



Garrett Ranking of Constraints and Satisfaction of Makhana (*Euryale ferox*) Growers in Bihar

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HIGHLIGHTS

- Labour and Skill Requirements were identified as the most significant constraint, impacting the efficiency and output of Makhana farming.
- Lack of Technological Support for cultivation and postharvest processes hinders growth potential and affects farmer satisfaction.
- Landownership insecurity affects long-term investments, emphasizing the need for land reform policies to promote improved agricultural practices.

ARTICLE INFO

Keywords: Constraints, Garrett ranking, Makhana, Satisfaction, Technological support.

<https://doi.org/10.48165/IJEE.2025.613RN04>

Conflict of Interest: None

Research ethics statement(s):

Informed consent of the participants

ABSTRACT

The study aimed to identify the key constraints Makhana (*Euryale ferox*) growers face in the districts of Madhubani and Darbhanga, Bihar, and assess their satisfaction with various aspects of Makhana cultivation. The study was conducted in 2024 and 2025, the research involved a total of 360 randomly selected Makhana growers (262 male and 98 female). A descriptive research design was employed, utilizing the Garrett Ranking Method to evaluate constraints and a 5-point Likert scale to assess satisfaction levels across various aspects of cultivation, including production, income, labour, and postharvest practices. The findings revealed that the most significant challenges included skilled labour requirements, land ownership issues, and lack of technological support. Farmers expressed moderate satisfaction with cultivation practices, although satisfaction with income generation was notably low. The study highlights the need for improved technology, better market access, and increased financial support to enhance both productivity and the economic sustainability of Makhana farming. Addressing these constraints could improve farmer satisfaction and ensure the long-term viability of Makhana cultivation in the region.

INTRODUCTION

Makhana, also known as fox nut or Gorgon nut, is a water-loving crop primarily grown in stagnant water bodies such as ponds, swamps, and ditches. The cultivation of Makhana is highly labour-intensive, involving manual operations from sowing to processing (Singh et al., 2023). This high labour demand contributes to the crop's substantial market value. Makhana is recognized for its nutritional benefits, including its high carbohydrate and protein

content and low fat, making it a popular ingredient in local diets and a growing commodity in international markets (Sharma et al., 2020). Additionally, the crop is valued for its medicinal properties, which has further boosted its recognition globally (Kumar & Jha, 2025). Makhana plays an important role in Bihar's rural economy, providing income and employment opportunities for resource-poor farmers. The state is the largest producer of Makhana in India, contributing over 80% of the country's total output, with districts such as Darbhanga, Madhubani, and Katihar being the primary

production areas (Kumar et al., 2020). Despite its economic significance, Makhana farming faces several challenges, including labour-intensive cultivation processes, inadequate access to modern agricultural practices, and limited market infrastructure. These constraints affect the productivity and profitability of the crop, making it essential to address these issues for the sustainable growth of Makhana farming in Bihar (Kumar et al., 2021).

This study aims to identify the major constraints faced by Makhana growers and evaluate their satisfaction with the cultivation process. The primary objective is to gain an in-depth understanding of the factors influencing the productivity and economic viability of Makhana farming. Addressing key constraints, such as labour requirements, access to improved varieties, technological support, and market infrastructure, will enhance both farmer satisfaction and productivity (Ahmad, 2020). By focusing on the psycho-social and economic aspects of Makhana cultivation, the research will provide actionable insights into how targeted interventions can improve the livelihoods of Makhana farmers. This approach is justified as it not only highlights the challenges farmers face but also offers a comprehensive understanding of the factors influencing their satisfaction and overall productivity. The results of this study could guide policymakers, agricultural extension services, and other stakeholders in developing effective strategies for improving the Makhana sector, ensuring its sustainable growth and increased profitability for farmers (Khadatkar et al., 2020).

METHODOLOGY

The study was conducted in the districts of Madhubani and Darbhanga located in the state of Bihar, which were purposively selected due to their prominence in Makhana cultivation, characterized by high land area, production, and productivity. Given their significant contribution to the regional agricultural economy, these districts provided a relevant context for understanding the challenges faced by Makhana growers. A total of 360 Makhana growers were randomly selected, including 262 male and 98 female respondents. The research design was descriptive and aimed at identifying the key constraints and satisfaction levels among farmers. The Garrett ranking method was applied to assess the severity of constraints, where respondents rated 25 identified constraints on a scale from 1 (least severe) to 5 (most severe). These constraints were derived from existing literature and discussions with local farmers. Garrett scores were calculated by multiplying the rank of each constraint by the number of respondents who rated it, then dividing the sum by the total number of participants, resulting in a ranked list of constraints.

Satisfaction levels were evaluated using a 5-point Likert scale across 11 key aspects of Makhana cultivation, including production, income, labor, technological adoption, and postharvest practices. Respondents rated their satisfaction from “Extremely Unsatisfied” to “Extremely Satisfied.” Weighted scores for each statement were calculated by multiplying the frequency of responses by their respective scale values, and the mean scores were used to rank satisfaction levels. Data were analyzed using SPSS (version 22.0), with descriptive statistics, including mean scores and rankings, computed to summarize the constraints and satisfaction levels. The findings from this methodology provide a comprehensive

understanding of the factors influencing Makhana farming, highlighting the primary challenges growers face and their satisfaction with current cultivation practices.

RESULTS

The perceived satisfaction of Makhana growers was assessed using a 5-point Likert scale across 11 statements. The Table 1 & 2 presents the weighted scores, mean scores, and ranks, illustrating satisfaction levels related to various aspects of Makhana cultivation, including production, income, practices, technology, and postharvest mechanisms.

DISCUSSION

The results from the Garrett Ranking method and the perceived satisfaction assessment offer critical insights into the challenges and opportunities faced by Makhana (*Euryale ferox*) growers in Bihar. This study highlights various constraints affecting the cultivation and production processes, providing a solid foundation for addressing the key barriers in Makhana farming (Kumar & Jha, 2025). The primary constraint identified through the Garrett Ranking method is the skilled labour requirement, which ranks first with a total score of 9416.58. This finding underscores the importance of skilled labour in improving agricultural productivity. The significant role of skilled labour is crucial for Makhana farming (Kumar & Jha, 2025), where traditional cultivation systems remain dominant. The reliance on manual labour further exacerbates the challenges associated with low productivity and inefficient practices (Kumar et al., 2011). The land ownership issues highlight a persistent barrier to long-term investment and stability in Makhana cultivation. Uncertainty over land tenure often deters farmers from investing in modern agricultural technologies, ultimately limiting growth potential (Sabu & Roy, 2024).

The lack of technological support is another prominent issue, suggesting that outdated cultivation techniques and inadequate access to modern technologies constrain farmers similar to Das et al., (2014). The absence of technological advancement in postharvest and production processes limits the ability to scale Makhana farming. While the importance of adopting new technologies, such as irrigation systems and processing machinery, is recognized, the lack of financial resources to invest in these tools remains a significant barrier similar to Shashi et al., (2023).

In terms of satisfaction, the results from Table 2 reveal that Makhana growers express moderate satisfaction across various aspects of cultivation. Notably, the highest satisfaction is observed with production, indicating that while Makhana remains a viable crop, farmers still encounter challenges in optimizing yields and ensuring consistent outputs. Climatic factors play a significant role, as fluctuations in water levels directly affect pond productivity, which in turn contributes to dissatisfaction with postharvest processes (Valaei et al., 2017). Interestingly, the moderate satisfaction with labour suggests that while the cultivation process remains labour-intensive, farmers continue to value the human aspect of the work, despite its manual and demanding nature. However, income satisfaction is notably low, pointing to financial limitations that growers face, despite substantial investments in time and effort (Kumar et al., 2011). This gap between input and output

Table 1. Garrett Ranking of Constraints in Makhana Cultivation

Constraints	Total Garrett Score	Mean Garrett Score	Rank
Skilled Labour Requirement	9416.58	26.16	I
Land Ownership Issues	8766.59	24.35	II
Traditional Cultivation Systems	7833.30	21.76	III
Lack of Technological Support for Postharvest and Production Processes	7449.95	20.69	IV
Irrigation Cost	7316.63	20.32	V
Troublesome Cultivation Practices (e.g., manual, outdated methods)	7066.65	19.63	VI
High Interest Rates of Local Money Lenders	7033.32	19.54	VII
Unavailability of Suitable Ponds and Control of Aquatic Weeds	6849.99	19.03	VIII
Lack of Financial Resources for Investment	6699.96	18.61	IX
Marketing	6583.30	18.29	X
High Input of Cultivation (Including Labour and Fertilizer)	6166.66	17.13	XI
Rate Fluctuations	6083.35	16.90	XII
Lack of Disease Management Practices	5899.92	16.39	XIII
Limited Access to Government Support for Makhana Growers	5849.97	16.25	XIV
Adoption of New Technologies (e.g., irrigation systems, processing machinery)	5383.29	14.95	XV
Lack of Financial Support from Banks/ICAR/Govt	5116.66	14.21	XVI
Climatic Variability	5000.00	13.89	XVII
Low Selling Price	4850.01	13.47	XVIII
Lack of Scientific Knowledge of Cultivation	4633.34	12.87	XIX
Unproductive Ponds	4633.32	12.87	XX
Distance of Pond from Home	4583.26	12.73	XXI
Lack of Suitable Variety	4250.03	11.81	XXII
Short Lease Period	4149.98	11.53	XXIII
Irrigation Inefficiency and High Cost	3583.32	9.95	XXIV
Unmet/Unfulfilled Training Needs	3399.98	9.44	XXV

Table 2. Perceived Satisfaction of Makhana Growers (n=360)

Statement	Weighted Score	Weighted Mean Score	Rank
Are you satisfied with the production you are getting at present?	1298	3.605	I
Do you think Makhana is very beneficial for your livelihood?	1296	3.600	II
Are you satisfied with the Makhana cultivation practice you are adopting?	1295	3.597	III
Do you need better technology for Makhana production?	1278	3.550	IV
Are you satisfied with the Makhana cultivation?	1276	3.544	V
Are you satisfied with the labour you put into Makhana production?	1274	3.538	VI
Are you satisfied with the indigenous system of Makhana cultivation?	1270	3.527	VII
Are you satisfied with the postharvest mechanism you are adopting in Makhana production?	1252	3.477	VIII
Do you have any problem in postharvest of Makhana?	1246	3.461	IX
How satisfied are you with the customers to whom you sell Makhana?	1194	3.316	X
How satisfied are you with the income you receive from Makhana cultivation?	1041	2.891	XI

can be attributed to various factors, including low selling prices, limited market access, and outdated postharvest technology, all of which hinder the marketability of Makhana and affect the profitability of its cultivation. Addressing these challenges will be crucial for improving the economic viability of Makhana farming and enhancing farmer satisfaction (Singh et al., 2020).

Furthermore, the need for better technology is a common theme that emerges across constraints and satisfaction. This underscores the crucial need for technological intervention to improve productivity, streamline postharvest processing, and enhance the quality of Makhana products (Gireesh et al., 2019; Kademani et al., 2024). The challenge of meeting this need is compounded by limited financial support, which restricts grower's

ability to adopt more advanced technologies and improve overall production efficiency (Shashi et al., 2023).

CONCLUSION

The study highlights the key constraints and satisfaction levels of Makhana growers in Bihar, emphasizing the critical role of skilled labour, land ownership issues, and lack of technological support in limiting productivity and farmer satisfaction. Despite the crop's potential, the labour-intensive nature of its cultivation, coupled with inadequate access to modern agricultural techniques and market infrastructure, possess significant barriers to sustainable growth. Farmers expressed moderate satisfaction with production and labour, but income generation remains a major concern due to low selling

prices and limited market access. The findings underscore the need for targeted interventions, including improved technology adoption, better market linkages, and financial support for Makhana farmers. Addressing these challenges will enhance the economic viability and sustainability of Makhana farming in Bihar, thereby improving farmer's livelihoods and contributing to the sector's long-term growth. This study provides a framework for policy formulation and practical solutions to enhance Makhana cultivation.

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