

# Harvesting *Euryale ferox* (*makhana*) from wetland (*beel*) fisheries of Assam

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Local boys with *makhana* fruits.

## *Euryale ferox* (*makhana*)

*Makhana*, *Euryale ferox* (Nymphaeaceae) is a perennial aquatic herb with gigantic floating leaves that grows in still shallow water (0.2-2.0 m depth) with a rhizomatous stem deeply rooted in the sediments or mud by thick, fleshy root clusters<sup>1,2,3</sup>. *Makhana* is a nutritious dry fruit containing 0.1% fat, 76.9% carbohydrate, 9.7% protein, 12.8% moisture, 20 mg/100 g calcium, 90 mg/100 g phosphorus and 1,400 mg/100 g iron<sup>4</sup>. In Dhaka and Chittagong the seeds are very popular as food and medicine<sup>5</sup>. The plant has been known to the people of Assam as 'nikhori' and 'makhana' and has been reported from some beels of Assam<sup>6</sup>. Economically, no such expenditure is incurred on its cultivation in these wetlands as the seeds left over after harvest germinates subsequently as a crop for the next season.

## The *makhana* wetlands (*beels*)

In India, *makhana* is particularly reported in north Bihar and lower Assam (62.86%) and the distribution, existence and potential of *E. ferox* in Assam is fragmentary as the aquatic

cash crop grows wild in the state and is rarely cultivated in water bodies<sup>7</sup>. Ten such wetlands (*beels*) of the lower part of Assam in rural Kamrup District were investigated to witness the traditional practice of *makhana* harvest. The *beels* were under the jurisdiction of Assam Agricultural University (AAU) namely; (i) Rangai *beel* - 890 m<sup>2</sup> (ii) Bhabuwa *beel* - 2,346 m<sup>2</sup> (iii) Thaliputa *beel* (Part I) - 212 m<sup>2</sup> (iv) Thaliputa *beel* (Part II) - 417 m<sup>2</sup> (v) Balasari *beel* - 200 m<sup>2</sup> (vi) Bagheswari *beel* - 545m<sup>2</sup> (vii) Mandira *beel* - 1,175 m<sup>2</sup> (viii) Bidhanjika *beel* - 820 m<sup>2</sup> (ix) Tiplai *beel* - 537 m<sup>2</sup> and (x) Hogol *beel* - 860 m<sup>2</sup>. The water area of these beels has been recorded during the dry period in winter season which becomes one mass of water body during the rainy season when fresh floods flow into the beels from the tributaries of river Brahmaputra. These *beels* are wide and spread out, irregular in shape and with a minimum depth of 1.5-3.0 m in the dry season. The *beels* are mostly leased out on a short-term basis as per AAU norms to the local *lessees* and *mohaldars* for fisheries purposes.





Fruit of makhana crop.

### Identifying the *makhana* areas

The presence of makhana in the beels can be easily identified by its gigantic prickly floating leaves, which are green on the upper side and purple to red on the lower, thorny, oval or rounded with a diameter of 0.2-1.3 m. Flowers are violet-blue or red in colour. Petioles are prickly and deep green or pink. The fruit are round, spongy and prickly outside containing 12-20 seeds. The seeds are small, black, artillate and encrusted with a thick sheath around the white edible part inside. The plant was recorded to have best growth in old, perennial water bodies having thick layer of mucky bottom that is rich in nutrients; freshly excavated ponds with hard substratum are not suitable for this plant. These wetlands are normally poor in oxygen (below 4 ppm) and have a low pH due to the acidic soil; they also exhibit higher productivity of macrophytes and support a wider biodiversity of invertebrates. Makhana grows naturally in these wetlands, mostly in lower Assam along with other aquatic plants such as *Trapa natan* var. *bispinosa* (singori), *Nelumbo nucifera* (podum), *Nymphaea lotus* (boga bhet) and *Ipomoea aquatica* (kolmou), *Hydrilla verticillata*, *Ceratophyllum demersum*, *Utricularia* spp., *Potamogeton* spp., *Najas* spp., *Marsilea* spp., *Pistia stratiotes*, *Lemna* spp., *Salvinia cuculata*, and *Eicchornia* spp. etc. These plants are considered as biological indicators for favourable soil and water quality for *E. ferox* manifestation<sup>4</sup>.

### The *makhana* harvesters

The sowing and harvesting of makhana seeds is conducted by groups of migratory people belonging to the *Mallah* or *Sahini* community of Bihar. The lessee who takes the *beels* on lease for fish production assigns a middleman or a local person to supervise the harvest of makhana seeds. The migrants from Bihar take temporary shelter in the vicinity of the beels for 20-30 days until the seeds are completely harvested. The middlemen accounts the collected seeds with the help of the harvesters and the seeds are kept for sun-drying on the banks, which are later transported to Bihar for its further processing.

### Method of operation

Harvesting of *makhana* is quite a cumbersome task and requires skill. The *makhana* seeds are usually fallen and scattered over the bottom of the *beels* and must be collected manually during the month of September-November. 10-12 skilled personnel are seen harvesting makhana at a time. The group surveys for a precise location of the fallen seeds within the beel on a boat. Once the location is confirmed, two persons among the group stay on the boat itself and the rest of the harvesters dive into the water to collect the seeds. Each one of them remains inside the water for a few seconds in each dive and sweeps the scattered makhana seeds with their bare hands over the soil surface to make a heap





*Temporary shelter of the harvesters.*



*Mallah or Sahini community of Bihar.*





Harvesters diving in search of makhana seeds.



A bamboo woven gaanja for sieving makhana seeds.



A lift net in operation in flood water.

of seeds underwater, marking the sites with long splits of bamboo or floating material above the water surface. It takes one to one and a half hours to sweep all the makhana fruit in one operation. The harvesters get back to the boat or swim back to the bank after the operation. As the harvesting is done in the colder part of the year, the harvesters take one to two hour rest intervals under the sun before the next harvest. During these intervals, one of the harvesters, recognised as master harvester, dives into the water several times to collect the heaps of makhana seeds in a cylindrical bamboo made drum commonly known as *gaanja*. The drum is woven with bamboo splits in such a way that the same works like a sieve. The mouth of the drum remains open whereas the base is closed by separate bamboo webbing. The base is slighter broader in diameter (100 cm) as compared to mouth (90 cm). The master harvester sieves the unwanted materials from the seeds by dipping and picking the *gaanja* with seeds in water several times. The seeds are brought to the bank of the beel to dry in the sun for several days. 80-120 kg of *makhana* seeds are typically harvested with 3-4 operations in a day as reported by the harvesters.

### Fishes of the beels

Most of the fishes are indigenous and are commercially important as food and also with ornamental value. As the *beels* are of an open type, fishes are stocked naturally with flood water from the Jajjali River, a major tributary of the Brahmaputra. More than 40 varieties of fishes are harvested by the local fishers as an additional animal crop based on natural recruitment. In certain cases, the young of carps such as *Catla catla* (catla), *Ctenopharyngodon idella* (grass carp), *Hypophthalmichthys molitrix* (silver carp), *Labeo rohita* (rohu), *Cirrhinus mrigala* (mrigal) and minor carps are also stocked to fetch a higher return. Some of the groups of fishes identified are;

- Major carps – *Catla catla*, *Labeo rohita*, *Cirrhinus mrigala*, *Hypophthalmichthys molitrix*, *Ctenopharyngodon idella*, *Cyprinus carpio*.
- Minor and medium carps – *Labeo gonius*, *L. bata*.
- Catfishes and air-breathing fishes – *Sperata aor*, *Mystus spp.*, *Clarias magur*, *Heteropneustes fossilis*, *Anabas testudineus*.
- Knife fishes - *Notopterus notopterus*, *Chitala chitala*.
- Murrels – *Channa marulius*, *C. straita*, *C. punctata*, *C. gachua*.
- Eels – *Monopterus spp.*, *Mastacembelus spp.*, *Macrogna-thus spp.*
- Freshwater prawns – *Macrobrachium spp.*
- Others – *Chanda spp.*, *Rasbora spp.*, *Badis spp.*, *Devario spp.*, *Nandus spp.*, tilapia and gouramies.

### Economics

There is no established record on the economics of the makhana crop in Assam. The raw seeds are sold at the rate of Rs. 60 – 70 per kg in Assam. The collected seeds are usually transported to Bihar for their further processing and





Traps for installation in flood waters.

the processed seeds are sold at the rate of Rs. 350 per kg in Bihar and other northern parts of India. The harvesters get a share of the harvest from their contractors based on the quantity of seeds reaching Bihar. The contractor also makes a deal with the *beel* lessee based on the harvest being made.

### The rationale

Myriad *beels* of various dimensions are scattered throughout the lower part of Assam that are suitable for stocking and rearing useful aquatic flora and fauna of high economic importance under controlled conditions. The general people of Assam are largely unaware of the nutritious use of *makhana* seeds as relished by people in other parts of India and abroad as food items or for medicinal use. However, the raw edible part of the seeds are eaten by rural folk in interior villages as a casual food. Moreover, these *beels* can be profitably managed for fish culture as well as for growing water fruits, mainly *makhana* and *singori*. After the harvesting of the *makhana* crop, air-breathing fishes like *magur* (*Clarias magur*), *singhi* (*Heteropneustes fossilis*), *kawai* (*Anabas testudineus*), *goroi* (*Channa spp.*), mud eels (*Macrognathus aculeatum*, *Mastacembelus armatus*, *M. pancalus*), small sized fishes (*Puntius spp.*, *Trichogaster spp.*, *Glossogobius giuris*, *Chanda spp.*, *Oxygaster bacaila*), and a few crustaceans, which generally get access and enter through the adjoining water bodies can provide nutritional security and additional income to the farmers without incurring any input cost towards fish seeds, fish feeds and zero level management in these *beels*. Therefore, providing advanced and organised marketing facilities, basic incentives to cultivators and new technology with processing plants to boost production will generate the interest of farmers in cultivation of *makhana* in Assam.



Local catfishes harvested from the beels.



Local eels harvested from the beels.





A local auction market with the harvested fishes from the beels.

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Women selling molluscs in the local market.