500.00 (5.33) | 204981.58 (5.74) | 168857.14 (5.60) | 245666.67 (5.51) | 210869.57 (4.29) | 193665.45 (5.35) |
| Pakka Store | 92982.46 (2.56) | 113157.89 (2.65) | _ | 85815.79 (2.23) | 58000.00 (1.92) | 117666.67 (2.64) | 100434.78 (2.04) | 78937.25 (2.11) |
| Total | 3636052.63 (100.00) | 4263157.89 (100.00) | 2112500.00 (100.00) | 3604615.79 (100.00) | 3016714.29 (100.00) | 4460000.00 (100.00) | 4920869.57 (100.00) | 3672376.40 (100.00) |

Figures in the parenthesis are percentages of the total
Source: Primary data collected in the year 2024

### 4.10. Cropping pattern

Cropping pattern refers to how much land is allocated to different crops at any particular time, whereas multiple cropping entails growing more than one crop on the same land in a single year. Multiple cropping is a prevalent method in Subhash Palekar Natural Farming (SPNF), with a main crop often combined with legumes to improve nitrogen fixation, soil health, and ecology. Climate, altitude, the availability of resources, and management techniques all affect cropping patterns. Crop distribution, farm size behavior, and cropping intensity clearly differ between Natural Farming (NF) and Chemical Farming (CF), according to the analysis of sampled farmers. Under natural farming, tomato occupies the biggest share of gross cropped area across all farm sizes (20.39% overall), followed by cauliflower and garlic (17.56%). Beans and capsicum together account for about 29.76% of the planted area, demonstrating higher crop diversification and legume inclusion. Cropping is more focused on monocrops in chemical farming. Beans make up 15.10% of the entire area, while tomatoes continue to be the most important crop (23.65%), followed by cauliflower (16.72%) and garlic (18.99%). Gross cropped area rises with farm size under both methods. It varies from 0.47 ha to 1.35 ha under CF (average 0.74 ha) and from 0.43 ha to 1.58 ha under NF (average 0.77 ha). NF has a little larger net sown area (0.42 ha) than CF (0.41 ha). Cropping intensity is constantly greater under natural farming. Marginal farmers record 194.33% under NF compared to 186.56% under CF, while total cropping intensity is at 187.39% for NF against 182.43% for CF. This demonstrates increased acceptance of multiple cropping under natural farming and more effective land utilization.

**Table 10. Cropping pattern of the sampled households under Natural and Chemical Farming**

| | Natural Farming (Area in Hectares) | | | | Chemical Farming (Area in Hectares) | | | |
|---|---|---|---|---|---|---|---|---|
| Particulars | Marginal | Small | Medium | Overall | Marginal | Small | Medium | Overall |
| Beans | 0.06 (13.07) | 0.24 (23.17) | 0.30 (18.69) | 0.14 (16.78) | 0.06 (13.54) | 0.20 (20.61) | 0.18 (13.14) | 0.11 (15.10) |
| Capsicum | 0.06 (13.26) | 0.13 (12.09) | 0.22 (13.72) | 0.10 (12.98) | 0.05 (10.07) | 0.17 (17.56) | 0.19 (14.28) | 0.10 (12.51) |
| Tomato | 0.10 (23.67) | 0.15 (14.27) | 0.31 (19.71) | 0.14 (20.39) | 0.12 (26.04) | 0.18 (18.55) | 0.30 (22.14) | 0.17 (23.65) |
| Cauliflower | 0.09 (21.97) | 0.16 (15.44) | 0.22 (14.08) | 0.13 (18.97) | 0.09 (19.62) | 0.12 (12.37) | 0.17 (12.36) | 0.11 (16.72) |
| Garlic | 0.07 (16.67) | 0.22 (20.75) | 0.23 (14.59) | 0.14 (17.56) | 0.09 (18.75) | 0.18 (18.14) | 0.28 (21.00) | 0.14 (18.99) |
| Potato | 0.05 (11.36) | 0.15 (14.27) | 0.30 (19.20) | 0.11 (13.31) | 0.06 (11.98) | 0.13 (12.78) | 0.23 (17.10) | 0.10 (13.03) |
| Gross cropped area | 0.43 (100.00) | 1.04 (100.00) | 1.58 (100.00) | 0.77 (100.00) | 0.47 (100.00) | 0.98 (100.00) | 1.35 (100.00) | 0.74 (100.00) |
| Net sown area | 0.22 | 0.57 | 0.93 | 0.42 | 0.25 | 0.55 | 0.78 | 0.41 |
| Cropping intensity | 194.33 | 182.12 | 170.04 | 187.39 | 186.56 | 178.58 | 173.05 | 182.43 |

Figures in the parenthesis are percentages of the total
Source: Primary data collected in the year 2024

## 5. Conclusion

The results unequivocally show that although both agricultural systems coexist in similar agro-ecological environments, their approaches to production, investment priorities, and resource usage are very different. Households engaged in natural farming show marginally better social indices, such as a favorable sex ratio and slightly higher literacy rates. Both systems rely heavily on family labor, however natural

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farming has slightly higher dependency ratios due to more household involvement in agricultural operations. Natural farmers use a bigger percentage of land for cultivation, indicating more intense land use, even if chemical farmers own comparatively larger landholdings. Livestock plays a more central role in natural farming, as shown by larger and more diverse livestock holdings and more investment in livestock-related infrastructure. Chemical farming, on the other hand, mainly relies on tank and drip irrigation systems and is more capital-intensive, especially when it comes to irrigation and overall farm investment. Nonetheless, it is evident from income analysis that natural farming produces a larger overall average income (₹15,90,376.50) than chemical farming (₹9,42,843.18), and that it is more dependent on farm-based income than off-farm sources. Cropping pattern analysis indicates better crop diversification and continuously higher cropping intensity under natural farming due to the use of multiple cropping and legume-based systems. Chemical farming still focuses mostly on monocrops and uses less intensive cropping. In comparison to chemical farming, natural farming provides a more resource-efficient, diverse, and environmentally sustainable production method, according to the study's overall findings. With sufficient institutional support and governmental backing, natural farming holds considerable promise for strengthening farmer livelihoods, improving soil health, and encouraging sustainable agricultural growth in hill regions like Himachal Pradesh.

## 6. Policy Implications

The study's conclusions offer crucial policy insights for advancing sustainable agriculture and bolstering the uptake of natural farming in hilly areas like Himachal Pradesh.

First, state policies should prioritize scaling up natural farming through organized expansion programs because natural farming households exhibit higher farm-based income and greater cropping intensity. Outreach and acceptance can be improved by strengthening current programs, such as cluster-based natural farming projects. Second, because livestock plays such an important part in natural farming, policy assistance for indigenous cattle rearing, veterinary service, and livestock-based input preparation facilities is necessary. Programs for natural farming and livestock development should be integrated to improve system sustainability. Third, as adoption is heavily influenced by cost reduction and credit limits, financial institutions ought to create customized credit products for natural farming, such as low-interest loans and transition support. During the conversion process, lowering financial risk will promote greater involvement. Fourth, to guarantee income security and encourage farmers, it is crucial to set up specialized procurement systems, certification procedures, branding, and premium pricing for natural products. Overall, to improve the long-term viability and scalability of natural farming systems, an integrated policy framework including market development, livestock promotion, financial inclusion, institutional support, and targeted extension services is required.

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