**Original Research Article**

**Income and Employment patterns in the Production and Marketing of Azalea (*Rhododendron indica)* in Kalimpong district of West Bengal**

**Abstract**

The study aims to highlight the role of Azalea farming in improving the socio-economic conditions of hill farmers and its potential as a sustainable floricultural enterprise. Azalea cultivation not only generates significant income but also provides substantial employment opportunities, particularly in labor-intensive activities such as pot preparation, sowing, intercultural operations, and marketing. The present study was carried out in Kalimpong district of West Bengal during 2023-2024. Systematic and scientific approach are followed to outline the results of the study conducted. In each of the Kalimpong-I and Kalimpong-II Blocks, a nuclear village along with two adjacent villages are purposively selected to form a cluster of three villages. In each cluster of Kalimpong-I and Kalimpong-II Block, complete list of Azalea producers is prepared separately. From each cluster, 25 sample producers are finally selected with the help of Simple Random Sampling without Replacement Method (SRSWOR) for the flower growers. The study reveals that Azalea farming contributes substantially to farmers' income across all farm sizes, with smaller farms exhibiting higher returns over variable costs and net income due to optimized resource use and family labor involvement. Additionally, the employment generation aspect highlights the sector's ability to provide labor opportunities, particularly in regions with limited alternative livelihoods. Encouraging cluster development among Azalea growers, supported by public-private partnerships to build essential infrastructure like cold storage and transport facilities, can minimize post-harvest losses and improve supply chain efficiency. By integrating these policies, Azalea cultivation can be transformed into a sustainable and highly profitable venture, contributing significantly to rural development and economic growth in the hill regions of West Bengal, India.

Keywords: Azalea farming, economic growth, agro-climatic conditions, Employment patterns

**Introduction**

Azalea (*Rhododendron indica*) is a highly valued ornamental plant known for its vibrant, long-lasting blooms and adaptability to diverse environments in temperate zones worldwide (De Riek *et. al.,* 2018; Kobayashi *et. al.,* 2021). In the hill zones of West Bengal, particularly in Kalimpong district, Azalea cultivation has gained prominence (Kharga and Roy, 2020) due to its aesthetic appeal and growing demand in domestic and export markets. The plant thrives in the region's favorable agro-climatic conditions, making it a key contributor to the livelihoods of small and marginal farmers.

Azalea cultivation not only generates significant income but also provides substantial employment opportunities, particularly in labor-intensive activities such as pot preparation, sowing, intercultural operations, and marketing (Rahimi et al., 2013; De Riek et al., 2018). Despite its potential, the sector faces challenges, including high input costs, market fluctuations, and dependency on traditional farming practices. Understanding the economic viability and employment patterns associated with Azalea cultivation is crucial to enhancing its sustainability and profitability (Hao et al., 2024).

This study focuses on analyzing the income and employment dynamics of Azalea production in Kalimpong-I and Kalimpong-II blocks of Kalimpong district. Key economic indicators such as gross income, net income, and returns to management are evaluated alongside employment patterns, with a focus on family and hired labor contributions. By providing a detailed assessment, the study aims to highlight the role of Azalea farming in improving the socio-economic conditions of hill farmers and its potential as a sustainable floricultural enterprise **.**

**Research Methodology**

The present study is carried out in Kalimpong district of West Bengal. Systematic and scientific approach are followed to outline the results of the study conducted.

**Kalimpong District:**

Kalimpong district lies between 27.05940 North latitude and 88.46950 East longitude of West Bengal, India. It was formed on 14 February 2017, after splitting from the Darjeeling district as the 21st district of West Bengal. It consists of the Kalimpong Municipality and three community development blocks viz. Kalimpong I, Kalimpong II and Gorubathan. The district has its headquarters at Kalimpong. Apart from the Kalimpong municipality that consists of 23 wards, the district contains rural areas of 42 gram panchayats under three community development blocks viz. Kalimpong-I, Kalimpong-II and Gorubathan..The majority of the population today in Kalimpong district is the Gorkhas, while a significant minority is tribal.

**Source of data and sampling design:**

The present study is primarily based on micro level farm survey analysis conducted in 2023-24. With a view to examine the components, a well-structured and pre-tested interview schedule is utilized for the collection of data from flower growers, wholesalers, commission agents and retailers present in the study area..

**Selection of District:**

The present work is undertaken to critically analyze the production and marketing of principal flowers and for selection of samples, a **Multistage sampling technique** is followed. Kalimpong district of West Bengal state is purposively selected based on availability of flower growers/cultivators.

**Selection of Blocks:**

Azalea is selected from the district of Kalimpong, Kalimpong-I and Kalimpong-II Blocks are purposively selected.

**Selection of Clusters:**

In each of the Kalimpong-I and Kalimpong-II Blocks, a nuclear village along with two adjacent villages are purposively selected to form a cluster of three villages. In each cluster of Kalimpong-I and Kalimpong-II Block, complete list of Azalea producers is prepared separately. From each cluster, 25 sample producers are finally selected with the help of **Simple Random Sampling without Replacement Method (SRSWOR)** for the flower growers.

**TABLE 1. District-wise and Block-wise sample distributions of selected floricultural crops**

|  |  |  |  |
| --- | --- | --- | --- |
| **District** | **Block** | **Selected floricultural crop (Azalea)** | |
| **Clusters selected** | **No. of respondents** |
| **Kalimpong** | **Kalimpong-I** | Pudung, Sherpa Gaon, Bong Busty | 25 |
| **Kalimpong-II** | Munsong, Burmaik, Paiyong | 25 |
|  | **Total** |  | 50 |

**Analytical techniques**

In order to fulfill various objectives, set-out, tabular method of analysis was followed. However, statistical tools are also used as and when required

**Income measures:**

The following income measures have been calculated and studied during the course of the study (Raju *et. al.,* 2003):

**(i) Gross income:** It is the total value of main product.

GI = (Qm × Pm)

where,

GI = Gross income

Qm = Quantity of main product

Pm = Price of main product

1. **Returns over variable cost (RVC):**

RVC = Gross income – Cost A1

1. **Farm business income (FBI):**

FBI = Gross income – Cost A2

1. **Family labour income (FLI) or returns to family labour:**

FLI = Gross income – Cost B2

1. **Net income (NI):**

NI = Gross income – Cost C2

1. **Returns to management**

RM = Gross income – Cost C3

**(vii) Returns per rupee (RPR)**

RPR= Gross income/ ha ÷ Cost C2/ha

**Results and Discussion**

**Analysis of Income and Employment patterns in the Production and Marketing of Principal Floricultural Crops in Kalimpong--I Block of Kalimpong District of West Bengal**.

The Table 2 shows that the gross income (GI) is highest for marginal farmers at ₹ 1,546,125, while the lowest GI is recorded for semi-medium farmers at ₹ 1,055,450. In terms of returns over variable costs (RVC), marginal farmers also have the highest returns of ₹ 777,599, while the semi-medium farmers have the lowest returns of ₹ 614,134. When examining family labour income (FLI), the trend follows a similar pattern, with the marginal farmers generating ₹ 796,109 compared to ₹ 632,634 for semi-medium farms. Net income (NI) ranges from ₹ 816,152 for the marginal farmers to ₹ 644,904 for semi-medium farmers. The returns to management (RM) shows a similar variation, peaking at ₹ 897,767 for the marginal farmers. In terms of returns per rupee (RPR), semi medium farmers achieve the highest returns at 2.57, while the pooled average is 2.17, reflecting more stable but lower returns across all farm sizes​.

**Table 2. Size Group-wise Income Generation pattern of Azalea flower growers in Kalimpong-I Block of Kalimpong District of West Bengal (2022-23)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sl. No** | **Particulars** | **Category of farms** | | |  |
| **Size <1** | **Size 1-2** | **size 2-4** | **Pooled** |
| **1** | **Gross income (GI)** | 1546125.00 | 1484968.75 | 1055450.00 | 1388189.52 |
| **2** | **Returns over variable cost (RVC)** | 777599.47 | 756879.73 | 614134.71 | 712331.52 |
| **3** | **Family labour income (FLI)** | 796109.47 | 775399.73 | 632634.71 | 730943.52 |
| **4** | **Net income (NI)** | 816152.10 | 793761.23 | 644904.34 | 747570.40 |
| **5** | **Returns to management (RM)** | 897767.31 | 873137.36 | 709394.77 | 822327.44 |
| **6** | **Returns per rupee (RPR)** | 2.12 | 2.15 | 2.57 | 2.17 |

The Table 3 displays the employment generation in terms of family and hired labour for Azalea flower growers in Kalimpong-I Block. Marginal farmers have a total family labour contribution of 43.86 man-days and hired labour of 29.26 man-days, resulting in a total labour usage of 73.12 man-days. Small farmers record slightly higher labour utilization, with 44.86 man-days of family labour and 30.26 man-days of hired labour, amounting to 75.12 man-days in total. Semi-medium farmers have the highest total labour usage, with 45.86 man-days of family labour and 31.26 man-days of hired labour, making a total of 77.12 man-days. The pooled average for all farm sizes is 46.86 man-days of family labour, 32.26 man-days of hired labour, and 79.12 man-days of total labour. This indicates that while smaller farmers depend more heavily on family labour, larger farms hire more external labour, which align with the study conducted by (Patra et al., 2020) showing that larger farms often outsourced labour to meet higher demand during intensive farming periods.

**Table 3. Size Group-wise employment generation (in mandays) of Azalea flower growers in Kalimpong-I Block of Kalimpong District of West Bengal (2022-23)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Size-Group (hectare)** | **Total Family labour (mandays)** | **Total Hired Labour (mandays)** | **Total labour (mandays)** |
|
| **<1 (n=20)** | 43.86 | 29.26 | 73.12 |
| **1 to 2 (n=4)** | 44.86 | 30.26 | 75.12 |
| **2 to 4 (n=1)** | 45.86 | 31.26 | 77.12 |
| **Pooled** | 46.86 | 32.26 | 79.12 |

**Size Group-wise Income Generation Pattern of Azalea flower growers in Kalimpong-II Block of Kalimpong District of West Bengal (2022-23)**

The Table 4 displays the income generation patterns for Azalea flower growers in Kalimpong-II Block, West Bengal, during 2022-23, categorized by farm size. For marginal farmers, the gross income (GI) is ₹1,711,306.86, slightly higher than small farmers, reporting a gross income of ₹1,698,125.00. Semi-medium farmers show a lower gross income of ₹1,548,214.29, contributing to a pooled average gross income of ₹1,577,615.74 across all farm sizes. The returns over variable cost (RVC), representing income after deducting variable costs, are highest for marginal farmers at ₹759,936.19, followed by ₹768,275.53 for small farmers and ₹761,643.33 for semi medium farmers.

Family labour income (FLI), is also highest for farms marginal farmers at ₹778,436.19. small farmers report a slightly higher FLI of ₹786,795.53, while semi-medium farmers earn ₹780,543.33, resulting in a pooled FLI average of ₹781,916.97. Net income (NI), accounting for all costs and expenses, followed a similar pattern, with marginal farmers earning ₹838,289.09, small farmers receive ₹841,005.40, and semi medium farmers record ₹826,876.58, with a pooled NI of ₹835,367.86. Returns to management (RM), which reflect the income after expenses and management costs, is highest for small farmers at ₹925,105.94, followed by marginal farms at ₹922,118.00, and semi-medium farmers earn ₹909,564.24. The pooled RM is ₹918,904.65. In terms of returns per rupee (RPR), which measures income per rupee spent, semi-medium farmers have the highest efficiency at 2.15, while small farmers have 1.98, and marginal farmers have 1.96.

**Table 4. Size Group-wise Income Generation Pattern of Azalea Growers in Kalimpong-II Block of Kalimpong District of West Bengal (2022-23)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sl. No** | **Particulars** | **Category of farms** | | | |
| **Size <1** | **Size 1-2** | **Size 2-4** | **Pooled** |
| **1** | **Gross income (GI)** | 1711306.86 | 1698125.00 | 1548214.29 | 1577615.74 |
| **2** | **Returns over variable cost (RVC)** | 759936.19 | 768275.53 | 761643.33 | 763276.56 |
| **3** | **Family labour income (FLI)** | 778436.19 | 786795.53 | 780543.33 | 781916.97 |
| **4** | **Net income (NI)** | 838289.09 | 841005.40 | 826876.58 | 835367.86 |
| **5** | **Returns to management (RM)** | 922118.00 | 925105.94 | 909564.24 | 918904.65 |
| **6** | **Returns per rupee (RPR)** | 1.96 | 1.98 | 2.15 | 2.13 |

**Size Group-wise Employment Generation (in mandays) of Azalea growers in Kalimpong-II Block of Kalimpong District of West Bengal (2022-23)**

The Table 5 reveals the employment generation in terms of family and hired labour for Azalea flower growers in Kalimpong-II Block, West Bengal, during the 2022-23 season. Marginal farmers have a total family labour contribution of 60.67 man-days and hired labour of 40.55 man-days, resulting in a total labour usage of 101.22 man-days. Small farmers record slightly lower family labour utilization with 55.14 man-days and hired labour of 45.69 man-days, amounting to a total of 100.83 man-days. For semi-medium farmers, hired labour contribute more significantly, with 56.95 man-days compared to 44.04 man-days from family labour, resulting in a total labour usage of 100.99 man-days. The pooled average for all farm sizes shows 52.81 man-days of family labour, 47.23 man-days of hired labour, and a total labour usage of 100.04 man-days. This indicates that marginal farmers rely more on family labour, whereas semi-medium farms depend more on hired labour to meet their cultivation needs.

**Table 5 Size Group-wise Employment Generation (in mandays) of Azalea growers in Kalimpong-II Block of Kalimpong District of West Bengal (2022-23)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Size-Group (hectare)** | **Total Family labour** | **Total Hired Labour** | **Total labour** |
| **<1 (n=20)** | 60.67 | 40.55 | 101.22 |
| **1 to 2 (n=4)** | 55.14 | 45.69 | 100.83 |
| **2 to 4 (n=1)** | 44.04 | 56.95 | 100.99 |
| **Pooled** | 52.81 | 47.23 | 100.04 |

**Conclusion**

Azalea (*Rhododendron indica*) cultivation in the hill zones of West Bengal, particularly in Kalimpong district, demonstrates significant potential as a sustainable and economically viable floricultural enterprise. The study reveals that Azalea farming contributes substantially to farmers' income across all farm sizes, with smaller farms exhibiting higher returns over variable costs and net income due to optimized resource use and family labor involvement. Additionally, the employment generation aspect highlights the sector's ability to provide labor opportunities, particularly in regions with limited alternative livelihoods. However, the profitability of Azalea cultivation is influenced by several factors, including input costs, market access, and efficient labor utilization.

To address these challenges, policies aimed at developing organized markets, establishing cooperative models, and promoting export-oriented strategies are essential to enhance price realization and market reach. Providing subsidies on inputs such as plant protection chemicals and irrigation equipment, along with tailored credit schemes for floriculture, can reduce production costs and enable farmers to invest in advanced practices. Strengthening agricultural extension services and organizing regular training programs can equip farmers with modern cultivation and post-harvest handling techniques, while research and development efforts should focus on introducing high-yielding, disease-resistant varieties and sustainable farming practices. Encouraging cluster development among Azalea growers, supported by public-private partnerships to build essential infrastructure like cold storage and transport facilities, can minimize post-harvest losses and improve supply chain efficiency. By integrating these policies, Azalea cultivation can be transformed into a sustainable and highly profitable venture, contributing significantly to rural development and economic growth in the hill regions of West Bengal.

**References**

1. De Riek, J., De Keyser, E., Calsyn, E., Eeckhaut, T., Van Huylenbroeck, J., & Kobayashi, N. (2018). Azalea. *Ornamental crops*, 237-271**.**
2. Kobayashi, N., Nakatsuka, A., Ohta, H., Kurashige, Y., Handa, T., Scariot, V., Caser, M., Demasi, S., De Riek, J., De Keyser, E. & Van Huylenbroeck, J. (2021). Contribution of the Rhododendron ripense Makino Chloroplast genome to the development of evergreen azalea cultivars. *The Horticulture Journal*, *90*(2), 223-231.
3. Kharga, B. D., & Roy, R. Floriculture enterprise: Blooming the flower of life. *Indian Horticulture*, *67*(4).
4. Raju, V. T., Raju, V. T., Shankar, V., & Rao, V. S. (2003). *Economics of farm production and management*. Oxford and IBH Publishing Company Pvt. Limited.
5. Rahimi, S., Naderi, R., Ghaemaghami, S. A., Kalatejari, S., & Farham, B. (2013). Study on effects of different Plant Growth Regulators types in shoot regeneration and node formation of Sutsuki Azalea (Rhododendron indicum): a commercially important bonsai. Procedia Engineering, 59, 240-246.
6. Hao, Z., Li, Y., Yang, Y., Song, J., Meng, J., & Guan, W. (2024). Studies on Distant Hybridization Compatibility between the Azalea (Rhododendron× hybridum hort.) and the Rhododendron decorum Franch. Native to China. Horticulturae, 10(10), 1089.
7. De Riek, J., De Keyser, E., Calsyn, E., Eeckhaut, T., Van Huylenbroeck, J., & Kobayashi, N. (2018). Azalea. Ornamental crops, 237-271.