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# Economic Analysis of Makhana Cultivation in Darbhanga and Madhubani Districts of Bihar, India

**Amardeep Sharma, R. R. Mishra, Bipin Saw and Nasim Ahmad***

*Department of Agricultural Economics, Dr. Rajendra Prasad Central Agricultural University, Pusa- 848125, Bihar, India*

**Corresponding author*

**A B S T R A C T**

Makhana or gorgon nut (*Euryale ferox)* is an aquatic crop belongs to *Nymphaeaceae* family and is grown in some districts of north Bihar. The present study was conducted in two leading makhana producing districts, Darbhanaga and Madhubani of Bihar. The main objective of the investigation was to assess the costs and returns from cultivation of makhana in the study area. The results revealed that on an average the cost of cultivation of Makhana was estimated to be Rs. 57370.50/ha. The share of variable cost in total cost of cultivation was found 81.80 % and remaining 18.20 % was accounted for by fixed cost. Among variable costs, the cost of human labour alone amounted to Rs. 33606.03/ha which constituted 58.60 % of the total cost. Among various items of fixed cost, pond rent was the most important cost and was estimated to be Rs. 9492.07/ha constituting 16.54% of total per hectare expenditure. On an average per hectare production of raw Makhana was found 19.07 quintals. Gross return, per hectare of Makhana pond was observed to be Rs.171630.00. Net returns, over Cost A, Cost B and Cost C were worked out to be Rs. 117344.80/ha, Rs.105739.70/ha and Rs.103617.24/ha, respectively. Benefit- Cost ratio came out to be 2.16, 1.60 and 1.52 over Cost A, Cost B and Cost C respectively. Cultivation of makhana has immense potential for enhancing the economic status of the *Mallah* (Fishermen) community who are particularly engaged in its cultivation. Makhana cultivation may be promoted by the state government along with NRC, Darbhanga and training cum demonstration programme on cultivation practices should be imparted for efficient cultivation. Makhana cultivated in pond system is totally an organic product. This aspect of Makhana should be highlighted and promoted among the developed countries of the world to fetch foreign exchange. Scientific community can also help in boosting up the marketing of makhana by highlight the nutritional values and other benefits.

**K e y w o r d s**

Makhana, Cost of cultivation, Gross return, Net return, Benefit- Cost ratio

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## Introduction

Makhana or gorgon nut (*Euryale ferox)* is an aquatic crop belongs to *Nymphaeaceae* Family is boon to the rural poor, especially of north Bihar, Bengal and lower Assam who have perfected art of cultivating makhana. The seeds of Makhana are popped and eaten as roasted as well as used in preparation of various kind of sweets and recipes. It has nutritional and medicinal properties and there is a great export potential of this crop.

Makhana is one of important cultivable herbs and its origin is considered to be South-East Asia and China from where it spread to some

other countries of the world. It is cultivated in tropical and sub-tropical regions of South-East Asia, Russia, North America and some parts of India. In India, it is cultivated in West Bengal, Bihar, Manipur, Tripura, Assam, Jammu & Kashmir, Eastern Odisha, Madhya Pradesh, Rajasthan and Uttar Pradesh. However, it is commercially cultivated in North Bihar, Manipur, some parts of West Bengal and Madhya Pradesh.

Bihar is one the largest producer of Makhana in the country and accounts for more than 80 % of the total production (Kumar, 2018). Despite of that, the area under makhana cultivation is reported to be declined by about 35% in past few decades from 20,000 ha to 13,000 ha (Singh, 2014). Darbhanga, Sitamarhi, Madhubani, Saharsa, Supaul, Araria, Kishanganj, Purnia and Katihar are the major makhana growing districts of Bihar. ICAR National Research Centre for Makhana Research, Darbhanga has reported that total area under Makhana cultivation in India is about 15000 hectares. The production of Makhana seeds is about 120000 MT which after processing yield 40,000 MT of Makhana pop. The estimated value of Makhana production at farmers end is Rs.250 crore and it generates the revenue of Rs.550 crore at trader's level (Anonymous, 2010).

Makhnan has nutritional and medicinal values. Makhana pop is considered to be highly nutritious and healthy food. It is a good source of carbohydrates, proteins and minerals and is popular as a highly nutritious snack outside its traditional and religious connotation. Makhana contains 12.8% moisture, 9.7% protein, 0.1% fat, 0.5% minerals, 76.9% carbohydrates, and 1.4 mg/100 g of carotene (Sah *et al*., 2013). In terms of calorific value, Makhana gives 362 kcal/100 gm for raw and 328 kcal/100 gm for popped. Hence, the calorific value of Makhana compares well with staple food like wheat, rice, etc (Shankar *et al.*, 2010). Makhana is considered to be superior to dry fruits such as almonds, walnut, coconut and cashew nut in terms of sugar, protein, and ascorbic acid and phenol content (Bilgrami *et al.*, 1983). In China, Makhana is mandatory constituent in baby food because of its well established medicinal properties (Anonymous, 2014).

Makhana is recommended for treatment of diseases regarding respiratory, circulatory, digestive, excretory and reproductive systems (Qudrat *et al*., 2000). The edible seed is known for its tonic, astringent, deobstruent, antirheumatic, Antidiuretic and roborant properties. It is also utilized to overcome post natal weaknesses in women and in case of men its aphrodisiac and spermatogenic potential is utilized (Jha *et. al*., 1991). Ayurveda, the Indian system of medicine recommends Makhana to be beneficial in Tridosas (the seminal problem). In Unani system of medicine Makhana is used against dysmenorrhoea. Makhana is used as a tonic and for the treatment of leucorrhoea and good immunostimulant (Puri *et al*., 2000).

Very few studies have been conduced to assess the costs and returns in makhana production in the state or national level. Considering the economic potentials of makhana, the present study was conducted in two prominent makhana growing districts Darbhanaga and Madhubani of Bihar for assessing costs and returns on its cultivation.

## Materials and Methods

Darbhanga and Madhubani districts of north Bihar were purposively selected for conducting the study as have larger area under Makhana cultivation in Bihar. A list of Makhana growing blocks was prepared on the basis of Makhana pond area and arranged in ascending order. Out of the total Makhana

growing blocks in Darbhang and Madhubani district, Manigachhi block and Andhrathari block were selected randomly. After selection of block, list of all the villages were prepared and five villages from these two selected blocks were selected randomly. In this way, ten villages i.e. five villages from each district were selected. Lists of all the Makhana growers of all five selected villages in each selected block were prepared along with their pond area.

The list was rearranged in ascending order based on their pond area under Makhana cultivation. From the list of all Makhana growers in a block, fifteen Makhana growers were randomly selected. In similar fashion, fifteen Makhana growers were selected from other block also. In this way altogether thirty Makhana growers were selected for detailed study. The data were collected on well structured schedule pertaining to different costs of inputs, labour costs etc. The cost of cultivation of makhana is computed by adopting the cost concepts proposed by Commission for Agricultural Costs and Prices (CACP).

## Results and Discussion

The cost of production of any crop is most important aspect of the farm economy both from individual farmer's point of view as well as national point of view. From individual farmer's point of view, it helps them to readjust their scarce resource in order to obtain better returns; from national point of view it provides a guideline to the planner in formulating the price policy, both for factors as well as of the produce.

In every production process, there are some inputs (raw materials) which are transformed into output. During the agricultural production, inputs like seed, fertilizer, water, etc are converted into product (output). The agricultural production process involves some cost which can broadly be divided into two groups: operational cost and fixed cost. Operational cost is also known as variable cost or working cost and comprises those inputs which vary with the level of production like seed, manures, fertilizers, irrigation, plant protection measures, human labour, interest on working capital, etc, whereas fixed cost, which is also known as overhead cost, includes rental value of owned pond from other or government leased-in pond, cost on upkeep of assets including depreciation and interest on fixed capital. The details of cost on different cost components are presented in Table 1.

An examination of table revealed that per hectare variable and fixed costs, on an average, worked out to Rs. 46915.59 and Rs. 10454.91 accounting for nearly 81.80 % and 18.20 %, respectively. Among items of variable costs, human labour was the most important and was accounted to be on an average of Rs 33606.03/ha constituting nearly 58.60% of total cost as most of the operations in cultivation of makhana is being done manually by human labour. Another important variable cost was materials cost *i.e.* seed, insecticide/pesticide and fertilizer and material cost was computed to be Rs. 7496.73 being13.10 % of total per hectare expenditure.

Seed, insecticide/pesticide and fertilizer costs were assessed to Rs. 4506.72/ha, Rs.659.12/ha and Rs. 2330.89/ha accounting for nearly 7.90 %, 1.15 % and 4.10 % of the total per hectare expenditure, respectively. Larger share of seed in total cost was partly due to higher seed requirement per hectare (80-90 kg) and partly due to higher price per unit of seed (Rs 80-90). The expenditure on insecticide/pesticide and fertilizer was nominal, mainly because of the fact that Makhana cultivation was carried out traditionally by fisherman community based

on age old experiences in which use of insecticide/pesticide and use of fertilizer was uncommon. Among various items of fixed cost, it was observed that the cost of leasing-in pond was Rs. 9492.07 which accounted for 16.54 % of total cost. Rental value of owned land was found to be Rs. 10915.88 per hectare. This may be because of the fact that the cost of lease was decided through auction. Intense competition among bidders may have increased the leasing-in charges.

Farm business analysis of makhana production is presented in Table 2. In terms of cost concepts, Cost A, Cost B and Cost C were estimated at Rs. 54285.20/ha, Rs. 65890.30/ha and Rs. 68012.76/ha, respectively. Gross return, per hectare of Makhana pond was observed Rs. 171630.00. Net return, over Cost A was worked to 103617.24/ha. Benefit- Cost ratio came out to be 2.16, 1.60 and 1.52 over Cost A, Cost B and Cost C, respectively.

The cost of production of Makhana seed was estimated to be Rs. 2846.62, Rs. 3455.18 and Rs. 3566.48 per quintal based on Cost A, Cost B and Cost C, respectively. Farm business income and family labour income was amounted to be Rs. 105379.57 and Rs. 116381.96 while turnover, percentage return on working capital and percentage return on fixed capital was worked out to be 299.16%, 201.93% and 200.36%, respectively.

**Table.1** Cost of cultivation of Makhana

| **Operational Cost** | | | |
|---|---|---|---|
| **Sl.No.** | Cost items | Cost (Rs/ha) | Percentage of total cost |
| **1.** | Human labour | | |
| | a)Owned | 2122.46 | 3.70 |
| | b)Hired | 31483.57 | 54.88 |
| | Total human labour cost | 33606.03 | 58.60 |
| **2.** | Material cost | | |
| | a)Seed | 4506.72 | 7.90 |
| | b)Insecticide/pesticide | 659.12 | 1.15 |
| | c)Fertilizer | 2330.89 | 4.10 |
| | Total material cost | 7496.73 | 13.10 |
| **3.** | Water filling | 3169.61 | 5.52 |
| **4.** | Miscellaneous cost | 1056.70 | 1.84 |
| **5.** | Interest on working capita@7% for 6 months | 1586.52 | 2.80 |
| | Total variable cost | 46915.59 | 81.80 |
| **Fixed cost** | | | |
| **1.** | Pond revenue | 81.12 | 0.14 |
| **2.** | Rent for leased-in pond | 9492.07 | 16.54 |
| **3.** | Depreciation | 192.50 | 0.34 |
| **4.** | Interest on fixed capital @8% per annum | 689.22 | 1.20 |
| | Total fixed cost | 10454.91 | 18.20 |
| | Total cost(T.V.C+T.F.C) | 57370.50 | 100.00 |

T.V.C = Total Variable Cost, T.F.C = Total Fixed Cost
Rental value for owned pond (per ha) = Rs. 10915.88

**Table.2** Results of farm business model of makhana production for the study area

| Sl. No. | Parameters | Amount |
|---|---|---|
| **1.** | Cost of cultivation over | |
| | Cost A (Rs /ha) | 54285.20 |
| | Cost B (Rs /ha) | 65890.30 |
| | Cost C (Rs /ha) | 68012.76 |
| **2.** | Production (quintal) | 19.07 |
| **3.** | Gross return (Rs /ha) | 171630.00 |
| **4.** | Net returns over | |
| | Cost A (Rs /ha) | 117344.80 |
| | Cost B(Rs /ha) | 105739.70 |
| | Cost C(Rs /ha) | 103617.24 |
| | Benefit-Cost ratio over | |
| | Cost A | 2.16 |
| | Cost B | 1.60 |
| | Cost C | 1.52 |
| **5.** | Cost of production over | |
| | Cost A (Rs /ha) | 2846.62 |
| | Cost B(Rs /ha) | 3455.18 |
| | Cost C(Rs /ha) | 3566.48 |
| **6.** | Farm business income (Rs /ha) | 105379.57 |
| **7.** | Family labour income(Rs /ha) | 116381.96 |
| **8.** | Turnover (percentage) | 299.16 |
| **9.** | Percentage return on working capital (percentage) | 201.93 |
| **10** | Percentage return on fixed capital (percentage) | 200.36 |

From the above discussion it may be concluded that on an average cost of cultivation of Makhana was estimated to be Rs. 57370.50/ha. The share of variable cost in total cost of cultivation was 81.80% and remaining 18.20% was accounted for by fixed cost. Among variable costs, the cost of human labour alone amounted to Rs. 33606.03/ha which constituted 58.60% of the total cost.

Larger expenditure on human labour was probably on account of the fact that growing Makhana was a labour intensive enterprise and most of the operations were carried out by human labour. Material cost was the second most important item of cost with a substantial share of 13.10% in total cost. Per hectare, expenditure on material inputs, on an average amounted to Rs. 7496.73 being 13.10% of total per hectare expenditure. Among various items of fixed cost, it was observed that pond rent was the most important cost item of expenditure and it was estimated to be Rs. 9492.07/ha constituting 16.54% of total per hectare expenditure.

On an average per hectare production of raw Makhana was 19.07 quintals. The cost of production of Makhana seed was estimated to be Rs. 2846.62, Rs. 3455.18 and Rs. 3566.48 per quintal based on Cost A, Cost B and Cost C, respectively. Gross return, per hectare of Makhana pond was observed Rs.171630.00. Net returns, over Cost A was worked out to be Rs. 117344.80, over Cost B it was Rs.105739.70 and over Cost C it was Rs.103617.24. Benefit- Cost ratio came out to

be 2.16, 1.60 and 1.52 over Cost A, Cost B and Cost C respectively. On an average, per hectare of pond, family labour income and farm business income amounted to Rs. 116381.96 and Rs. 105379.57. While turn-over rate, percentage return over working capital and percentage return over fixed capital, per hectare of pond worked out to be 299.16%, 201.93 % and 200.36% respectively.

Cultivation of makhana has immense potential for enhancing the economic status of the *Mallah* (Fishermen) community who are particularly engaged in cultivation. Makhana cultivation may be promoted by the state government along with NRC, Darbhanga and training cum demonstration programme on practices should be imparted for efficient cultivation. Makhana cultivated in pond system is totally an organic product. This aspect of Makhana should be highlighted and promoted among the developed countries of the world to fetch foreign exchange. Scientific community can also help in boosting up the marketing of makhana by highlight the nutritional values and other benefits.

## References


Anonymous (2010). ICAR National Research Centre for Makhana, Darbhanga

Bilgrami KS, Sinha KK, Singh A. (1983). Chemical changes in dry fruits during aflatoxin elaboration by *Aspergillus flavus* L. *Current Science*. 52(20): 960-64.

IL&FS, 2014, Food Processing in Bihar The Road Ahead, 46/89, India http://foodprocessingindia.co.in/state_pdf/Bihar/BiharPolicy.pdf (Last accessed: 28/01/2020)

Jha V, Barat GK, Jha UN (1991). A Nutritional evaluation of Euryale ferox Salisb (Makhana). *Journal of food science and Technology* 8 (5):326-28.

Kumar A. (2018). A diagnostic study of makhana production technology among the growers of Madhubani district (Doctoral dissertation, Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur).

Puri A, Sahai R, Singh KL(2000) Immunostimulant activity of dry fruits and plants materials used in Indian traditional medical system for mothers after child birth and invalids. *Journal Ethnopharmacology* 71 (1-2):89-92.

Qudrat I, Khuda M, Mukherji BD, Hossain MA, Khan NA (2000). Properties of certain starch varieties and their sources in East Pakistan. *Pakistan Journal of Scientific and Industrial Research*, 3: 159-162.

Sah, K.N., Radhika, P., Seema (2013). A study on price spread and marketing efficiency of Makhana in Madhubani district of Bihar *Journal Resources ANGRAU* 41(4) 81-87

Shankar, Mamta, Chaudhary, Neha and Singh, Dheer (2010). A Review on Gorgon Nut. International Journal of Pharmaceutical & Biological Archives. 1(2):101–107

Singh A. 2014. Centre to boost 'makhana' cultivation. Times of India. Available: https: //timesofindia.indiatimes.com/india/Centre-to-boost-makhanacultivation [Accessed 31 August 2014]


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