

Makhana Production in Malda District: Cost and Return Analysis

Shubhadip Kushari^{1*}, Prof. Goutam Bhowmik²

ABSTRACT

Makhana, an aquatic white crop, has recently become a popular in flood-prone districts of eastern and north-eastern India. 90% of global Makhana production comes from India. Bihar is the leading state to produce Makhana in India followed by West Bengal. In West Bengal, Malda is the leading Makhana producing district. It is widely believed that Makhana cultivation in the district is on the rise because farmers are reaping greater return than that of other crops. In this backdrop, an effort will be made to estimate the cost and return generated on an average by the cultivators out of Makhana. The estimated return is compared with the combined opportunity cost of land, labour and capital to assess the genuine profitability. The present study also highlights the process of Makhana guri production (field base eco system and pond based eco system) along with value chain. Study is empirical in nature and based on both primary and secondary data collected in the present time frame (2024-25). Multi stage sampling technique was adopted. In the first stage, blocks (Harischandrapur I, Harischandrapur II, Chanchal I, Chanchal II) were chosen purposively based on the area of land used for Makhana production. In the second stage, 125 Makhana producers were chosen conveniently for collecting estimated cost and return data. Study revealed that farmers earned a profit of 30 to 55 percent during 2024-25. Comparing this return with the respective opportunity cost pointed out that the cultivation of crop offers farmers of Malda district a scope to earn higher return. As a district, Malda has already gained fame for its mangoes, similar scope has been there for Makhana as well and with adequate patronage from the Government and investment from prominent private players, Malda can be economically developed through Makhana production and its effective marketing.

Keywords: Makhana, Malda, Cost analysis, Factor analysis, Implicit cost

Makhana, an aquatic crop, grows in tropical and subtropical climates. Makhana is exclusively grown commercially in India and China. The global makhana market is expected to continue growing at a 7% CAGR between 2019 and 2023 (Shashi et al. 2023). It has a good source of calories, carbohydrates, proteins, and minerals; therefore, it provides various health benefits such as kidney health and hormonal balance, blood pressure and sugar control, weight loss, and more. In India, Makhana pop is commonly consumed as a snack, curry and offered as prasad at religious places. In China, it is utilised

¹Research Scholar, Department of Commerce, University of Gour Banga, West Bengal

²Professor, Department of Commerce, University of Gour Banga, West Bengal

*Corresponding Author

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for both medicinal as well as for food. It is commonly consumed as a snack in the United States and other countries.

In India, it is produced in Bihar, West Bengal, Manipur, Tripura, Assam, Jammu & Kashmir, Eastern Odisha, Madhya Pradesh, Rajasthan and Uttar Pradesh. However, the crop is a boon for the rural poor, particularly those living in flood-prone areas of north Bihar, West Bengal, and lower Assam. Between 2012 and 2022, the area under Makhana cultivation expanded by roughly 171%, from 13000 hectares to 35224 hectares, while total pop production increased by 152%, from 9360 tonnes to 23656 tonnes (DOH, 2022). India contributes to 90% of global Makhana output. More than 200 MT of Makhana pop (1% of total makhana produced in India) is exported from India, generating approximately 10 crores in revenue at the farmer level and more than 20 crores at the trader level. Bihar is the major producer, accounting for 80% of total Makhana production in India. West Bengal comes second in makhana production, primarily in Malda and North Dinajpur districts are two leading districts in Makhana production in West Bengal. With the Malda and North Dinajpur districts leading the way.

Makhana is being grown throughout the north Malda region, however Harischandrapur I, Harischandrapur II, and Chanchal II have emerged as the leading blocks in terms of cultivation area. Makhana pop from Makhana Guri is predominantly made in Harischandrapur II block by competent workers from Bihar. However, Harischandrapur I block has recently begun this process. Malda is well-known for producing mangoes, jute, and silk cocoons, all of which turn golden when mature. That is why Malda is referred to as the golden product producing district. Makhana, although being a white crop, has a high profit potential, propelling it to the golden crops list with mangoes, jute, and silk.

Although Makhana is a cash crop in Malda, is it also a cash crop for farmers? The present study intends to examine the cost and return analysis of a makhana producer, as well as the entire Makhana Guri production process.

LITERATURE REVIEW AND RESEARCH GAP

Rahaman et al. (2019) investigated Makhana marketing channels, margins, marketing efficiency, and producers' share of consumer prices in Bihar and India. The results revealed that Makhana's marketing system was extremely well-organised by a small number of large traders. They make a good profit by selling Makhana to consumers, but the producer receives a very small portion of the profits.

Sharma et al. (2020) analysed the cost and return on Makhana cultivation in Bihar's Darbhanga and Madhubani districts. It turned out that the variable cost of Makhana production was almost 81.80% per hectare. Wages paid to labours were a major component of variable costs.

Singh et al. (2020) studied the current circumstances surrounding Makhana production, value-added products, market structure, marketing costs, margins, and export promotion tactics in India in general, and specifically Bihar.

Singh et. al. (2021) explored the process of value addition in Makhana through post-harvest management. The study addresses value addition of Makhana process in three ways namely through Packaging, change in Place and change in time.

Shashi et al. (2023) investigated the profile of Makhana growers as a single crop ecosystem and Makhana as a fish eco system in Katihar area. The results revealed that the majority of respondents did not use any credit or government assistance. They did not receive any instruction as well. Makhana cultivation with a fish eco system yields a greater return than Makhana cultivation with only crops.

Kushari et.al. (2024) explore marketing channels and assessed marketing cost, marketing margin, producer's share, price spread and marketing efficiency of Makhana in Malda district. Results indicated that the marketing cost is highest in channel-III followed by channel-II and lowest in channel-IV. marketing margin and price spread follow the same pattern. The marketing efficiency was found to be highest in channel-IV followed by channel-II and channel-III.

Sharma et.al. (2024) conducted a cost-benefit study of Makhana farming in Darbhanga district using both a field-based and pond-based ecosystem. The field-based eco system was more expensive than the pond-based eco system, but the yield and gross returns were determined to be higher.

The above review indicated a scarcity of studies on the cost and return analysis of Makhana production, particularly in West Bengal and, more specifically, in Malda district, the state's primary Makhana producing district. The present study, therefore, intends to fill this research gap. The study is carried out in three major Makhana growing blocks in Malda (Harischandrapur-II, Chanchal II, and Harischandrapur-I) to investigate Makhana production, costs, and returns in the district.

Objective of the Study

The main objectives of the study are:

- i) To highlight the processes involved in Makhana production (both for Field base eco system, and Pond base eco system) and
- ii) To assess the cost and return analysis in Makhana production.

RESEARCH METHODOLOGY

The study is descriptive and analytical in nature and based on both primary & secondary data. To meet the second objective, Multi stage sampling was adopted. In the first stage, blocks were chosen purposively based on the area of land used for Makhana production. In the second stage, 125 Makhana producer were chosen conveniently from Harischandrapur I, Harischandrapur II and Chanchal II Blocks (because of absence of any list of Makhana producers in the possession of the Department of FPI & Horticulture, Chanchal Sub-division, Malda). The data thus collected will be properly tabulated, analysed and interpreted with simple statistics and cost analysis technique. Recent time frame (2024 – 25) is used as it would help us to capture the present status of production of Makhana in Malda district.

Highlight the Processes Involved in Makhana Production

Makhana is mostly planted in two eco systems: one in permanent water bodies with a water depth of 4-6 feet, known as the pond eco system, and the other in the filed eco system, where makhana cultivation takes place in agricultural fields with a water level of 1 to 2 feet.

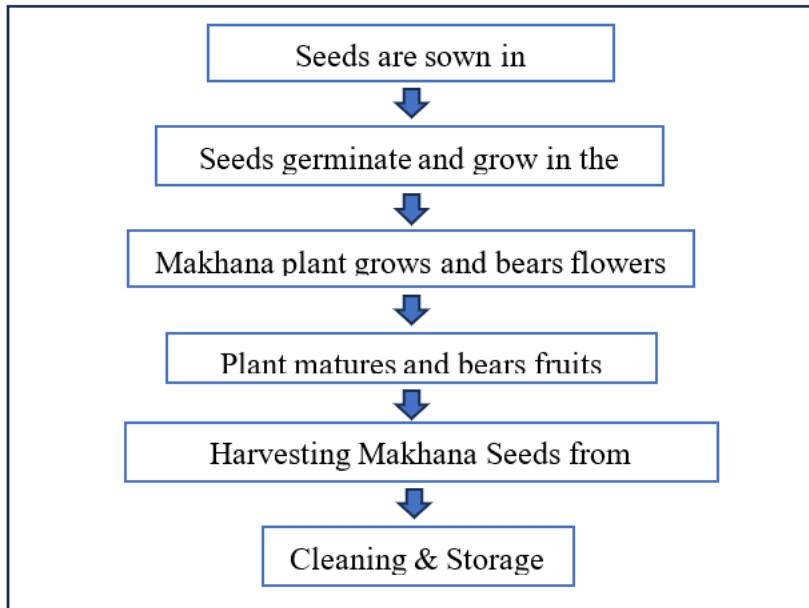
• POND ECO SYSTEM

In December, 80 to 90 kilogrammes of healthy Makhana seeds are spread on the upper surface of water bodies for direct sowing. After 35 to 40 days of sowing (in January), seed

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germination begins at the pond's bottom, and by the end of February or early March, Makhana plants have reached the water's surface. At this stage, more plants are thinned to maintain an appropriate gap of (1×1) metre between rows of plants. Flowers and fruits typically take 5 to 6 months to fully develop and mature. Later, in September and/or October, all of the stored makhana seeds are extracted from the bottoms of the water bodies. Uncollected seeds from aquatic bodies germinate in the next season. The flow chart 1 presents the whole procedures of Makhana Seeds (Guri) production in Pond base eco system.

Chart 1: Steps involve in Makhana Guri Production in Pond base eco system



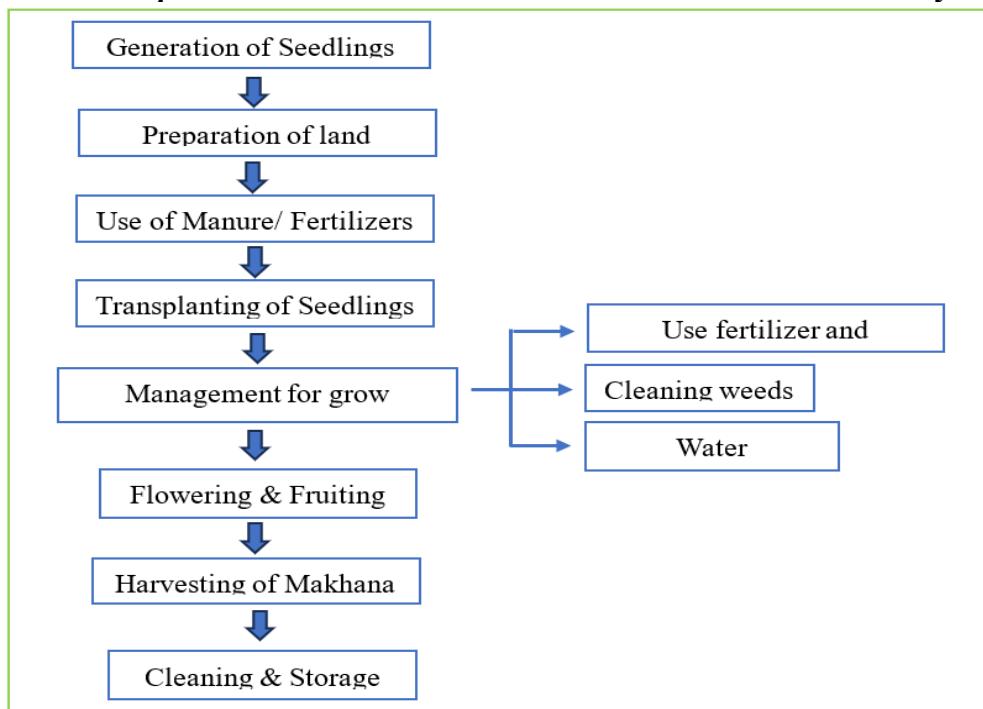
Source: Constructed by the Author

• FIELD BASE ECO SYSTEM

This is the newly adopted Makhana cultivation system, standardised by the Institution. In this system Makhana cultivation is taken place in agriculture field at a water depth of 1 to 2ft. The system is very easy to operate, after makhana cultivation this system allows to farm the same field for cereals and other field crops in the same year. Makhana seedlings are initially raised in the nursery and then transplanted in the main field at the appropriate time. Depending upon the availability of the field and the nursery, transplanting might take place between the first week of February to third week of April. Through this system, it can be possible to reduce the duration of Makhana crop up to the three months. The process of Makhana cultivation on field base eco system are shown below:

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Chart 2: Steps involve in Makhana Guri Production in Field base eco system



Source: Constructed by the Author

Cost and Return Analysis in Makhana Production in Respect of Producer (Farmers)

To calculate the cost of Makhana cultivation in Malda district, it's important to understand the type of cultivation practiced by farmers. This includes cultivating on their own land, leased land, using their own money, and borrowing money. During the cost analysis, the average of each cost from the 125 farmers that make up the study's population is used to determine the cost of each item. Accordingly, three distinct cases are observed.

- i) Cultivation Makhana on own land and using own fund.
- ii) Cultivation Makhana on own land and using borrowed fund.
- iii) Cultivation Makhana on leased land and using borrowed fund.

Farming on leased land requires borrowing resources from others, therefore the combination of leased land and personal funds is not feasible.

1. Makhana Cultivation on Own Land and Using Own fund

Table 1: Calculation of Explicit Cost per Bigha

Particulars	Explicit Cost (₹)
1. Direct materials:	
i) Seeds (10kg)	2100
2. Direct labour:	2400
i) Labour cost for weeding (before planting)	1600
ii) Labour cost for land Preparation	600
iii) Transplanting Seedlings	
iv) Labour cost for collecting mature seeds from water	10000
3. Direct expenses:	1500
i) Irrigation	3100
ii) fertilisers	1000
iii) pesticides	
iv) plastic cost for retention	650

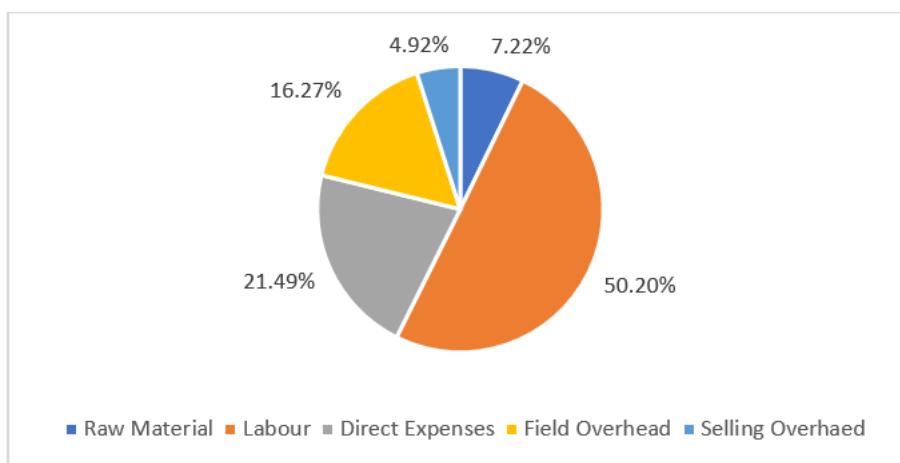
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Particulars	Explicit Cost (₹)
4. Prime cost (1+2+3)	22950
5. Field overhead	2500
i) Rent of tractor or tractor	2200
ii) Rent of water marshal machine	
6. Field cost (4+5)	27650
7. Administration overhead	-
8. Cost of production (6+7)	27650
9. Selling overhead/ marketing overhead	48
i) Packing cost (gunny bags/ jute sacks)	100
ii) Carriage outward	
iii) Brokerage and commission for selling products (2% on sales)	1280
10. Total cost (8+9)	29078
11. Weighted Average production (Quintal/ bigha)	2.47
12. Weighted Average Selling Price (per quintal)	25928
13. Selling price (12×13)	64042
14. Profit (13-10)	34964
15. Return on Sales (14/13) *100	54.59%

Source: Authors own Contribution

It is impossible to extract all of the makhana guri from water through harvesting procedure; so, the remaining seeds are used to produce seedlings in the next year. As a result, farmers who have been producing makhana for many years no longer purchase new seeds from the market or elsewhere. For this reason, farmers do not include the cost of seeds in their expenses. In this scenario, analysing the cost of makhana cultivation reveals that labour payments account for over half of the cultivation cost. In-depth analysis reveals that workers which are involved in harvesting are earned about one-third of the overall cost of makhana cultivation. Direct expenses such as irrigation, fertiliser, insecticides, and plastic cost for retention account for more than 20% of the total cost. Field overhead such as rent of tractor or tractor and rent of water marshal machine amount for more than 16% of total cost. Selling overhead cost are very minimal for this case. In this category famers earn 54.59% profit by cultivating makhana.

Chart 3: Cost Analysis of Makhana Cultivation on Own Land and Using Own fund



Source: Constructed by the Author

Makhana Production in Malda District: Cost and Return Analysis

Table 2: Calculation of Opportunity Cost per Bigha

Particulars	Amount
i. Labour cost for weeding (before planting)	800
ii. Labour cost for land Preparation	800
iii. Labour cost for weeding (after planting)	1600
iv. Lease rent of land	15000
v. Interest on invested Fund	1600
vi. Total Opportunity Cost/ Bigha	19800
vii. Absolute surplus from Makhana cultivation/bigha (Explicit profit – Opportunity cost) = (34964 – 19800)	15164

Source: Authors own Contribution

The survey indicated that the price of Makhana land ranged between 12,000 to 18,000 per bigha, therefore the average was 15,000. In this case, farmers could earn ₹15000 per bigha as rent had he not cultivated. Similarly, he receives no wages for the amount of days he works on his own farm; the money he would have received if he had worked on someone else's land is the opportunity cost of his labour. In this case, since he cultivated the land with his own capital, there is no interest to be paid. But if he had not cultivated the land and had kept the money in the bank, he would have received an interest from it, which would have been the opportunity cost of his capital. In this case, opportunity cost is 19800 and absolute surplus 15164.

2. Makhana Cultivation on Own Land and Using borrowed fund

Table 3: Calculation of Explicit Cost per Bigha

Particulars	Explicit Cost (₹)
1. Direct materials:	
i) Seeds (10kg)	2100
2. Direct labour:	
i) Labour cost for weeding (before planting)	1600
ii) Labour cost for land Preparation	600
iii) Transplanting Seedlings	
iv) Labour cost for collecting mature seeds from water	10000
3. Direct expenses:	
i) Irrigation	1500
ii) fertilisers	3100
iii) pesticides	1000
iv) plastic cost for retention	650
4. Prime cost (1+2+3)	22950
5. Field overhead	
i) Rent of tractor of tractor	2500
ii) Rent of water marshal machine	2200
6. Field cost (4+5)	27650
7. Administration overhead	
i) Interest on borrowed funds	4000
8. Cost of production (6+7)	31650
9. Selling overhead/ marketing overhead	
i) Packing cost (gunny bags/ jute sacks)	48
ii) Carriage outward	100
iii) Brokerage and commission for selling products (2% on sales)	1280
10. Total cost (8+9)	33078
11. Weighted Average production (Quintal/ bigha)	2.47

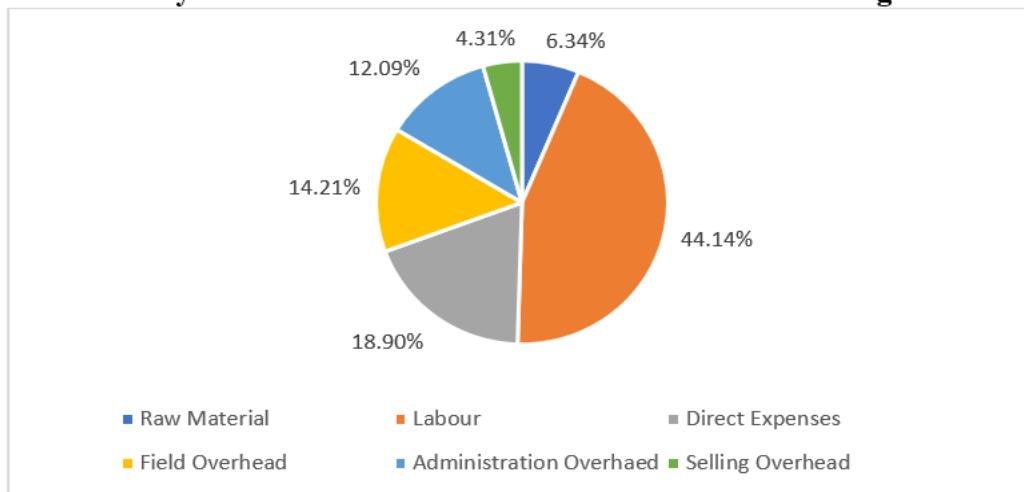
Makhana Production in Malda District: Cost and Return Analysis

Particulars	Explicit Cost (₹)
12. Weighted Average Selling Price (per Quintal)	25928
13. Selling price (12×13)	64042
14. Profit (13-10)	30964
15. Profit in percentage (14/13) *100	48.35%

Source: Authors own Contribution

In this case, Makhana farmers borrow money from moneylenders to meet their demands because agricultural finance is unavailable. Moneylenders' loans have monthly interest rates ranging from 1% to 1.50%. Since Makhana farming takes eight months, they must pay no more than eight months' interest on the debt obtained from moneylenders. Currently, some farmers have received gold loans from banks to cultivate Makhana. However, due to the small number of farmers, the interest rate on those loans was not considered in this study. In this category famers earn 48.35% profit by cultivating makhana. analysing the cost of makhana cultivation reveals that more than 40% total cost is spent on direct labour. Irrigation, fertilisers, and pesticides make up roughly 20% of overall costs, making them the second highest. Field overhead such as rent of tractor or tractor and rent of water marshal machine amount for nearly 15% of total cost. The moneylender's capital interest amount which is a part of Administration overhead, ranks fourth, accounting for 12% of the overall cost. Selling overhead cost is accounted below 5% of total cost. In Chart 2 cost analysis of Makhana Cultivation on Own Land and Using borrowed fund is presented.

Chart 4: Cost Analysis of Makhana Cultivation on Own Land and Using borrowed fund



Source: Constructed by the Author

Table 4: Calculation of Opportunity Cost per Bigha

Particulars	Amount
i) Labour cost for weeding (before planting)	800
ii) Labour cost for land Preparation	800
iii) Labour cost for weeding (after planting)	1600
iv) Lease rent of land	15000
v) Total Opportunity Cost/ Bigha	18200
vi) Absolute surplus from Makhana cultivation/bigha (Explicit profit – Opportunity cost) = (30964 – 18200)	12764

Source: Authors own Contribution

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In this situation, farmers' opportunity cost is calculated, which includes the cost of own labour as well as the opportunity cost of own land. Since, farmer borrowed the necessary capital from the moneylender, there is no opportunity cost associated with it. The opportunity cost for this 18,200, and absolute surplus is ₹ 12764.

3. Makhana Cultivation on lease Land and Using borrowed fund

Table 5: Calculation of Explicit Cost per Bigha

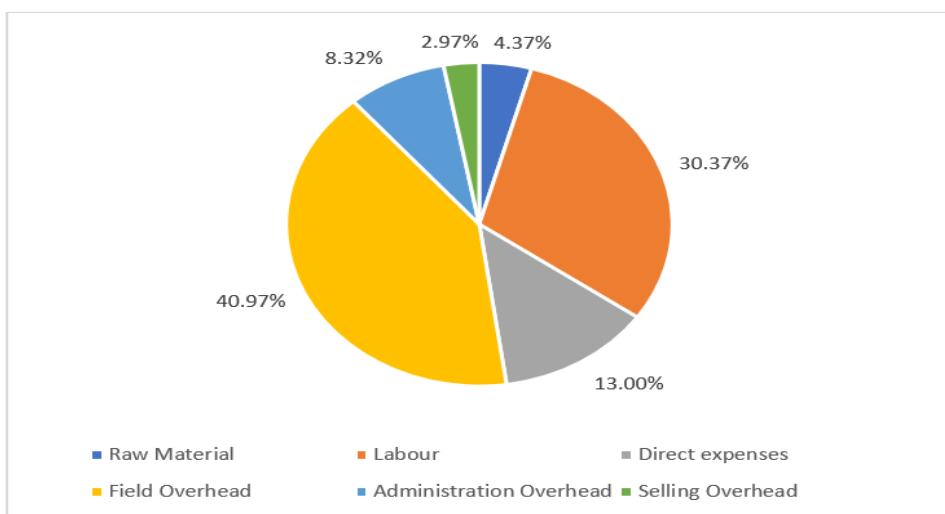
Particulars	Explicit Cost (₹)
1. Direct materials:	
i) Seeds (10kg)	2100
2. Direct labour:	
i) Labour cost for weeding (before planting)	2400
ii) Labour cost for land Preparation	1600
iii) Transplanting Seedlings	600
iv) Labour cost for collecting mature seeds from water	10000
3. Direct expenses:	
i) Irrigation	1500
ii) fertilisers	3100
iii) pesticides	1000
iv) plastic cost for retention	650
4. Prime cost (1+2+3)	22950
5. Field overhead	
i) Lease rent of land	15000
ii) Rent of tractor of tractor	2500
iii) Rent of water marshal machine	2200
6. Field cost (4+5)	42650
7. Administration overhead	
i) Interest on borrowed funds	4000
8. Cost of production (6+7)	46650
9. Selling overhead/ marketing overhead	
i) Packing cost (gunny bags/ jute sacks)	48
ii) Carriage outward	100
iii) Brokerage and commission for selling products (2% on sales)	1280
10. Total cost (8+9)	48078
11. Weighted Average production (quintal/ bigha)	2.47
12. Weighted Average Selling Price (per Quintal)	25928
13. Selling price (12×13)	64042
14. Profit (13-10)	15964
15. Profit in percentage (14/13) *100	33.20%

Source: Authors own Contribution

In this category farmers earn 33.20% profit by cultivating makhana in FY 2024-25. Chart 3 shows that the highest portion of cost is spent on field overhead, which accounts for more than 40% of overall cost. More particularly, land lease rent accounted for more than 30% of overall cost. Labour payments account for more than 30% of total costs. Irrigation, fertiliser, and pesticides account for 13% of total costs, making them the third highest. The moneylender's capital interest, which is part of the Administration overhead, comes fourth, accounting for 8% of the total cost. Selling overhead cost is less than 3% of overall cost.

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Chart 5: Cost Analysis of Makhana Cultivation on Lease Land and Using Borrowed Fund



Source: Constructed by the Author

Table 6: Calculation of Opportunity Cost per Bigha

Particulars	Amount
i) Labour cost for weeding (before planting)	800
ii) Labour cost for land Preparation	800
iii) Labour cost for weeding (after planting)	1600
iv) Total Opportunity Cost/ Bigha	3200
v) Absolute surplus from Makhana cultivation/bigha (Explicit profit – Opportunity cost) = (15964 – 3200)	12764

Source: Authors own Contribution

In this situation, farmers' opportunity cost is calculated, which includes the cost of own labour only. Since, farmer borrowed the necessary capital from the moneylender and the land in which they cultivate Makhana is lease land. So, there is no opportunity cost associated with land and capital. The opportunity cost for this 18,200, and absolute surplus is ₹ 12764.

FINDINGS AND CONCLUSION

- In Malda district, Makhana is cultivated primarily on field-based eco system.
- Makhana farming is labour intensive process as such labour cost is high followed by direct expenses and on-field overhead cost
- In cases of makhana cultivation on lease land, the field overhead cost is the highest, followed by labour cost and direct expenses.
- Farmers earn between 30% to 55% profit in FY 2024-25, depending on their category.
- In each of the three scenarios, the farmer earned more profit from cultivating makhana than the next best alternative availability to them.

In fine, it can be said that Makhana cultivation in Malda district provide farmers with an opportunity to earn absolute surplus profit in comparison of the next best alternative available to the farmer which in this case, is to work as unskilled labour while leaving his land. However, this is the finding based on data for the last year harvesting season.

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Conflict of Interest

The author(s) declared no conflict of interest.

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