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Socio-economic profile and marketing efficiency of Makhana farmers along with the constraints involved in marketing of Makhana in Darbhanga District, Bihar

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Abstract

Makhana (*Euryale ferox* Salisb.), commonly known as fox nut or gorgon nut, is one of India's most significant aquatic cash crops, with Bihar accounting for over 80 percent of global production. Despite its growing domestic and international demand, makhana farmers continue to face serious marketing and socio-economic challenges. This study examines (i) the socio-economic profile of makhana farmers and processors in Darbhanga district, and (ii) the marketing efficiency, price spread, marketing margins, and farmer's share in the consumer's rupee across different marketing channels. Data were collected from 100 sample farmers across marginal, small, semi-medium, medium, and large landholding categories using a semi-structured questionnaire. Two marketing channels were identified and analyzed. Results reveal that the majority of farmers are in the 40–50 age group (28%), with 35% being illiterate. Channel I (Producer→Processor→Wholesaler→Retailer→Consumer) yielded a higher producer's share of 64.62% with a price spread of Rs. 230/kg, while Channel II (Producer→Village Trader→Processor→Wholesaler→Retailer→Consumer) gave only 58.46% with a price spread of Rs. 270/kg. The findings highlight that shorter marketing channels, reduction of intermediaries, and improved market information can significantly enhance farmer income. Key recommendations include strengthening farmer cooperatives, expanding cold storage infrastructure, and enhancing market-linkage programmes.

Keywords: Makhana, fox nut, socio-economic profile, marketing efficiency, price spread, marketing margin, Bihar, Darbhanga

1. Introduction

Makhana (*Euryale ferox* Salisb.) is a globally significant aquatic crop belonging to the family Nymphaeaceae, cultivated predominantly in stagnant water bodies such as ponds, wetlands, and oxbow lakes. India dominates global makhana production, with Bihar alone contributing more than 80 percent of the country's output and approximately 85 percent of world supply. The total area under makhana cultivation in India is estimated at 15,000 hectares, yielding approximately 1,20,000 metric tonnes of seeds annually, which are processed into nearly 40,000 metric tonnes of popped makhana.

Nutritionally, makhana is rich in carbohydrates (76.9%), protein (9.7%), and essential minerals including calcium, magnesium, phosphorus, and iron, while being extremely low in fat (0.1%). These properties have driven its rising popularity as a health food both domestically and internationally. The global makhana market is valued at approximately USD 35 million, with the Asia-Pacific region accounting for nearly 85 percent of demand. The estimated producer-level value of makhana production in India stands at approximately Rs. 250 crore, while the trade value reaches nearly Rs. 550 crore, indicating a substantial gap

that warrants investigation into marketing channels and intermediary roles.

Despite its economic importance, the makhana sector faces persistent structural challenges. Farmers, particularly those belonging to small and marginal landholding categories and the fisher community, often lack access to organized markets, modern processing technology, and adequate financial resources. Intermediaries dominate price determination due to their control over storage and processing infrastructure, resulting in farmers receiving only 40–60 percent of the final retail price. The makhana sector, therefore, presents a compelling case for rigorous empirical analysis of both farmer socio-economic conditions and marketing channel efficiency.

The present study focuses on two specific research objectives: (i) to assess the socio-economic profile of makhana farmers and processors in the study area, and (ii) to evaluate the marketing efficiency, price spread, marketing margins, and farmer's share in the consumer's rupee across different marketing channels in Darbhanga district of Bihar. Darbhanga was purposively selected as it is one of the leading makhana-producing districts in the state with a significant concentration of traditional cultivation practices

across two major blocks — Keoti and Manigachhi.

1.1 Significance of the Study

The findings of this study are expected to contribute to a better understanding of the socio-economic conditions of makhana farmers and the efficiency of existing marketing systems. By identifying key constraints and inefficiencies, the study aims to provide actionable recommendations for policymakers, agricultural extension workers, and market intermediaries to improve farmer welfare and supply chain performance. This is particularly relevant in the context of the Government of India's commitment to doubling farmer incomes and expanding agri-export potential.

2. Review of Literature

A substantial body of literature exists on makhana production economics, marketing, and socio-economic dimensions. This section reviews key studies that inform the present research.

Trivedi (2003) ^[16] documented that makhana has been cultivated in the Mithilanchal region for nearly 200 years, noting that the production process is tedious and labour-intensive, with only one-third of total produce recovered as popped makhana. NRCM (2003) confirmed that despite India holding near-monopoly status in makhana production and processing, economic returns to producers and processors remain disproportionately low relative to market-level value.

Jha and Ahmad emphasized the labour-intensive nature of makhana activities, noting that seed collection and popping require skilled manual labour, while a lack of mechanization significantly increases production costs. Mandal *et al.* (2010) ^[8] detailed the agronomic conditions required for makhana cultivation, highlighting the importance of tropical wetland ecosystems and suitable water management for optimal yields.

Prakash and Choudhary (2014) ^[11] analyzed marketing costs and price spread, finding that middlemen capture a significant portion of profit in the makhana supply chain, with producers receiving only about 53 percent of the final consumer price. This finding is central to understanding the economic disempowerment of makhana farmers.

Kumar and Jha (2015) studied marketing channels in Darbhanga and Madhubani districts, finding that farmers' heavy dependence on middlemen stems from the absence of organized markets and storage infrastructure. Marketing efficiency was found to be higher in shorter channels where producers transacted directly with processors. Singh *et al.* (2014) ^[14] similarly noted that inefficiencies in marketing channels and lack of value chain integration result in substantial income losses for farmers.

Pandey and Mishra (2018) ^[10] reported that farmers located near organized clusters and processing centres receive higher margins compared to those in remote areas, underscoring the importance of market proximity and infrastructure. Jha *et al.* (2021) ^[2] confirmed that middlemen dominate price determination due to their control over storage, with farmers generally receiving only 40–50 percent of the final retail price.

More recently, Kaur and Singh (2022) ^[4] found that rising demand for branded and packaged makhana in urban

markets has shifted bargaining power towards organized processors, potentially further marginalizing smallholder farmers. Sonu and Jha (2025) ^[15] identified significant variations in income levels, resource access, and market participation among makhana farmers in Bihar, calling for targeted policy interventions to address socio-economic disparities.

3. Research Methodology

3.1 Study Area

Darbhangha district of Bihar was purposively selected for the study due to its status as one of the leading makhana-producing districts in the state. The district covers an area of approximately 2,278 square kilometres, situated in the fertile Mithila region of north Bihar. Its sub-tropical humid climate, rich alluvial soil, and extensive network of ponds, wetlands, and river systems create ideal ecological conditions for makhana cultivation. Annual rainfall in the district ranges from 1,200 to 1,300 mm, replenishing water bodies essential for the crop. From within the district, Keoti and Manigachhi blocks were purposively selected due to their larger makhana pond area and higher concentration of makhana cultivators.

3.2 Sampling Design

A multi-stage sampling procedure was employed. In the first stage, Darbhanga district was purposively selected. In the second stage, Keoti and Manigachhi blocks were selected. In the third stage, villages with the highest concentration of makhana cultivation were selected with the assistance of block officials and panchayat records. In the fourth stage, a village-wise list of makhana farmers was prepared, and 10 percent of farmers were selected using simple random sampling, yielding a final sample of 100 farmers. Respondents were stratified into five landholding categories: marginal (less than 1 ha), small (1–2 ha), semi-medium (2–4 ha), medium (4–6 ha), and large (above 7 ha). For marketing channel analysis, market intermediaries including village traders, processors, wholesalers, and retailers were also interviewed.

3.3 Data Collection

Primary data were collected through semi-structured questionnaires administered personally to farmers and market intermediaries. Separate questionnaires were designed for farmers (covering socio-economic characteristics, cultivation practices, and marketing behaviour) and for market functionaries (covering price data, marketing costs, and margins). Secondary data were gathered from government reports, ICAR publications, official statistical records of the selected blocks, and published research studies.

3.4 Analytical Tools

The following analytical tools were employed in the study:

- **Marketing Efficiency:** Shepherd's formula — $ME = V/(MC)$, where V is the value of commodity sold and MC is the total marketing cost.
- **Price Spread:** Calculated as the difference between the consumer price and the price received by the producer.

- Producer's Share in Consumer Rupee: (Producer's price / Consumer's price) $\times$ 100.
- Marketing Margin: Difference between price received and price paid at each stage of the marketing chain.
- Garrett's Ranking Technique: Applied to rank constraints based on percentage position scores assigned by respondents.
- Descriptive Statistics: Frequencies, percentages, and tabular presentation for socio-economic profile analysis.

4. Results and Discussion

4.1 Socio-Economic Profile of Makhana Farmers (Objective 1)

The socio-economic profile of the 100 sampled makhana farmers in Darbhanga district was assessed on the basis of age distribution, literacy levels, family size, number of family members engaged in farming, occupation, and annual income. The results are presented below.

4.1.1 Age-Wise Distribution of Sample Farmers

Table 1: Age-Wise Distribution of Sample Farmers

Age Group (Years)	Marginal	Small	Semi-medium	Medium	Large	Total	Percentage (%)
Below 30	5	4	5	4	1	19	19%
30 to 40	6	5	6	5	5	27	27%
40 to 50	5	6	5	6	6	28	28%
Above 50	5	5	5	4	7	26	26%
Total	21	20	21	19	19	100	100%

Source: Primary Survey Data, 2024-25

Table 1 reveals that the age profile of makhana farmers in Darbhanga district is relatively spread across productive adult age groups. The majority of farmers (28%) fall in the 40–50 years age group, indicating that middle-aged adults constitute the dominant farming workforce. Farmers in the 30–40 years age group account for 27 percent, while those above 50 years represent 26 percent of the sample. A smaller but significant proportion (19%) of farmers are below 30 years, suggesting some degree of youth participation in makhana cultivation, though this remains limited compared to other age cohorts.

These findings indicate that makhana farming is predominantly practiced by experienced adult farmers. The relatively low share of youth farmers is a concern, as it may signal declining intergenerational transfer of cultivation knowledge. The skew towards older farmers also suggests potential future labour constraints as the farming population ages. Policy efforts targeted at engaging youth through skill training and financial incentives could improve long-term sustainability of the makhana sector.

4.1.2 Literacy Levels of Sample Farmers

Table 2: Literacy Levels of Sample Farmers

Education Level	Marginal	Small	Semi-medium	Medium	Large	Total	Percentage (%)
Illiterate	9	9	8	7	2	35	35%
School Level	7	6	8	8	6	35	35%
College Level	4	4	4	4	6	22	22%
Professional & Others	1	1	1	0	5	8	8%
Total	21	20	21	19	19	100	100%

Source: Primary Survey Data, 2024-25

Table 2 shows that the literacy profile of makhana farmers is diverse. An equal proportion of farmers (35% each) are either illiterate or educated up to the school level (Class 1–10), making these two categories together account for 70 percent of the sample. College-level educated farmers constitute 22 percent, while those with professional or other higher educational qualifications represent 8 percent. The low share of college-educated farmers (30%) is a concern, as it limits access to market information, government schemes, and modern agricultural technologies. Illiteracy among 35 percent of farmers significantly

constrains their ability to maintain farm records, access digital market platforms, and participate in formal credit markets. The reliance on traditional and oral methods for knowledge transfer further limits technology adoption. These findings underscore the need for farmer education programmes, mobile-based advisory services, and extension outreach that do not rely exclusively on written communication.

4.1.3 Family Size of Sample Farmers

Table 3: Family Size of Sample Farmers

Family Size	Marginal	Small	Semi-medium	Medium	Large	Total	Percentage (%)
Below 4	5	4	4	4	0	17	17%
4 to 6	4	4	5	5	0	18	18%
6 to 8	7	7	7	6	8	35	35%
Above 8	5	5	5	4	11	30	29%
Total	21	20	21	19	19	100	100%

Source: Primary Survey Data, 2024-25

The family size data in Table 3 indicate that makhana farmers generally belong to large joint families. A substantial majority of farmers (35%) have a family size of 6 to 8 members, while 29 percent have families with more than 8 members. Together, 64 percent of farmers belong to families with six or more members. Only 17 percent of farmers have families smaller than 4 members. This prevalence of large family sizes is consistent with the socio-cultural patterns of the Mithila region and reflects the labour-intensive nature of makhana cultivation, which benefits from larger family labour pools.

Large family sizes also imply higher household consumption requirements and greater dependency ratios, which may limit the investable surplus available for farm improvements. At the same time, a larger family provides a ready source of unpaid family labour for the demanding activities of makhana seed collection, processing, and marketing. This labour availability is an important hidden asset that partially offsets the financial disadvantages faced by marginal and small farmers.

4.1.4 Annual Income Distribution of Sample Farmers

Table 4: Annual Income Distribution of Sample Farmers (Rs./Year)

Annual Income (Rs/Yr)	Marginal	Small	Semi-medium	Medium	Large	Total	Percentage (%)
Below 50,000	3	2	2	1	1	9	8%
50,001 to 1,00,000	5	8	3	6	2	24	20%
1,00,001 to 1,50,000	9	11	10	8	5	43	36%
1,50,001 to 2,00,000	4	4	3	5	2	18	15%
Above 2,00,000	0	0	2	2	2	6	5%
Total	21	25	20	22	12	100	83%*

Source: Primary Survey Data, 2024-25 | *17 respondents had mixed/non-farming income; 83 classified by farming income only.

Table 4 reveals significant income heterogeneity among makhana farmers. The largest income category is Rs. 1,00,001 to Rs. 1,50,000 per annum, which accounts for 36 percent of the sample. The Rs. 50,001 to Rs. 1,00,000 category and the Rs. 1,50,001 to Rs. 2,00,000 category each account for 20 percent of farmers, together forming a substantial middle-income segment. Farmers earning above Rs. 2,00,000 per annum constitute only 5 percent of the sample, while those earning below Rs. 50,000 represent 8 percent.

The concentration of farmers in the Rs. 1,00,001 to Rs. 1,50,000 income bracket suggests that while makhana farming generates a modest livelihood, it falls short of

ensuring economic security or enabling significant capital investment. The data also reveal a strong correlation between landholding size and income — large farmers are more represented in higher income categories, while marginal farmers dominate lower income brackets. This underscores the need for income-enhancement strategies specifically targeted at marginal and small makhana farmers through improved market access, value addition support, and supplemental livelihood programmes.

4.1.5 Constraints Faced by Farmers in Makhana Marketing

Table 5: Constraints Faced by Farmers in Makhana Marketing (Garrett's Ranking)

S. No.	Constraints	Frequency	Percentage (%)	Garrett Rank
1	Lack of market knowledge/awareness	72	72%	I
2	Low selling price of makhana	70	70%	II
3	Weight loss due to drying	68	68%	III
4	Lack of training services	65	65%	IV
5	Lack of government support	64	64%	V
6	Lack of suitable variety	62	62%	VI
7	Lack of technical support	60	60%	VII

Source: Primary Survey Data, 2024-25 | Garrett's Ranking Method applied

Table 5 presents the major marketing and production constraints faced by makhana farmers, ranked using Garrett's Ranking Technique. The most critical constraint reported by 72 percent of respondents was lack of awareness regarding market knowledge and price information. This significantly impairs farmers' ability to negotiate fair prices and connect with better-paying markets. The second-ranked constraint was the low selling price of makhana, cited by 70 percent of farmers, reflecting the weak bargaining power of producers in the supply chain.

Weight loss due to drying during storage and transportation was ranked third (68%), highlighting post-harvest losses as a significant economic challenge. Lack of training services (65%), inadequate government support (64%), absence of suitable improved varieties (62%), and limited technical

assistance (60%) were ranked fourth through seventh respectively. These findings collectively point to a systemic deficit in institutional support, infrastructure, and market integration for the makhana sector in the study area.

4.2 Marketing Efficiency, Price Spread and Farmer's Share in Consumer Rupee (Objective 2)

Two distinct marketing channels were identified for makhana in the study area. An analysis of price spread, marketing costs, marketing margins, and producer's share in the consumer's rupee was conducted for each channel. The findings are presented below.

4.2.1 Marketing Channels Identified

- Channel I: Producer → Processor → Wholesaler →

Retailer → Consumer

- Channel II: Producer → Village Trader → Processor → Wholesaler → Retailer → Consumer

Channel I is a relatively shorter chain involving four intermediary stages, while Channel II introduces an additional Village Trader between the producer and the

processor, resulting in a longer and more costly supply chain. Both channels ultimately end at the consumer price of Rs. 650 per kg, but differ significantly in the price received by producers and the costs incurred at each stage.

4.2.2 Price Spread Analysis – Channel I (Producer → Processor → Wholesaler → Retailer → Consumer)

Table 6: Marketing Margin, Price Spread and Market Efficiency – Channel I (Rs./Kg)

S. No.	Particulars	Price/Kg (Rs.)
1	Net price received by producer	420
2	Total marketing cost (Producer) – Packing, materials, misc.	15
3	Sale price of Producer / Purchase price of Processor	435
4	Marketing cost (Processor) – Loading, carriage, processing, misc.	55
5	Margin of Processor	25
6	Sale price of Processor / Purchase price of Wholesaler	515
7	Marketing cost (Wholesaler) – Loading, carriage, misc.	30
8	Margin of Wholesaler	35
9	Sale price of Wholesaler / Purchase price of Retailer	580
10	Marketing cost (Retailer) – Loading, carriage, misc.	25
11	Margin of Retailer	45
	Retail Price / Consumer Price	650
	Total Marketing Cost	125
	Price Spread	230
	Producer's Share in Consumer Rupee	64.62%

Source: Primary Survey Data, 2024-25

Table 6 presents the detailed price spread for Channel I. In this channel, the producer receives Rs. 420 per kg as net price. After incurring marketing costs of Rs. 15 (packing, packing materials, and miscellaneous charges), the producer sells to the processor at Rs. 435 per kg. The processor adds value through loading, transportation, processing, and miscellaneous services at a cost of Rs. 55, and earns a margin of Rs. 25, selling to the wholesaler at Rs. 515 per kg. The wholesaler incurs a marketing cost of Rs. 30 and retains a margin of Rs. 35, selling to the retailer at Rs. 580 per kg. At the retail level, an additional marketing cost of Rs. 25 and a margin of Rs. 45 bring the final consumer price to Rs.

650 per kg. The total marketing cost across all stages amounts to Rs. 125 per kg, and the total price spread (consumer price minus producer net price) is Rs. 230 per kg. The producer's share in the consumer's rupee under Channel I is 64.62 percent, which represents a relatively favourable outcome for the farmer compared to Channel II. This higher share is attributable to the absence of a village trader, which eliminates one layer of margin and associated costs.

4.2.3 Price Spread Analysis – Channel II (Producer → Village Trader → Processor → Wholesaler → Retailer → Consumer)

Table 7: Marketing Margin, Price Spread and Market Efficiency – Channel II (Rs./Kg)

S. No.	Particulars	Price/Kg (Rs.)
1	Net price received by producer	380
2	Total marketing cost (Producer) – Packing, materials, misc.	15
3	Sale price of Producer / Purchase price of Village Trader	395
4	Marketing cost (Village Trader) – Grading, repackaging, misc.	30
5	Margin of Village Trader	25
6	Sale price of Village Trader / Purchase price of Processor	450
7	Marketing cost (Processor) – Loading, carriage, processing, misc.	50
8	Margin of Processor	20
9	Sale price of Processor / Purchase price of Wholesaler	520
10	Marketing cost (Wholesaler)	30
11	Margin of Wholesaler	30
12	Sale price of Wholesaler / Purchase price of Retailer	580
13	Marketing cost (Retailer)	25
14	Margin of Retailer	45
	Retail Price / Consumer Price	650
	Total Marketing Cost	150
	Price Spread	270
	Producer's Share in Consumer Rupee	58.46%

Source: Primary Survey Data, 2024-25

Table 7 presents the price spread for Channel II, which incorporates an additional Village Trader. The producer receives only Rs. 380 per kg in this channel — Rs. 40 less than in Channel I. After adding marketing costs of Rs. 15, the producer sells to the Village Trader at Rs. 395 per kg. The Village Trader incurs Rs. 30 in marketing costs (grading, sorting, repackaging, and miscellaneous), earns a margin of Rs. 25, and sells to the processor at Rs. 450 per kg.

The processor sells to the wholesaler at Rs. 520 per kg after incurring costs of Rs. 50 and earning a margin of Rs. 20. The wholesaler sells to the retailer at Rs. 580 per kg after Rs. 30 in costs and a Rs. 30 margin. The retailer sells to the consumer at Rs. 650 per kg after Rs. 25 in costs and a Rs. 45 margin. Total marketing costs in Channel II are Rs. 150 per kg, and the price spread is Rs. 270 per kg.

The producer's share in the consumer's rupee under Channel II is only 58.46 percent — approximately 6 percentage points lower than Channel I. The village trader's involvement results in a lower procurement price for the producer and an additional margin extraction that increases the overall marketing cost. This finding strongly supports the promotion of Channel I-type arrangements that bypass village traders and enable producers to transact directly with processors.

4.2.4 Comparative Summary of Marketing Channels

Indicator	Channel I	Channel II
Net Price Received by Producer (Rs./kg)	420	380
Total Marketing Cost (Rs./kg)	125	150
Price Spread (Rs./kg)	230	270
Consumer Price (Rs./kg)	650	650
Producer's Share in Consumer Rupee (%)	64.62%	58.46%
Number of Intermediary Stages	3	4

Source: Primary Survey Data, 2024-25

The comparative analysis clearly establishes that Channel I is more efficient and more remunerative for producers than Channel II. Despite identical consumer prices in both channels, Channel I delivers Rs. 40 more to the producer per kg and reduces total marketing costs by Rs. 25 per kg, resulting in a 6.16 percentage point higher producer share. The introduction of the village trader in Channel II creates an additional margin extraction point that disproportionately reduces producer income without adding proportionate value for the consumer.

5. Discussion

The findings of this study reveal a complex picture of socio-economic vulnerability and marketing inefficiency in the makhana sector of Darbhanga district. The socio-economic profile data highlight that the majority of makhana farmers are middle-aged, with limited formal education, large family sizes, and modest annual incomes concentrated in the Rs. 1,00,000 to Rs. 1,50,000 range. These characteristics are consistent with broader patterns of agricultural household poverty in North Bihar (Sonu and Jha, 2025; Mandal, 2019) [15, 7].

The educational attainment data are particularly concerning. The high rate of illiteracy (35%) among farmers severely limits their ability to access digital market platforms,

government welfare schemes, and formal credit institutions. This creates a vicious cycle where information asymmetry reinforces market dependency on intermediaries. The findings of Prakash and Choudhary (2014) [11] and Jha *et al.* (2021) [2] are validated in the present study — producers receive substantially less than the retail consumer price, with the deficit being absorbed by marketing costs and intermediary margins.

The marketing channel analysis reveals that Channel I (without a village trader) is more efficient and more equitable than Channel II. The producer's share of 64.62 percent in Channel I, while relatively higher than reported in some earlier studies (Sah *et al.*, 2013 reported 53%) [12], still leaves significant scope for improvement. The price spread of Rs. 230 per kg in Channel I, rising to Rs. 270 per kg in Channel II, represents the cost of market access failures and the premium captured by intermediaries.

From a policy perspective, the analysis of constraints is equally significant. The top-ranked constraint — lack of market knowledge — speaks to a fundamental information gap that, if addressed through digital platforms, farmer cooperatives, and mobile advisory services, could substantially improve negotiating capacity and market outcomes. The weight loss during drying (ranked 3rd) points to a critical post-harvest infrastructure deficit that can be addressed through subsidized solar drying facilities and cold storage investments.

6. Conclusion and Policy Recommendations

This study provides comprehensive empirical evidence on the socio-economic conditions of makhana farmers and the inefficiencies in makhana marketing channels in Darbhanga district, Bihar. The key conclusions are as follows:

- Most makhana farmers are middle-aged (28% in 40–50 years group), with limited formal education (35% illiterate) and large family sizes (64% have 6+ members), reflecting the traditional agrarian character of the sector.
- Annual farm income is predominantly in the Rs. 1,00,001–1,50,000 range (36%), with limited financial surplus for investment in improved inputs or technology.
- Channel I is more efficient and more remunerative than Channel II, delivering Rs. 40 more per kg to producers, with a lower price spread (Rs. 230 vs. Rs. 270/kg) and a higher producer share (64.62% vs. 58.46%).
- Lack of market knowledge, low selling prices, and post-harvest losses are the three most critical constraints faced by makhana farmers in the study area.

Based on these findings, the following policy recommendations are offered:

- Promote Channel I arrangements by facilitating direct producer-to-processor linkages through Farmer Producer Organizations (FPOs) and contract farming agreements.
- Establish Market Information Systems (MIS) through mobile-based platforms and Common Service Centres (CSCs) to reduce information asymmetry and empower farmers in price negotiations.
- Invest in post-harvest infrastructure including grading facilities, solar dryers, and cold storage warehouses in

makhana-producing blocks to reduce weight loss and quality deterioration.

- Launch targeted literacy and digital literacy programmes for makhana farming communities to improve access to government schemes, formal credit, and e-commerce platforms.
- Strengthen the role of ICAR Makhana Research Centre, Darbhanga in disseminating improved cultivation and processing technologies through intensive extension campaigns.
- Provide dedicated marketing support including subsidized transportation, support prices, and regulated market yards to reduce dependence on village traders and other intermediaries.

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