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India's Makhana Sector Emerges as a High-Value Aquatic Crop Economy with Rising Production, Processing and Export Potential:

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Recent Developments and Government Push:

- The **National Makhana Board** was formally constituted in Bihar on **14 September 2025** and launched by the Prime Minister on **15 September 2025**, following its announcement in the **Union Budget 2025–26**. The Board aims to strengthen production, processing, value addition, marketing and export promotion across the makhana value chain.
- The Government has approved the **Central Sector Scheme for Development of Makhana** with an outlay of **₹476.03 crore** for **2025–26 to 2030–31**, covering research and innovation, quality seed production, farmer capacity building, improved harvesting, post-harvest management, value addition, branding, marketing, export promotion and quality control.

Current Status of India's Makhana Sector:

Production and Geographical Concentration:

- India is the **world's leading producer of makhana**, while **Bihar remains the dominant producing State**, with major production centres including Katihar, Purnia, Madhubani, Darbhanga, Saharsa, Supaul, Araria, Madhepura and Sitamarhi.
- Makhana is concentrated particularly in **North Bihar**, where shallow water bodies, wetlands, favourable agro-climatic conditions and traditional cultivation knowledge support its production.
- India's makhana production increased from **63,910 MT in 2024–25 to 80,590 MT in 2025–26**, while average productivity increased from **2.03 MT/ha to 2.34 MT/ha**, indicating simultaneous expansion of production and improvement in productivity.
- Bihar produced approximately **60,000 MT in 2025–26**, with average productivity of **2.00 MT/ha**, making the State the principal production centre in the national makhana economy.

Nature and Cultivation:

- Makhana, scientifically known as ***Euryale ferox***, is an **aquatic crop** traditionally cultivated in ponds, wetlands and other shallow water bodies, with its edible seeds processed and popped for consumption.
- It is cultivated mainly in **Bihar, West Bengal and Assam**, while cultivation is also expanding into non-traditional regions with improved technologies and government support.
- Modern cultivation is increasingly moving beyond traditional ponds towards **field-system cultivation**, which can enable better water management, crop rotation and integration with other agricultural activities.
- **Swarna Vaidehi**, developed by the Indian Council of Agricultural Research, was the first released improved makhana variety in India and has demonstrated substantially higher yield potential than traditional cultivars.

Economic and Market Significance:

Kamaraj IAS Academy

Plot A P.127, AF block, 6 th street, 11th Main Rd, Shanthi Colony, Anna Nagar, Chennai, Tamil Nadu 600040

Phone: **044 4353 9988 / 98403 94477** / Whatsapp : **09710729833**

Domestic Demand and Value Addition:

- Makhana has increasingly moved from a **traditional regional food to a premium health-oriented food product**, supported by rising health awareness, demand for plant-based foods and expansion of branded snack products.
- Its relatively high nutritional value, including **protein, dietary fibre and minerals**, together with low fat and sodium content, has strengthened its position in the health-food market.
- The sector offers significant scope for **value addition** through flavoured makhana, ready-to-eat snacks, makhana flour, processed food products and other branded products.
- Such diversification can increase the **share of consumer value accruing to farmers and local enterprises** rather than concentrating value primarily in raw or minimally processed products.

Export Potential:

- The introduction of **dedicated HSN codes for makhana products in 2025** has improved the identification and tracking of makhana-related international trade and can support more reliable export-policy formulation. APEDA notes separate codes for popped makhana, makhana flour and powder, and other makhana products.
- India's export market remains concentrated in major destinations such as the **United States, Canada and the United Arab Emirates**, creating both a strong market base and a diversification challenge.
- APEDA market intelligence indicates that exporters are exploring markets such as **Australia, South Africa and the European Union**, which can reduce excessive dependence on individual markets and strengthen export resilience.
- Expansion towards premium international markets requires stronger **quality standards, traceability, packaging, branding, food safety compliance and product diversification**.

Government Measures for Sectoral Development:

National Makhana Board:

- The Board functions under the administrative control of the **Department of Agriculture and Farmers Welfare** and brings together representatives from agriculture, rural development, commerce, food processing, micro, small and medium enterprises, farmers, processors, exporters, research institutions and financial institutions.
- This multi-stakeholder structure can promote **institutional convergence** across production, processing, finance, research, marketing and exports.
- The **Union Budget 2025–26** envisaged organising people engaged in the makhana sector into **Farmer Producer Organisations**, thereby improving collective input procurement, processing, bargaining power and market access.

Central Sector Scheme for Development of Makhana:

- The scheme received **₹30 crore** for 2025–26 and **₹90 crore** for 2026–27, with support extending to production and productivity enhancement, seed production, post-harvest management, processing, research, export promotion, market development, branding, extension and capacity building.
- During 2025–26, an additional **1,010 hectares** was brought under makhana cultivation and **73 hectares** was covered under seed production programmes.
- A total of **89 Front Line Demonstrations** were conducted to demonstrate improved production technologies, while training, seminars and exposure visits were used for farmer capacity building.
- The scheme benefited **8,159 farmers** during 2025–26, demonstrating an effort to expand support beyond the traditional production belt.

Research, Technology and Value-Chain Development:

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Role of National Research Centre for Makhana:

- The **ICAR-National Research Centre for Makhana at Darbhanga** is a specialised research institution working on production, productivity, processing, value addition, technology development and farmer capacity building.
- Its research has contributed to **high-yielding varieties, water-efficient cultivation, integrated farming systems and makhana-cum-fish farming**, creating opportunities for resource optimisation and additional farm income.
- The Centre has also developed and licensed technologies such as **seed washers, seed graders, roasting machines, popping machines and popped-makhana graders**, helping mechanise labour-intensive stages of the value chain.
- These interventions are important because traditional makhana cultivation involves substantial manual labour, including harvesting seeds from underwater conditions, which increases production costs and occupational challenges.

Integrated and Sustainable Farming:

- **Makhana-cum-fish farming** provides an example of integrated aquaculture-agriculture systems in which the same water resource can support multiple income-generating activities.
- Water-efficient cultivation and field-based systems can potentially expand makhana cultivation while improving resource-use efficiency, provided that local hydrological conditions and ecological sustainability are adequately considered.
- Such approaches align the makhana sector with broader objectives of **climate-resilient agriculture, diversification of farm incomes and sustainable resource management**.

Key Challenges:

Production and Productivity:

- Traditional cultivation remains **labour-intensive**, particularly during harvesting and seed collection, making mechanisation and improved farm practices essential for reducing production costs.
- Productivity varies significantly across production systems and regions, creating a need for wider adoption of improved varieties, scientific cultivation practices and quality seed.

Value-Chain and Infrastructure Gaps:

- Inadequate **grading, drying, storage, processing, packaging and cold-chain-related infrastructure** can reduce quality and limit value realisation.
- Farmers often receive a smaller share of final consumer value when processing, branding and marketing are controlled by intermediaries rather than producer organisations.

Export and Market Risks:

- Concentration in a limited number of export destinations creates vulnerability to **tariff changes, demand fluctuations, food-safety regulations and geopolitical disruptions**.
- Export competitiveness therefore requires diversification of destinations as well as movement towards higher-value processed products.

Way Forward:

Building a Globally Competitive Makhana Value Chain:

- The policy focus should shift from merely increasing production towards an integrated **farm-to-market value chain** covering quality seed, scientific cultivation, mechanisation, processing, branding, logistics and

exports.

- Stronger **Farmer Producer Organisations** can improve aggregation, collective bargaining, processing investment and direct market linkages.
- Greater public-private collaboration can accelerate development of affordable harvesting and processing machinery suitable for small and marginal producers.
- **Geographical Indication-based branding of Mithila Makhana**, combined with traceability and quality certification, can strengthen premium-market positioning.
- Export diversification towards **Europe, Australia, West Asia and other high-value markets** should be accompanied by compliance with international food-safety and quality standards.
- Research institutions should focus on **climate-resilient varieties, water-efficient cultivation, mechanised harvesting, processing efficiency and new value-added products**.
- The National Makhana Board should function as a coordinating institution that connects **farmers, research institutions, processors, exporters, financial institutions and government schemes**.

Value Addition for UPSC:

Prelims Facts:

- **Scientific name:** *Euryale ferox*.
- **Nature:** Aquatic crop traditionally cultivated in ponds, wetlands and shallow water bodies.
- **Major producing State:** Bihar.
- **Major research institution:** ICAR-National Research Centre for Makhana, Darbhanga.
- **Improved variety:** Swarna Vaidehi.
- **Government institution:** National Makhana Board.
- **Central Sector Scheme outlay:** ₹476.03 crore for 2025–26 to 2030–31.
- **GI product:** Mithila Makhana.

Mains Conclusion:

- India's makhana sector represents the transition of a **traditional aquatic crop into a high-value agri-food economy**. The combination of the National Makhana Board, dedicated financial support, scientific research, improved varieties, mechanisation, value addition and export diversification can transform makhana into a stronger source of **farmer income, rural employment, regional development and agricultural exports**. The decisive policy challenge is to ensure that this expansion remains **farmer-centric, technologically efficient, environmentally sustainable and globally competitive**.