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## Economic analysis and profitability assessment of high-tech cabbage cultivation in Chhattisgarh

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### Abstract

The present study investigates the economics and profitability of Cabbage cultivation under high-tech farming conditions in the Chhattisgarh Plains. Using data from 240 sample farms across varying farm sizes, detailed cost and return analysis was conducted to assess economic viability. The overall cost of cultivation per hectare was estimated at Rs. 226162.33 with variable costs comprising around 61.65 percent mainly contributed by manures and fertilizers, plant protection, and labour inputs. Fixed costs accounted for 38.35 percent, including depreciation and rental value of owned land. Among labour inputs, hired labour formed the major cost component. The total cost of cultivation varied slightly across farm sizes, with large farms incurring Rs. 227557.31 per hectare and small farms Rs. 224371.27 per hectare.

Gross returns from Cabbage cultivation under high-tech conditions were calculated at Rs. 525000.89 per hectare, resulting in a net return of Rs. 354580.91 per hectare and an output-input ratio of 3.17. Break-even analysis revealed that the required yield to cover total cost was 113.63 quintals per hectare, while actual yields averaged 350.23 quintals per hectare. Offering a significant margin of safety at 67.54 percent. Profitability improved with scale, as larger polyhouses demonstrated higher economic efficiency. The study concludes that Cabbage cultivation under protected structures such as polyhouses and use high-technologies under farming highly profitable and economically sustainable, particularly when supported with proper input management and scale optimization.

**Keywords:** Economics, profitability, high-tech vegetables farming, break even analysis, marketing participation

### Introduction

Vegetables are a vital component of Indian agriculture, contributing significantly to nutritional security and economic development. India's diverse agro-climatic conditions and seasonal variability enable year-round cultivation of a wide array of vegetable crops. With nearly one-third of the Indian population adhering to a vegetarian diet, vegetables play a crucial role in supplying essential nutrients such as vitamins, minerals, dietary fiber, and plant-based proteins. Rising consumer demand for fresh, high-value produce and shifting dietary patterns have spurred rapid growth in the vegetable sector. Moreover, the integration of modern technologies including improved hybrids, integrated nutrient and pest management (INM/IPM), better farmer training, and supportive policy frameworks has further enhanced productivity and quality across the country. Protected cultivation, in particular, has emerged as a transformative solution, allowing for year-round vegetable production by mitigating adverse environmental conditions and maximizing resource use efficiency.

Chhattisgarh, with its bio-geographical diversity and availability of small fragmented landholdings, presents a unique niche for high-tech and off-season vegetable cultivation. The state has increasingly adopted protected cultivation technologies such as polyhouses, shed nets, drip irrigation, and mulching to promote sustainable and profitable farming. According to recent data from the Department of Horticulture and Farm Forestry, Government of Chhattisgarh, the 49178.33 hectare area under protected cultivation, including shed net houses and playhouses, has expanded to cover several hectares. These initiatives are further supported by central and state schemes like the National Horticulture Mission, which provide subsidies and infrastructure development to encourage adoption. In this context, high-tech vegetable farming holds immense

potential for enhancing farmer incomes, improving produce quality, and ensuring a stable supply of vegetables even under adverse climatic conditions.

## Materials and Methods

### Sampling Procedure and Sample Size

Chhattisgarh state comprises of 33 districts, each contributing to the state diverse agricultural economy. Among them, Raipur, Durg, Mahasamund, Bilaspur and BalodaBazar has been selected purposively for study purpose based on highest area covered under Chhattisgarh plain.

### Nature and Source of Data

#### Primary data

Primary data for the study was collected directly from high-tech vegetable growers across five selected districts in the Chhattisgarh Plains agro-climatic zone. A percentage proportionate sampling method was employed to ensure adequate representation of the grower population in each district. Specifically, 30% of the total high-tech vegetable growers in the selected districts were sampled for the survey.

In total, 240 farmers practicing high-tech vegetable cultivation were selected using this method. The district-wise distribution of the sample households was as follows: Raipur 63, Durg 45, Mahasamund 69, Bilaspur 32, and Baloda Bazar 31.

#### Secondary data

Secondary data was collected from research papers, books, journals, and reports from government and non-government agencies to support and complement the findings.

### Analytical tools

#### Cost and Return Analysis

The cost and return analysis of Cabbage cultivation under high-tech farming in the Chhattisgarh Plain zone was conducted using the Cost of Cultivation methodology prescribed by the CACP.

The Commission of Agricultural Costs and Prices (CACP), concept were used for estimation of Cost concepts. Under this method, the cost of cultivation and production was computed by using the 7 Cost concepts, which are known as cost A<sub>1</sub>, cost A<sub>2</sub> cost B<sub>1</sub>, cost B<sub>2</sub> and cost C<sub>1</sub>, cost C<sub>2</sub>, and cost C<sub>3</sub>.

**Cost A<sub>1</sub>:** Consist of following 16 items of costs:-

1. Value of hired human labour (permanent and casual)
2. Value of bullock labour(owned & hired)
3. Value of owned machinery labour(owned & hired)
4. Value of fertilizers, insecticides and fungicides.
5. Value of seed (both farm-produced and purchased)
6. Irrigation charges and land revenue
7. Interest on the working capital.
8. Depreciation on farm implements

Cost A<sub>2</sub> = Cost A<sub>1</sub> + Rent paid for Leased in Land.

Cost B<sub>1</sub>= Cost A<sub>1</sub>+ Interest on value of Owned fixed Capital assets (excluding land) Cost B<sub>2</sub> = Cost B<sub>1</sub> + Rental value of owned land

Cost C<sub>1</sub>= CostB<sub>1</sub>+ImputedvalueofFamilyLabour. Cost C<sub>2</sub>= Cost B<sub>2</sub> + Imputed value of Family labour.

CostC<sub>3</sub>=Cost C<sub>2</sub> +10 percent of cost C<sub>2</sub> taking as managerial allowances.

#### a) Input-Output Ratio

Input-output ratio indicates the efficiency of input.

#### b) Income Analysis

- **Family labour income:** It is measured on earning of a farmer and his family for his labour and managerial work. It is equal to gross income minus total expenses excluding wage of unpaid family labour.

Family labour income = Gross income Cost B

- **Farm business income:** It is a measure of earning of farmer and his family for his capital investment, labour and managerial work.

Farm business income = Gross income Cost A<sub>1</sub>

- **Farm investment income:** This is the sum of net income, rental value of owned land and interest on fixed capital.

Farm investment income = Farm business income Imputed value of family labour.

- c) **Returns:** Returns were noted in quintals and the monetary values were calculated at prevailing market prices.

#### d) Benefit-Cost ratio analysis

It is a ratio between the value of net return and the cost of cultivation at different cost concepts. This is the ratio which represents returns obtained per rupee of investment. It was worked out by dividing net return by the total cost.

#### e) Break Even Point Analysis

The point at which the two curves, i.e., total cost curve and total revenue curve intersect is called the break-even point (BEP) which indicates the level of production at no profit no loss. In other words, the quantity at which all costs allocated to a product are equal to all revenue from its sale is known as break-even point (Sahu *et al.*, 2020; Singh and Singh, 1999; Sunil Kumar *et al.*, 2010) [3, 6, 7].

$$BEP = F / (P - AVC)$$

Where,

BEP = Break Even Point in terms of physical units of production.

F = Total Fixed Cost (Rs.)

AVC = Average variable cost of vegetable crop production (Rs.)

P = Price of the output (Rs.)

#### Disposal pattern:

To examine the marketing pattern of major crops at different categories of farms, simple analysis was done.

#### Marketable surplus

To estimate the marketable surplus of produce, total quantity used for different purposes is deducted from total production of crop.

Marketable Surplus = Total quantity produced - Total quantity used for consumption

Where,

MS=Marketable Surplus, P = Total Production

C=Family members consumption S=Quantity retained for seed.

### Price Spread

Price Spread = Price Received By the Farmer / Retail Price Paid By the Consumer × 100  
Review literature

### Economics and Profitability of Tomato Production under High-tech Conditions

Costs and return of cabbage cultivation is essential to understand that how much cost incurred for different inputs and whether farmers are receiving the profit or not. It is therefore, the cost and return of cabbage cultivation under high-tech was estimated in Rs per hectare, which is given in table 4.17. The total cost of cultivation of cabbage of sample farms at overall was Rs 226162.33 per hectare, total variable cost was 61.65 per cent and the share of cost manure and fertilizer 18.65 per cent cost was maximum followed by materials imputed plant protection 12.78 per cent, human labour (hired and family labour) and found to be 7.67 per cent, seed 4.61 per cent, interest on working capital 3.55 per cent, machine power cost (machine) 1.84 per cent. Total fixed cost was 38.35 per cent, Depreciation was 22.11

percent, rental value of owned land was 13.26 per cent and interest on fixed capital was 2.84 per cent. Among all the input cost human labour was noticed to be the major cost. In which, inputted value of hired labour cost was shared comparatively more than that of family labour cost i.e. 4.45 percent. The total cost of cultivation of cabbage under high-tech was increasing with respect to farm size of holdings and found to be maximum under large farms Rs 227557.31 hectare and minimum at small farms Rs 224371.27 per hectare.

### Costs obtain on the basis of different cost concept of cabbage crop in under high-tech farming

Cost of cultivation of cabbage of sample farms in the high-tech farming area has been worked out and presented in table 4.18. It is envisaged that Cost A1 as designated the variable cost and it was found to be Rs 101617.55 per hectare on overall basis, indicates the interest on fixed capital imputed with Cost B1 Rs 114598.88 per hectare rental value of own land Rs 30000.25 per hectare prevailed in the study area.

**Table 4.17:** Cost of cultivation of cabbage under high-tech farming in the study area.(Rs/ha)

| Particulars                           | Small               | Medium              | Large               | Overall             |
|---------------------------------------|---------------------|---------------------|---------------------|---------------------|
| <b>A. Material cost</b>               |                     |                     |                     |                     |
| Seed                                  | 12250.35<br>(4.23)  | 13800.45<br>(4.74)  | 14200.55<br>(4.85)  | 13417.48<br>(4.61)  |
| Manures and fertilizer                | 54300.12<br>(18.77) | 54400.23<br>(18.69) | 54200.34<br>(18.50) | 54300.56<br>(18.65) |
| Plant protection                      | 30000.67<br>(13.37) | 28500.78<br>(12.58) | 28200.89<br>(12.39) | 28900.91<br>(12.78) |
| Irrigation charges                    | 5000.11<br>(1.73)   | 5000.22<br>(1.72)   | 5000.33<br>(1.71)   | 5000.44<br>(1.72)   |
| Total material cost                   | 101551<br>(35.10)   | 101702<br>(34.94)   | 101602<br>(34.68)   | 101619<br>(34.90)   |
| <b>B. Human labour cost</b>           |                     |                     |                     |                     |
| Family labour                         | 12500.15<br>(4.32)  | 12645.26<br>(4.34)  | 13800.37<br>(4.71)  | 12982.48<br>(4.45)  |
| Hired labour                          | 8200.19<br>(2.83)   | 9750.29<br>(3.35)   | 9500.39<br>(3.24)   | 9150.49<br>(3.14)   |
| Total human labour cost               | 20700<br>(7.15)     | 22396<br>(7.69)     | 23301<br>(7.95)     | 22133<br>(7.60)     |
| <b>C. Power use cost</b>              |                     |                     |                     |                     |
| <b>Bullock labour</b>                 |                     |                     |                     |                     |
| Machine power                         | 5200.51<br>(1.80)   | 5380.61<br>(1.85)   | 5500.71<br>(1.88)   | 5360.81<br>(1.84)   |
| Total power use cost                  | 5200.51<br>(1.80)   | 5380.61<br>(1.85)   | 5500.71<br>(1.88)   | 5360.81<br>(1.84)   |
| Interest on working capital @8%       | 10196.91<br>(3.52)  | 10358.92<br>(3.56)  | 10432.93<br>(3.56)  | 10328.94<br>(3.55)  |
| (I). Total Variable Cost              | 137646.89           | 139833.90           | 140832.91           | 139437.92           |
| (A + B + C + Int.)                    | (61.35)             | (61.72)             | (61.89)             | (61.65)             |
| <b>D. Fixed cost</b>                  |                     |                     |                     |                     |
| Depreciation                          | 50000.01            | 50000.02            | 50000.03            | 50000.04            |
| (Polyhouse, Drip, etc.)               | (22.28)             | (22.07)             | (21.97)             | (22.11)             |
| Land revenue                          | 300.05<br>(0.13)    | 300.06<br>(0.13)    | 300.07<br>(0.13)    | 300.08<br>(0.13)    |
| Rental value of land                  | 30000.09<br>(13.37) | 30000.10<br>(13.24) | 30000.11<br>(13.18) | 30000.12<br>(13.26) |
| Interest on fixed working capital @8% | 6424.13<br>(2.86)   | 6424.14<br>(2.84)   | 6424.15<br>(2.82)   | 6424.16<br>(2.84)   |
| (II). Total Fixed Cost                | 86724.38<br>(38.65) | 86724.39<br>(38.28) | 86724.40<br>(38.11) | 86724.41<br>(38.35) |
| Total Cost                            | 224371.27           | 226558.29           | 227557.31           | 226162.33           |
| (A + B + C + D)                       | (100)               | (100)               | (100)               | (100)               |

**Note:** Figures in parentheses indicate percentages of the total cost

**Table 4.18:** Cost estimates of cabbage under high-tech cultivation in the study area (Rs/ha)

| Particulars | Small     | Medium    | Large     | Overall   |
|-------------|-----------|-----------|-----------|-----------|
| Cost A1     | 101550.11 | 101700.22 | 101600.33 | 101617.55 |
|             | (59.85)   | (59.76)   | (65.19)   | (61.62)   |
| Cost B1     | 114050.44 | 114345.55 | 115400.66 | 114598.88 |
|             | (67.21)   | (67.19)   | (74.05)   | (67.24)   |
| Cost B2     | 144050.77 | 144345.88 | 145400.99 | 144598.88 |
|             | (84.90)   | (84.82)   | (93.30)   | (87.54)   |
| Cost C1     | 124246.10 | 124703.21 | 125832.32 | 124927.54 |
|             | (73.22)   | (73.27)   | (80.74)   | (75.30)   |
| Cost C2     | 154246.43 | 154703.54 | 155832.65 | 154927.87 |
|             | (90.90)   | (90.90)   | (99.99)   | (93.93)   |
| Cost C3     | 169670.76 | 170173.87 | 155832.98 | 170419.70 |
|             | (100)     | (100)     | (100)     | (100)     |

**Note:** Figures in parentheses indicate percentages of the total cost

Normally, farmers are cultivating the crop in their own land but it has imputed rental value of land of Rs 30000.12 per hectare a notified Cost B2 was Rs 144598.88 per hectare. The Cost C1 found to be Rs 124927.54 per hectare, includes the value of Cost B1 and imputed value of family labour was found to be Rs 12982.48 per hectare. The Cost C2, found to be Rs 154927.87 per hectare, includes the value of Cost B2 and imputed value of family labour and The Cost C3, found to be Rs 170419.70, imputed value of managerial allowances at 10 per cent of Cost C2.

**Table 4.19:** Farm profitability of cabbage under protected cultivation in the study area (Rs/ha)

| Particulars              | Small     | Medium    | Large     | Overall   |
|--------------------------|-----------|-----------|-----------|-----------|
| Yield (qtls)             | 350.12    | 348.23    | 352.34    | 350.23    |
| Gross Returns            | 525000.45 | 522000.56 | 528000.67 | 525000.89 |
| Farm Business Income     | 423450.78 | 420300.89 | 426400.90 | 423383.52 |
| Family Labour Income     | 380950.34 | 377655.45 | 382600.56 | 380402.12 |
| Net Income (Farm Income) | 355329.67 | 351827.78 | 372168.89 | 354580.91 |
| Farm Investment Income   | 370754.12 | 367297.23 | 372168.34 | 370073.56 |
| Output-Input Ratio       | 3.09      | 3.06      | 3.38      | 3.17      |

### Farm profitability of cabbage under high-tech farming

The economics of cabbage cultivation presented in table 4.19. It has been observed from empirical findings that overall output input ratio were found to be 3.21, On an overall basis Gross returns (total income) was observed to the Rs 525000.89 per hectare, while net returns was found to be Rs 354580.91 per hectare and overall production of tomato under high-tech was 350.23 quintal per hectare.

### Break-even analysis and margin of safety

Table 4.20 presents the results of break-even analysis and margin of safety for cabbage under protected cultivation. The results revealed overall that 350.23 quintals respectively. The breakeven yield, returns and percent of total output, increased with size of polyhouse. The margin of safety in protected cultivation of cabbage was almost thrice and twice of small to large respectively. The margin of safety for small 236.89 quintal, medium 234.55 quintal, and large 248.11 quintal sized polyhouses was also estimated. Further, the overall percent margin of safety under protected cultivation of cabbage in 67.54 percent.

**Table 4.20:** Break-even analysis of cabbage under protected cultivation (Rs/ha)

| Particulars                   | Small     | Medium    | Large     | Overall   |
|-------------------------------|-----------|-----------|-----------|-----------|
| Cost of Cultivation (Rs.)     | 169670.61 | 170173.32 | 155832.03 | 170419.74 |
| Yield (qtls)                  | 350.12    | 348.23    | 352.34    | 350.23    |
| Break-Even Yield (qtls)       | 113.61    | 113.46    | 103.90    | 113.63    |
| Gross Returns                 | 525000.45 | 522000.56 | 528000.67 | 525000.56 |
| Net Returns                   | 355329.40 | 351826.70 | 372168.00 | 354580.30 |
| Break-Even Returns            | 169670.60 | 170173.32 | 155832.03 | 170419.74 |
| Margin of Safety (qtls)       | 236.89    | 234.55    | 248.11    | 236.39    |
| Margin of Safety (Rs.)        | 355329.45 | 351826.70 | 372168.00 | 354580.30 |
| Margin of Safety (% of yield) | 67.88     | 67.40     | 70.49     | 67.54     |

### Conclusion

The economic analysis of Cabbage cultivation under high-tech conditions demonstrates its high profitability and strong financial viability. With a total cultivation cost of Rs 170419.74 per hectare and gross returns of Rs 525000.56 per hectare, farmers achieved a substantial net return of Rs. 354580.30 and an output-input ratio of 3.17. Variable costs made up the majority of total expenses, with manures and fertilizers being the largest component, followed by plant protection and human labour. The break-even yield was calculated at 113.63 quintals per hectare, significantly lower than the actual average yield of 350.23 quintals, resulting in a wide margin of safety at 67.54 percent. These results indicate that high-tech Cabbage cultivation is not only productive but also economically secure, offering a lucrative option for farmers seeking to enhance income through protected horticulture.

### References

1. Dias N, Thilani M, Bandara S. Factors influencing farmers' adoption of protected agriculture: a case of vegetable farmers in dry zone Sri Lanka. *Curr Investig Agric Curr Res*. 2020;13(14):16-20.
2. Franco D, Singh DR, Praveen KV. Economic feasibility of

- vegetable production under polyhouse: a case study from Palakkad district of Kerala. *J Crop Weed*. 2018;14:134-139.
3. Kumar S, Gupta S. Crop diversification towards high-value crops in India: a state level empirical analysis. *Agric Econ Res Rev*. 2015;28(2):339-350.
4. Maspatella M, Garnevska E, Siddique MI, Shadbolt N. Towards high value markets: a case study of smallholder vegetable farmers in Indonesia. *Int Food Agribus Manag Rev*. 2018;21(1):73-88.
5. Paulrajan R, Jacob F. Business models of vegetable retailers in India. *Great Lakes Herald*. 2010;4(1):31-43.
6. Sahu T, Gauraha AK, Chandravanshi V, Sai YK. Economic analysis of tomato in shade net cultivation in Durg district of Chhattisgarh. *J Pharmacogn Phytochem*. 2018;7(2):883-885.
7. Singh A, Kumar S. Economic analysis of production and marketing of major vegetable crops in Uttar Pradesh. *Int J Creat Res Thoughts*. 2024;12(1):2320-288.
8. Thakur N, Sharma R, Kumar K, Sharma A. Evaluation of the socio-economic status of open and protected vegetable growers in mid hill zone of Himachal Pradesh. *Prog Hortic*. 2023;55(2).