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# Makhana Triumphs over Flood: A Success Story from Darbhanga, Bihar

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## Abstract

Makhana farming, though highly profitable, is a cost intensive proposition. Farmers may have to suffer huge monetary losses if a mature crop of makhana is washed away by the running flood water, a situation not so uncommon in flood prone areas of Mithilanchal region in north Bihar. Here I present the success story of a makhana farmer who beat the flood to save his crop and ensured a net income of Rs. 1,10,000.00/ha from makhana farming in a flood hit region of Darbhanga, where the entire area (*Chaur*) surrounding the farmer's field remained submerged and unproductive. As the farmer confirms, this is the highest he got from makhana cultivation in any of the flood hit years over the past decade and a half. Net fencing around the field coupled with scientific methods of makhana farming did the trick. This story shows the way to successful makhana farming despite the challenges posed by recurrent floods in Mithilanchal region of Bihar.

## Background Information

Mithilanchal region of Bihar can be considered as the global capital of makhana production, due not only to its massive contribution to the total makhana production but also to its rich heritage of the technical know-how in production and processing of makhana (*Euryale ferox* Salisb.). Owing to the growing demand of makhana driven by the increasing global awareness about its nutritional and medicinal values, there has been a renewed focus on cultivation, processing and value addition of makhana in recent times (Kumar *et al*., 2020a; Singh *et al*., 2020). Given the potential economic benefits of makhana farming, its seed is deservedly called as black diamond. Net profit from this aquatic cash crop, also known as fox nut and gorgon nut, has been shown to be many folds higher than the other competing crops traditionally grown in *Mithila* region of Bihar (Kumar *et al*., 2020b). In many low land areas, where rice cannot be grown due to recurrent floods in the region, makhana can be grown successfully. It needs stagnant water (lentic ecosystem) to grow and fructify. Water depth of as little as 1.0 ft is good enough for makhana, though it has been seen to withstand up to 12 ft water and even more. Lotic ecosystem (running water) does not favour its cultivation. Water with heavy current, as seen in intense flood events, can be damaging to makhana crop as it can wash out the floating makhana seeds or even uproot the plants, leading to heavy financial losses to farmers. Such incidences are not uncommon in Mithilanchal region of Bihar, which has seen quite a few heavy floods in recent years. The present article reports success story of a farmer who, in consultation with the author, successfully raised makhana in his low lying area situated in the village *'Shisho Pashchimi'*, near *Nirankari Bhawan*. The farmer (Mahendra Sahani, shown in Figure 3), perplexed by the recurrent crop damages due

**Crop:** Makhana (*Euryale ferox* Salisb.)

**Name of the Farmer and Address:** Mahendra Sahani, Village: Karkauli, PO: Majhigama, Darbhanga (847 306), Bihar.

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to heavy floods in recent years and poor crop performance due to lack of awareness about scientific cultivation, was contemplating to leave makhana farming before he met the author (Dr. Manoj Kumar, Scientist, ICAR-RCER, Research Centre for Makhana, Darbhanga). He learnt scientific methods of makhana farming from the author, and strategized to save makhana crop from any possible damages caused by the impending flood, as experienced in recent years. He not only saved his crop form the intense flood experienced this year (2020), but also ensured a net income of Rs. 1,10,000.00 per ha from makhana farming on a land, in vicinity of which the entire area (*Chaur*) remained submerged and unproductive (Figure 1).

Figure 1: Makhana field of Mahendra Sahani appearing like a green island in an entirely flood inundated area

Figure 2: Net fencing around makhana field installed before the onset of rain

## Institutional Interventions

Following technical inputs were provided by the Scientist from Research Centre for Makhana, Darbhanga for successful cultivation of makhana by Mahendra Sahani,

Figure 3: Mahendra Sahani showing a tender leaf of makhana

which helped him save his crop despite heavy flood and challenges posed by biotic stresses.

• ***Techniques of Nursery Raising*:** Since transplanted crop of makhana yields better than the direct sown crop, the farmer was trained in the art of nursery raising. In addition to better yield of transplanted crop, nursery raising also reduces the seed requirement to one-third compared to direct broadcasting method. Nursery was raised in the first week of January, 2020, using seed @ 20 kg per 500 $m^2$ of nursery area for transplanting in one ha area.

• ***Transplanting Technique*:** Makhana seedlings were ready to transplant by early April. Seedlings were carefully uprooted to avoid any major damage to root system, and transplanted at a line to line and plant to plant distance of 1.25 m each.

• ***Weeding, Plant Protection and Crop Monitoring*:** Weeding was done manually at the early growth period after transplanting and before flowering. Insect pest appearances in the growing crop were reported to the expert (author) through Whatsapp, as physical movement of the farmer to RCM, Darbhanga was restricted due to the lockdown caused by COVID-19 pandemic. Solutions were also provided through Whatsapp and phone calls. However, in the available windows and after the lockdown was lifted, the author made visits to his makhana field for monitoring of general crop health and growth. Timely suggestions on plant protection measures proved decisive in saving makhana from heavy insect-pests

infestations in mid-growth phase of the crop.

• ***Net Fencing*:** In order to save the floating makhana seeds from being washed away by the running flood water, net fencing was installed around the crop before the onset of rain, anticipating the flood occurrence as experienced in recent years. The net, locally known as *chatti jaal*, was supported by bamboo poles installed at regular intervals just inside the boundary of the field (Figure 2). Net fencing proved the ultimate saviour when heavy flood struck the area in monsoon of 2020. Importance of net fencing can be realised by looking at the picture shown in Figure 1, wherein makhana field of Mahendra Sahani appears like a lonely green island in the entire area (*Chaur*) inundated with flood water, having no crop at all. The farmer grew makhana at some other places also, with no net fencing, and he lost his crop almost entirely. Figure 4 and 5 show the expert visiting makhana fields (with no net fencing) of Mahendra Sahani, and taking stock of the insect-pests infestations, general crop growth, and the damages caused by the incumbent flood.

## Results and Outcomes

As a result of the technological interventions by the expert from Research Centre for Makhana, Darbhanga, the farmer earned an income never experienced on his farm before. He cultivated makhana in 0.2 ha area with net fencing, from which he produced 4.0 quintals of makhana seed @ 20 q/ha. With a total input cost of Rs. 30,000.00, he obtained a gross income of Rs. 52,000.00. The net income earned by 0.2 ha of makhana farming (with net fencing) was Rs. 22,000.00, implying a net income of Rs. 1,10,000.00 /ha (Table 1). The same crop grown by Mahendra Sahani at other places, without net fencing, produced almost nothing as the heavy current of flood water washed away the seeds from his field. Plants were also damaged heavily by the flood where fencing was not done (Figure 4 and 5).

Figure 4: Dr. Manoj Kumar (Scientist) monitoring the flood affected makhana crop (with no net fencing)

Figure 5: Dr. Manoj Kumar (Scientist) taking stock of the insect-pests infestation in a flood affected makhana crop (with no net fencing)

Table 1: Summary of the production and income from makhana farming

| Sl. No. | Parameters | Values |
|---|---|---|
| 1 | Cost of cultivation for 0.2 ha (Rs.) | 30,000.00 |
| 2 | Makhana seed production from 0.2 ha (q) | 4.00 |
| 3 | Gross return from total produce (Rs.) | 52,000.00 |
| 4 | Net income from total produce (Rs.) | 22,000.00 |
| 5 | Cost of cultivation/ha (Rs.) | 1,50,000.00 |
| 6 | Gross return from total produce/ ha (Rs.) | 2,60,000.00 |
| 7 | Net income/ha (Rs.) | 1,10,000.00 |

It's important to note that the cost of cultivation per hectare appears a bit higher than the normal due to the additional cost incurred on net fencing. However, the net used this year can be reused in coming seasons too. A few irrigations were also given to the crop before onset of rain, which also added to the input cost. It may be noted that no fertilizer or organic manures were applied to the crop, and despite the multiple challenges posed by heavy flood and biotic stresses, the farmer could produce as much as 20 quintals of makhana per hectare, leading to a net income of Rs. 1,10,000.00 /ha. Income analysis on per hectare basis has been presented just for the sake of ease of comprehension and comparison.

## Success Point

Technological interventions made by the Scientist from Research Centre for Makhana, Darbhanga, resulted in a net income of Rs. 1,10,000.00 /ha from makhana

farming in a flood-hit region of Darbhanga (*Shisho Pashchimi* to be specific), where the entire area (*Chaur*) surrounding the farmer's field remained submerged and unproductive. Net fencing around the field coupled with adoption of scientific methods of makhana farming did the trick. As the farmer confirms, this is the highest he got from makhana farming in any of the flood hit years over the past decade and a half. Other makhana fields of the same farmer, with no net fencing, produced almost nothing due to the damages caused by heavy flood.

## Conclusion

Recurrent flood remains a major challenge to otherwise highly profitable makhana farming in flood prone area of Mithilanchal region in north Bihar. As proved by the success of Mahendra Sahani, makhana can be grown quite profitably even in flood-hit years by the simple technique of net fencing and adoption of scientific methods of makhana cultivation.

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