*Original Research Article*

# ANALYSIS OF SOCIO-ECONOMIC CHARACTERISTICS OF POTATO FARMERS AND TREND, GROWTH RATE OF AREA, PRODUCTION OF POTATO IN NALANDA DISTRICT OF BIHAR, INDIA


## ABSTRACT:

The goal of the current inquiry was to understand the socio – economic situation of potato farmers. Bihar. In the Bihar district of Nalanda, farmers' socio-economic standing and means of subsistence were precarious. Potato farmers are distributed according to age, with 33% of them being under 30 years old, in three different age groups: small, below 30 to 50 years old, and medium, beyond 50 years old. The information in the table about the educational background of potato farmers shows that all farmers, from those who were illiterate to those who had graduated from high school and above, were engaged in the business of farming potatoes. Maximum 20% of respondents completed high school, followed by 19% of respondents who completed intermediate level, 17% of respondents who completed graduation and above, and least of 13% of respondents who completed primary. In addition, the study shows that average family size is 6%. As a result, the study area's economy was discovered to be predominately centred on agriculture. The result shows that the annual income of farmers consist of farm and non-farm sources i.e., 40% and 60% respectively. And The trend analysis's period-by-period results showed that the state's growth rate of potato-planted area was positive during periods I (2007–08 to 2011–12) and III (2017–18 to 2021–22), while the study area's growth rate of potato-planted area was positive during periods II (2012–13 to 2016–17) and negative during periods I and III.



**Keywords:** Potato growers, Land holding, Education, Family Income, Compound growth


## INTRODUCTION

One of the most important vegetable crops worldwide is the potato (Solanum tuberosum L.). It is a significant crop that is grown in the Indian plains during the winter, although even at high fertility levels, productivity varies greatly between regions, between areas within a region, and with cultural practices. It ranks fifth in production, yielding about 309.5 million tones, behind rice, wheat and maize. it covers about 21.22 million hectares. it is a crop from a temperature area. It has adapted to a variety of climatic conditions. Potatoes need a temperature of 18 to 20*c to grow. The PH range of the soil in which the potato is grown is


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grown is 5.2 to 6.4. In Bihar, potatoes are farmed on 3232.500 hectares, producing 6441.600 tonnes annually with a productivity of 20.69 ha in the 2018–19 growing season. All 38 of Bihar's districts cultivate potatoes, but Nalanda is the state's leading producer. Patna. Saran. 81 percent of the area is made up of Samastipur, Gopalganj, Vaishali, East and West Champaran, Muzaffarpur, and Siwan. with regard to output. With an annual yield of 5.74 million metric tonnes and a productivity of 17.78 metric tonnes per hectare, potatoes are produced on 0.32 million hectares in Bihar. Unfortunately, I was unable to locate any statistics for the Nalanda district especially for the years 2021–2022. In the Indian state of Bihar, potato farming is a significant agricultural endeavour.

## METHODOLOGY

### Sampling design

Samples were chosen using a multi-stage sampling technique.

### Selection of the study area

There are 38 districts in Bihar, and **Nalanda** was purposefully chosen as it has the most area and production of potato. The Nalanda district has 20 blocks, out of these blocks, **Bihar Sharif** and Noor **Sharai** was selected purposively based on potato cultivation's largest area. All of the villages are listed here in each selected block were obtained from the block development office. Bihar Sharif and Noor Sharai comprises of 75 Villages and 61 villages respectively. Out of which **6 percent** village in Bihar sharif Block and **8 percent** village in Noor Sharai Block was selected randomly. A complete list of the potato growers in each selected village were obtained from the village Head. 10 percent farmers were selected from each village randomly and categorized into three farm size groups based on area under cultivation.

List 1 : Complete list of potato growers in each selected village

| State | Districts | Blocks | Villages | No. of Farmers |
|---|---|---|---|---|
| BIHAR | | BIHAR SHARIF | Asaanagar | 16 |
| | | | Aalahdia | 14 |
| | | | Amdaha | 14 |
| | | | Braiapur | 13 |
| | | | Sodhi | 15 |
| | **NALANDA** | | | **72** |
| | | NOOR SHARAI | Dohia | 16 |
| | | | Ajaipur | 12 |
| | | | Andhana | 15 |
| | | | Chandasi | 17 |
| | | | Sordarbigha | 18 |
| | | | | **78** |

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| | | | |
|---|---|---|---|
| | | **Total** | **150** |

**Data Collection:**

Primary data was gathered from 150 randomly chosen farmers during the years of 2021 and 2022 through personal interviews in order to address the study's purpose. The data regarding cropping patterns, land utilizations, area, production and productivity of potato and general information on districts both the Bihar Agriculture Department and the District Statistical Department provided the data.

**Statistical analysis**

Simple statistical techniques like average, percentage, etcetera was carried out.

**ANALYTICAL PROCEDURE**

The following statistical tools were used in analysis of data and interpretation of result (socio-economic profile).

**Arithmetic Mean: -**

$$\text{Arithmetic Mean} = \frac{\sum X_i}{N}$$

Where , $\Sigma X_i$ = Sum of Variables

N = Total Number of Variables

$$\text{Weighted Mean} = \frac{\sum W_i X_i}{\sum W_i}$$

Where , $W_i$ = Weight of $X_i$

$X_i$ = Variable

The following statistical tools were used in analysis of data and interpretation of result (Growth rate).

**Compound Growth Rate analysis-**

The compound growth rate was calculated using an exponential function by analysing data of area, production, and productivity of potato crop in the study area.

$\mathbf{Y} = AB^2$ ……..…... (1)

Were,

Y = area/production/productivity/various inputs in $t^{th}$ year

A = refers to intercept

t = refers to year (time period) (say t= 1,2, 3 ……., n)

$B = 1 + \frac{r}{100}$

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were

r = annual compound growth rate for area, production and productivity.

with the use of two flanks of the equation's logarithm. Log Y has been transformed into a linear form, with "t" acting as the independent variable.

$\text{Log } Y_t = \log A + t \log B$

In ease of writing, we can write this as if log A=a and log B=b.

$\text{Log } y_t = a + t$ …… (2)

Time (t) serves as the independent variable in this semi-log function. We then have typical equations of this type utilising the ordinary least squares technique.

$\Sigma \log y_t = na + b \Sigma t$

$\Sigma \log yt = a \Sigma t + b \Sigma t^2$……... (3)

Where, n is the number of observations in years

A and B's values have been calculated by resolving the equation (2=3). The approach listed below has been used to derive compound growth rate from obtained regression coefficients.

When b is a positive value, the anti-log of b was obtained, one was deducted from the antilog value b and then the value of b-1 was multiplied by one hundred. As a result, it provides a rising type compound growth rate (CGR). The process for determining compound growth rate is the same when b has a negative value, but the growth rate result was negative. When the compound annual growth rate is negative that means the growth has been slowing down over the time period.

The compound annual growth rate is determined by the following formulae which indicated an even rate of change from one observation to the next-

$r = (B\text{-}1) \times 100$

$r = (\text{Antilog } b - 1) \times 100$

**RESULT AND DISCUSSIONS:**

**Family size**

The total number of family members is referred to as family size. Family size has a significant impact on the socioeconomic aspects of farm households, particularly those that are connected to the availability of labour and the production of income. A medium-sized family should make more money and contribute more labour than a smaller-sized household. Therefore, it is assumed that a household with a relatively big number of people will use inputs more effectively and will have greater supervision. The sample was divided into four broad categories based on the number of family members: small (5.6 members), medium (5.2

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members), large (6.2 members), and marginal (6.2 members) (5-6) Table 1 shows the size-wise distribution of the sample farmer households.

**Table.1 Socio-Economic status of sample farmers.**

| SI.NO. | Particular | Marginal | Small | Medium | Total |
|---|---|---|---|---|---|
| **1** | **No. of farmers** | 80 | 33 | 37 | 150 |
| **2** | **Average Family Size** | 6.2 | 5.8 | 5.2 | 5.7 |
| **3** | **Avg. Size of holding** | 0.47 | 1.34 | 3.93 | 1.51 |

The number of people in a household roughly correlated with their level of labour and ability to save for a farm. According to the current study, there was a positive correlation between the average family size and the operational holdings of the household, meaning that the size of the family grew as operational holdings grew.

**Average farm size**

Based on the magnitude of the operational hole, the respondents were post-stratified into farmers, small businesses, and marginal respondents. In Table no. 1., the total number of responders for each category is shown. In the research area, the concentration of operational holdings was very skewed. The typical amount of land that farmers own (1.51 ha).

Table no. 2. It is reasonable to assume that 27% of the respondents were old (above 50 years of age), 40% were middle-aged (30–50 years), and 33% were young (Below 30 years). Because most teenagers aren't interested in farming and are instead looking for better employment opportunities in populous areas, the bulk of replies falling under the time of life group is likely due to this reality. Another factor is that people in their middle years are more enthusiastic and productive at work than people who are older or younger. An individual may not be able to accept responsibility at an early age. The labour productivity and production of the farmer are projected to be impacted by his age.

**Table.2 Distribution of farmers according to their age.**

| SI.NO. | Age | Marginal | Small | Medium | Average |
|---|---|---|---|---|---|
| **1** | **Below 30 years** | 24 | 11 | 14 | 16.33 (33) |
| **2** | **30-50 year** | 31 | 13 | 16 | 20.00 (40) |
| **3** | **Above 50 years** | 25 | 9 | 7 | 13.67 (27) |
| **4** | **Total** | 80 | 33 | 37 | **150** |

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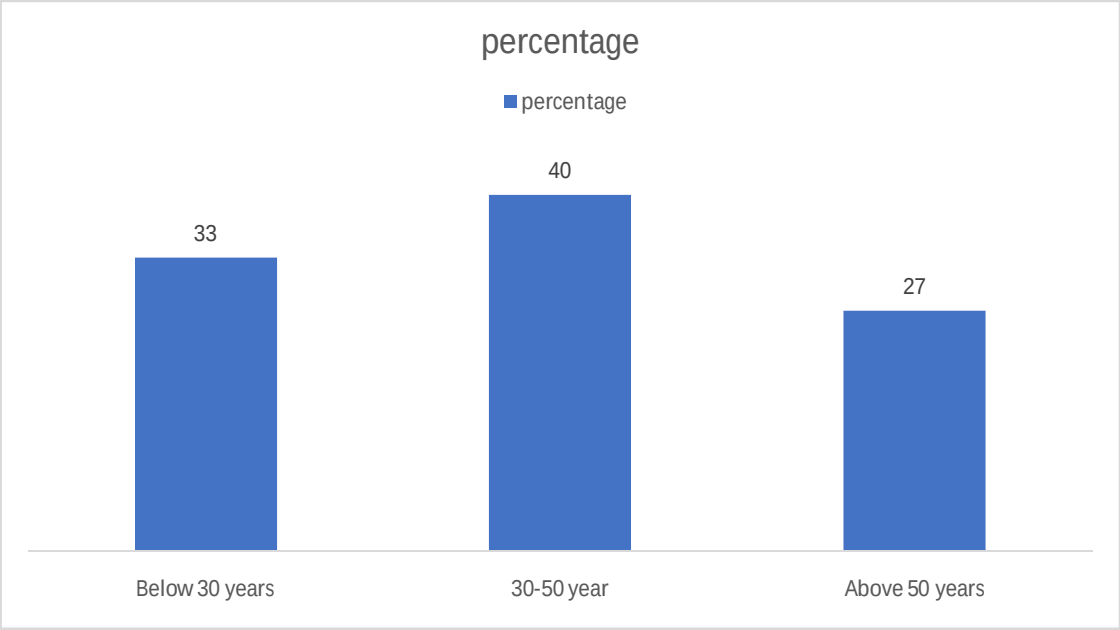


**Figure no. 1. Distribution of farmers according to their age.**

**Education**

The educational background of potato farmers is shown in Table no.3. The data in the table shows that all farmers, from those who were illiterate to those who had graduated from high school and higher, were participating in the potato farming industry. Maximum 20 percent of respondents had completed high school, followed by 19 percent who had completed intermediate level, and least 17 percent who had completed all levels of higher education.

The results showed that a sizable portion of respondents had good education, with 20% having completed high school, and 17% being illiterate. The farmers' conviction that obtaining a decent education will contribute to their future success is the real justification for it. This might be as a result of the farmers' easy access to colleges and universities as well as their high level of understanding of the value of formal education in the current environment.

**Table no. 3: Educational status of farmers**

| S.NO. | Education | Marginal | Small | Medium | Total |
|---|---|---|---|---|---|
| **1** | **Illiterate** | 16 | 8 | 2 | 26 (17) |
| **2** | **Primary** | 12 | 3 | 4 | 19 (13) |

| | | | | | |
|---|---|---|---|---|---|
| **3** | **Middle school** | 11 | 4 | 6 | 21 (14) |
| **4** | **High school** | 16 | 6 | 8 | 30 (20) |
| **5** | **Intermediate** | 17 | 5 | 7 | 29 (19) |
| **6** | **Graduate & above** | 8 | 7 | 10 | 25 (17) |
| **7** | **Total** | 80 | 33 | 37 | **150 (100)** |

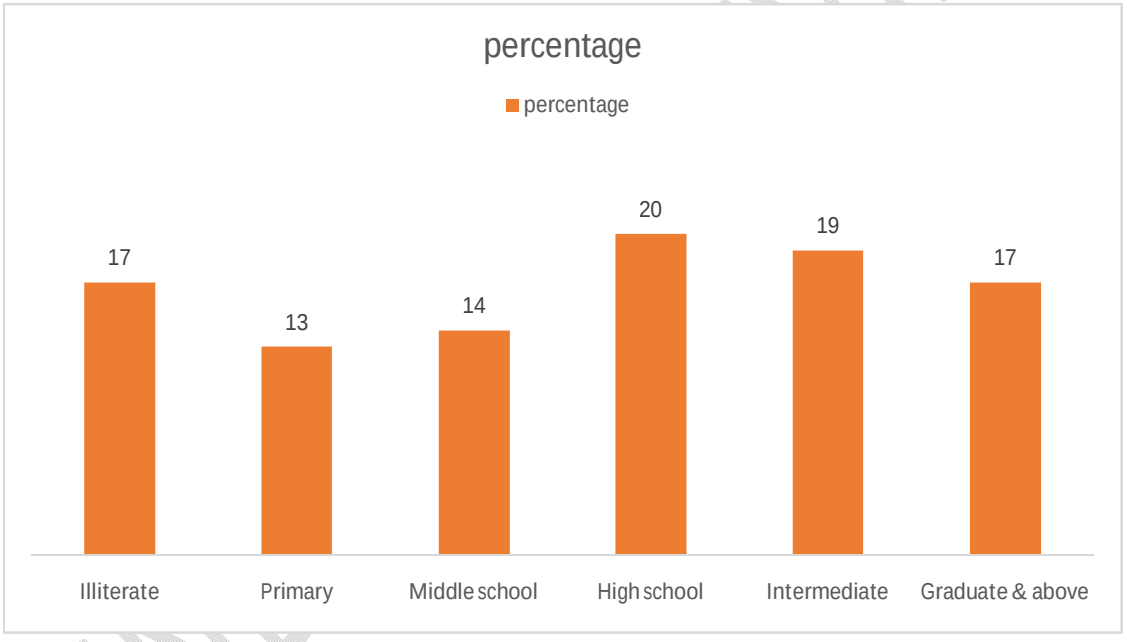


**Figure no.2. Educational status of farmers.**

**Farm Household's Net Income Per Annum**

A farming system strategy aims to use resources more effectively to increase the farmer's income. By distributing the risk among several businesses rather than just one activity, it also helps to reduce the production risk. Table 4 provides information on the household annual income from the main farming in the Nalanda district. Farm households had the highest net annual income (Rs. 201116.33), of which 40% came from agricultural businesses and 60% from non-farming activities (Rs.298946.67). This indicates that crop ventures generate less income than non-farming crop ventures.

**Table no.4 Annual Income of Farmers from Various Sources.**

**(Rs. /farm/annum)**

| Income | Marginal | Small | Medium | Average |
|---|---|---|---|---|
| **Farm (crop+Live-stock)** | 82709 | 205750 | 314890 | 201116.33 (40) |
| **Non-Farm (Labour, Business, Job etc.)** | 104560 | 387700 | 404580 | 298946.67 (60) |
| **Total** | 187269 | 593450 | 719470 | 500063 |

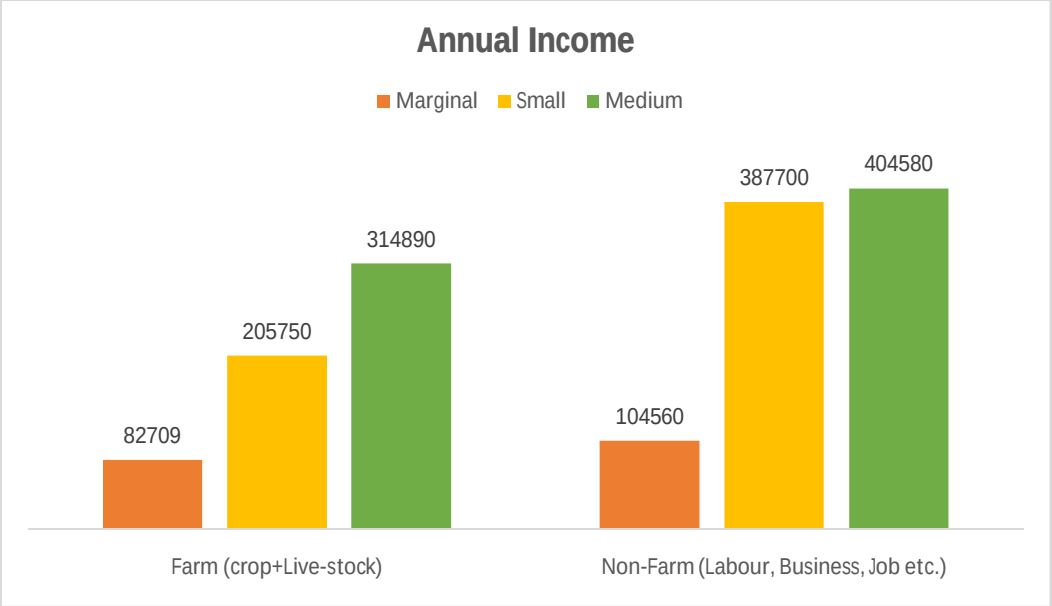


**Figure no.3: Annual Income of Farmers from Various Sources.**

**Cropping Pattern among major farming systems**

The cropping practises now used by farmers in the study area under various conditions are shown in Tables 5. The tables show that the Nalanda district. Paddy, maize, arhar, and moong were the main crops in the Nalanda district during the kharif season, according to Tables 5. Farm households that are in the rabi season cultivate wheat, potatoes, lentils, gramme, mustard, maize, and pea. Zaid also has short growing seasons for the vegetable crops

cucumber, watermelon, and muskmelon. The bulk of respondents were farmers, and their experience was similar because of the growing crop season. The crop is undoubtedly growing. The farmers' decisions to accept different sorts of fertilisers for their crops and to increase soil fertility are greatly influenced by the season. Scientists and extension agencies must perform extension activities such trainings, result demonstrations, technique demonstrations, meetings, exposure visits, and discussion in order to provide farmers a broad understanding of the situation and enable them to take further action.

**Table 5 Cropping Pattern in different crop Season**

| SI.NO. | Seasons | Crops |
|---|---|---|
| **1** | Kharif | Paddy, Maize, Arhar and Moong, |
| **2** | Rabi | Wheat, Potato, Lentil, Gram, Mustard, Maize and pea |
| **3** | Zaid | Vegetable, Watermelon, Muskmelon and Cucumber |

Nalanda district, as well as for the state of Bihar as a whole, compound growth rates of area, production, and productivity of potato were calculated in three different time period and are shown in Table no. 6.

**Table No. 6: Area, Production, Productivity of Potato crop**

| Year / Period | Area ('000 ha.) | Production ('000 Mt) | Productivity (t/ha) |
|---|---|---|---|
| **2009-10** | 27000 | 653320 | 24.2 |
| **2010-11** | 25000 | 646870 | 25.9 |
| **2011-12** | 25780 | 649500 | 25.2 |
| **2012-13** | 23400 | 624250 | 26.7 |
| **2013-14** | 20500 | 600000 | 29.8 |
| **2014-15** | 20800 | 650000 | 28.8 |
| **2015-16** | 20810 | 600000 | 31.2 |
| **2016-17** | 20000 | 576646 | 28.8 |
| **2017-18** | 24000 | 691975 | 28.8 |
| **2018-19** | 24800 | 693589 | 28.0 |
| **2019-20** | 24850 | 679300 | 26.5 |
| **2020-21** | 24900 | 695500 | 26.3 |

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| | | | |
|---|---|---|---|
| **2021-22** | 25000 | 703680 | 25.27 |
| **Average** | 23999.23 | 651894.6 | 27.5 |

Source: www.bihar./vegetable statical data

**Table No.7: Compound annual growth rate of area, production, productivity of potato crop**

| Period | Year | Area | Production | Productivity |
|---|---|---|---|---|
| **Period I** | 2007-08 to 2011-12 | -8.66** | -9.61** | -8.82** |
| **Period II** | 2012-13 to 2017-18 | 0.06 | -2.13 | -2.19** |
| **Period III** | 2018-19 to 2019-22 | -2.85** | 0.86 | 3.82** |
| **Overall Period** | 2008-09 to 2019-22 | 5.68** | 7.95*** | 2.15** |

*** 1% level of significance ($p < 0.01$)

** 5% level of significance ($p < 0.05$)

* 10% level of significance ($p < 0.10$)

The table 7 shows that annual expansion for the entire time period under examination, with annual growth rates of 5.68 percent for area, 7.95 percent for production, and 2.15 percent for yield. The results had statistical significance. It is interesting that, during the course of the time, both the study area's production and productivity and the state's overall productivity had positive yearly development. This could be attributed to the use of high-quality planting materials, an increase in cold storage facilities, and a focus on post-harvest management by the current administration to prevent farmers from losing their produce during the transfer from field gates to consumer plates.

**CONCLUSION:**

The findings demonstrate that the respondent's socio – economic standing was moderate, with a strong economic background and greater access to all assets. The study shows that the source of income of farmers is getting more from non- farming than agriculture.

According to the study, potato saw annual growth rates in Nalanda district, where annual growth rates of 5.68% in area, 7.95% in production, and 2.15% in yield was recorded for the entire period under investigation. Statistics showed that the values were significant. Food and nutritional security are being ensured to a large extent by the cultivation of rabi crops in this district. In this context, access and provision of organic manures and fertilizers, quality seeds and irrigations are emerging as major contributing factor to inputs also leads to discussions

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on inputs and agricultural subsidies to achieve the larger goal of agricultural credit and sustainable rural livelihoods.

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