Plant Archives Vol. 24, Special Issue (GABELS), 2024 pp.615-618 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2024.v24.SP-GABELS.095

ECONOMIC ANALYSIS OF MAKHANA CULTIVATION IN DARBHANGA DISTRICT OF BIHAR, INDIA

Sujita Kumari Sharma[1], Meera Kumari[1], Shoji Lal Bairwa[1], M.Rahman[1], Chandan Kr. Panda[2], Fozia Homa[3] and Chanda Kushwaha[4]

[1]Department of Agril. Economics, Bihar Agricultural University, Sabour, Bhagalpur-813210, Bihar, India
[2]Department of Extension Education, Bihar Agricultural University, Sabour, Bhagalpur-813210, Bihar, India
[3]Department of S.M.C.A., Bihar Agricultural University, Sabour, Bhagalpur-813210, Bihar, India
[4]Department of Plant Pathology, Bihar Agricultural University, Sabour, Bhagalpur-813210, Bihar, India
*Corresponding author E-mail:smabm.bhu@gmail.com
(ORCID ID: 0000-0002-7606-0144)

ABSTRACT

The water crop known as makhana or gorgon nut (*Euryale ferox*), a member of the Nymphaeaceae family, is produced in a few districts in north Bihar. The present study was carried out in one of the Bihar's major makhana-producing districts of Bihar i.e., Darbhanaga. The main objective of study was to evaluate the expenses and benefits of makhana cultivation in Bihar. The findings showed that the cost of cultivating Makhana was calculated to be Rs. 63211.09/ha on average for pond system and Rs.76356.53 for field system. 79.73 per cent and 62.81 per cent of the overall cost of cultivation was found to be variable cost, and the remaining 20.26 per cent and 30.90 per cent was found to fixed cost for pond system and field system respectively. The cost of manpower alone, which is considered a variable cost, was Rs. 33107.11/ha and Rs.32333.33 of the whole cost for pond system and field system respectively. Pond rent and land rent, one of many fixed costs, was considered to be the most significant expense and was estimated to be Rs.7499/ha and Rs.17577 for pond system and field system respectively. 19.60 and 24.21 quintals of raw Makhana were produced on average per hectare in pond system and field system respectively. The gross return for Makhana Pond was found to be Rs.294000 and Rs.363150 per hectare for pond system and field system respectively. The *Mallah* (Fishermen) community, which is particularly involved in its cultivation, has great potential to benefit economically from the production of makhana. In addition to NRC, Darbhanga, and training and demonstration programmes on cultivation techniques, the state government may promote Makhana cultivation. These practises should be provided for effective cultivation.

Keywords : Makhana, Cost and Returns, Pond System, Field System, Variable Cost, Fixed Cost.

Introduction

Euryale ferox Salisb. is an aquatic crop, belonging to the family of *Nympheaceae.* It is commonly known as Makhana, Gorgon nut or Fox nut, and grown in stagnant perennial water bodies like ponds, land depressions, oxbow lakes, swamps and ditches. Makhana seeds are also known as black diamond. It is a plant of tropical and subtropical climate. Makhana cultivation provides livelihood to thousands of resource poor farmers, particularly in Bihar and Manipur. It is a cash crop and marketed in the form of popped Makhana commonly known as Makhana lava. Makhana primarily serves the purpose of being consumed as food item for local and religious purposes. Being the non-cereal food, Makhana is a food item during vast religious fast for various people. Popped Makhana is highly digestible and is used in the preparation of a number of delicious and rich sweet

dishes like kheer, pudding, milk based sweets, for preparation of food items during fasting etc. These days Makhana is used by food industries as an ingredient of ready-to-eat products (World Bank, 2007). The seed become only edible after being processed and are highly nutritious.

Makhana is considered as a native of South-East Asia and China, but distributed to almost every part of the world. However, its commercial cultivation is limited to North Bihar, Manipur, parts of West Bengal and Madhya Pradesh. The total area under Makhana cultivation in India is about 15,000 ha (ICAR National Research Centre for Makhana Research, Darbhanga). The production of Makhana seeds is about 1,20,000, which after being processed yield 40,000MT of Makhana pop. The estimated value of Makhana production at farmer's end is Rs.250 crores and it generates the revenue of Rs.550 crores at trader's level. (Anonymous, 2010).

In the state of Bihar, major Makhana producing districts are Darbhanga, Sitamarhi, Madhubani, Saharsa, Supaul, Araria, Kishanganj, Purnea, Katihar. Approximately, 80 per cent of the total production of processed Makhana comes from Darbhanga, Madhubani, Purnea and Katihar districts alone. However, the area under Makhana cultivation has declined up to 35 per cent (from 20,000 ha to 13,000 ha) and has accounted for 85 per cent of total yield in the year 2012 (Singh, 2014). As an aquatic plant, Makhana requires permanent standing water throughout its growth period. Natural and man- made water bodies in such districts are ideal for cultivation of this crop. The investment on inputs like fertilizers and other agro-chemicals is moderate. Even investment in pests and disease control is meagre as it is less infected by pests and disease. Cultivation of Makhana is highly cumbersome, labour intensive, and involves human drudgery while sweeping the bottom of water body for collection. It is followed by processing of raw seeds, which is equally painstaking activity. However, these farmers are the one who has to face lots of problems in final from production, distribution to the last consumers.

Materials and Methods

Darbhanga district was purposively selected for conducting the study on economics of Makhana cultivation. Multipurpose random sampling method was used as the sampling procedure for the selection of respondents. In the first stage, two blocks were chosen from the district. In the second stage, two villages were chosen from each of the two blocks. And in the third stage 10 market intermediaries and 15 Makhana farmers were randomly selected. Therefore, a sample of size 100 was used for conducting the study. Data collection regarding the various costs involved i.e. labour cost, material cost etc. was done through personal interview with the aid of semi-structured schedule. The cost and returns analysis was made in accordance with the CACP methodology.

Results and Discussion

The cost of production is an important aspect for farmer, it plays an important role in making correct decision regarding the combination of different resources required in production of crop.

In every production process some raw materials are required which are thereafter converted into output. In Makhana cultivation those raw materials were seed, fertilizer/manure, and insecticide/pesticide. Irrigation was also required in both the pond and field systems, electricity cost was involved as electric motor pumps were being used for pumping water into pond and field. Both the items involved in the production process has been divided into fixed cost items and variable cost items.

The details of different cost components for pond system as well as returns generated in pond system has been given below in Table 1 and Table 2 respectively.

Table 1: Total cost incurred in pond system of cultivation.

S. No.	Cost items	Cost (Rs./ha)	Percentage of total cost
	Variable Cost items		
1.	Human labour		
	Owned/Family labour	2546.22	4.02
	Hired	30560.89	48.34
	Total human Labour cost	33107.11	52.37
2.	Material Cost (input cost)		
	Seed	3688.90	5.85
	Insecticide/Pesticide	701.11	1.10
	Fertilizer/manures	4434.22	7.01
	Total material cost	8824.23	13.95
3.	Water filling (irrigation cost)	6787.22	10.73
4.	Miscellaneous cost	1055.40	1.66
5.	Interest on working capital @ 12 % p.a.	628.96	0.99
	Total Variable Cost (A)	50402.92	79.73
	Fixed Cost items		
	Rent for leased/owned in pond revenue	7499.00	11.86
	Depreciation (per year)	205.32	0.32
	Electricity charges (per season)	4998.00	7.90
	Interest on fixed capital @ 10 % per annum	105.85	0.16
	Total Fixed Cost (B)	12808.17	20.26
	Total Cost (A+B)	63211.09	100

Source: Field Survey -2021-22

The overall cost incurred and returns generated has been given in Table 2. The production under pond system was found to be 19.60 quintal which gave a gross return of Rs. 2.94 lakhs. The net returns and benefit cost ratio was found to be highest under Cost A_1 and least under Cost C_3. The farm business income, family labour income and net income was found to be Rs. 245937.98, Rs. 238333.13 and Rs. 235786.91 respectively.

Table 2 : Cost and returns from cultivation of Makhana in pond system.

S. No.	Particulars	Amount (in Rs./ha)
1.	**Cost of cultivation**	
	Cost A_1	48062.02
	Cost A_2	55561.02
	Cost B_1	48167.87
	Cost B_2	55666.87
	Cost C_1	50714.09
	Cost C_2	58213.09
	Cost C_3	64034.39
2.	**Production (quintal)**	19.60
3.	**Gross Return**	294000.00
4.	**Net Returns over**	
	Cost A_1	245937.98
	Cost A_2	238438.98
	Cost B_1	245832.13
	Cost B_2	238333.13
	Cost C_1	243285.91
	Cost C_2	235786.91
	Cost C_3	229965.61
5.	**Benefit cost ratio over (in ratio)**	**B:C**
	Cost A_1	5.11:1
	Cost A_2	4.29:1
	Cost B_1	5.10:1
	Cost B_2	4.28:1
	Cost C_1	4.79:1
	Cost C_2	4.05:1
	Cost C_3	3.59:1
6.	**Income measures related to cost concepts**	
	Farm Business Income (in Rs./ha)	245937.98
	Family Labour income (in Rs./ha)	238333.13
	Net income (in Rs./ha)	235786.91

Source: Field Survey -2021-22

The total variable and fixed cost incurred in field system has been given in Table 3. Total variable was found to be Rs.47959.66 out of which human labour cost constituted 42.34 per cent of total cost incurred. Since, significant amount of fertilizers, pesticides were used for the maintenance of Makhana in field system, total material cost incurred was found constitute 21.21 per cent of total cost. Irrigation was required to be done 4 times during the crop period in field system, therefore it constituted 23.89 per cent of total cost incurred. Interest on variable cost was calculated at 12 per cent per annum.

Total fixed cost incurred was found to constitute 30.90 per cent of total cost, out of which rent for owned/leased in land was found to constitute 23.01 per cent of total cost under the category of fixed cost. Depreciation was calculated over the equipment used for field preparation and Makhana cultivation. Electricity was required for the purpose of running motors for pumping water into the field. Interest on fixed capital was calculated at 10 per cent per annum and managerial cost was calculated at 10 % of variable cost. Therefore, total cost was found to be Rs. 76356.53.

Table 3: Total cost incurred in field system of cultivation.

S. No.	Cost items	Cost (Rs./ha)	Percentage of total cost
A.	**Variable cost items**		
1.	Human labour		
	Owned/ Family labour	6995.66	9.16
	Hired	25337.67	33.18
	Total human Labour cost	32333.33	42.34
2.	Material Cost (input cost)		
	a) Seed	3753.00	4.91
	b) Seedling	0	0
	c)Insecticide/pesticide	3432.00	4.49
	d)Manures/Fertilizers	9226.11	12.80
	Total material Cost	15626.33	21.21
3.	Irrigation cost	18245.00	23.89
4.	Miscellaneous cost	2088.13	2.73
5.	Interest on working capital @12 % per annum.	719.38	0.94
	Total Variable Cost (A)	47959.66	62.81
B.	**Fixed Cost items**		
1.	Rent for owned/ leased in land	17577.00	23.01
2.	Depreciation (per year)	859.28	1.12
3.	Electricity charges (per season)	4589.00	6.00
4.	Interest on fixed capital @ 10% per annum	575.63	0.75
	Total Fixed Cost (B)	23600.91	30.90
C.	Managerial Cost (10% of variable cost)	4795.96	6.28
	Total Cost (A+B+ C)	76356.53	100

Source: Field Survey -2021-22

The overall cost incurred and returns generated has been given in Table 4. The production under field system was found to be 24.21 quintal which gave a gross return of Rs. 3.63 lakhs. The net returns and benefit cost ratio was found to be highest under Cost

A_1 and least under Cost C_3. The farm business income, family labour income and net income was found to be Rs. 300274.20, Rs. 282121.60 and Rs. 275125.90 respectively.

Table 4: Cost and returns from the cultivation of Makhana in field system.

S. No.	Particulars	Amount (in Rs./ha)
1.	**Cost of cultivation**	
	Cost A_1	62875.79
	Cost A_2	80452.79
	Cost B_1	63451.42
	Cost B_2	81028.42
	Cost C_1	70447.08
	Cost C_2	88024.08
	Cost C_3	96826.48
2.	**Production (quintal)**	24.21
3.	**Gross Return**	363150.00
4.	**Net Returns over**	
	Cost A_1	300274.20
	Cost A_2	282697.20
	Cost B_1	299699.00
	Cost B_2	282121.60
	Cost C_1	292702.60
	Cost C_2	275125.90
	Cost C_3	266323.50
5.	**Benefit cost ratio over (in ratio)**	**B:C**
	Cost A_1	4.77:1
	Cost A_2	3.51:1
	Cost B_1	4.72:1
	Cost B_2	3.48:1
	Cost C_1	4.15:1
	Cost C_2	3.12:1
	Cost C_3	2.75:1
6.	**Income measures related to cost concepts**	
	Farm Business Income (in Rs./ha)	300274.20
	Family Labour income (in Rs./ha)	282121.60
	Net income (in Rs./ha)	275125.90

Source: Field Survey -2021-22

Summary and Conclusion

In the analysis of cost and returns in Makhana cultivation, it was found that field system is relatively more expensive method for cultivating Makhana as the total cost incurred is Rs.76356.53 while in pond system, the total cost incurred is Rs.63211.09. But the yield and gross returns from field system was found to be higher than pond system. The production can be enhanced by providing better technological back-up to the farmers. Also, training and extension services would help farmers in learning the scientific methods of cultivation which would ease their drudgery and give positive impact over production of Makhana.

References

Kumar, A., Singh, A.K., Kumar, A. and Kumari, S. (2020). Constraints faced by makhana growers of Madhubani district and suggestions to eliminate them. *Indian Journal of Extension Education*, 56(3), 177-180.

Kumar, L., Gupta, V.K., Singh, I.S., Bhatt, B.P. and Kumar, D. (2014). Sequential double cropping system of makhana (Euryale ferox Salisb.) cultivation in agricultural fields of north Bihar, India. *Int. J. Agricult. Stat. Sci.* 10(1):105-108.

Mehta, B.K. and Sharma, M.K. (2007). Development of technology for Makhana processing. *Journal of Applied Biology*, 17(1/2): 46-48.

Sharma, A., A study on the economics of Makhana production: A village level approach in Madhubani and Darbhanga districts of Bihar. Msc. Thesis. Dr. Rajendra Prasad Central Agricultural University, Pusa, Bihar – 848125

Sharma, A., Mishra, R.R., Saw, B. and Ahmed, N. (2020). Economic Analysis of Makhana Cultivation in Darbhanga and Madhubani District of Bihar, India. *Int. J. Curr. Microbiol, App. Sci,* 9(4), 1097-1102.