**Economic Analysis of Chilli Nurseries in Palnadu District Andhra Pradesh, India**

 **ABSTRACT**

Despite facing challenges such as fluctuating market demand and rising input costs, the nurseries in Palnadu continue to play an essential role in the chilli cultivation sector, serving both domestic needs and export markets. This study delves into the operations, economic significance, and prospects of chilli nurseries in Palnadu, highlighting their critical role in sustaining the district's agricultural economy. The study was conducted on chili nurseries at Palnadu District of Andhra Pradesh, India. Data for the study was collected through a well-defined and pre-tested schedule, using personal interviews to gather accurate information. For the estimation of costs and returns, simple statistical tools such as descriptive statistics, frequencies, and percentages were utilized. The study highlights the economics of chili nurseries. Data were collected from 30 randomly selected nurseries across three mandals: Rajupalem, Sattenapalli, and Rentachintala. The study identifies two cultivation cycles. Cycle 1, where 58.33% of the area was under a contract growing model, had higher demand, leading to greater labor use (528.67 man-days/hectare) and higher costs (Rs. 2,106,947/hectare). Cycle 2, with only 39.17% cultivation due to reduced demand, required fewer labor inputs (202.4 man-days/hectare) and lower costs (Rs. 1,703,906/hectare). The average production per hectare was 4.14 million seedlings in Cycle 1 and 1.62 million seedlings in Cycle 2, generating net incomes of Rs. 1,493,143 and Rs. 323,141.50, respectively. The benefit-cost ratios were 1.71 in Cycle 1 and 1.19 in Cycle 2. The variation in cultivation costs between cycles is attributed to differences in input and service utilization, including human labor, manures, fertilizers, and specialized resources like coco peat.

***Keywords:*** Labor utilization, Cost of cultivation, Output and returns, Cost concepts, Measures of Farm income, Benefit-cost ratio.

**INTRODUCTION**

Vegetables are most important constituents of Indian agriculture and nutritional security due to their high yield, short duration, economic viability, healthful richness and creating on-farm and off-farm employment. New vegetable varieties /hybrids and technological interventions have given tremendous boost to vegetable production. Chili is one of the major commercial vegetable crops that increase the income of rural people with creating employment opportunity and improvement in living standard. In India, vegetable in general and chili in particular is majorly grown by small and marginal farmers for whom it is an important source of income (Suhasini et al., 2023; Pal et al., 2025). Chillies (*Capsicum* spp.), belonging to the Solanaceae family, are one of the most significant commercial spice crops globally, often hailed as the "wonder spice." With their ability to add pungency, taste, flavour, and colour, chillies are an indispensable ingredient in a variety of cuisines worldwide (Sharma et al., 2018). Chilli is an indispensable condiment of every Indian household. It is used in daily diet on one form or the other. It is a rich source of vitamin A and with good medicinal properties among the spices consumed per head; dry chilli fonts constitute a major share (Maharshi and Kumar, 2022). India, as the world's largest producer, consumer, and exporter of chillies, plays a pivotal role in the global spice trade. Within India, the Palnadu district of Andhra Pradesh stands out as a major hub for chilli cultivation, thanks to its fertile soils and favorable climatic conditions (Hettigedara et al., 2019).

Palnadu has gained prominence not just for chilli cultivation but also for its thriving chilli nurseries (Latifah et al., 2021). These nurseries are crucial to the agricultural process, supplying high-quality seedlings that contribute to better yields and enhanced disease resistance. The economic importance of these nurseries cannot be overstated, as they support local livelihoods and contribute significantly to the region's agricultural output (Chopra & Chopra, 2004). Economic impact assessment of new technologies delivers helpful information to justify investment efforts in research and development to generate new technologies. Assessment of the economic impacts of technology delivered helpful information to justify investment efforts in research and development to generate new technologies (Pal et al., 2023).

Despite facing challenges such as fluctuating market demand and rising input costs, the nurseries in Palnadu continue to play an essential role in the chilli cultivation sector, serving both domestic needs and export markets. This article delves into the operations, economic significance, and future prospects of chilli nurseries in Palnadu, highlighting their critical role in sustaining the district's agricultural economy.

**MATERIALS AND METHODS**

Andhra Pradesh was purposively selected as the focus area for this study due to its status as the leading state in India for chilli production, making a significant contribution to the national output. Within Andhra Pradesh, Palnadu district was chosen for the study as it is the largest chilli-growing district in the state. To select nursery owners in the study area, a purposive-cum-random sampling technique was employed. A total of 30 nurseries were randomly selected from three mandals: Rajupalem, Sattenapalli, and Rentachintala.

Data for the study was collected through a well-defined and pre-tested schedule, using personal interviews to gather accurate information. For the estimation of costs and returns, simple statistical tools such as descriptive statistics, frequencies, and percentages were utilised. Additionally, cost concepts, farm efficiency measures, and concepts like depreciation and amortisation were applied to estimate fixed costs.

**RESULTS AND DISCUSSION**

Seedling cultivation in this nursery is conducted in two cycles, known as Cycle 1 and Cycle 2. During Cycle 1, the nursery operates primarily under a contract growing model, covering 58.33% of the total cultivation. However, contract growing is not practiced in Cycle 2, where the average cultivation drops to 39.17% due to lower demand for seedlings. The nursery farmers receive an average price of Rs. 1.25 per seedling and Rs. 55 per tray under the contract growing model.

Human labour is a key factor in the cost structure of chilli nurseries under shade nets. From table 1, it was stated that on average, 528.67 man-days per hectare were used in Cycle 1 and 202.4 in Cycle 2. Daily maintenance tasks like irrigation and weeding required the most labour, with 276.34 man-days in Cycle 1 and 111.37 in Cycle 2. Sowing was also labour-intensive, needing 129.6 man-days in Cycle 1 and 50.37 in Cycle 2. Uprooting seedlings required 61.29 man-days in Cycle 1 and 23.36 in Cycle 2, while coco peat preparation took 47.17 man-days in Cycle 1 and 17.3 in Cycle 2. Fewer man-days were needed for seedbed and drainage channel preparation in Cycle 2 due to infrastructure reuse. This reduction in labour highlights the importance of efficient initial preparation, leading to long-term savings and improved operational efficiency.

The profitability of any enterprise depends on both costs and returns, with total costs generally divided into variable and fixed categories. Farming communities often focus on variable costs like seeds, fertilizers, labour, and miscellaneous expenses when calculating profit and loss. However, a comprehensive economic analysis also considers fixed costs, including depreciation, interest on fixed capital, rent, and land revenue. In this study from the Table 2, the total cultivation cost per hectare for chilli nurseries was ₹2,106,947 in Cycle 1 and ₹1,703,906 in Cycle 2. Variable costs were ₹1,539,737 (73.07%) in Cycle 1 and ₹1,136,696 (66.71%) in Cycle 2, while fixed costs remained constant at ₹567,210, accounting for 26.92% in Cycle 1 and 33.28% in Cycle 2. Seed costs were the highest input expense, at ₹972,936 (46.17%) in Cycle 1 and ₹914,565 (53.67%) in Cycle 2. Human labour, crucial for various cultivation practices, was also a significant expense, amounting to ₹263,628 (12.51%) in Cycle 1 and ₹101,066 (5.93%) in Cycle 2. Other costs included fertilizers, plant protection chemicals, cocopeat, and interest on working capital. Among fixed costs, amortization of nursery establishment was the largest, at ₹398,433 (18.91% in Cycle 1 and 23.28% in Cycle 2). Other fixed costs included interest on fixed capital, depreciation, and land rent. The analysis showed that costs were higher in Cycle 1 due to full-scale cultivation, while Cycle 2 costs were lower as it covered only 39.17% of the cultivation area. This difference reflects the larger scale of operations in Cycle 1, leading to proportionally higher costs.

From the Table 3, the yield and gross returns per hectare for chilli nurseries in Cycle 1 were 4,140,000 seedlings, generating a gross income of Rs. 3,600,090, while in Cycle 2, the yield was 1,621,638 seedlings with a gross income of Rs. 2,027,048. The lower yield in Cycle 2 was due to only 39.17% of the nursery being cultivated. In Cycle 1, income came from both contract farming (Rs. 1,443,667.50) and nursery-owned seeds (Rs. 2,156,422.50). Net income was Rs. 1,493,143 in Cycle 1 and Rs. 323,141.50 in Cycle 2, with cultivation costs of Rs. 2,106,947 and Rs. 1,703,906, respectively.

The cost of cultivating chilli nurseries was analysed using the cost concepts commonly applied in farm management studies, including Cost A1, Cost A2, Cost B1, Cost B2, Cost C1, Cost C2, and Cost C3. Of these, Cost C2 is the most comprehensive, as it includes both fixed and variable costs. The cultivation costs for chilli nurseries, based on these cost concepts, were calculated and are presented in Table 4. On average, the total cost of cultivation (Cost C2) was higher, amounting to Rs. 1,708,509.86 in Cycle 1 and Rs. 1,305,469.77 in Cycle 2.

The success of farm businesses is evaluated through key indicators like farm business income, family labor income, net income, farm investment income, and returns per rupee of expenditure, as detailed in Table 5. In Cycle 1, farm business income was Rs. 2,018,747, family labor income was Rs. 1,905,977, and net income was Rs. 1,720,725.6. Cycle 2 showed lower figures, with farm business income at Rs. 839,945, family labor income at Rs. 727,175, and net income at Rs. 591,027.7. Farm investment income was Rs. 2,004,347 in Cycle 1 and Rs. 834,345 in Cycle 2. The returns per rupee of expenditure were Rs. 1.71 in Cycle 1 and Rs. 1.19 in Cycle 2.

**Table 1 Human labour utilization – operation-wise in chilli seedlings cultivation**

 (Man days per hectare)

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No** | **Particulars** | **Cycle 1** | **Cycle 2** |
| 1 | Cocopeat Preparation | 46.17(8.73) | 17.3(8.54) |
| 2 | Formation of drainage channels | 5.77(1.09) | 0 |
| 3 | Removal of Stubbles | 6.13(1.15) | 0 |
| 4 | Seedbed Preparation | 3.37(0.63) | 0 |
| 5 | Sowing of seeds | 129.6(24.51) | 50.37(24.88) |
| 6 | Daily maintenance activities | 276.34(52.57) | 111.37(55.02) |
| 7 | Uprooting of Seedlings | 61.29(11.59) | 23.36(11.54) |
| 8 | Total | 528.67(100.00) | 202.4(100.00) |
| 9 | Owned | 36(6.80) | 14(6.91) |
| 10 | Hired | 492.67(93.19) | 188.4(93.08) |

Note: Figures in parentheses indicate percentages to the total.

# **Table 2 Cost of cultivation of chilli seedlings component-wise**

 (in Rupees per hectare)

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No** | **Particulars** | **Cycle 1** | **Cycle2** |
| **1** | **Variable cost** |  |  |
| a | Human Labour | 263628(12.51) | 101066(5.93) |
|  | Owned | 14400(0.68) | 5600(0.32) |
|  | Hired | 249228(11.82) | 95466(5.60) |
| b | Cost Of Seeds | 972936(46.17) | 914565(53.67) |
| c | Fertilisers | 42245(2.00) | 16548(0.97) |
| d | Plant Protection Chemicals | 23563(1.11) | 9229(0.54) |
| e | Coco Peat | 220953(10.48) | 86548(5.07) |
| f | Miscellaneous | 6255(0.29) | 1251(0.07) |
| g | Interest rate on Working Capital | 10157(0.48) | 7489(0.43) |
|  | **Total Variable cost** | 1539737(73.07) | 1136696(66.71) |
| **2** | **Fixed Cost** |  |  |
| a | Land revenue | 375(0.01) | 375(0.02) |
| b | Rental value of land | 68334(3.24) | 68334(4.01) |
| c | Depreciation | 55632(2.64) | 55632(3.26) |
| d | Amortized Cost | 398433(18.91) | 398433(23.38) |
| e | Interest on Fixed capital | 44436(2.10) | 44436(2.60) |
|  | **Total Fixed Cost** | 567210(26.92) | 567210(33.28) |
| **3** | **Total Cost** | 2106947(100.00) | 1703906(100.00) |

 Note: Figures in parentheses indicate percentages to the total.

# **Table 3 Output and returns per hectare chilli nurseries**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S. No** | **Particulars** | **Units** | **Cycle 1** | **Cycle 2** |
| 1 | **Yield in physical units** |
| a | Main product | Seedlings | 4140000 | 1621638 |
| b | By product | - | - | - |
| 2 | **Yield in monetary units** |
| a | Main product | Rupees | 3600090 | 2027048 |
| b | By product | - | - | - |
| 3 | Gross Returns | Rupees | 3600090 | 2027048 |
| 4 | Cost of Cultivation | Rupees | 2106947 | 1703906 |
| 5 | Net Returns | Rupees | 1493143 | 323141.5 |

# **Table 4 Cost concepts in chilli seedlings production**

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No** | **Particulars** | **Cycle 1** | **Cycle 2** |
| 1 | Cost A1 | 1581340.92 | 1187100.83 |
| 2 | Cost A2 | 1649674.25 | 1255434.16 |
| 3 | Cost B1 | 1625776.53 | 1231536.44 |
| 4 | Cost B2 | 1694109.86 | 1299869.77 |
| 5 | Cost C1 | 1640176.53 | 1237136.44 |
| 6 | Cost C2 | 1708509.86 | 1305469.77 |
| 7 | Cost C3 | 1879360.84 | 1436016.74 |

# **Table 5 Measures of farm income in production of chilli seedlings**

|  |  |  |  |
| --- | --- | --- | --- |
| **S. No** | **Particulars** | **Cycle 1** | **Cycle 2** |
| 1 | Gross Income | 3600091 | 2027048 |
| 2 | Net Income  | 1720725.6 | 591027.7 |
| 3 | Farm Business Income | 2018747 | 839945 |
| 4 | Family Labour Income | 1905977 | 727175 |
| 5 | Farm Investment Income | 2004347 | 834345 |
| 6 | Returns per Rupee Expenditure | 1.708676583 | 1.189647786 |

**CONCLUSION**

The study highlights that Cycle 1, with its contract growing model, exhibited superior efficiency and stability in seedling production due to pre-ordered seedlings, leading to higher profitability. In contrast, Cycle 2 faced reduced seedling production and profitability due to lower demand and the absence of contract growing. The significant drop in labor requirements from Cycle 1 to Cycle 2 underscores effective cost management, which was necessary due to the decreased demand. Reduced input use in Cycle 2 further reflects efficient resource management in response to this demand shift. The variation in cultivation costs between cycles is attributed to differences in input and service utilisation, including human labor, manures, fertilizers, and specialised resources like coco peat. Despite both cycles being profitable, Cycle 1 achieved a higher return on investment, earning Rs. 1.71 per rupee spent compared to Rs. 1.19 in Cycle 2, highlighting its greater financial reward and efficiency during a period of full-scale production.

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