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## Economics of an emerging enterprises of makhana cultivation: A case study of Chhattisgarh plains

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#### Abstract

An attempt has been done for analysis for economics of an emerging enterprises of makhana cultivation: a case study of Chhattisgarh plains. The research was carried out in Dhamtari and Raipur District of Chhattisgarh. Dhamtari KVK under farmers and Ojas Farm are cultivating makhana in pond system. The overall cost of cultivation of Makhana per hectare is Rs. 1,27,105.04. The gross return for makhana was Rs. 2,83,500/ha. The average yield per ha is Rs. 18.9 qt. and net returns is Rs. 1,56,395/ha. The total cost of cultivation of Makhana is Rs. 80464.37 / ha. The gross return for makhana is Rs. 2,17,500/ha. The average yield was 14.5 qt. The net returns is Rs. 1,37,035.62/ha. The cost of processing per kg of the makhana seed is Rs. 22.50. The cost of processing makhana pop is Rs. 70.31 per kg. Benefit-cost ratio for makhana is 1:1.23. The Input-output ratio for makhana is 1:2.23. Benefit-cost ratio for makhana is 1:1.70. The input-output ratio for makhana is 1:2.70. The major constraints in the production of makhana was lack of technical knowledge about cultivation, followed by limited availability of seed, lack of modern equipment, lack of credit availability, adverse environment factors, lack low productivity and used old processing technique, problems in the processing of makhana ware lack of processing machinery and equipment, followed by nonavailability of credit facility, and health risks and dependence on climate conditions.

**Keywords:** Cost-return, processing cost, constraints makhana

#### Introduction

Makhana or Fox Nut (*Euryale ferox*) Family Nymphaeaceae, the makhana plant is considered as native to Southeast Asia and China. Makhana is a high-value commodity commercially cultivated only in Bihar and certain parts of eastern India. The makhana market has grown at a CAGR (Compound Annual Growth Rate) of almost 7percent during the forecast period of 2019-2023. (<https://agrilexchange.apeda.gov.in>). Bihar is the world's greatest producer of makhana, accounting for 90% of global production makhana cultivation is primarily practiced in West Bengal, Bihar, Manipur, Tripura, Assam, Madhya Pradesh, Rajasthan, and Uttar Pradesh. Makhana is considered as an aquatic crop in India; Bihar is the leading state in its production and processing. The total area under makhana cultivation in India is estimated to be 15,000ha. It yields 1,12,000 MT of makhana seeds, which after processing yields 40,000MT of makhana pop. (<https://horticulture.bihar.gov.in>).

A single makhana plant produces about 100 seeds and there are about 10,000 plants in 1 ha. The yield of raw makhana seed is about 1.8 -2.0 t/ha of pond area. The chemical constituents of the popped kernels in percentages are 12.8 moisture, 76.9 carbohydrates, 9.7 protein, 0.1 fat, 0.5 total minerals, 0.02 calcium, 0.9 phosphorous, 0.0014 iron. It was found makhana superior to dry fruits such as almonds, walnut, cashew nut and coconut in contents of sugar, proteins, ascorbic acid and phenol.

Makhana cultivation is one of the new adoptions among farmers in Chhattisgarh as a possibility of providing them with good profitability. This was done exclusively for the first time in the dhamtari district of Chhattisgarh by KVK research team. This led to the farmers sowing makhana as a cash crop, making it an ideal product to conduct economic analysis. Very few studies have been conducted on economies in makhana production in the state on a national level. Looking at the above fact the study on economics of an emerging enterprises of makhana cultivation: A case of Chhattisgarh plains has been done with the help of following specific objectives:

1. To examine the cost and returns of makhana cultivation.
2. To analyze the processing cost of makhana.
3. To find out the constraints in the production and processing of makhana.

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## Material and Methods

### Selection of farm

The study was conducted in the Dhamtari and Raipur district of Chhattisgarh. In Dhamtari and Raipur district Dhamtari KVK under farmer and OJAS FARM was selected purposively for the study. For the current study Makhana seeds and Makhana pop products was selected.

This chapter presents the materials and research technique used with respect to the selection of study, Dhamtari KVK under farmer and OJAS FARM respondent member data collecting, and analysis tools.

### Analysis of cost of cultivation of makhana

To determine the total cost, operating expenses as well as fixed expenses related to the cultivation of makhana are taken into account.

### Income measures

#### A. Gross income

Gross income = Total yield (kg) × Market price of the crop (Rs. /Kg)

#### B. Net return

Net return = Gross income - Total cost

#### C. Input -Output ratio

Input-Output ratio =  $\frac{\text{Gross income}}{\text{Total cost}}$

#### D. B-C ratio

B-C ratio =  $\frac{\text{Net return}}{\text{Total cost}}$

## Result and Discussion

### Cost and return of makhana cultivation in dau ji farm

It is evident from the table 1 that, the total yield of makhana seed of dau ji makhana was 18.9qt. Per hectare and price of per qt. seed is Rs. 15,000 so the value of total gross return was Rs. 2,83,500 per hectare. The benefit cost ratio of makhana was found to be 1.22 and the input- output ratio of makhana was found to be 2.22. The net return of makhana was noticed Rs. 1,56,395 per hectare, from the above it was reveals that in makhana cultivation the average cost was found to be 1,27,105.04. It is evident that Dua ji makhana members are engaged in a successful business of growing makhana

**Table 1:** Cost cultivation of makhana in Dua ji makhana farm

| Operational cost |                             |                  |                          |
|------------------|-----------------------------|------------------|--------------------------|
| S. No.           | Cost items                  | Cost per hectare | Percentage of total Cost |
| 1                | Owened labour               | 11431.29         | 11.59                    |
| 2                | Hired labour                | 48980.08         | 49.67                    |
|                  | Total human labour cost     | 60411.37         | 61.27                    |
| 3                | Seedling                    | 6780             | 6.87                     |
| 4                | Insecticide/ pesticide      | 2690.9           | 2.72                     |
| 5                | Manure/fertilizer           | 4598             | 4.66                     |
|                  | Total material cost         | 14068.9          | 14.26                    |
| 6                | Irrigation charges          | 16560            | 16.79                    |
| 7                | Miscellaneous cost          | 3760.35          | 3.81                     |
| 8                | Interest on working capital | 3792.02          | 3.84                     |
| 9                | Total operational cost      | 98592.64         | 100                      |
| Fixed cost       |                             |                  |                          |
| 10               | Rental value /owned pond    | 24979.52         | 87.60                    |
| 11               | Depreciation                | 940.84           | 3.29                     |
| 12               | Interest on fixed capital   | 2629.53          | 9.09                     |
| 13               | Total of fixed cost         | 28512.39         | 100                      |
|                  | Total cost (TVC+TFC)        | 127105.04        |                          |
| Returns          |                             |                  |                          |
|                  | Yield (in qt.)              | 18.9             |                          |
|                  | Price Rs/qt.                | 15,000           |                          |
|                  | Gross returns (in Rs)       | 2,83,500         |                          |
|                  | Net returns (in Rs)         | 1,56,395         |                          |
|                  | Benefit cost ratio          | 1.23             |                          |
|                  | Input-output ratio          | 2.23             |                          |

### Cost and return of makhana cultivation in Dhamtari district

Table 2 represent the cost & return of makhana cultivation in Dhamtari district. The total yield of makhana seed was 14.5 qt. and price of per qt. seed is Rs. 15,000 so the value of total gross return was Rs. 2,17,500. The benefit cost ratio of

makhana was found to be 1.70 and the input-output cost ratio was 2.70. The net return of makhana was noticed to be Rs. 1,37,035.62 per hectare. From the it was also reveals that in makhana cultivation the average cost was found to be Rs. 80,464.37. It is evident that KVK under members are engaged in a successful business of growing makhana.

**Table 2:** Cost cultivation of makhana in Dhamtari KVK

| Operational cost |                             |                  |                          |
|------------------|-----------------------------|------------------|--------------------------|
| S. No.           | Cost items                  | Cost per hectare | Percentage of total cost |
| 1                | a) Owned labour             | 8516.6           | 14.37                    |
| 2                | b) Hired labour             | 25625.56         | 45.24                    |
|                  | Total human labour cost     | 34142.16         | 57.61                    |
| 3                | a) Seedling                 | 4710             | 7.94                     |
| 4                | b) Insecticide/ pesticide   | 1820.43          | 3.07                     |
| 5                | c) Manure/fertilizer        | 2840             | 4.79                     |
|                  | Total material cost         | 9370.43          | 15.81                    |
| 6                | Irrigation charges          | 11230            | 18.94                    |
| 7                | Miscellaneous cost          | 2240.32          | 3.78                     |
| 8                | Interest on working capital | 2279.31          | 3.84                     |
| 9                | Total operational cost      | 59262.22         | 100                      |
| Fixed cost       |                             |                  |                          |
| 10               | Rental value/owned pond     | 18649.25         | 87.95                    |
| 11               | Depreciation                | 625.43           | 2.94                     |
| 12               | Interest on fixed capital   | 1948.46          | 9.09                     |
| 13               | Total of fixed cost         | 21202.14         | 100                      |
|                  | Total cost                  | 80464.37         |                          |
| Returns          |                             |                  |                          |
|                  | Yield (in qt.)              | 14.5             |                          |
|                  | Price Rs/qt.                | 15,000           |                          |
|                  | Gross returns (in Rs)       | 2,17,500         |                          |
|                  | Net returns (in Rs)         | 1,37,035.62      |                          |
|                  | Benefit cost ratio          | 1.70             |                          |
|                  | Input-output ratio          | 2.70             |                          |

**Tools and equipment used in processing of Makhana**

**Khonghli or Deli:** It is a small bamboo stick bucket with cylindrical shape. It is used for storing raw, popped seed and in polishing operations.

**Sieve:** Sieve is made of iron sheets with wooden frames. In general, seven to ten sieves of different mesh sizes are used for grading of raw makhana seed.

**Mats:** Mats are used for sun-drying raw makhana seed before roasting.

**Iron pan:** It is a cooking pan or utensil which is used for pre-heating and roasting of Makhana seeds.

**Aphara, Batna and Thapi:** These are wooden appliance made of hardwood, mostly of shisum or mango. It is a platform on which roasted seeds are hit with flat wooden hammer called Thapi.

**Chula's (Earthen Pans):** They are utilized for roasting the sun-dried seeds or guris without sand mix.

**Bamboo Sticks:** These are utilized to stir the Makhana seeds while roasting them.

**Table 3:** Requirement of equipment of makhana

| S. No. | Equipment           | Cost/in Rs. | Average No. of units Required (per ha.) | Total cost In Rs. |
|--------|---------------------|-------------|---|-------------------|
| 1      | Khonghli            | 390         | 5                                       | 1770              |
| 2      | Sieves for seed     | 250         | 10                                      | 2500              |
| 3      | Sieves for pop      | 910         | 4                                       | 3640              |
| 4      | Mats                | 150         | 18                                      | 2700              |
| 5      | Iron pan            | 500         | 3                                       | 1500              |
| 6      | Aphra, Batna, Thapi | 100         | 3                                       | 300               |
| 7      | Bamboo sticks       | 25          | 5                                       | 125               |
|        | Total               |             |   | 12,410            |

**Processing Cost of Makhana**

For makhana, processing in the major activity in order to get the final flavorful soft good. It is best skilled activity. This activity is ready by real cheapie and self -made machines.

**Table 4:** Processing cost of per 1 quintal of makhana seed (32 Kg of makhana pop), (in Rs)

| S. No | Items of cost                                    | Amount | Percentage to total processing cost |
|-------|--|--------|-------------------------------------|
| 1     | Human labour                                     | 1000   | 44.45                               |
| 2     | Fuel (wood)                                      | 200    | 8.89                                |
| 3     | Packing  | 1000   | 44.44                               |
| 4     | Equipment  | 50     | 2.22                                |
| 5     | Total processing cost per 100 kg of makhana seed | 2250   | 100                                 |
| 6     | Total processing cost per 1 kg of makhana seed   | 22.50  |                                     |
| 7     | Total processing cost per 1 kg of makhana pop    | 70.31  |                                     |

Cost of total human labour for 100 kg of makhana seed was found Rs.1000. Total fuel cost of 100 kg of makhana seed processor no. was found to be Rs. 200. Total equipment's cost for 100 kg of makhana seed was Rs. 50. Total packing of 100 kg in makhana seed was Rs.1000. Total processing cost 1 kg of makhana pop was Rs.70.31. The table reveal also that the gross processing costs per 100 kg of makhana seed was found Rs.2250. Human labour cost was calculated and it was 44.45 percent of the total processing cost. The charges levied on the labour were large. The average cost of fuel was Rs.200, which was 8.89 percent of total processing cost.

**Constraints in production and processing of Makhana**

**Table 5:** Constraints in production of makhana

| S. No. | Constraints in production of makhana               | Garret ranking |
|--------|--|----------------|
| 1.     | Lack of Technical knowledge about cultivation      | I              |
| 2.     | Labour intensive cultivation                       | II             |
| 3.     | Lack of modern equipment                           | III            |
| 4.     | Lack of credit availability                        | IV             |
| 5.     | Limited availability of seed.                      | V              |
| 6.     | Adverse Environment factors.                       | VI             |
| 7.     | Low productivity and used old processing technique | VII            |

**Tables 6:** Constraints in processing of makhana

| S. No. | Constraints in processing of makhana                    | Garret Ranking |
|--------|---|----------------|
| 1.     | Lack of processing machinery and equipment              | I              |
| 2.     | Non availability of credit facility.                    | II             |
| 3.     | Dependence on climate and health risk of the processor. | III            |

**Conclusion**

Makhana cultivation in Chhattisgarh plain has the potential to become an emerging income generating enterprise for farmers. Overall, in potential production area makhana would need to consider local consumer preference, competition and distributed channels. The main challenge to makhana producers is to carefully manage the major constraints of makhana production to maximize their yields and profits. This may involve investing in modern equipment and improving processing techniques and handling practices, and exploring market potential for their finished products in the

Chhattisgarh state.

### Future Scope

Makhana cultivation identified in the present research in Chhattisgarh state low area covered in makhana cultivation and demand, value is high in market, so low cost and high profit provided of farmer because multipurpose uses and high nutritional value present in makhana, which further increase area and production in future.

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