NOBO PALLOB

Magazine 1st Foundation Anniversary Special Edition | 2026 |

VOL : 02

Poverty Alleviation Through Women's Empowerment

Make Agriculture Sustainable with Renewable Resources

Strict Awareness to Protect Forests and Wildlife

আবার আসিব ফিরে

আবার আসিব ফিরে ধানসিঁড়িটির তীরে- এই বাংলায়
হয়তো মানুষ নয়- হয়তো বা শংখচিল শালিখের বেশে,
হয়তো ভোরের কাক হয়ে এই কার্তিকের নবান্নের দেশে
কুয়াশার বুকে ভেসে একদিন আসিব এ কাঁঠাল ছায়ায়।
হয়তো বা হাঁস হব- কিশোরীর- ঘুঙুর রহিবে লাল পায়
সারাদিন কেটে যাবে কলমীর গন্ধভরা জলে ভেসে ভেসে।
আবার আসিব আমি বাংলার নদী মাঠ ক্ষেত ভালোবেসে
জলাঙ্গীর ঢেউয়ে ভেজা বাংলার এই সবুজ করুণ ডাঙ্গায়।

হয়তো দেখিবে চেয়ে সুদর্শন উড়িতেছে সন্ধ্যার বাতাসে।
হয়তো শুনিবে এক লক্ষ্মীপেঁচা ডাকিতেছে শিমূলের ডালে।
হয়তো খইয়ের ধান ছড়াতেছে শিশু এক উঠানের ঘাসে।
রূপসার ঘোলা জলে হয়তো কিশোর এক সাদা ছেঁড়া পালে
ডিঙ্গা বায়; রাঙ্গা মেঘ সাঁতরায়ে অন্ধকারে আসিতেছে নীড়ে
দেখিবে ধবল বক; আমারেই পাবে তুমি ইহাদের ভীড়ে।

জীবনানন্দ দাশ

Welcome To

NObo Pallob

Research and Development Wing

Nobo Pallob is the bi-monthly magazine of Research and Development Wing, IAAS Bangladesh IUBAT, established to serve as a dynamic platform for intellectual exchange, knowledge-sharing, and research dissemination. This magazine reflects the vision of IAAS Bangladesh IUBAT and IAAS Bangladesh, providing members with an opportunity to express their insights, discoveries, and perspectives on agriculture, environmental sustainability, and various scientific disciplines that contribute to these fields.

All members, including the Executive Board (EB), Control Board (CB), Quality Board (QB), General Members, Alumni, Strategic Advisers, Advisers, and members of IAAS Bangladesh's all Local Committees, are welcome to submit articles. The magazine will be published every two months, ensuring a consistent flow of thoughtful discussions, Agricultural heritage, research, and innovations in agricultural sciences and related areas.

The editorial board of Nobo Pallob will be primarily led by members of the Executive Board and Control Board of IAAS Bangladesh IUBAT, who will oversee the selection, editing, and publication of articles.

Aim

This magazine aims to expand agricultural knowledge, encourage scientific discussions, explore agricultural history and heritage, and enhance the writing skills of IAAS members. By fostering a culture of academic excellence and professional growth, Nobo Pallob will serve as a valuable platform for aspiring agricultural professionals, researchers, and enthusiasts committed to sustainability and innovation.

Message From
Chief Adviser

The establishment of IAAS Bangladesh at IUBAT on November 14, 2024 marked a historic milestone in the journey of agricultural students at IUBAT—International University of Business Agriculture and Technology. As the first non-government university in Bangladesh, founded in 1991 by the late Prof. Dr. Alimullah Miyan, IUBAT has long been committed to academic excellence and innovation. Its global recognition in the QS World Rankings 2025 further reflects this commitment, placing IUBAT among notable institutions in Bangladesh and across Asia.

It is a matter of great pride to witness the inspiring progress of IAAS Bangladesh at IUBAT within such a short time. Since its inception, the organization has initiated several remarkable activities that demonstrate both creativity and responsibility among our students. From developing the Asia Pacific Traditional Food Preservation Documentary to hosting the insightful seminar "Flow of the Delta," the platform has continuously promoted knowledge sharing and global engagement. The establishment of the Ratnavandar Herbarium Project at the Bangladesh National Herbarium and the educational visit to the Central Cattle Breeding and Dairy Farm have further strengthened students' academic exposure and practical learning. Through these initiatives, IAAS Bangladesh at IUBAT has not only enriched the academic journey of agricultural students but has also brought recognition and honor to the university at national and international levels.

As we celebrate the first foundation anniversary through this special edition of "Nobo Pollob," I am confident that our students will continue to uphold the spirit of innovation, leadership, and sustainability. By thinking globally and acting locally, they are shaping a promising future for agriculture and proudly representing Bangladesh within the global IAAS community.

Prof. Dr. Md. Shohidullah Miah
Chief Adviser
IAAS Bangladesh IUBAT
College of Agricultural Sciences, IUBAT

Message From
IAAS President

Warm greetings to the vibrant community of IAAS Bangladesh IUBAT.

It is with immense pride and joy that I congratulate you on the first anniversary of IAAS Bangladesh IUBAT and the publication of the second volume of your magazine, "Nobo Pallob."

The name "Nobo Pallob," signifying "new leaves," perfectly encapsulates the spirit of your local committee. In just one year, you have demonstrated that youthful energy, when paired with a passion for agricultural sciences, can create a powerful platform for innovation and exchange. Watching your growth from a distance has been inspiring; you have truly become a vital branch of our global IAAS family.

This anniversary edition is more than just a collection of articles; it is a testament to your resilience, creativity, and commitment to the agrifood system. At IAAS World, our mission is to promote the exchange of knowledge and experience among students in agriculture and related sciences. By documenting your insights and activities in this magazine, you are not only contributing to that mission but also inspiring the next generation of agricultural leaders in Bangladesh and beyond.

As you celebrate this milestone, I encourage you to keep nurturing the "new leaves" of your ideas. The world faces complex challenges, from climate change to food insecurity, and it is the dedication of students like you that gives me hope for a more sustainable and food-secure future.

I wish IAAS Bangladesh IUBAT continued success in all its future endeavors. May "Nobo Pallob" continue to flourish and provide a voice for the budding experts of our field.

Go Further, Go IAAS!

S M Riaz-us Saleheen
President
IAAS World

Message From
IAAS Netherlands

Warmest greetings to the members of IAAS Bangladesh IUBAT,

It is with great pleasure and a sense of shared pride that I congratulate you on the Foundation Anniversary of your Local Committee and the publication of this special edition of "Nobo Pollob."

My recent visit to the IUBAT campus remains a significant highlight of my time in Bangladesh. Serving as the keynote speaker for the session "Flow of The Delta" allowed me to witness firsthand the remarkable energy of your members. As a researcher dedicated to biodiversity, restoration, and water conservation, I was deeply impressed by the sophisticated level of inquiry and the genuine passion your students hold for protecting our global wetlands and ecosystems.

The launch of "Nobo Pollob" is a testament to that very spirit. Seeing a magazine entirely curated and written by the members themselves—focusing on agriculture and related sciences—is truly inspiring. It demonstrates that the next generation of agricultural leaders in Bangladesh is not just learning, but actively contributing to the scientific discourse.
In a world where water conservation and ecological restoration are becoming the cornerstones of food security, the intellectual curiosity I saw at IUBAT gives me great hope. Your dedication to understanding the "flow" of our environment is what will ultimately drive sustainable innovation.

I wish IAAS Bangladesh IUBAT continued success in all your future endeavors. May this magazine be a platform for growth, a celebration of your hard work, and a catalyst for even deeper research and collaboration.

David Mornout
National Director
IAAS Netherlands

Message From National Strategic Adviser

The first anniversary of IAAS Bangladesh IUBAT marks more than the passage of time—it represents a bold beginning driven by passion, leadership, and purpose. In just one year, the members of this organization have demonstrated that determined young minds can transform ideas into impactful actions.

"Nobo Pallob," meaning a new leaf, perfectly symbolizes renewal, growth, and the courage to move forward. This publication is not only a reflection of creativity but also a testament to the intellectual spirit of the students who are shaping the future of agriculture. Through initiatives, research engagement, educational visits, and innovative communication platforms, IAAS Bangladesh IUBAT has shown that agricultural leadership begins with curiosity and commitment.

The strength of this platform lies in its people—students who are willing to think beyond boundaries, challenge limitations, and work together for meaningful change.

I firmly believe that IAAS Bangladesh IUBAT will continue to rise as a dynamic hub of innovation, collaboration, and global engagement. Let this anniversary and this special edition of "Nobo Pallob" serve as a powerful reminder: when vision meets action, even the boldest dreams can take root and flourish.

My sincere congratulations and best wishes for the journey ahead.

Plabon Saha
National Strategic Adviser
IAAS Bangladesh

Message From National Strategic Adviser

Nelson Mandela once said, “It always seems impossible until it’s done.” The journey of IAAS Bangladesh IUBAT beautifully reflects the meaning of these inspiring words. In a remarkably short period, the organization has demonstrated how determination, teamwork, and vision can transform ideas into meaningful achievements.

As the National Strategic Adviser, I am truly delighted to witness the enthusiasm and dedication of the members of IAAS Bangladesh IUBAT. Their commitment to innovation and active engagement has already begun to create a positive impact within the academic community and beyond. Initiatives such as creative publications, knowledge-sharing programs, and educational visits show how young agricultural leaders are exploring new horizons while strengthening their practical understanding of agriculture and sustainability.

The publication of “Nobo Pollob” itself symbolizes fresh growth and new beginnings—just like a young leaf that represents hope, progress, and the promise of a brighter future. It is inspiring to see students taking such initiatives to express ideas, share experiences, and connect academic learning with real-world challenges.

I sincerely hope IAAS Bangladesh IUBAT will continue to amaze us with its innovative activities, leadership, and collaborative spirit. May this platform keep empowering students to learn, lead, and contribute toward building a more sustainable agricultural future for Bangladesh and the global community.

My heartfelt best wishes for their continued success and growth.

Famin

Famin Jahan Ayishi
National Strategic Adviser
IAAS Bangladesh

Message From
Local Director

Welcome to the first foundation anniversary special edition of “Nobo Pollob” magazine published by IAAS Bangladesh IUBAT. It is a proud milestone for us, marking our very first anniversary. About a year ago, we set out with a vision to empower our agricultural students.

Agriculture in recent times is no longer just about cultivation. It has become a gathering place for minds seeking to reform policies, embrace data-driven innovations, and secure global food systems. Over the past year, through relentless online sessions, seminars, visits to agricultural research organizations and industry, we have worked to bridge the gap between classroom theory and practical impact. Within the pages of this magazine, you will discover immersive ideas and thoughts of tomorrow's leaders. These contributing minds include our dedicated local committee members as well as brilliant minds across the nation and the globe.

This magazine exists thanks to the hard work of our editorial team, who curated, designed, and refined this edition. I am deeply grateful to every student and youth leader who submitted an article. Your ideas and efforts inspire us to shape the future of agriculture.

The future of agriculture and global food systems will not be saved by the methods of our predecessors. The future belongs to those who dare to rethink it. We need people with bold ideas and the fortitude to challenge the existing system. The articles of this magazine aims to accommodate research, insights, and strategies from youth ready to take the helm.

With this edition, we aim to question current perspectives, ideas, systems, and policies in agriculture. We are not just learning about agriculture; we are helping to shape its future.

Shahriar Mannan Imon Talukder
Local Director
IAAS Bangladesh IUBAT

Message From Head of Control Board

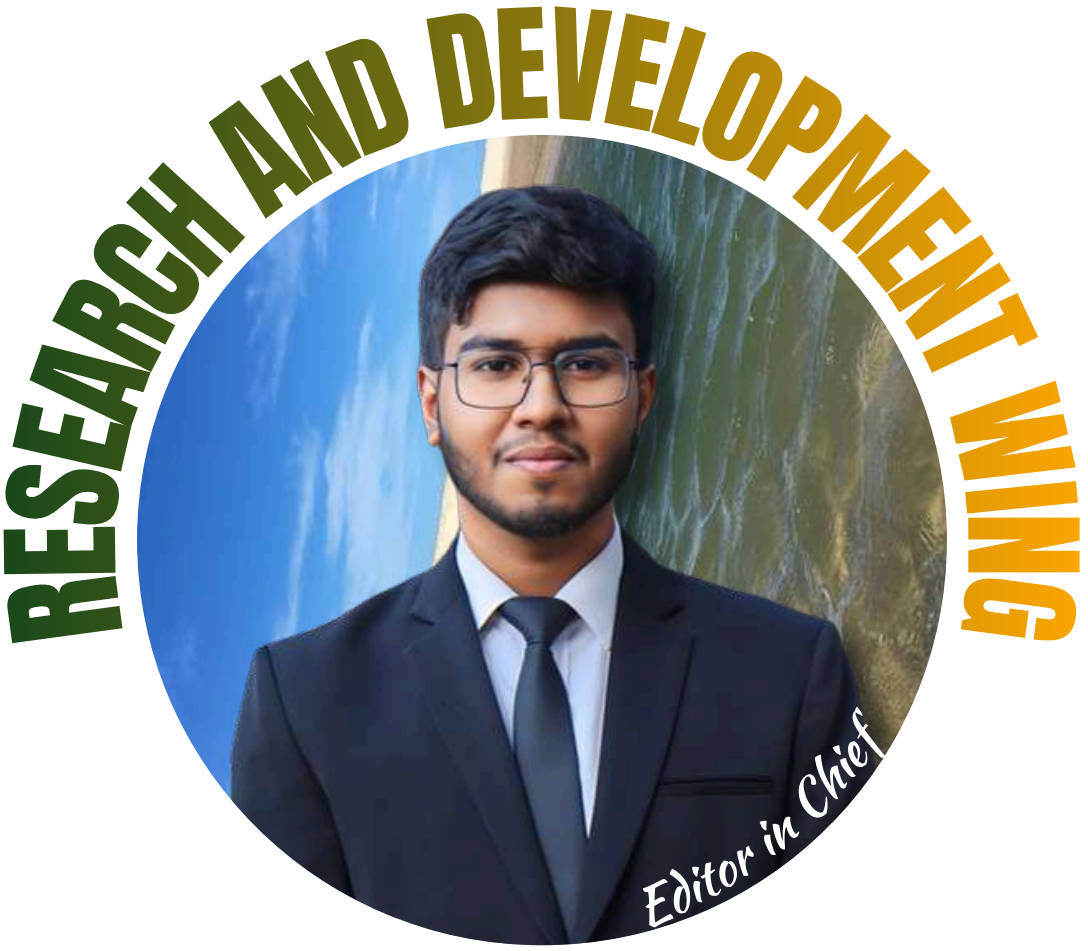
It is with great pleasure and pride that I extend my heartfelt message on the occasion of the second publication of “Nobo Pollob,” a remarkable initiative by IAAS Bangladesh IUBAT. The journey from the first edition to this second publication reflects the dedication, creativity, and collective enthusiasm of our students and organizers.

The title “Nobo Pollob,” meaning new leaves, beautifully symbolizes growth, renewal, and the emergence of fresh perspectives. In this spirit, the magazine serves as a vibrant platform for young minds to express their thoughts, ideas, and creativity, while contributing to a culture of knowledge and intellectual exchange.

The successful continuation of this publication demonstrates the perseverance and collaborative efforts of the editorial team, contributors, and all individuals involved. Initiatives like this are invaluable in nurturing creativity, inspiring innovation, and encouraging students to explore their academic and literary potential. I sincerely appreciate the commitment and hard work of everyone who contributed to making this publication possible. I firmly believe that “Nobo Pollob” will continue to flourish, inspiring new voices and fostering creativity within our academic community.

I wish the magazine every success in the years to come. With sincere appreciation and best wishes.

Shahoriar Sabbir Tulon
Head of Control Board
IAAS Bangladesh IUBAT



It is with immense pride and gratitude that I present the first foundation anniversary special edition of Nobo Pollob. This publication stands as a reflection of our journey one defined by curiosity, commitment, and a shared vision to empower the next generation of agricultural leaders.

Over the past year, we have witnessed how agriculture is evolving into a dynamic field shaped by innovation, research, and global collaboration. Through this magazine, we aim to capture that transformation by bringing together diverse perspectives, insightful analyses, and forward-thinking ideas from passionate young minds.

I extend my heartfelt appreciation to our contributors, whose dedication and creativity have enriched these pages, and to our editorial team, whose tireless efforts made this edition possible.

As we celebrate this milestone, let us continue to question, innovate, and lead with purpose because the future of agriculture depends on the ideas we nurture today.

Sourav Kanti Bala
Research and Project Development Officer
IAAS Bangladesh IUBAT

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Nobo Pallob

1st Foundation Anniversary
Special Edition

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70% of the Nation's Guava:

The Untold Story of Barishal's Fruitful Fields

Before you even see the boats, you smell it—the unmistakable, honeyed scent of ripening guavas drifting through the heavy morning fog. Welcome to Bhimruli, where the river doesn't just flow; it feeds the nation.

Why It Is Special ?

Barishal is the undisputed **"Guava Kingdom of Bangladesh."** The region cultivates more than 24,000 hectares of guava orchards and supplies nearly 70% of the nation's total guava production. What makes it extraordinary is not just scale, but system: trade here flows on water, not roads. Commerce moves with tides and canals, forming one of South Asia's rare surviving river-centric supply chains, sustained for generations by farmers, traders, and boatmen.

Author: Md. Rezwanur Rahman Ratul

History

The exact origins of Barishal's floating guava markets are undocumented, but local history places their existence at over a century old. In the river-dominated areas of Jhalakathi and Swarupkathi, poor road connectivity once made land-based trade nearly impossible. Farmers adapted ingeniously by transforming canals into natural marketplaces. Over time, these informal exchanges evolved into organized floating markets, turning waterways into the region's primary commercial arteries.

Local folklore further suggests that nearly 200 years ago, guava cultivation in Barishal began with seeds brought from Gaya, India. This initiative is widely attributed to an individual named Purnachandra Mondol, from whom the guava variety later became known as "Purnomondoli Guava" or "Gaya Guava." Its popularity among local communities laid the foundation for large-scale commercial guava cultivation, which eventually supported the growth and sustainability of the region's iconic floating markets.

Renowned Personalities Visited Here

Often called the **"Venice of Bengal,"** the floating guava markets have gained international recognition. They have attracted notable visitors such as former U.S. Ambassador Dan Mozena, former Indian High Commissioner Harsh Vardhan Shringla, and Algerian Ambassador Abdelouahab Saidani. Their visits have elevated Barishal's profile from a rural trading hub to an emerging destination for cultural and eco-tourism.

Market Area

The heart of floating trade is Bhimruli, strategically located at the meeting point of three canals, making it the largest floating guava market in the region. Supporting markets such as Kuriana and Atghar form an interconnected network across Pirojpur and Jhalakathi. During peak season (July–September), trade begins at dawn and continues until late morning, before boats disperse toward urban markets. The floating market guava is not cheaper because it is inferior - it is cheaper because the farmer stands at the weakest end of the supply chain.

The floating markets of Barishal-especially Bhimruli and Kuriana primarily trade in Desi Peyara (local guava). This is not the imported or supermarket-grade Thai guava. It is a river-grown, seasonal variety, harvested at peak ripeness and sold within hours of picking.This distinction is crucial.

Why Floating Market Guava Is Special ?

Floating market guava is special because it is:

- Indigenous variety (Desi Peyara)
- River-irrigated, grown on fertile alluvial soil
- Naturally ripened (not waxed or chemically treated)
- Ultra-fresh - often reaching buyers within 6-12 hours of harvest
- Aromatic and soft-fleshed, unlike the hard, long-shelf-life varieties

In contrast, most “normal” guava sold in city supermarkets prioritizes appearance, size, and shelf life, not flavor.

Corrected Price Comparison:

Type of Guava	Location	Price (BDT/kg)
Desi Peyara (Floating Market)	Farmer sale price	15–20
Desi Peyara (Floating Market)	Urban retail price	80–100
Thai / Commercial Guava	Supermarkets & online	120–150

What Is the Real Price Difference ?

- Floating-market guava and “normal” city guava are often the same fruit -Desi Peyara.
- The difference is not quality, but who captures the value.
- A guava bought for 15 BDT from a farmer’s boat may be sold for 100 BDT in Dhaka within 24 hours.

The Thai guava, often mistaken as “better,” is a different variety entirely-valued for size and crunch, not aroma or taste.

Biodiversity and Lifestyle of Farmers

Barishal's orchards are rich in biodiversity. Alongside the famed Desi Peyara-soft, aromatic, and jelly-centered-farmers cultivate Thai guava, Strawberry guava, and Kazi guava. These orchards coexist with canals, fish ponds, coconut groves, and paddy fields, forming a vibrant agro-ecological landscape.

Farmers lead an amphibious lifestyle. Boats are essential for reaching orchards, transporting harvests, and accessing markets. Their daily routines follow the rhythm of rivers: rain nourishes the soil and enhances scenic beauty, yet also complicates harvesting and transport, making resilience a way of life.

Suggested Tour

Visit during the monsoon season **(July-August)** when canals are full and trade is at its peak. Begin at Bhimruli Floating Market at dawn to witness the most vibrant activity. Then take a private boat through the Kuriana backwaters to explore orchards up close. Buy guavas directly from a farmer's boat-the freshest fruit you will ever taste, and an experience that captures the soul of riverine Bangladesh.

The Problems

- Seasonal flooding and climate uncertainty
- Pest infestations and crop disease
- Severe lack of cold storage infrastructure
- Around **30% post-harvest loss**
- Dependence on exploitative middlemen

The Solutions

- **Agricultural Technology:** Replacing aging trees with high-yield hybrids such as BARI Peyara-1, combined with high-density planting to significantly boost output.
- **Infrastructure Development:** Establishing cold storage facilities and agro-processing parks to convert fresh guavas into jams, jellies, pulp, and juice potentially creating 10,000 new jobs.
- **Cooperative Power:** Farmer cooperatives that strengthen bargaining power, reduce dependency on middlemen, and ensure fairer pricing.

Conclusion

Barishal's floating guava markets are far more than places of trade they are a living heritage producing the nation's "Green Gold." While challenges in storage, pricing, and logistics persist, strategic investment in processing and cold-chain infrastructure could unlock a USD 50-70 million export economy, transforming rural livelihoods and elevating Bangladesh's global agricultural identity

Chui Jhal : The Pride of Southern Bangladesh

Introduction :

Chui Jhal (also known as Chui or *Piper chaba*) is a highly valued climbing plant known for its natural and medicinal qualities. Native to tropical regions, it grows exceptionally well across many South Asian countries, including India, Nepal, Bhutan, Myanmar, Malaysia, Indonesia, Singapore, Sri Lanka, and Thailand. Historically, Chui Jhal has been cultivated for centuries in different parts of the world. In Bangladesh, it is particularly popular in the southern districts such as Khulna, Jessore, Bagerhat, and Satkhira, where most of the country's supply is produced. Traditionally used both in cooking and herbal medicine, various parts of the plant—like its stem, roots, and petioles—are widely utilized. It has become especially famous for enhancing the flavor of meat dishes, especially goat meat, and is also used in fish and lentil preparations.

Though the fruit of Chui Jhal is not commonly consumed in Bangladesh, in some other South Asian countries, the dried fruit is used as a spice, much like cloves. Its strong, distinct aroma and flavor have helped it earn a permanent place in many kitchens. The plant grows by attaching itself to other trees and can also spread along the ground. It flourishes well with host trees like mango, jackfruit, mahogany, betel nut, silk cotton, coconut, and kafla (Dillenia pentagyna), with those grown on mango, jackfruit, and kafla trees considered the highest in quality.

Author: Sourav Kanti Bala

Botany of Chuijhal

Chuijhal, also known as *Piper chaba*, belongs to the family Piperaceae, genus *Piper*, and species *chaba*. It is a climbing vine that can grow up to 40–50 feet when supported. The leaves are heart-shaped, about 2–3 inches long, and resemble betel or black pepper leaves, which often causes confusion.

Chuijhal is a dioecious plant, meaning male and female flowers grow on separate vines. Pollination occurs naturally. The flowers are red and elongated, resembling chili peppers from a distance. The fruit is about 1 inch in diameter, typically red but turns brown or black when ripe. Flowers bloom in the rainy season, and fruits appear in early winter.

Chuijhal is a valuable spice crop. The stem is greyish, and the leaves are green like betel leaves. All parts—stem, roots, branches—are used as spices. There are two main types: one with a thick stem (20–25 cm in diameter), and another with a thinner stem (2.5–5 cm). The plant can grow up to 10–15 meters and is long-living.

Chemical composition and herbal properties

Aromatic Oil	0.7%
Alkaloids & Piplaratin	5%
Popirin	4-2%
Glycosides & Mucilage	0.3%
Piperine	0.13-0.15%
Fructose & Sesamin	6%

Medicinal Benefits of Chuijhal

- Relieves gastric issues and constipation.
- Enhances appetite and helps with loss of hunger.
- Heals inflammation in the stomach and intestines.
- Calms nervous tension and mental restlessness.
- Acts as a natural sleep aid and reduces body pain and weakness.
- Helps new mothers recover from body aches post-delivery.
- Treats cough, phlegm, asthma, breathing problems, diarrhea, and anemia.
- A mix of one inch of Chuijhal vine and ginger cures cold.
- Rich in diverse herbal healing properties.

Land and Soil

Chuijhal grows well in loamy or sandy loam soil with good drainage and partial shade. No special land is needed;

regular orchard or garden soil works fine. Waterlogging around the plant base should be avoided during rain or flood.

Planting Time and Method :

Chuijhal is planted twice a year—in April-May and October-November—using stem cuttings (locally called "por"). Each cutting should be 50–75 cm long with at least 4–5 nodes. Commercially, saplings are raised in polybags before transplanting.

Cutting Treatment :

To prevent pests and diseases, cuttings should be soaked in a solution (2–3g of Provax/Bavistin per liter of water) for 30 minutes and then rinsed before planting.

Fertilizer and Irrigation :

Mostly organic inputs like compost or cow dung are used. Some farmers apply small amounts of urea, TSP, and MOP. Weekly irrigation is needed in dry seasons, and waterlogging should be avoided during monsoon.

Support, Harvesting, and Yield :

Chuijhal requires support trees like mango, jackfruit, or betel nut to climb, ensuring better growth and protection. While it can grow along the ground, the vines are more vulnerable to damage, especially during the rainy season. Harvesting begins one year after planting, but optimal yields are achieved from plants aged 5–6 years. Each mature plant can produce 15–25 kg annually, with an average yield of 2.0–2.5 metric tons per hectare.

Economic Importance of Chuijhal

Chuijhal is a valuable crop in the nursery and spice industry, gaining popularity in southern Bangladesh, especially in Khulna, Barishal, and Faridpur. It grows naturally in hilly areas and is sold both fresh and dried, priced from BDT 700–1500/kg fresh and BDT 1500–3000/kg dried. Even 2–4 plants can meet a family's annual needs and provide extra income. With medicinal benefits and potential to replace chili, it can save billions for the country. Chuijhal is also exported and inspires restaurants at home and abroad. It aids digestion, improves appetite, relieves gas, cough, and body pain. Promoting its planned cultivation, processing, marketing, and research could strengthen the economy and generate foreign income, making Chuijhal a highly promising agricultural resource.

Importance of Vegan Probiotics for Health, Vegan Probiotics Production Impact on Agriculture & SDG Gole

Introduction :

The word "probiotic" was coined by Kollath (1953) and is derived from the Greek language, meaning "for life." According to Lilly and Stillwell (1965). probiotics are substances produced by microorganisms that promote the growth of other organisms. Vegan probiotics are live bacterial strains that originate from vegan sources, unlike traditional probiotics derived from dairy sources. They are often produced through a fermentation process, and you can easily incorporate vegan probiotics into your diet through probiotic foods, supplements, and drinks. 68% of UK adults consider gut health to be essential to overall health. Regardless of dietary preferences, we are all waking up to the beneficial role probiotics can play in supporting our health and well-being. The good news is that vegans are more likely to have well-balanced guts, as they generally consume more fruits and vegetables (which are rich in fiber - a key gut nutrient).

These benefits include:

- Improving our digestive health
- Boosting our immune system
- Protecting our mood

Author: Asmaul Husna

Sources of vegan probiotic

Vegan probiotic food	Sources of vegan probiotic
Rice milk yogurt	Made from fermented rice milk.
Kimchi	A spicy, fermented Korean dish made from vegetables like cabbage and radishes.
Sauerkraut	Fermented from cabbage.
Tempeh	Made from fermented soybeans.
Miso	A fermented soybean paste.
Natto	Fermented soybeans.
Sourdough bread	Made through a fermentation process, it naturally contains probiotics.
Pickled vegetables	Naturally fermented pickles, especially cucumbers.
Kombucha	A fermented tea beverage.
Water kefir	A fermented beverage made from water and kefir grains.
Coconut kefir	A fermented beverage made from coconut milk and kefir grains
Kvass	A fermented bread drink.
Soy yogurt	Made from fermented soy milk.
Almond yogurt	Made from fermented almond milk.

Health benefits of probiotics

Probiotics are beneficial bacteria that support gut health and provide various health benefits.

Here are some key advantages of consuming probiotics:

1. Digestive Health :

- Restore gut flora balance, especially after antibiotics,
- Help manage diarrhea, including antibiotic-associated and infectious diarrhea.
- Alleviate symptoms of irritable bowel syndrome (IBS) and inflammatory bowel
- (IBD) like Crohn's and ulcerative colitis.
- Reduce bloating, gas, and constipation.

2. Immune System Support :

- Strengthen the body's natural defense by enhancing immune response.
- Help prevent infections, including respiratory and urinary tract infections.
- Reduce inflammation and autoimmune disease risk.

3. Mental Health Benefits :

- Improves mood and helps manage stress, anxiety, and depression through the gut-brain axis.
- It may support cognitive function and reduce symptoms of neurological disorders like Alzheimer's and autism.

4. Heart Health :

- Help lower LDL ("bad") cholesterol and increase HDL ("good") cholesterol.
- It may reduce blood pressure.
- Aid in reducing inflammation linked to heart disease.

5. Weight Management and Metabolism :

- Promote healthy metabolism and may help regulate appetite.
- Prevents weight gain and supports fat loss by influencing gut bacteria balance.
- Reduce inflammation associated with obesity.

6. Skin Health :

- Improving conditions like eczema, acne, and rosacea.
- Reduce allergic reactions and inflammation-related skin issues.

7. Women's Health :

- Maintain vaginal flora balance, preventing yeast infections and bacterial vaginosis.
- Supports urinary tract health and reduces infection risk.

8. Allergies and Food Sensitivities :

- Reduce the severity of allergies, including hay fever.
- Improving tolerance to lactose and other food sensitivities.

Impact on Agriculture

The post-harvest loss of fruits and vegetables is a common problem in Bangladesh, ranging from 23.6% to 43.5%, which accounts for an annual loss of Tk. 3442 crore. It's very harmful for our farmers. During peak seasons, farmers get more vegetables and fruits. Most of the fruits and vegetables are perishable.

Therefore, there is an urgent need to minimize post-harvest losses by adopting appropriate processing and preservation techniques. Globally, there are various methods by which food is preserved like canning, freezing, and drying. However, most of them are expensive or possess food safety implications like botulism (toxicity caused by Clostridium botulinum) in canned foods. On the contrary, Vegan probiotic production from fermentation ensures food safety by preventing the growth of potential spoilage and pathogenic at low pH (Wafula et al., 2016). Furthermore, this method contributes to food preservation and the reduction of food waste, offering a sustainable approach to meeting global nutritional needs.

Impact on SDG Gole

The vegan probiotics production fermentation process is very easy. Our rural women and men can produce vegan probiotics and they can produce it commercially. It will directly impact SDG GOLE 1,2,3,4,8,10.

SDG 1: No Poverty – By creating new sources of income through probiotic production and sales, rural families can improve their livelihoods and break the cycle of poverty.

SDG 2: Zero Hunger – Vegan probiotics enhance gut health, which improves nutrient absorption and supports better overall nutrition. Locally available, fermented foods also contribute to food security.

SDG 3: Good Health and Well-being – Probiotics support digestive health, boost immunity, and reduce the risk of certain illnesses, leading to better public health, especially in rural areas with limited access to medical care.

SDG 4: Quality Education – Training programs and knowledge-sharing on probiotic production can empower communities with valuable scientific and entrepreneurial skills.

SDG 8: Decent Work and Economic Growth – The development of small-scale probiotic enterprises can provide employment and stimulate local economies.

SDG 10: Reduced Inequalities – Empowering rural women and marginalized groups with practical skills in probiotic production helps bridge the gap between urban and rural economic opportunities.

CONCLUSION

Vegan probiotics are a powerful tool for enhancing gut health, supporting the immune system, and promoting overall wellness.

Their plant-based nature makes them accessible to a wide range of individuals, offering both health benefits and ethical advantages.

By incorporating vegan probiotics into your daily routine, you can take a proactive step toward a healthier and more sustainable lifestyle.

From Ocean to Market: The Journey of Shutki at Naziratek, Cox's Bazar

Every morning in Naziratek, the salty breeze carries more than the smell of the ocean - it carries the hopes, hands, and hard work of thousands. Just 3 km from the tourist-packed streets of Cox's Bazar, Naziratek Shutki Palli thrives as one of Bangladesh's largest dry fish processing hubs.

Shutki and its Journey Through Time

Shutki, or dried fish, is one of the oldest traditional food items in Bengal. Long before refrigeration existed, drying was the best way to preserve fish for months. Over time, it became more than just a preservation method - it became a culinary identity.

In coastal regions like Chattogram, Cox's Bazar, and Noakhali, fishing communities developed shutki-making as a family trade, passing techniques from one generation to the next. From small river fish to large sea catches, nearly every variety has been dried using sun, salt, and skill. Today, shutki remains a popular delicacy across Bangladesh - and its journey from sea to sun to plate reflects the resilience of coastal life.

Why Naziratek is Called Shutki Palli ?

"Shutki" means dried fish, and "Palli" means village the name fits perfectly. Naziratek is home to nearly 9,000 people directly involved in the shutki industry, from fishers to processors, packers, and marketers. Built in 1987 and organized into a cooperative in the '90s, this coastal hub is more than a workplace it's a lifeline for thousands of coastal families.

Sources of Raw Material

The raw fish used for drying are mainly collected directly from local fishermen. These fresh catches are then transported from the fish landing centers to the drying areas. The transportation is mostly done using simple and traditional means such as non-mechanized vans, rickshaws, bicycles, or even carried manually by laborers on their heads or shoulders.

Author: Faisal kamal

Traditional Shutki Processing:

A–Z The shutki journey begins with raw fish freshly brought in from the sea. The production process includes:

- **Cleaning & Salting:** Fish are washed and soaked in salt water typically 1 kg salt for 12 kg fish.
- **Sun-Drying:** Fish are laid out on elevated bamboo racks or hung on strings to dry for 2–7 days, depending on species and weather.
- **Turning & Tending:** Workers flip the fish multiple times a day to ensure even drying and prevent rot.
- **Spicing:** Some fish are treated with turmeric and chili water to add natural protection.
- **Sorting & Storage:** Once dried, fish are sorted by size and quality, then packed for markets.

Large fish like tuna are sliced, stretched, and dried using special bamboo frames. Smaller fish like loitta (Bombay duck) are sun-dried whole. This process is both an art and science, passed through generation.

Seasonal Patterns of Production

Dry fish production here mostly peaks during October to March, when the sea is calmer and sunlight is reliable. During this time, Naziratek transforms into a buzzing hub of activity. However, the monsoon season poses major challenges — excessive rain can spoil huge quantities of fish, affecting both income and food security for these families.

Who Makes the Magic Happen?

Nazirartek is home to around **30,000 people** who are directly or indirectly involved in the shutki industry. The workforce includes fishermen, fish sorters, driers, packagers, transporters, and sellers. Entire families including women and children contribute in various stages of the production chain. Despite their hard work, most of these families live in modest, often substandard housing, lacking proper sanitation and healthcare facilities. The economic conditions are tough, with seasonal earnings and vulnerability to cyclones and floods adding to their hardships. However, their resilience and pride in their work are unwavering.

Involvement of Women and Families

One of the most notable features of Naziratek's economy is the strong involvement of women and entire families. While men usually go to sea or manage transportation, women handle much of the cleaning, drying, and packaging. Children also assist during school breaks. It's a community effort that binds generations and households together.

Why Shutki is So Popular Among Bengalis, Especially in Chittagong?

Shutki is a beloved part of Bengali cuisine, especially in Chittagong, where coastal life and strong flavors go hand in hand. Its rich, bold taste brings a sense of tradition to every meal. Passed-down family recipes like shutki bhuna or shutki with mustard oil make it more than food — it's emotion and memory. For many, especially Chattogram locals, no feast feels complete without the nostalgic aroma of this iconic dry fish dish.

Why is Nazirartek Shutki So Famous, and How Many Varieties Are Made?

Nazirartek produces over 30 varieties of dried fish, making it a top shutki hub in Bangladesh. From small fish like Loitta, Mola, and Chewa to larger ones like Churi, Tuna, Shrimp, and Koral — the variety is vast. Its fame comes from quality, tradition, and technique. Sun, sea air, and skilled local hands ensure natural drying with added turmeric and chili for flavor and safety. This artisanal process makes Nazirartek shutki a favorite in markets across Bangladesh and a high-demand export in global trade.

From Coastal Markets to Global Consumers: Where Nazirartek Shutki Travels

Once the fish has been carefully dried, meticulously sorted, and hygienically packaged, Nazirartek shutki begins an extensive journey that spans both national and international markets. At the local level, it is supplied to some of the most prominent and bustling dried fish hubs in Cox's Bazar, including Kolatoli Shutki Market, Sugandha Market, Bermiz Market, and Bazarghata. These markets are widely recognized by tourists and local consumers alike as trusted destinations for sourcing authentic, premium-quality dried fish in Cox's Bazar.

From these coastal marketplaces, bulk buyers and professional traders ensure wider distribution across Bangladesh. Nazirartek shutki reaches major commercial and cultural centers such as Dhaka, Chattogram, Sylhet, Rajshahi, and Khulna, where demand for traditionally processed, high-quality dried fish remains consistently strong throughout the year.

Extending far beyond domestic borders, Nazirartek dried fish is also exported to several countries with significant South Asian diaspora communities, including the United Kingdom, the United States, Malaysia, Saudi Arabia, and other Middle Eastern nations. These international exports not only introduce Bangladesh's rich shutki heritage to global consumers, but also significantly contribute to foreign exchange earnings and strengthen the livelihoods of local ishers, processors, and traders in Nazirartek. In this way, the shutki industry serves as both a cultural ambassador and an economic lifeline for the coastal community.

Conclusion

The Nazirartek shutki industry is more than a source of dried fish it's a symbol of Bangladesh's coastal heritage, economic resilience, and community strength. From local markets in Cox's Bazar to international exports, shutki connects tradition with trade. Despite challenges like poor infrastructure and low wages, thousands remain committed to this craft. With improved support for hygienic shutki processing and sustainable practices, this vital sector can thrive further — preserving the Bengali dried fish tradition while empowering the hardworking people who keep it alive, one fish at a time.

Gulavjam
Bengal's Sweet Fragrant Treasure

Introduction :

Bengal is not only rich in culture, but also boasts a agriculture-friendly environment and fertile land, home to countless trees. A myriad of crops flourish here. Apart from its mangoes, jamun, and jackfruit, there are countless other fruits, each one a pearl in the crown of Bengal. Today, I will write about one such pearl: the rose apple. Its name evokes a sense of fragrance and prosperity. With a gentle aroma reminiscent of roses and the sweetness of ripe jamun, the rose apple once adorned the plates of kings and zamindars.

In those days, it had special uses. The zamindars would delight in consuming 'sura,' a type of alcohol with a pungent smell, but the delightful sweet fragrance of rose apples would elevate the experience. The juice of the rose apple was mixed into the 'sura.' Over time, the zamindari system has vanished, taking with it the luster of the rose apple. However, it is still nurtured

by a few devoted gardeners. Unfortunately, the general public is not familiar with this fruit anymore and has become enamored with foreign fruits. Allow me to introduce this unique fruit, including its scientific name and lineage.

Origin

The origin of the rose apple fruit is Indonesia. It is cultivated in the regions of Indonesia and Malaysia, and there are also gardens in the

Author: Ahnaf Tahmid

Philippines. From there, it arrived in our South Asian countries, Bangladesh and India. In India, it is especially popular in the southern regions, such as Tamil Nadu and Kerala, where it is grown. Although there are no commercial gardens for it in Bangladesh, gardening enthusiasts are including it in their gardens. Nowadays, people who are conscious about fulfilling their nutritional needs with local vegetables and fruits are aware of the benefits of rose apple.

Scientific Classification

Kingdom	Plantae
Division	Angiosperms
Class	Magnoliopsida
Order	Myrtales
Family	Myrtaceae
Genus	*Syzygium*
Species	*Syzygium jambos*

Botany

The Gulavjam [*Syzygium jambos* (L.) Alston (1931)] is an evergreen, up to about 12 m tall tree, with the bark of a pale brown colour and ample and thick crown. The leaves, on a short petiole (5-10 mm), are simple, opposite, lanceolate, linear or oblong, with sharp apex, 10-24 cm long and 2-6 cm broad, rather coriaceous, of an intense glossy green colour, but the young ones, which are pinkish. The inflorescences are in terminal cymes carrying 2 to 8 hermaphrodites perfumed flowers, with 4 ovate and concave petals, about 1,5 cm long and a crowd of 1,5-4 cm long, cream white, stamina; solitary flowers may rarely appear at the axil of the leaves.

The flowers are pollinated by nectarivorous birds and by insects, in particular, bees, which produce a honey with a special taste. The fruits are generally globular berries, at times slightly piriform, of 2,5-5 cm of diameter, when ripe of white or pale yellow colour, at times with pink shades, with a 1-1,5 cm thick pulp, yellowish, sweet, with a slight perfume of rose.

The fruit has a central cavity containing one seed, of 1-1,5 cm of diameter, polyembryonic (up to four embryos). It reproduces by seed, which, due to the shortness of its germination capability must be placed in the ground as soon as possible, on a sandy soil, kept humid, in shaded position; the germination takes place in 1 to 4 months, the fructification by the fourth year of age; it can reproduce also by semi-woody cutting, with low success rates and by air layering.

Nutritional value per 100 g

- Energy : 25 Kcal
- Carbohydrates :5.7 g
- Fat : 0.3 g
- Protein : 0.6 g

Vitamins

- Vitamin C : 22.3 mg (25%)
- Vitamin A : 0.017 mg
- Thiamine (B1) : 0.02 mg
- Riboflavin (B2) :0.03 mg
- Niacin (B3) : 0.8 mg

In addition, minerals include potassium 4%, calcium 2%, zinc 1%, phosphorus

1%, magnesium 1%, and manganese 1%. Iron is usually not present.

Benefits

Gulabjam contains a considerable amount of vitamin C and calcium. Considering its nutritional value, 100 grams of this fruits contains 20 milligrams of vitamin C. Vitamin C strengthens the immune system and acts as an antioxidant, which is beneficial for the heart. It helps in controlling bad cholesterol in the blood. Vitamin C is also very beneficial for the skin and hair as it maintains skin brightness. Furthermore, vitamin C aids in wound healing. On the other hand, calcium is a primary component for the structural framework of the human body. It helps in bone formation and strengthens them. Therefore, it is very beneficial for women over 45 who suffer from back pain and joint pain. Additionally, local practitioners in the region utilize it for various treatments. Gulabjamun plays an effective role in relieving stomach pain, diarrhea, and nausea. The extracts from its leaves and bark help in controlling diabetes.

Conclusion

Gulabjam is a highly suitable tree for afforestation and commercial cultivation because of its medium size, high fruit yield, ornamental beauty, and adaptability to courtyards, rooftops, and public spaces. It supports biodiversity, especially birds, while offering environmental, nutritional, and economic benefits. Including Gulabjamun in afforestation can enrich ecosystems, diversify diets, reduce fruit imports, and, with ongoing varietal improvement, strengthen sustainable agriculture and environmental conservation for future generations and national development.

The Voice for Bangladesh's Trees

In an age shaped by rapid urban growth and digital living, Meet the Man Who Turned Tree Knowledge into a Movement, Azharul Islam Khan's quiet devotion to trees feels both rare and deeply meaningful. Widely known as "Brikkhobhondhu" (Friend of Trees), Azharul Islam Khan is a Bangladeshi botanist, environmental educator, and social media voice who has dedicated his life to helping people reconnect with nature.

Born in 1970 in Nandail, Mymensingh, Azharul Islam Khan's bond with the natural world began early. His father's love for gardening strongly influenced his childhood. As a young boy, Azharul Islam Khan spent hours observing plants, learning through trial and error, and slowly developing a deep respect for trees. What began as curiosity gradually turned into a lifelong passion.

A Passion That Became a Mission

Azharul Islam Khan later studied Botany at the University of Dhaka, .

Author: Asmaul Hosna Poushi

where he gained formal scientific knowledge. Yet, for Azharul Islam Khan, education was never meant to remain limited to books or classrooms. He believed plant knowledge should be shared in a way that feels simple, practical, and connected to daily life.

In 2008, Azharul Islam Khan began sharing his botanical insights on Facebook, posting videos and written content about both common and lesser-known plant species. What started as a personal interest slowly grew into a meaningful platform. People were drawn to Azharul Islam Khan's clear explanations, gentle storytelling, and genuine love for trees.

Championing Trees Beyond Just Planting

Unlike many environmental initiatives that focus only on planting trees, Azharul Islam Khan emphasizes understanding and appreciating plants. He encourages people to identify trees, learn their names, and understand their ecological importance—especially native species.

Azharul Islam Khan regularly visits botanical gardens, forests, and urban green spaces, documenting plant life and explaining its value. Through his work, he reminds people that trees are not just silent background elements, but living companions that support life in countless ways.

His approach blends scientific knowledge with emotional connection, inspiring people to observe nature more closely and treat trees with care and respect.

Impact and Influence

Now in his mid-fifties, Azharul Islam Khan continues to work tirelessly to spread plant awareness. He places special importance on educating young people, believing that early exposure to nature creates a stronger sense of environmental responsibility.

Azharul Islam Khan's journey shows that true environmental advocacy does not always require institutions or fame. It begins with curiosity, consistency, and the courage to share knowledge sincerely.

Legacy and Vision

The true legacy of Azharul Islam Khan lies not only in the trees he has studied or nurtured, but in the awareness he has planted in people's minds. Through his videos and writings, he has inspired a growing community to see trees as essential partners in maintaining ecological balance and human well-being.

His story proves that when knowledge is shared with honesty and love, it continues to grow—just like the trees Azharul Islam Khan has devoted his life to protecting

Fields to Algorithms:

The Future of Bangladesh Agriculture with the Effect of Machine Learning

Introduction

Bangladesh is mostly an agrarian country that must contend with resource limitations and climatic uncertainties on top of the growing population. Machine learning (ML) has made precision farming, predictive analytics, and data-driven decision-making possible and has become a game-changing technology to modernise agriculture over the last several years. This article examines the current uses of machine learning (ML) in Bangladeshi agriculture, the key challenges, long-term solutions, and evaluates the potential of the AI-based farming solution in the future.

In Bangladesh, agriculture, the country's main economic sector, employs nearly 40 per cent of the labour force and supplies nearly 13 per cent of the GDP. Conventional farming methods, nonetheless, are becoming less productive in the face of problems such as climatic fluctuations,

Author: Tasnim Tahara

insect attacks, and unreliable harvests. The integration of machine learning is an example of a paradigm shift since it will alter agricultural management systems to be more intelligence-driven, as opposed to intuition-driven systems.

Machine learning is a branch of artificial intelligence that enables computers to analyse large and complex data, discover trends and make predictions. This is the latest technology, which is being implemented in Bangladesh to enhance the use of resources, anticipate risks, and enhance the productivity of vital crops such as rice, jute, wheat, and potatoes.

Current use of machine learning in Agriculture:

Crop Yield Forecasting:

Researchers are applying algorithms like the Random Forest and Gradient Boosting to predict the yields given the temperature, rain and soil fertility.

Pests and Diseases Identification:

One of the deep learning models that has been implemented to identify diseases on cellphone-taken crop photos is Convolutional Neural Networks (CNNs). A CNN model to detect rice leaf blight, which achieved 94% accuracy, to enable early intervention and control the excessive use of pesticides.

Weather and Climate Prognostication:

Weather models built on machine learning can assist farmers in receiving predictions on rainfall and drought trends to have a more accurate way of scheduling the time when they plant and irrigate their farms.

Forecasting Market Prices:

Crop market forecasting is being carried out using recurrent Neural Networks (RNNs). RNN-based models can forecast the change in prices at least one week in advance, providing a farmer with the opportunity to make their selling choices using more reliable information.

Challenges

Data Limitations

- *Lack of good, localised data limits the performance of the models.*

Limited rural internet/digital literacy

- *ML is not accessible to many rural areas.*

Financial Barriers

- *Most farmers are unable to afford IoT or ML-enabled tools.*

Institutional Gaps

- Lack of coordination between the research institutes, ministries, and the private sector.

Cultural Resistance

- Insufficient awareness and training among the farmers are some of the reasons why these systems are not trusted by the farmers using AI.

Recommendations and Strategic Solutions

Build National Agri-Data infrastructure:

- Develop an open-access agricultural data hub by working with BARC and BRRI, and universities.

Install ML Literacy Programs:

- Train extension officers and local farmers on how to use AI-based mobile platforms.

Encourage Low-Cost IoT Solutions:

- Local actors such as the iFarmer or KrishiHub may create cheaper IoT smart sensors that smallholders can use.

Increase Public-Private Collaborations:

- Introduce the ICT Division and Ministry of Agriculture to AI innovators so they can scale successful pilot projects.

Develop Bangali-language AI platforms:

- Implement voice-based advisory systems to diagnose pests and give recommendations on crops in real-time.

Future Perspectives:

The future of machine learning (ML) in the agriculture of Bangladesh is bright because the country is moving towards the Bangladesh Smart Vision 2041. ML has the potential to transform conventional agriculture into precision agriculture with data-driven approaches using localized innovations and policy support.

Precision and Smart Farming:
ML will optimise irrigation, application of fertilisers and pest control using inexpensive sensors, drones, and satellite images information - farmers will generate more and less waste, especially in large plantations like Rajshahi and Rangpur.

Climate-Resilient Agriculture:
With floods, droughts, and salinity taking place in Bangladesh, the ML-based climate models may be helpful to predict the impact of the weather and soil variations on adaptive agriculture and crop selection in coastal regions such as Khulna and Barisal.

Agri-FinTech and Insurance:
Machine learning will facilitate AI-based crop insurance and credit scores, which will render financial services affordable to smallholders through apps such as iFarmer and bKash.

Bangali-language online translation advice:
ML voice assistant and AI chatbots based on the use of natural language processing will offer real-time farming guidance, pest identification, and market predictions in Bangla.

Youth Policy Support and Innovation:
It will be important to encourage young entrepreneurs and enlarge rural digital infrastructure. Startup Bangladesh and the ICT Division can facilitate the faster adoption of AI and local innovation in the form of public-private partnerships.

In conclusion, ML can make Bangladesh's agriculture smarter, more resilient, and more inclusive—empowering farmers, boosting productivity, and strengthening food security.

Floating Garden: A Delta Innovation

Introduction

Bangladesh is a low-lying deltaic country where nearly one-third of the land remains submerged during the monsoon season. Frequent flooding, waterlogging, and the effects of climate change have made conventional agriculture increasingly challenging in many regions. In response to these environmental constraints, local farmers especially in the southern districts have developed and sustained a remarkable adaptive cultivation technique known as floating gardening, locally referred to as Baira or Dhap cultivation.

Floating gardening is an indigenous hydroponic farming system that enables farmers to cultivate crops on floating beds constructed from aquatic weeds and other organic materials.

The practice originated centuries ago in the south-central wetlands of Bangladesh particularly in Gopalganj, Pirojpur, Barisal, and parts of Sylhet where land remains under water for 6–8 months a year. Historically, this technique emerged as a survival strategy for smallholder and landless farmers to ensure food production during prolonged periods of flooding. The basic structure of a floating bed is formed using water hyacinth (Eichhornia crassipes), straw, and other biodegradable materials layered to create a buoyant platform. These beds, usually 6–15 meters long and about 1 meter thick, float on water bodies such as canals, beels, and low-lying flooded areas. Vegetable seedlings such as spinach, okra, gourds, turmeric, and leafy greens are planted directly on the beds. The nutrient-rich decomposing organic matter provides a natural growing medium that supports healthy plant growth without soil.

Author: Jannatul Joty

In recent decades, floating gardening has gained national and international attention as a climate-resilient agricultural innovation. The Food and Agriculture Organization (FAO) and the Department of Agricultural Extension (DAE) have recognized it as a best practice for climate adaptation in flood-prone regions. NGOs such as Practical Action and research institutions like Bangladesh Agricultural University (BAU) and BARI have conducted extensive studies to modernize and scale up this traditional technique through improved bed design, pest management, and integrated fish-vegetable systems (such as Integrated Floating Cage Aquageoponics System).

Today, floating gardening serves not only as a sustainable livelihood strategy but also as an eco-friendly solution to climate change induced agricultural challenges. It supports food security, empowers rural women, and makes efficient use of wetlands that would otherwise remain unproductive for most of the year. The success of floating gardens in Bangladesh has even inspired similar projects in other flood-prone countries, such as Cambodia, Myanmar, and South Sudan.

Procedure of Floating Gardening in BD

The procedure of floating gardening in Bangladesh follows a traditional yet scientifically adaptive process, allowing cultivation on water surfaces during the monsoon season. The main stages include bed preparation, seed sowing, crop management, and harvesting.

1. Selection of Site

Farmers select shallow water bodies such as canals, haors, beels, or waterlogged paddy fields where water depth remains between 1–2 meters throughout the growing period. The site must have low water current and moderate sunlight exposure to ensure bed stability and good crop growth.

2. Preparation of Floating Bed

The bed, locally known as Baira or Dhap, is made primarily from water hyacinth (Eichhornia crassipes), paddy straw, and other aquatic weeds. Layers of freshwater hyacinth are stacked on top of one another to form a floating mat

about 1 meter thick and 6–15 meters long. The bed is left to decompose for 7–10 days, allowing the organic matter to stabilize and become nutrient-rich. Farmers then add a thin layer of compost or decomposed cow dung on the top to enhance fertility.

3. Seed Sowing and Transplanting
Seeds are first germinated in small nursery trays or banana leaf cups filled with decomposed organic matter. Once seedlings are strong enough, they are transplanted onto the floating beds. Common crops include okra, spinach, bottle gourd, pumpkin, tomato, turmeric, chili, and leafy vegetables.

4. Crop Management

- **Watering:** The surrounding water naturally provides moisture, so minimal watering is needed.
- **Pest and Disease Control:** Farmers often use organic pest repellents, such as neem extract or chilli-garlic spray.
- **Anchoring:** The beds are tied with bamboo poles or ropes to prevent drifting during strong winds or water currents.
- **Nutrient Management:** Additional decomposed organic matter is added periodically to replenish nutrients.

Economic Benefits

1. Low Input Cost
The materials used such as water hyacinth, straw, and local compost—are readily available and inexpensive, reducing overall production costs compared to conventional farming.

Economic Benefits of Floating Gardening

2. High Yield and Profitability
According to field studies by the Department of Agricultural Extension (DAE) and Bangladesh Agricultural University, floating gardens can generate two to three crop cycles during the monsoon season. Farmers can earn 20,000–30,000 BDT per season per decimal of floating bed, depending on crop type and market price.

3. Employment Generation
Floating gardening provides seasonal employment opportunities, especially for rural women, who often manage seedbeds, transplanting, and harvesting. This enhances household income and women's empowerment in marginalised communities.

4. Food Security and Nutrition
During floods, when other fields are submerged, floating gardens supply continuous access to fresh vegetables, improving family nutrition and reducing dependence on external markets.

5. Environmental Sustainability
An eco-friendly system that conserves wetlands by using invasive plants like water hyacinth, reduces soil degradation, and supports carbon sequestration through organic recycling.

6. Climate Resilience
It is recognized by the FAO and IPCC as a climate-smart practice, enabling food production amid floods, waterlogging, and salinity intrusion.



Effects of Vermicompost and Risk Husk Ash on the Yield of Sweet Gourd

Introduction

Botanical name of Sweeet Gourd is *Cucurbita moschata*. Sweet gourd, scientifically known as *Momordica cochinchinensis,* has a long and fascinating history. It's believed to have originated in Southeast Asia Sweet gourd is a wild vegetable native to East and South-East Asia comprising India, Myanmar, Philippines, Vietnam, Thailand, Japan, China, Indonesia and New Guinea. Archaeological evidence suggests gourds, including sweet gourds, were among the earliest domesticated plants, with some dating back to 13,000 BC. It is a dioecious and stout perennial climber growing up to 20m high with tuberous roots.The plant is dioecious, meaning it has separate male and female flowers. The fruits are ovoid, oblong or round with bright red arils, rich in carotene and lycopene.

In Bangladesh, the annual sweet gourd harvest is difficult to pinpoint with precise figures, but research indicates an average yield of 7.49 t/ha. In the winter of 2020-21, 17768.36 hectares of sweet gourds were cultivated, according to journal binet. While not a direct annual harvest figure, this demonstrates a significant portion of the vegetable production in Bangladesh. Bangladesh's annual export of sweet gourds (including pointed gourds) is relatively small. In the 2015-16 financial year, only 2,000 tonnes were exported, despite annual production of nearly 0.1 million tonnes of pointed gourds. The total value of vegetable exports from Bangladesh was USD 141 million in 2019.

Author: Afiya Ibnath

Effect of Vermicompost in Sweet Gourd

Vermicompost is highly beneficial for Bangladesh's agricultural sector and economy. It offers a sustainable and cost-effective way to improve soil quality, increase crop yields, and generate income, while also promoting environmental health.

Vermicompost, created through the breakdown of organic matter by earthworms, benefits sweet gourd plants by improving soil health, increasing nutrient availability and promoting plant growth. It acts as a natural fertilizer and soil amendment, enhancing water retention and aeration. Additionally, vermicompost can help control soil-borne diseases and pests, contributing to healthier sweet gourd plants and potentially higher yields.

Chemical Effects

Improved Soil Chemistry:
Vermicompost increases the content of organic carbon and nitrogen in the soil.

Increased Nutrient Availability:
It provides essential nutrients like nitrogen, phosphorus, and potassium in readily available forms, enhancing plant growth.

Enhanced Soil pH and Structure:
Vermicompost can help lower soil pH and improve soil structure, leading to better aeration and water infiltration.

Organic Effects:

Increased Organic Matter:
Vermicompost adds organic matter to the soil, which is crucial for soil health and fertility.

Improved Soil Microbes:
It stimulates beneficial microbial activity in the soil, which plays a vital role in nutrient cycling and plant health.

Enhanced Water Retention:
Vermicompost increases the soil's water-holding capacity, reducing the need for frequent irrigation.

Growth Stage Effects

Increased Plant Growth:
Vermicompost promotes vegetative growth, including leaf and stem development.

Improved Yield:
It leads to higher yields of sweet gourd fruits, contributing to increased productivity.

Enhanced Fruit Quality:
Vermicompost can also improve the quality of the sweet gourd fruits, such as size and taste.

Early Flowering:
In some cases, vermicompost application can promote early flowering in sweet gourd, leading to a shorter growing season.

Production process of Vermicompost

Vermicompost, a rich soil amendment created by worms, is produced through a relatively simple process. It involves preparing a suitable container or bin, adding bedding material, introducing worms, feeding them organic waste, and maintaining the right moisture levels. The worms then break down the waste into nutrient-rich castings, which can be used to enrich soil.

Market price and demand

In Bangladesh, vermicompost is gaining popularity and can be sold for Tk 10-15 per kilogram. Demand is increasing due to its effectiveness in improving soil health and enhancing crop yields, with some farmers selling it locally for Tk 12-20 per kg. While specific market prices may vary, the overall trend shows a rising demand for organic fertilizers like vermicompost, particularly in agricultural areas.

Conclusion

Sweet gourd contains moderate carbohydrates and fiber, with very small amounts of protein and fat. Per 100 g, it provides about 3.69 g carbohydrates, 1.2 g fiber, 0.6 g protein, and only 0.02 g fat, while being composed of approximately 96% water. It is a source of several vitamins, including thiamine (B1), riboflavin (B2), niacin (B3), pantothenic acid (B5), vitamin B6 (each contributing about 2–3% of daily requirements), folate (1%), and vitamin C (10%). It also supplies essential minerals such as calcium and iron (2% each), magnesium (3%), potassium (4%), phosphorus (2%), and zinc (7%).
Beyond its nutritional value, sweet gourd contributes significantly to food security by enhancing crop diversity, increasing cropping intensity, and improving land-use efficiency, especially in resource-poor areas. Its suitability for intercropping with other vegetables helps improve overall nutrition and reduces the risk of crop failure. Moreover, its adaptability to adverse conditions, including salinity, makes sweet gourd an important crop for marginal lands, expanding opportunities for sustainable food production.

Farming on the Edge: How Nepal's High-Hill Agriculture is Adapting to Climate Change

Introduction

Nestled between the towering Himalayas and the fertile plains of the Terai, Nepal's high-hill regions—above 1,500 meters—offer a remarkable, lesser-known agricultural system that is both traditional and resilient. While much of South Asia focuses on flatland agriculture, Nepal has, for centuries, practiced hill farming, where farmers cultivate terraces carved into steep slopes, manage microclimates, and grow unique crops rarely seen in the lowlands. With climate change threatening conventional agriculture across the globe, Nepal's high-hill farming is gaining renewed attention for its adaptive, sustainable, and locally tailored methods. For agriculture students in Bangladesh, where the terrain and climate are vastly different, this farming system offers fascinating lessons on resilience, innovation, and ecological harmony.

Author: Sagar Poudel

What Makes High-Hill Farming Unique ?

1. Terrace Farming

Nepal's hills and mountains are too steep for flat farming. Instead, farmers cut step-like terraces into slopes, preventing soil erosion and allowing water retention. This practice dates back centuries and is still widely used in districts like Gorkha, Ramechhap, Sindhuli, and Mustang. On average, a single farmer may manage 20–30 small terraces, growing multiple crops in one season— for e.g. millet on upper terraces, maize in the middle, and vegetables or pulses below.

2. Vertical Crop Zoning

Unlike in the lowlands, high-hill agriculture in Nepal depends on altitude-based crop zoning. For instance:

- Below 1,200m: Rice, maize, mustard
- 1,200–2,000m: Millet, beans, ginger, turmeric, apple
- Above 2,000m: Buckwheat, barley, potatoes, herbs like Jatamansi and Yarsagumba

This zoning system allows farmers to diversify risk—a key resilience strategy in the face of unpredictable weather

3. Traditional Water Management – "Dhunge Dhara" and "Kulo" Systems

High-hill communities have engineered gravity-fed irrigation systems called kulo, and stone spouts (dhunge dhara) that distribute spring water across terraced fields. These low-tech but high-impact systems are community-managed and adapted to local topography, minimizing dependence on modern irrigation.

Unique High-Altitude Crops of Nepal

Here are some crops and produce unique to Nepal's high hills that are rarely seen in Bangladeshi fields:

Crop/Produce	Specialty	Area (Districts)
Jumli Marsi Rice	Grown at 2,300m – world's highest rice variety	Jumla
Mountain Apples	Low-chill apples grown without refrigeration	Mustang, Dolakha
Amriso (Broom Grass)	Used for erosion control and broom-making	Kavre, Ramechhap
Jatamansi, Chiraito	Medicinal herbs for export	High Himalayas
Buckwheat & Barley	Drought-resistant superfoods	Dolpa, Mugu, Humla

Climate Resilience from the Himalayas

High-hill farmers are often the first to observe the impacts of climate change — warmer winters, irregular monsoons, and rising pest pressure. In response, they have developed and sustained several resilient farming practices, including:

- Crop diversity: A typical household cultivates 5–7 crops per season, which spreads risk and reduces dependence on a single crop.
- Agroforestry: The integration of trees with crops and livestock supplies fodder, fuelwood, fruits, and timber, while improving soil stability and reducing erosion on steep slopes.
- Organic manure use: Due to limited access to chemical fertilizers, high-hill farms primarily depend on compost, crop residues, and livestock manure to maintain soil fertility.
- Water management: Farmers use traditional water-harvesting methods and gravity-fed irrigation systems to cope with limited and seasonal water availability.
- Indigenous knowledge: Local seed varieties and traditional farming calendars help farmers adapt to changing climatic conditions and preserve agrobiodiversity.

A 2022 study by the

Jumli Marsi Rice

Mountain Apples

Amriso (Broom Grass)

Jatamansi

Chiraito

Buckwheat

International Centre for Integrated Mountain Development (ICIMOD) reported that 81% of high-hill farms rely on traditional composting rather than chemical fertilizers, highlighting the role of low-input, climate-resilient practices in sustaining mountain agriculture.

New Trends: Introducing Technology to the Hills

While high-hill farming remains largely traditional, modernization is happening:

Solar-powered irrigation pumps are being used where electricity is absent.
Plastic tunnels and greenhouses are helping farmers extend growing seasons for tomatoes, cabbages, and chilies.
In some areas, farmers are adopting mobile-based weather alerts and market pricing systems—through platforms like Smart Krishi Nepal.

Final Thoughts

High-hill farming in Nepal is not just agriculturist's an ancient art of survival, deeply embedded in the landscape and culture. For Bangladeshi readers and students, it offers a unique case study in farming with nature, not against it.

As global agriculture shifts toward resilience and sustainability, Nepal's hill farmers working on narrow ledges between the sky and the valley might just be the world's unsung pioneers.

Sources & References

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When Life Ends in Waste, Power Rises in Crops

Introduction

Turning Ends into Beginnings

Daily, large quantities of food and organic waste are thrown away worldwide, often ending up in dumps where they contribute to greenhouse gas emissions and environmental harm. In 2019, the United Nations Environment Programme (UNEP) claims that more than 931 million tonnes of food waste were produced. However, what if a tomato end, a banana peel, or leftover rice could be the beginning of a new cultivation? This article examines how waste is not really the end of life but transforms into a valuable factor in the rejuvenation of agriculture. Through sustainable technology and ecological methods, organic waste is being transformed into a commodity, turning yesterday's scraps into the crops of tomorrow.

1. The Science Behind Organic Waste Transformation

Organic waste is a term that is often used to describe what most people think of as food waste – waste from one's kitchen, from one's farm, leaves that have fallen, and even animal waste. However, within this waste lies a treasure of essential elements such as nitrogen, phosphorus, and potassium, all of which are needed for the healthy growth of plants. And what makes organic waste so special, is the fact that nature has already figured out how to convert this waste into the best form that plants can take in.These conversions, which are also called the decomposition of the waste, are brought about by the actions of tiny

Author: Khondoker Arman

organisms living in the soil. One of the most common ways in which this transformation is brought about is through composting, a process by which aerobic bacteria (bacteria that require air to live) are used to convert organic waste into compost, which is a powder that rich in nutrients. Depending on the amount of waste produced, composting can take from just a few weeks to several months to complete, but the end result is always the same, a powdery, dark-brown substance that contains the best nutrients for plantsThen there's anaerobic digestion, a process that skips oxygen altogether. In sealed containers called digesters, bacteria decompose waste to create two valuable byproducts: biogas and digestate. The gas can be used for cooking, lighting, or even powering generators, while the leftover liquidr ich in nutrients can be used as organic fertilizer.Another natural marvel is vermicomposting, where earthworms play the lead role. These creatures consume waste and excrete nutrient-packed castings that enhance soil fertility, structure, and microbial life. This method is especially suited to small-scale farming or urban garden settings, offering a low-cost, low-tech solution.What's the big picture? The outcome of all these processes is that waste becomes a resource. Compost and organic fertilizers increase soil's water retention and support healthier plant growth. Studies show that using these organic amendments can boost yields by up to 30% and reduce dependence on costly, synthetic fertilizers. That's a win for the environment and the economy..In essence, the science of organic waste transformation is a dance of biology and chemistry that turns yesterday's trash into tomorrow's food. As more people

into tomorrow's food. As more people recognize the potential beneath the surface, these natural processes are becoming essential tools in sustainable agriculture—especially for regions grappling with soil degradation and rising input costs.

2. Circular Economy: Waste as a Resource

For decades, the world has followed a linear "take–make–dispose" model of production and consumption, a system that wastes resources and harms the planet. The circular economy offers a smarter alternative by treating waste as a valuable resource that can be reused, recycled, or regenerated.

In agriculture, this means turning organic waste from households, markets, and farms into compost or biogas instead of sending it to landfills where it emits methane. These circular practices mimic natural cycles by returning nutrients to the soil and supporting sustainable food production.

Cities are increasingly adopting this approach. In Bangalore, urban food

waste is composted locally and sent back to nearby farms, while in Kigali, agricultural waste is converted into biogas and organic fertilizer, supporting clean energy and higher crop yields. Circular agriculture bridges the urban–rural divide by transforming city waste into rural resources. This reduces landfill pressure, lowers farmers' dependence on chemical fertilizers, cuts costs, and improves soil health. Environmental benefits include reduced greenhouse gas emissions and greater resilience of food systems. Beyond the environment, circular agriculture creates green jobs, supports local markets, and encourages innovation. By rethinking waste as a beginning rather than an end, the circular economy offers a sustainable and hopeful future for both cities and farmlands.

3. Boosting Soil Health and Crop Productivity

Soil is the hidden foundation of agriculture, yet in many low-income regions it is severely degraded. Decades of chemical-intensive farming have left soils nutrient-poor, compacted, and biologically inactive, resulting in lower yields and growing dependence on synthetic inputs. Organic waste offers a natural solution. When converted into compost or organic fertilizer, materials such as manure, crop residues, and food waste return essential nutrients to the soil. Unlike synthetic fertilizers, organic matter improves soil structure, increases carbon content, and supports beneficial microbes—key elements of long-term soil fertility. Compost loosens soil, improves aeration, and enhances water retention, helping crops survive dry conditions.

Vermicompost further enriches soils with enzymes and microbes that improve nutrient cycling and plant health. Crops grown in such soils are stronger and more resistant to pests and diseases, reducing the need for chemical pesticides. The benefits are measurable. In Bangladesh, studies show that farms using compost and vermicompost achieved up to 25% higher yields than those relying only on chemical fertilizers. Since organic inputs are often locally available and affordable, they also reduce costs for smallholder farmers. Restoring soil through organic waste recycling is more than a technical fix—it is a step toward sustainable agriculture. When soil health improves, productivity, resilience, and food security grow alongside it.

4. Technology and Innovation in Waste-to-Crop Solutions

Traditionally, organic waste was converted into fertilizer using manual methods like composting and vermiculture. Today, technology has

made this process faster and more efficient. Smart composting systems use sensors to control temperature and moisture, while modern biogas digesters optimize energy and fertilizer production through digital monitoring. Innovations such as biochar improve soil fertility and store carbon, and agri-tech startups now produce pelletized organic fertilizers from market waste. Blockchain adds transparency by ensuring fertilizer quality and traceability. Overall, technology is transforming organic waste into a valuable resource, supporting sustainable, circular agriculture.

5. Social and Economic Benefits for Low-Income Nations

In many low- and middle-income countries, agriculture, waste management, and unemployment are closely linked. Transforming organic waste into agricultural inputs offers a single solution that addresses all three challenges while promoting inclusive development.

Waste-to-fertilizer systems create jobs in waste collection, processing, composting, and biogas production—especially in rural and peri-urban areas. In countries like Nepal and the Philippines, such initiatives have provided income and skills for women and youth, strengthening their role in community development.

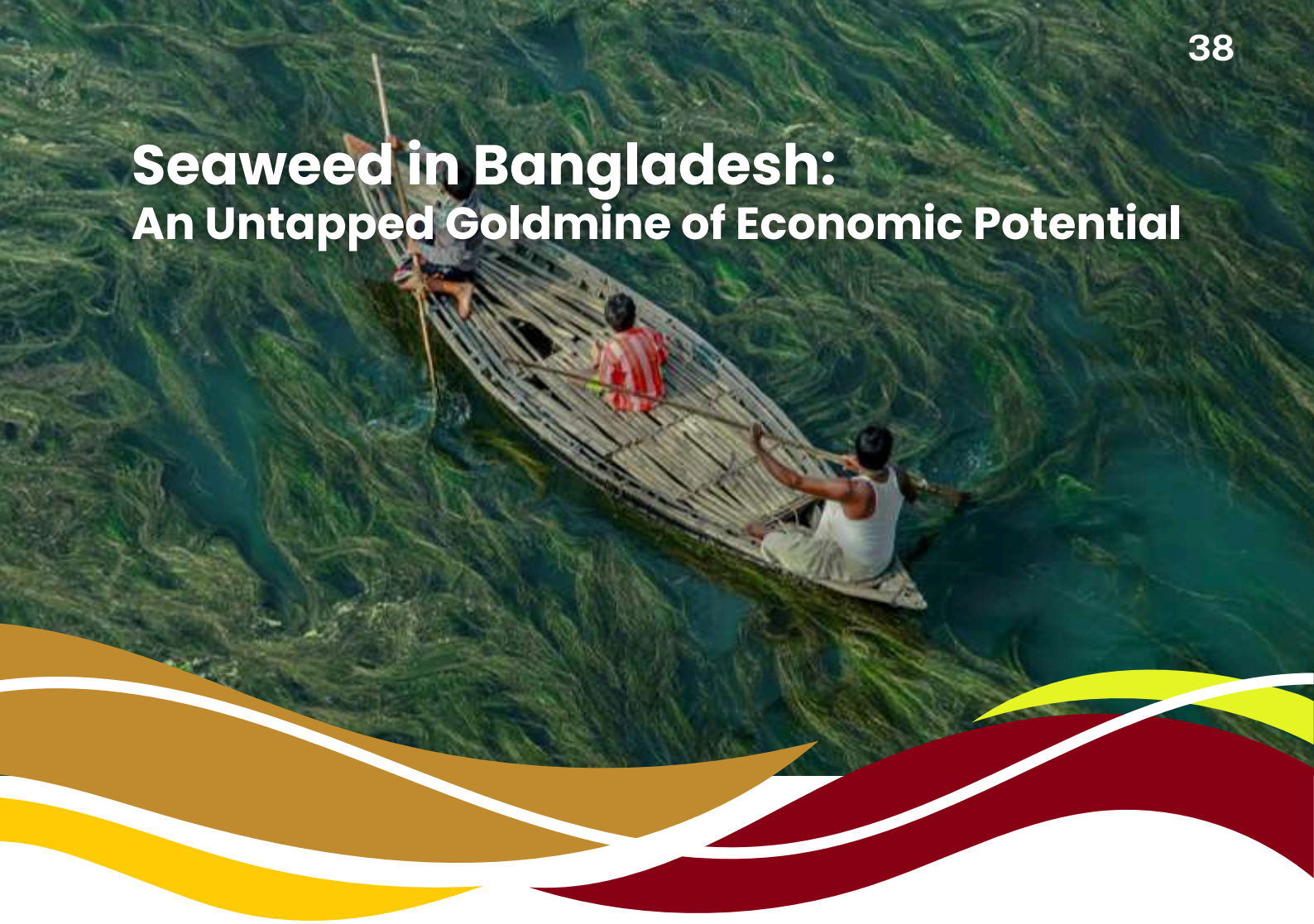
Organic fertilizers also reduce costs for farmers. Unlike expensive imported chemical fertilizers, compost and vermicompost can be produced locally, improving soil health and increasing long-term productivity. This leads to higher yields and better farm incomes. Health benefits are equally important. Reduced reliance on chemical fertilizers and pesticides lowers health risks for farmers and prevents contamination of soil and water. Community-led composting projects further build social cohesion and encourage environmental awareness. Overall, converting waste into agricultural resources is not just an environmental strategy it is a human-centered solution that supports jobs, health, and resilient food systems.

Conclusion

Cultivating Power from the End of Life

The journey from waste to harvest is not merely a technological change but a change in mindset. When organic waste is perceived as a useful resource rather than as a waste disposal problem, sustainable solutions can be found for food production, energy production, and the restoration of the environment. In countries where waste management and agricultural productivity obstacles exist, combined solutions give a glimmer of hope. With sustained backing, education, and invention, the conclusion of one lifecycle, be it a banana peel or a mound of market waste, can indeed empower the next cycle, restoring life to both the soil and the community.

Seaweed in Bangladesh:
An Untapped Goldmine of Economic Potential



Introduction

The colossal coastal waters of Bangladesh conceal a resource that has been referred to as a goldmine by scholars and authorities—seaweed. Although at present Bangladesh is already able to produce only a couple of hundred tons of seaweed per year, studies and pilot projects indicate that the potential is huge. Finally, the common name of many species of algae used in the sea can be used in foods, cosmetics, fertilizers and even biofuels. The article discusses the potential of the seaweed industry in Bangladesh, on the basis of scholarly articles, industry news, governmental policies and case studies to demonstrate how seaweed cultivation can be transformed into a coastal economic success. Among other key issues, there are the discussions on nature of the seaweed in Bangladesh, conducive coastal habitat, local community (particularly women) benefits, prospects of exporting the products, setback to the growth, and current efforts to promote this young industry.

Rainer Wealth

The coastal and sea waters of Bangladesh have a rich seaweed diversity. According to surveys, there are almost 200 varieties of seaweed in the Bangladesh waters. Out of these, researchers have singled out about 8-14 species that were commercially useful to cultivate. Examples of such notable algae are red algae such as Hypnea musciformis and Gracilaria tenuistipitata, and green algae such as Ulva intestinalis and Ulva lactuca. Such varieties are of great interest since

Author: Md. Rakibul Hasan

they are sources of useful hydrocolloids (e.g. agar and carrageenan) and edible as sea-vegetables. Already small-scale experimental farms have been initiated in the coastal waters of Bangladesh to cultivate Hypnea, Gracilaria, and Ulva. Altogether, a recent government-funded study discovered 220 species of seaweed in the Bay of Bengal - a remarkable marine genetic resource which highlights how much natural wealth can be found below the waves of Bangladesh. Nonetheless, seaweed farming is a fledgling industry in spite of this biodiversity. So much to date is confined to pilot projects and research trials; in other words, the country has hardly scratched the surface of its seaweed potential.

Ideal Coastal Conditions for Seaweed Farming

Bangladesh has an exceptionally good geography coupled with climate that supports seaweed aquaculture. The Bay of Bengal has a 710 km long shoreline of the country which covers approximately 25,000 km2 of shallow coast and estuaries. A large portion of this coastline is not more than 5 meters deep and highly nutritious, which makes a perfect environment in which marine algae can grow. More specifically, the southeast coast (Bazar region and Saint Martin Island) have warm tropical waters, low tidal flats, and ideal salinity (approximately 20-34 ppt) to support the growth of seaweed. Such shallow coastal water and inter tidal areas enable farmers to install rope lines or stakes to grow seaweeds at a low cost. The climate - tropical monsoon long warm season implies that seaweed can be grown practically all year long.

Farmers record a primary planting season of approximately October/November to the month of March, although all year round cultivation of certain hardy species such as Hypnea is possible.

Fishing seaweed is environmentally friendly. It does not need fresh water, farmland, or chemical fertilizers it is merely the seaweed which absorbs the sunlight, carbon dioxide and marine nutrients to grow. Indeed, by growing seaweed, one can enhance the environment along the coastal waters by absorbing the excess nutrients and carbon dioxide. The officials specify that industrial cultivation of seaweeds may save the ecology of the coasts as well as aid in the defense against the erosion. Another way that seaweed farms may help mitigate climate change is proposed by scientists who note that the farms may sequester carbon and improve the biodiversity. Combined with its geography and climate, the coast of Bangladesh is similar to a natural nursery of seaweeds, which would offer a highly favorable environment to expand the sector of the blue economy

Empowering the Coastal Communities (Particularly Women)

Farming of seaweeds is very promising to boost the economy of people living along the coastline, such as the establishment of new jobs for women. A large number of the populace in Bangladesh coastal region are the small-scale fishers or farmers in poverty. An alternative or supplemental income source, such as the introduction of seaweed

cultivation, can help to diversify the income and curb excessive dependence on capture fisheries. The cost of starting up seaweed farming is comparatively little—ropes, stakes, and locally obtained seaweed seed cuttings are all that is needed—and the crop can be ready to be harvested within 6-8 weeks. The barrier to entry is low, therefore creating the opportunity to engage even marginalized groups. Women in reality tend to be in high ranks in the cultivation of seaweed across the globe, and so is Bangladesh. Since there is the option to tend to seaweed lines and dry harvests nearby and at their own time, it is not disruptive to the domestic tasks that women in rural areas tend to have.

In Cox's Bazar, dozens of family units headed by women, already, have engaged in small scale seaweed agriculture. Research conducted established that women usually perform such job as seedling preparation, seaweed to ropes, harvesting, and sun drying of crop whereas men help in strenuous duties such as gathering wild seed grain and selling the produce. Cox used 30 families (approximately 300 people) in Cox Bazar in one pilot program to cultivate seaweed, and women were instrumental in the production process. The participants say that seaweed income, however small at this time, offers much-needed supplementary income during the fishing off-season and has enhanced family nutrition (families also consume some of the harvest). More importantly, the women living in the area used to be employed solely in fish processing or in domestic work without pay before; seaweed offers them a new source of entrepreneurship and jobs making them more economically independent. According to sociological surveys conducted in the coastal communities, 85 percent of the respondents felt that women participation in seaweed farming is a positive change in the society making them feel empowered and their status are elevated.

Other than farming, jobs are also being generated with value added sea weed industries. Zahanara Green Agro, a Cox's Bazar business that is run by women, is a groundbreaking example. This company was started by an entrepreneur by the name of Zahanara Islam, and it has already created an impressive 138 food products and 22 cosmetic products with the help of locally grown seaweed. They include products such as drink powders that are made of seaweeds, chips, dessert, face packs, and even perfumes. Zahanara Green Agro currently has 50-60 employees, and utilizes the supply chain that involves hundreds of farmers (mostly female) in its supply chain under contract farming. According to Zahanara, they are the first in Bangladesh to venture into seaweed

products, and when people taste or have a sample of their seaweed products, they are charmed by the quality. These ventures reveal the potential of a stringent seaweed industry to provide downstream opportunities—cottage industries producing snacks and soaps or large-scale processing enterprises—where women usually become entrepreneurs, workers, and co-op members. Concisely, the economic potential of seaweed may be particularly significant to the economic welfare of Bangladesh in regard to coastal women who stand to get some income, become empowered as well as a pathway to blue economy entrepreneurship.

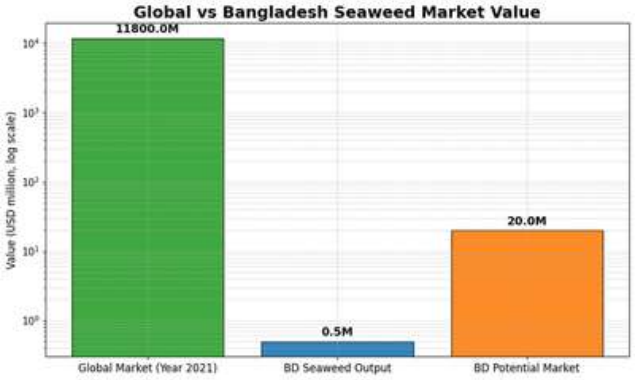
Global Market

Export Opportunity of Bangladesh

The other parts of the world have already wakened up to the commercial importance of seaweed and Bangladesh has an opportunity to take up the ride. Seaweed is a big business in the world: the global seaweed market is estimated to 18 billion USD in 2024, and it will hit 29 billion USD in 2030 due to the boom in sustainable foods, hydrocolloids, and bio-products. Asian giants such as China, Indonesia, and South Korea cultivate millions of tons of seaweed each year which feeds the food markets (e.g. nori, kelp, seaweed snacks) as well as industrial purposes (e.g. agar, carrageenan, fertilizers, animal feed supplements, etc.). In comparison, the contribution of Bangladesh is at present small - the nation only now grows about 400 tons of seaweed annually, which can be sold at a price of approximately Tk 55 million (approximately $500,000 USD). None of this finds its way to the world market yet: The Bangladesh Export Promotion Bureau has not reported any serious seaweed exports in dried or processed form so far. Stated differently, the country is virtually not currently a part of that 18-29 billion world market.

This, however, comes at the cost of a tremendous upside. Research indicates that the domestic market in Bangladesh alone of seaweed-derived products is potentially worth almost 20 million dollars - e.g. the local industries could use seaweed as raw material of biochemicals, pharmaceutical and cosmetic products, which would replace imports. The government estimates that the current imports by industries in Bangladesh is approximately Tk 28,000 crore of ingredients to make soaps, shampoos, and other products some of which can be replaced by extracts of seaweed that can be grown locally. Assume that a single quotient of that demand was satisfied using Bangladeshi seaweed, which would provide the local market with a multi-million dollar market and a saving in foreign exchange. And outside the domestic market, the export market is also beckoning: local consumers in Myanmar, India, China, Korea, Singapore, and even Chile have expressed interest in the seaweed produced in Bangladesh. As a matter of fact, although export data is zero, field surveys revealed that approximately 60 percent of Bangladeshi seaweed (in pilot farms) is discreetly sold to local intermediaries who subsequently export the produce to other countries outside the country, mainly to the neighboring countries and East Asia. These unaccounted sales imply that there is already a toehold, though very minimal, in the foreign markets. Bangladesh would have to increase production and

The silver lining is that the potential of the country in terms of its coastal capacity is enormous - tens of thousands of square kilometers of the most apt waters, in theory, millions of tons of seaweed could be produced in Bangladesh should there be enough investment and expertise. Even a moderate development of agriculture would soon make the nation a net producer of some of the seaweeds. As an example, once Bangladesh commercialized agar cultivation of Gracilaria and Gelidium, or Kappaphycus to carrageenan (a species that was successfully tested in Cox's Bazar), then it will be able to begin providing agar-agar producers or carrageenan refiners in the region. The market demand of these hydrocolloids is also high and increasing in the world and this is encouraging to export earnings in the future. By growing seaweed cultivation it has been observed by the Foreign Minister of Bangladesh that the nation can source Tk 16,000 crore ([?]$1.5 billion) of raw materials that are currently imported at the moment and export the excess - a win-win in the economic sector. To put it succinctly, Bangladesh is at the edge of an opportunity in exporting seaweed which is profitable. Its exploitation will involve the scaling up of the current pilot-scale farms to commercial-scale production, the establishment of processing plants (to dry, powder and extract agar/carrageenan), and supply chains linking farmers along the coast, domestic plants, as well as international purchasers. The demand exists—it is in specialty food firms, nutraceutical and cosmetic firms across the globe—but Bangladesh needs to increase production and match their quality to



Comparison of seaweed market value: global vs. Bangladesh. The global seaweed industry is worth billions (≈33 million tons yielding $11800 million USD), whereas Bangladesh's current output is valued at only around $0.5 million. However, Bangladesh's untapped local market for seaweed products is estimated at $20 million or more, and integration into the booming international market presents a major growth opportunity.

satisfy their demand. The following sections talk about what needs to be fought in order to do so and point out some positive developments already being realized.

Challenges

Despite strong potential, Bangladesh's seaweed sector struggles due to weak supply chains, fragmented farmers, lack of buyers, low domestic demand, poor post-harvest quality, environmental risks, and limited technical capacity. Cyclones, pollution, theft, and absence of hatcheries further reduce productivity. Institutional gaps—no clear policy, zoning, certification, or incentives—keep the industry informal and small. Short-term donor projects failed to build sustainable markets. Coordinated farmer organization, processing investment, awareness, policy support, and private-sector engagement are essential.

Conclusion

Export Opportunity of Bangladesh

In every piece of evidence, the seaweed has the potential to become a breakthrough blue resource for Bangladesh, provided that it is managed appropriately. The nation has the presence of growing conditions, abundant biodiversity, and a population that resides along the coasts and who will ultimately gain tremendously by the creation of new livelihoods. Scholarly and business studies agree that the seaweed industry farming may catalyze sustainable growth - it is green, climate-neutral, and profitable at large scale. Bangladesh will have to confront the prevailing problems to indeed make the seaweed the so-called goldmine. It entails investment in infrastructure (drying and storage facilities to maintain quality, such as rights to farming lands, a place in export promotion, funding of research and development, and public-private relationships to commercialize research findings) and encourages the idea of the public-private partnership to commercialize research findings. Essentially, Bangladesh is at the crossroads of the nascent seaweed industry. Development of a new sector, which supports the blue economy and positively influences communities live near the coastal regions, is unlockable through a thorough coordination of actions and investments in the country. Pilots and research have set the preparatory ground; it has to shift to full-scale commercialization. Provided it works, the vision is strong: a Bangladesh with green sea farms along its coastline, coastal residents have a stable income based on the wealth of the sea, local factories produce foods and biomaterials made of seaweed, and the products of the Made in Bangladesh label are sold to the markets all over the world. With this development to date and the momentum, Bangladesh has all the possibilities of making its sea waters into green gold—a real seaweed success story in the years to come.

THE AGRI-PRESERVE HUB

A Modern Solution to Post-Harvest Losses in Bangladesh

Introduction

Bangladesh's agricultural success is undermined by a broken post-harvest value chain that wastes a large share of what farmers produce. Fruits and vegetables experience losses of about 20–45%, while paddy and wheat lose roughly 18% after harvest, contributing to an estimated 2.4 billion USD in annual economic damage. Around 84% of Bangladeshi farmers are smallholders, meaning these inefficiencies hit the poorest producers the hardest and weaken both food security and rural livelihoods. The Agri-Preserve Hub is introduced as a decentralized, community-embedded infrastructure that can eliminate much of this waste, stabilize farmer income, and unlock higher-value markets through technology and better value-chain integration.

Agri-Preserve Hub was designed to solve that specific bottleneck: the gap between harvest and market where time, heat, and handling damage quietly erase value. The concept proposes a decentralized, farm-gate facility that helps farmers keep produce fresh longer, convert surplus into stable products, and prepare goods to meet market expectations —

Author: Shahriar Mannan Imon Talukder

without requiring expensive, centralized cold-chain infrastructure.

The Problem

Post-harvest loss at the first mile

The core issue isn't only production; it's what happens after production. Perishables begin degrading immediately after harvest, and in many rural settings the farmer has limited tools to slow that decline—no cold room nearby, no safe place to hold produce for even a few extra days, and no simple way to process oversupply when markets are flooded. As a result, farmers lose bargaining power and income, consumers face inconsistent quality, and the system wastes food that already cost land, water, fertilizer, and labour to produce.

The Solution

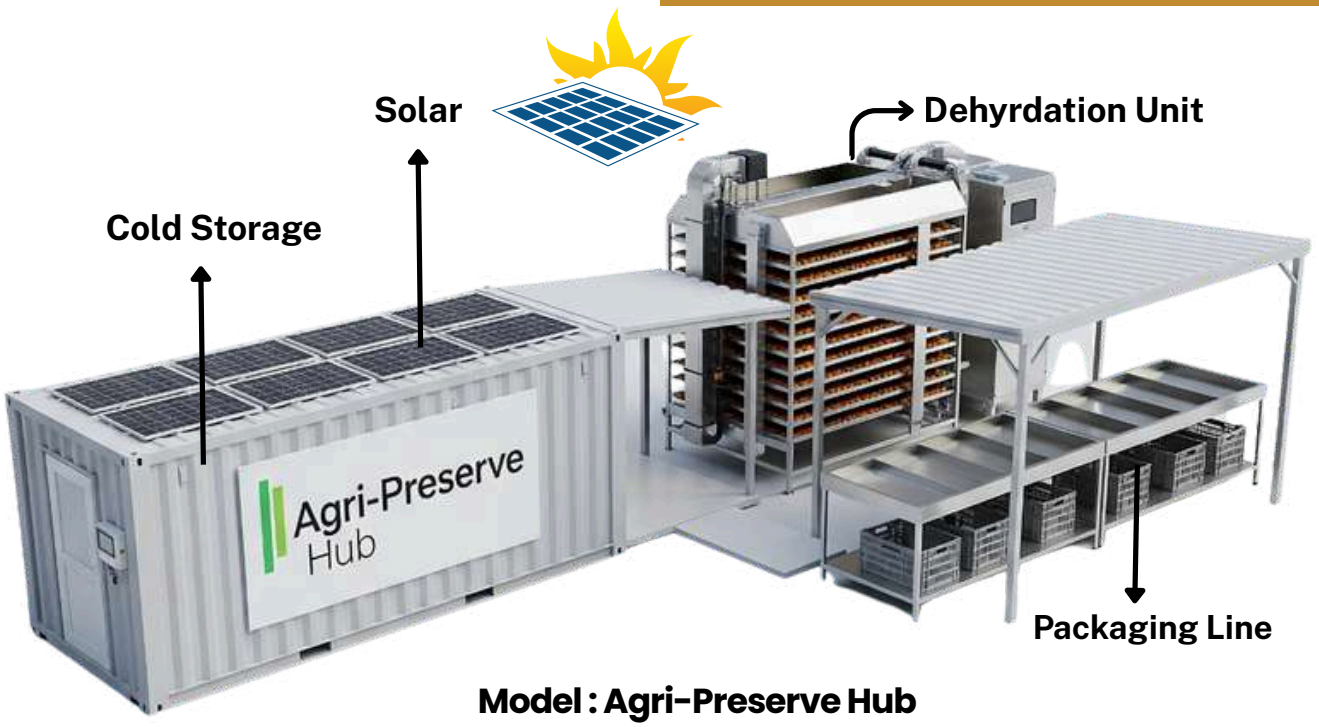
One hub, three services

Agri-Preserve Hub is structured as an integrated service point that combines three functions in one place:

Modular cold storage that extends the selling window for highly perishable crops, so farmers are not forced into distress selling the same day.

Hybrid drying that turns surplus produce into shelf-stable, value-added goods during peak harvest periods, when prices drop and spoilage rises.

A community processing and linkage space for sorting, grading, packaging, and skills training—helping farmers meet buyer standards and connect with better markets. The strength of the model is that these services work together. When a farmer brings produce to the hub, they can choose the best pathway—cooling for fresh sales, drying for surplus, or processing for premium presentation—rather than relying on a single option that fails during market shocks.



Model : Agri-Preserve Hub

Why the design is practical for Bangladesh

Agri-Preserve Hub is intentionally decentralized and scalable. Instead of assuming stable grid electricity and large centralized infrastructure, it is designed around solar-powered operation and modular expansion—start with essential capacity, then grow as utilization increases. The business logic also matters: the hub is envisioned as a community-run or cooperative-aligned service, enabling pay-per-use access so smallholders benefit without needing to own expensive equipment individually.

A blueprint for rural value retention

At its heart, Agri-Preserve Hub is about keeping value where it is created. When post-harvest handling improves, farmers gain time—and time creates choices: better prices, better negotiation, and better consistency. Over time, a network of such hubs can support local employment in operations and quality handling, encourage small-scale agro-processing, and reduce avoidable food waste while strengthening food security.

Farm Mechanization Idea Competition 2025

On Tuesday, 24 June 2025, I had the opportunity to participate in the Farm Mechanization Idea Competition 2025, jointly organized by BARI and the College of Agricultural Sciences, IUBAT, where our idea “The Agri-Preserve Hub” was presented as a poster concept. I am proud to share that our team—together with Sourav Kanti Bala (RPDO)—emerged as the Champion Team. This achievement reflects the strong recognition of our idea’s potential to transform Bangladesh’s first-mile preservation system and strengthen post-harvest management through innovation.

The Halda

Bangladesh's Premier Natural Gene Bank and The Cradle of Life

Introduction

Flowing through the heart of Chattogram, the Halda River is not merely a body of water; it is a silver ribbon of life, a biological masterpiece that defies the ordinary. While most rivers are celebrated for their scenery, the Halda is worshipped for its womb. It is the only tidal river on the planet where major Indian carps—specifically Rui, Katla, and Mrigal—voluntarily release their eggs into the current, turning the river into a living nursery. For Bangladesh, the Halda is a living heritage, a multi-million-dollar economic engine, and a critical pillar of the nation's food security.

Beyond its economic value, the Halda embodies a rare harmony between nature and tradition. For generations, local fishers have synchronized their lives with the river's lunar rhythms, carefully collecting fertilized eggs during peak spawning nights—an indigenous practice rooted in respect rather than exploitation. This fragile miracle, however, stands at a crossroads. Industrial pollution, riverbank encroachment, and unplanned development threaten the delicate conditions that make natural spawning possible. Protecting the Halda is therefore not just an environmental obligation; it is a moral responsibility—to safeguard biodiversity, sustain livelihoods, and preserve a cradle of life that has nourished the nation for centuries.

A Journey of 106 Kilometers

The Halda begins its journey in the Badnatali Hill Ranges of the Hill Tracts. It winds through the lush greenery of Fatickchhari, Raozan, and Hathazari for approximately 106 kilometers (66 miles) before it finally meets its mother, the Karnaphuli River.

Author: Tashnim Nishat

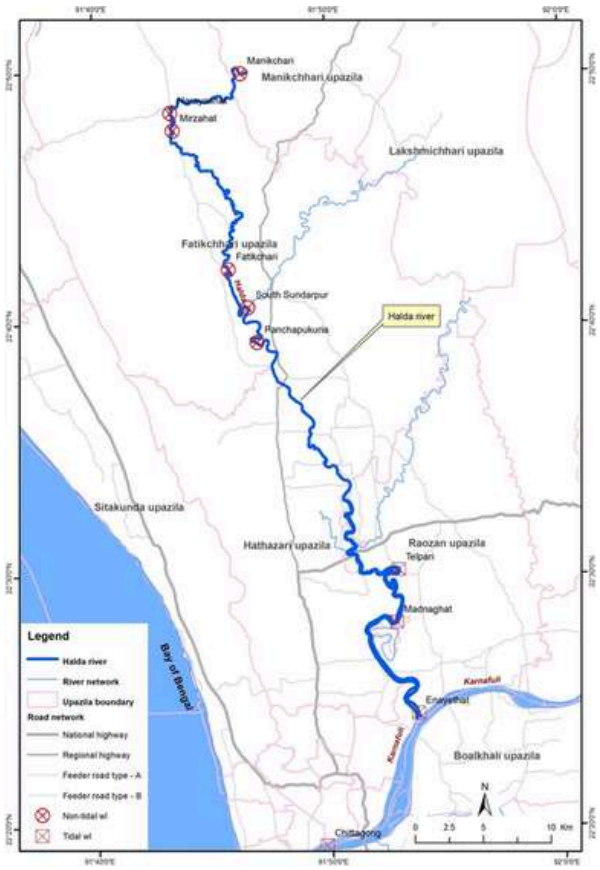
The average depth 21 feet (6.4 meters) and maximum depth reaches up to 30 feet(9.1 meters) at its deepest “kums”. Its basi area approximately 1,682 square kilometers, surrounded by the Sitakunda hills to the west and the Hill Tracts to the east. This connection is vital. The Karnaphuli serves as the "residence" where the massive mother fish live for most of the year. However, when the time comes to give life, these fish travel upstream into the Halda, seeking the unique sanctuary its waters provide.

Species Diversity

Fish and Animals

The Halda River is not just a river; it is a global biological wonder. Its unique status as the "Bangabandhu Fisheries Heritage" makes it one of the most protected and scientifically significant ecosystems in South Asia. The Halda River is incredibly rich in life, acting as a crossroads for freshwater, estuarine, and even some marine species.

- Fish Varieties: Scientists have recorded approximately 93 species of Ichthyofauna (fish and shellfish).
- Finfish: 83 species (including the famous Rui, Katla, Mrigal, and Kalbaush).
- Shellfish: 10 species (freshwater prawns and crabs).
- The "Special" Animal: The Ganges River Dolphin (Platanista gangetica), locally known as "Shushuk." The Halda is one of the few remaining healthy habitats for this critically endangered mammal. They are often seen jumping near the river's "Kums" (deep pools).
- Other Wildlife: The river basin supports 42 species of birds, as well as reptiles like the Peacock Softshell Turtle and mammals like the Asian Small-clawed Otter.



Map of Halda River

The Maternity Water: The Unique Chemistry of Halda River

The water of the Halda River is its most "magical" element. Scientists refer to it as "Maternity Water" because its chemical and physical properties are so precisely balanced that they act as a biological trigger for life.
Some Key aspects:

1. The "Chemical Cocktail" for Life
The water in the Halda isn't just H_2O; it is a complex mixture of minerals and gases that carps need to spawn.

- Dissolved Oxygen (DO): The Halda maintains a high DO level, often between 6.0 to 8.5 mg/L. This high oxygen content is vital for the survival of millions of eggs that are released at once.

- The pH Balance: The water is slightly alkaline, with a pH range typically between 7.0 and 8.0. This alkalinity protects the delicate shells of the fish eggs.
- Turbidity (Cloudiness): During the monsoon, the water becomes very "turbid" due to hill-wash (sediment from the mountains). While it looks "dirty" to humans, this sediment is rich in minerals that provide the first nutrients for the hatchlings.

2. The Temperature Trigger

- The Halda is a cool-water sanctuary.
- Temperature Difference: Its water is usually 2–3°C cooler than the neighboring Karnaphuli River.
- The Trigger: When the first pre-monsoon rains fall, the temperature of the Halda drops slightly. This sudden cooling, combined with the "smell" of the rainwater, tells the Mother Fish that it is time to release their eggs

The Miracle of the 'Golden' Eggs

- There is a poetic rhythm to the spawning. It doesn't happen every day; it requires a symphony of nature .Every year, during the pre-monsoon rains (usually between April and June), a spectacular event occurs. When the heavy rains coincide with the full or new moon, the "Mother Fish" migrate from the Karnaphuli River to the Halda. In the swirling oxbow bends of the river, they release millions of eggs.Local villagers, following traditions passed down through centuries, gather in hundreds of small boats to "mine" these golden eggs using specialized nets. Unlike hatchery-bred fish, the fry hatched from Halda eggs grow faster and are more resilient, making them the most sought-after seed for fish farmers across the country.

Fishing Seasons

When to Catch and When is it Prohibited?

Because of its heritage status, the rules on the Halda are very strict to protect the "Mother Fish."

- **Prohibited Period:** Strictly prohibited year-round. The government has imposed a complete ban on catching any fish or aquatic animals to protect the ecosystem.
- **Prohibited Period (Canals):** Fishing is banned in the 17 connected canals from February to July to allow mother fish to migrate safely into the Halda.
- **Suitable Time for Egg Collection:** April to June. This is the only exception. Under government supervision, local collectors are allowed to harvest fertilized eggs (not the fish themselves) during the spawning season.

- Banned Technology: Engine-driven boats and dredgers are banned year-round in critical spawning areas to prevent noise pollution and dolphin deaths.

The "Magic" of the Halda: Spawning only happens during a "Jo"—a specific moment when heavy rain, thunderstorms, a full or new moon, and the peak tide all occur simultaneously. This is the only time the river's "gold" (the eggs) can be gathered.

The Science of Suitability:

Why the Halda?

The Halda's importance lies in its specific hydrology. The river features several deep "kum" (depressions) and sharp bends that create the perfect turbulence and water chemistry—specifically a precise balance of temperature, salinity, and dissolved oxygen—required for carp spawning. Scientists often call the Halda a "biological laboratory" because its conditions are nearly impossible to replicate. Several factors make it the perfect cradle for fish:

- The Oxbow Bends: The river is famous for its sharp, "U-shaped" curves. These bends create natural turbulence and eddies, which keep the eggs buoyant and prevent them from sinking into the silt.
- The "Kums": At the bottom of these bends are deep natural pools called kums. These act as cold-water sanctuaries where fish can rest safely away from the heat and predators.
- The Perfect Chemistry: During the pre-monsoon rains, the runoff from the hills brings a specific mix of minerals and low salinity. This, combined with high dissolved oxygen and a specific water temperature, acts as a "biological key" that unlocks the spawning instinct in carps.

Halda The Natural GENE BANK

A Gene Bank is a place where genetic material is preserved. The Halda is called this because:

- **Genetic Purity:** The carp in the Halda have not interbred with hatchery-bred or hybrid fish. They carry the pure, original DNA of the species.
- **Superior Growth:** Fry (baby fish) hatched from Halda eggs grow 25-30% faster and are more resilient to diseases than any other fish in Bangladesh.
- **Sustainable Supply:** It provides nearly 60% of the natural carp seed demand for the entire country. If the Halda were to dry up, the genetic blueprint of these species would be lost forever.

The Economic Lifeline

How Farmers Benefit

The Halda is a multi-million dollar "gold mine" for the people of Bangladesh. The benefits are felt at every level:

- **The Egg Collectors:** Thousands of local villagers wait in small wooden boats. Using fine-mesh nets, they "sweep" the water to collect the eggs.

In a single night, a lucky fisherman can earn more than he typically does in a year.

- **The Hatcheries:** These eggs are taken to traditional mud pits (kua) along the banks. Within 18–24 hours, they hatch into tiny fry.
- **Nationwide Impact:** Halda fry are the "platinum standard." Because they are born in the wild, they grow faster and are far more resistant to disease than hatchery-bred fish. They are transported to ponds and lakes across all of Bangladesh, forming the backbone of the country's freshwater fish industry.

A heritage at Risk:

Despite its status as the "Bangabandhu Fisheries Heritage," the Halda is under threat from pollution, tobacco farming runoff, and illegal sand extraction. Protecting the Halda is not just an environmental duty; it is an act of gratitude toward a river that has fed millions for centuries.The Halda River is currently in a state of "emergency conservation." While it was officially re-declared a "Fishery Heritage" in November 2025 with the strictest laws in its history, it continues to face aggressive human and environmental threats.

- Below is a detailed breakdown of the threats facing the Halda and

- the multi-layered solutions being implemented.
- **Environmental & Human Threats:**
- **Pesticide Poisoning:** A new and terrifying trend where criminals use poison/pesticides in the water to catch fish quickly which causes instant oxygen depletion, killing everything from shrimp to large "Mother Fish."
- **Industrial Pollution:** Untreated waste from paper mills, power plants, and tanneries in the Chattogram region that lowers Dissolved Oxygen (DO) levels, making it impossible for eggs to hatch.
- **Rubber Dams & Sluice Gates:** Man-made structures used for irrigation in the upstream (Fatikchhari/Ramgarh) that blocks the migration path of mother fish and reduces the water flow needed for spawning.
- **Illegal Sand Mining:** Massive dredgers and manual sand lifting from the riverbed which destroys the "Kums" (deep natural pools) where mother fish rest and hide.
- **Tobacco Farming:** Intensive tobacco cultivation along the riverbanks. The nicotine and toxic pesticides wash into the river during rains, poisoning the "Maternity Water."
- **Climate Change:** Rising sea levels and unpredictable monsoon rains that causes Salinity Intrusion (saltwater coming from the ocean), which kills freshwater carp eggs.

Solution

"The Halda Protection Model"

The government and local scientists have developed a specialized strategy to save the river.

A. Legal & Administrative Solutions:

- **Total Fishing Ban:** As of late 2025, a complete ban on catching any fish or aquatic animals (except supervised egg collection) is in place year-round.
- **Heritage Zone Expansion:** Over 23,000 acres of land along the river have been designated as a protected "Heritage Zone."
- **Canal Closures:** Fishing is strictly banned in all 17 connected canals from February to July to ensure a safe passage for breeding fish.

B. Technological & Scientific Solutions:

- **Smart Monitoring:** Installation of CCTV cameras and real-time water quality sensors at key spawning points to catch illegal sand miners and polluters.
- **Drone Surveillance:** The River Police use drones to monitor remote oxbow bends that are difficult to reach by boat.
- **Artificial Restoration:** Plans are underway to re-excavate silted "Kums" (deep pools) and undo the damage caused by poorly planned embankments.

C. Community & Livelihood Solutions:

- **Alternative Livelihoods:** Encouraging tobacco farmers to switch to fruit or vegetable farming by providing free seeds and training.
- **Hatchery Support:** Providing financial aid to traditional egg collectors to maintain their "mud scoop" hatching plots (kua), which are more eco-friendly than industrial hatcheries.

Conslusion:

The Halda does not just flow; it breathes. It is a river that carries the heartbeat of a nation in every drop of its silty water. In one word Halda is irreplaceable.

A Vanishing Underwater Paradise:
Saint Martin's Coral Reef

Introduction

Saint Martin's Island is home to Bangladesh's only coral reef, a fragile underwater world whose rich biodiversity is now facing serious threats.Saint Martin's Island is a small coral island located in the north-eastern Bay of Bengal. It lies about 9 km south of the southern tip of the Teknaf upazila, Cox's Bazar and represents the southernmost point of Bangladesh. A small adjoining island that is separated at high tide, called Chhera Dwip, is about 8 kilometres west of the northwest coast of Myanmar, at the mouth of the Naf River.Around 8000 people live in this island. Coral reefs are very important for marine biodiversity and balance the ecosystem of marine life. Saint Martin's Island is the only coral reef in Bangladesh, making it ecologically unique and highly valuable.Protecting this reef is essential for preserving Bangladesh's marine biodiversity.

Author: Jahanara Zaman Noboni

History

During British occupation, Mr. O.M. Martin, who was the Commissioner of Chittagong Division between 1938-1940 brought this island under settlement record following which the island was named "Saint Martin's Island". Local people call this island "**NARIKEL JINJIRA**" because of abundant coconut production. It is also called "Daruchini Dip" which means "Cinnamon Island". The island itself was formed by the accumulation of coral debris, shells, sand, and

limestone. Today, Saint Martin's Island holds the only coral reef ecosystem in Bangladesh, making its origin and preservation ecologically significant.

Biodiversity

Saint Martin's Island, Bangladesh's only coral-bearing island, boasts a rich, unique, and fragile biodiversity, acting as a crucial habitat for over 1,076 recorded species of flora and fauna. The island's ecosystem, designated as an Ecologically Critical Area (ECA), features vibrant coral reefs, rocky subtidal reefs, seagrass beds, and sandy beaches that support diverse marine life.

Coral Species:

- The southern part of the island contains dense, diverse coral communities. Approximately 66 Scleractinian coral species, of which 19 are fossil corals, 36 are living corals and 11 species of soft corals.

Fish Species:

- The coral reef of St. Martin's Island supports a wide variety of reef-associated fish species. These fishes depend on the reef for food, shelter, and breeding. Approximately 225 species of fish are found- including herbivores, carnivorous and omnivorous fishes. Example: String ray, Dolphin, Shark, Dory fish, sea horse , sail fish , parrot fish, butterfly fish, clown fish, double tooth soldier fish, moon fish, black pomfret, different varieties of damsel.

Other species:

The reef ecosystem is rich in invertebrate diversity.Mollusks such as

snails, star fish, oysters, and clams hidden within coral crevices. They play roles in filtering water and recycling nutrients. Crustaceans like crabs, lobsters, and shrimps inhabit reef gaps and sandy bottoms, contributing to nutrient cycling and serving as prey for larger species. Sea turtles presence indicates the ecological importance of the reef.

The coral reef of St. Martin's Island plays several vital ecological roles. It Supports the marine food chain by providing primary productivity, shelter, and feeding grounds for organisms at different trophic levels.

It acts as a natural habitat, offering breeding, feeding, and nursery areas for countless marine species. The reef helps maintain ecosystem stability by enhancing biodiversity and supporting ecological interactions among species. Additionally, it protects the coastline by reducing wave energy and preventing erosion

Major Threats to Biodiversity of Saint Martin's Coral Reef

Climate Change

- **Sea Surface Temperature Increase & Coral Bleaching:** Around 45% of corals at St. Martin's Island have already been bleached due to temperature stress, and without action the rest could be lost by 2045.
- **Coral Species Loss:** Over the past few decades, the number of coral species recorded around the island has dramatically declined. From 141 species in the 1980s, only about 40–41 species remain.

Human Activities

- **Uncontrolled Tourism:** During peak tourist seasons, about 3,000–8,000 visitors per day travel to the island. This leads to increased waste, sewage, plastic pollution, and physical damage from boats and anchors. Coral & Shell Collection: Direct extraction of coral for souvenirs and construction is a major issue. One study shows that 24% of the island's original coral population has already been removed because of coral collection. Plastic and Waste Pollution: Plastic debris from tourists and local activities is a severe problem.
- **Over fishing:** Unregulated fishing over coral beds disrupts ecological interactions. Fish populations dependent on the reef are reduced because fishermen exploit the area without sustainable controls, weakening the reef's food web. It imbalances the food chain.When too many reef fish are removed, predators and herbivores are affected.

Pollution:

- **Oil Spill & Marine Traffic Waste:** Cruise boats and ferries continuously entering the reef area contribute oil residues and engine pollutants, degrading water quality around the reef.
- **Agricultural Runoff:** Though less studied around St. Martin's Island specifically, agricultural runoff reaching the Bay of Bengal increases nutrient loads in coastal water, encouraging algal blooms that reduce sunlight for corals.

- **Sewage Contamination:** Studies have detected E. coli, total coliform, and fecal coliform bacteria in beach waters; it indicates untreated sewage contamination. This degrades sea water quality and heightens coral stress.

Impacts of These Threats

- **Coral reef degradation:** Continuous exposure to climate change, pollution, and human disturbances leads to the physical breakdown of coral reefs. Healthy corals are replaced by dead or bleached corals, reducing reef structure and resilience.
- **Decline of marine species:** As coral reefs degrade, many marine organisms lose their food sources and habitats. This results in a significant reduction in fish populations, mollusks, crustaceans, and other reef-dependent species.
- **Ecosystem imbalance:** The loss of coral reefs disrupts the marine food chain. When key species decline, predator–prey relationships are disturbed, leading to overgrowth of algae and further damage to the ecosystem.
- **Impact on local fishermen and tourism:** Decreased fish availability negatively affects the livelihoods of local fishermen. At the same time, coral reef degradation reduces the natural beauty of the island, leading to a decline in eco-tourism and economic loss for local communities.

Conservation

1. Government Initiatives

- The government plays a key role in conserving the coral reef of St. Martin's Island. Declaring the area as a Marine Protected Area (MPA) helps restrict harmful human activities and ensures long-term protection of marine biodiversity. Fishing restrictions, including seasonal bans and limitations on destructive fishing methods, help restore fish populations and maintain ecological balance.

Conclusion

The coral reef of St. Martin's Island is a unique and valuable natural asset of Bangladesh that supports rich marine biodiversity and maintains ecological balance. Protecting this reef is crucial for sustaining marine life, coastal protection, and the livelihoods of local communities. However, increasing environmental and human-induced threats make sustainable management essential. Proper conservation policies, responsible tourism, fishing control, and public awareness can help reduce damage to this fragile ecosystem. Conservation of the reef is a shared responsibility of the government, communities, and individuals. Immediate and collective action is necessary to preserve the St. Martin's coral reef for future generations

2. Community Participation

- Active involvement of local communities is essential for effective conservation. Local awareness programs educate residents about the importance of coral reefs and the consequences of environmental damage. Promoting eco-friendly livelihoods, such as sustainable fishing and eco-tourism, reduces pressure on marine resources.

3. Individual Responsibility

- Individuals also have an important role in conservation. Reducing plastic use and ensuring proper waste disposal helps prevent marine pollution. Tourists and locals should avoid collecting corals or shells, as this directly damages the reef ecosystem.

Preserving the Silver Queen:
The Battle for Bangladesh's National Fish

Introduction

Whether in a bustling kitchen in Dhaka or a quiet village along the Meghna River, one scent unites: the rich, mouth-watering aroma of frying hilsha *(Tenualosa ilisha)*. The shimmering fish known locally as Ilish, is more than a meal. It is the crown jewel of the nation's cuisine. While it swims across South Asian waters, its true home is in Chandpur, the epicenter of a nationwide obsession. In Bangladesh, no celebration feels complete without hilsha. From Pohela Boishakh and weddings to religious festivals, gifting or serving a Hilsha is a symbol of honor and affection.

Author: Adiba Jahin

Origins

A fish that defies border

Hilsha leads a fascinating double life. It grows up in the salty ocean but makes a legendary journey upstream into freshwater rivers to lay its eggs. This isn't just a swim, it's a natural miracle timed perfectly with the moon. They travel hundreds of kilometers to specific freshwater spawning grounds in rivers like the Padma, Meghna, and even as far as the Ganges in India. After laying eggs, the exhausted adults return to the sea. The hatchlings, or jatka, then float downstream to grow in the estuarine and marine waters, completing the circle. Most spawning happens during September and October (the months of Ashwin-Kartik), usually under the light of a full moon. A single female can lay hundreds of thousands of eggs. The babies, called Jatka, start their lives in fresh water before heading back to the sea to grow.

The Backbone of the Economy

Hilsha is not just a cultural icon. It is a financial powerhouse. According to the Department of Fisheries (DoF), hilsha production has more than doubled over the last two decades. Today, it contributes around 1% of national GDP and 11% of total fish production. Over half a million fishers depend on it directly, while millions more earn livelihood through associated industries. Its export to Bangladeshi communities abroad brings in hundreds of millions of dollars annually.

The King of Fish on the Plate

Hilsha's legendary status comes from its unmatched flavor. With a fat content ranging between 22-36% its tender flesh is rich and aromatic. The high oil content allows it to be cooked in myriad ways without drying out. From the sublime Shorshe Ilish (in a pungent mustard gravy) and Ilish Paturi (steamed in banana leaf) to smoked (Ilish Bhapa) or simply fried, hilsha adapts to celebrate every spice and technique Bengali cuisine offers.

Nutritional Powerhouse

Hilsha is a nutritional powerhouse rich in essential amino acids, high quality protein, vitamin D, and B12. As a dark-fleshed fish, it contains long-chain omega-3 fatty acids, along with vital minerals such as iodine and selenium which is linked to promote heart health, reduced inflammation, and overall well-being.

Challenges and Conservation

Overfishing, pollution of rivers, and the construction of barriers disrupting migration routes threaten the hilsha population. There are several reasons (biological, industrial, and environmental) behind this:

Siltation:
Hilsa are anadromous (they move from the sea to fresh water to spawn). When rivers become shallow due to silt, the fish cannot navigate upstream, forcing them back into the sea or into smaller, more polluted channels which prevents the migration.

Climate Change & Rainfall:
Hilsa migration is triggered by rainfall and specific water temperatures. Due to the climate change, the recent irregular monsoon patterns and rising sea temperatures have confused migration cycles, leading to a shortage during the peak seasons.

Chemical Pollution:
A recent report highlighted the presence of microplastics, lead, and cadmium in Hilsa which is serious concerns for human health. Industrial effluents from hubs like Narayanganj flow into the Meghna, poisoning the nurseries where Hilsa grow.

Underwater noise pollution:
Hilsha are highly sensitive to noise. The massive increase in large vessel traffic for the Matarbari and Payra power plants creates constant underwater 'noise smog'. Consequently, disorient Hilsha, distract them from their way during migration.

Industrial Impact:
The construction of the Matarbari Ultra Super Critical Coal-Fired Power Project and similar plants (like Payra and Rampal) use massive amounts of river water for cooling and then release hot water back into the ecosystem. Hilsa are extremely sensitive to temperature changes, even a few degrees' difference can kill larvae and eggs. Additionally, dredging for these projects increases water turbidity (cloudiness), which prevents the growth of plankton which is the primary food for Hilsa. Besides that, increased maritime traffic for these power plants brings the risk of oil spills and coal dust discharge. Ship oil creates a surface film that reduces oxygen exchange in the water, while coal dust can settle on the riverbed, destroying the delicate environment where hilsa eggs are meant to hatch.

Use of "Current Net":
The use of the illegal "Current Jal" (monofilament gill nets) remains one of the greatest threats to the species' long-term survival. These nets are made of thin, almost invisible plastic thread. They don't just catch adult Hilsa, they trap Jatka (less than 25cm). By killing the jatka today, they ensure there will be no large, high-value Hilsa to catch next season.

Microplastics:
A very recent and alarming discovery is that most consumers are unaware about the presence of microplastics in Hilsha which enters the Bay of Bengal daily via the Ganges-Meghna system.

Gaps in Government Management: While the Bangladesh government is often praised for its "22-day ban" and "Jatka conservation weeks," several gaps exists:

- **Inadequate Compensation:** The Vulnerable Group Feeding (VGF) program provides rice to fishers during the ban, but it is often insufficient. Many fishers receive only 40kg of rice, which doesn't cover other living expenses (medicine, education, debt), forcing them to fish illegally at night to survive.
- **Focus on Rivers vs. Sea:** Research indicates that while river sanctuaries are monitored, there is a lack of conservation measures in the deep sea, where 60% of Hilsa are now caught due to river siltation.
- **Enforcement Gaps:** "Lower-level" officials often lack the logistics (fast boats, fuel, personnel) to patrol vast estuarine areas effectively, and in some cases, political influence protects large-scale illegal trawlers while small-scale fishers are penalized.

Measures to be taken

Hilsha's immense popularity pushed it to the brink of overfishing. Protecting hilsha now requires more than seasonal bans. It demands smart engineering, human policy, and modern enforcement. The measures that could help to mitigate the burden includes:

Fixing the rivers:
Targeted dredging must keep key migration corridors open, allowing hilsha to move freely from sea to river. Power plants along the coast should be forced to adopt closed-cycle cooling systems to prevent deadly thermal pollution. Ships servicing new ports must strictly control ballast water, oil, and coil dust discharge.

Supporting the fishers:
Rice handouts alone cannot sustain fishing communities. Compensation must combine food with cash support, allowing families to cover medicine, education, and debt during fishing bans.

Enforcing law by using technology: Manual patrols are no match for vast rivers and seas. Smart sensors, vessel tracking systems, and satellite surveillance can identify illegal fishing in real time and ensuring bans effectively.

Handling the invisible threats:
Noise from heavy shipping disrupts hilsha migration and must be regulated through designated silent zones. At the same time, stricter controls on plastic waste and industrial pollution are necessary to protect spawning grounds and human health.

Conclusion

The Hilsha from Chandpur is more than a culinary delight; it is a story of nature's wonder, a pillar of the economy, and a living cultural artifact. It embodies the rhythm of Bangladesh's rivers and the spirit of its people.

Drone Pollination:
A Technological Response to Bee Decline

Introduction

One of the most crucial processes in ecology that underlies global food systems is pollination. This is a routine operation by the natural pollinators who usually serve flowering plants by transporting pollen to different flowers. This seems to be the easiest form of biological interaction, which is the foundation of the productivity of a significant proportion of agricultural products and natural ecosystems.

However, in the past few decades, the population of pollinating insects (bees in particular) has been significantly decreasing seen on the world. Excessive pesticides, destruction of habitats, monoculture farming, new pathogens, and global warming have all led to the current ecological crisis that has never been experienced before. The Food and Agriculture Organisation (FAO) estimates that approximately three-quarters of major food crops globally depend, in part, on animal pollination, where the population reduction of pollinators amounts to a direct threat to food security, biodiversity, and rural livelihood.

To ensure that in this new challenge, scientists and engineers have begun to look at technological interventions as a potential supplemental pollination equipment, including robotics and micro-drones. Drone pollination is not designed to substitute nature but is to supplement the agricultural system, where the services on quality and reliability of natural pollination services are not satisfactory. The very thing that was considered to be science fiction is being experimented with in the research labs and experimental farms all over the world.

Author: Roksana Alal Maria

How Drone Pollination Works

Drones pollination systems typically use small and lightweight unmanned aerial vehicles (UAVs), which possess cameras, sensors, artificial intelligence algorithms and pollen-transfer systems. These drones are programmed to find the flowers using computer vision and image recognition, navigate the fields using the GPS and the autonomous flight control and to release the pollen with a high percentage of precision.

The most notable discovery was in Japan, where researchers at the National Institute of Advanced Industrial Science and Technology (AIST) developed a drone, which was covered with artificial hair by use of ionic gel. This gel allows the pollen grains to be electrostatically weighted to the surface of the drone, similar to the way in which the pollen is weighted to the bees. The deposit of pollen is transferred when the drone fly land gently on the flower, and the reproductive organs of the plant are not destroyed.

Meanwhile, in other nations such as the Netherlands and the United States, the research organizations and technology start-ups are developing swarm-based drone systems. Those systems also need artificial intelligence to coordinate a number of drones, so that drones are able to effectively cover large areas of agricultural land with minimal overlap and energy consumption. High-value crops like almonds, strawberries, tomatoes and apples, as well as greenhouse farming, are particularly good when such methods are employed.

Although drone pollination remains at the stage of high experimentation, the initial results prove that it is capable of enhancing the efficiency of pollination significantly in the controlled setting, especially in conditions where the number of natural pollinators is small.

Why This Innovation Matters

Drone pollination is not done to replace the bees but rather to introduce a backup technological system to stressed ecosystems. The current urbanisation, changes in climatic conditions, and excessive farming practices that disrupt the natural habitats are causing farmers to be unsure of their crop productions that are fruitful when they are pollinated.

In other places, pilot projects are also experimenting with hybrid systems whereby drones will not replace natural pollinators, e.g. Canada and Japan. These models seek to strike a compromise between the protection of the ecology and the yield of agriculture, particularly in regions where the number of pollinators might vary during the season or can collapse at any given time.

The drone pollination is a more substantial shift towards precision agriculture in its sustainability aspect, where a particular technological intervention of a product reduces waste of resources and saves productivity. Conducted reasonably, the drone-assisted pollination could help to stabilise food production without enhancing environmental degradation.

Challenges and Ethical Considerations

Nevertheless, drone pollination encounters a number of challenges, even though it is an effective method. Cost is one of the significant obstacles, with the state-of-the-art drones, sensors, and artificial intelligence being costly to produce, run, and maintain. This brings about accessibility issues, especially to the smallholder farmers in the developing nations. Another important matter is energy efficiency. Massive use of drones would mean that there has to be a battery charge or change, which would pose sustainability and carbon footprint concerns. Additionally, drone systems require the services of qualified staff and advanced infrastructure due to their technical nature of operation and maintenance. Special attention should also be paid to ecological and ethical issues. Other researchers warn that

overutilization of technological replacements may lead to the loss of motivation towards conserving and recovering the natural populations of pollinators. Long-term sustainability, they propose, should focus on restoring ecosystems in addition to technological innovation, instead of letting machines entirely overtake the natural operations.

However, lots of professionals consider drone pollination to be the emergency reserve- the alternative solution that may preserve food resources of the world in times of ecological pressure instead of replacing natural pollinators on a long-term basis.

Looking Toward the Future

A concept of flying robots pollinating crops can seem an unprecedented concept, though the history of agriculture is filled with a number of groundbreaking technologies, among which drip irrigation, satellite imaging, and precision fertilization used to be considered unrealistic. Such innovations were not new, but rather necessitated.

Another such silent revolution can be drone pollination. Its success in the future will be determined by responsible integration, interdisciplinary research, supportive policies, and the ongoing efforts to preserve the natural pollinators. This is not meant to substitute the lost but to create a holistic balance between technology and the sustainability of the environment.

In the end, drone pollination has been an excellent lesson, which is that technology can help keep the fields blooming, one flower after another as long as it is carefully designed and ethically utilised.

Conservation

The degradation of natural pollinators has posed a dire necessity of new technologies to ensure the sustenance of agricultural output. Drone pollination is a potentially beneficial additional method which can help partially feed crops, especially where natural pollination is low. Although it will not be able to substitute biological pollinators, conscientious adoption of drone technology, as well as conservation, can be used to reinforce food security and agricultural resiliency. Finally, technological innovation and environmental safety will be crucial to sustainable agriculture in the future.

Hand Pollination Vs Drone Pollination in Ulsan, South Korea.

The Guardian of the Green Shield:

How Nomita Mondol is Reforesting the Sundarbans

Introduction

A Battlefield of Mud and Tides

The Sundarbans—the world's largest mangrove forest—is currently a climate battlefield. On one side, the rising fury of the Bay of Bengal threatens to submerge this UNESCO World Heritage site; on the other, the thinning green walls of the forest struggle to stand.

Amidst this crisis, a new kind of warrior has emerged. Nomita Mondol, a woman from the mud-slicked riverbanks of Dacope, is not fighting with weapons, but with seeds. She is the living proof that while nature can be destroyed by human hands, it can also be reborn through them. Each seed Nomita plants is an act of defiance against despair. Where cyclones have torn open the earth and saline tides have poisoned the soil, she kneels and plants possibility. In a region where

Author: Mymonah Hossain Dolan

often measured in days, her work thinks in decades. These fragile saplings—brushed by wind, tested by salt—will one day rise as living barricades, softening storm surges, sheltering wildlife, and restoring the delicate balance between land and sea.

Nomita's quiet revolution reminds us that climate resilience is not only forged in conference halls or policy papers, but in the calloused hands of those who refuse to abandon their home. In the Sundarbans, hope does not roar; it takes root.

The Sundarbans

A Fragile Giant

Spanning approximately 10,000 square kilometers (with 60% in Bangladesh), the Sundarbans is a complex labyrinth of tidal waterways and mudflats. It is the only thing standing between the raw power of cyclones and millions of coastal lives.

- **The Area:** In Bangladesh, the forest covers over 436,000 hectares.
- **The Importance:** It is a "Bio-Shield" that reduces the energy of storm surges by up to 60%, yet this shield is retreating at an alarming rate.

The Hero: Nomita Mondol

Nomita lives in Paschim Dhangmari village, where the river is the only boundary between her home and the tigers' territory. For years, she was part of the cycle of destruction—not by choice, but by survival. Like most villagers, she used to

scavenge the forest floor for mangrove seeds, only to burn them in her stove as cooking fuel.

"I didn't know I was burning our only protection" Nomita reflects.

Everything changed in 2020. With the support of BEDS (Bangladesh Environment and Development Society), Nomita realized that those seeds weren't just fuel; they were the forest's children. She transformed from a scavenger into a steward, establishing a locally-led nursery on her own land. Despite the "societal taboos" of women working in the mud, Nomita's determination never wavered

Threads of the Sundarbans

A Region Under Siege

The forest is being strangled by two distinct threats:

1. Natural Disasters (The Environmental Toll)

- **Rising Tides:** Sea levels in the Sundarbans are rising at nearly 3 cm per year, almost twice the global average, steadily swallowing islands and shrinking human settlements. Entire villages have already vanished beneath the Bay of Bengal.
- **The Salt Poison:** Soil salinity has increased up to 15 times in some regions, poisoning freshwater sources, destroying crops, and killing the iconic Sundari trees — the very species that gave the forest its name. Once-fertile land is now cracked, barren, and unproductive.
- **Cyclone Impact:** Super-cyclones like Sidr (2007) and Amphan (2020) caused billions of dollars in damage and irreversibly altered forest structure. In 2024, Cyclone Remal exposed once again how fragile embankments become when mangrove buffers are weakened or removed.
- Erosion & Land Loss: Accelerated riverbank erosion is reshaping the delta, breaking natural sediment cycles and washing away mangrove roots before they can stabilize.
- Biodiversity Stress: Increasing temperature, salinity, and habitat loss are pushing wildlife — such as the Bengal tiger, spotted deer, and river dolphins — toward ecological collapse.

2. Man-Made Disasters (The Human Toll)

- **Seed Scavenging:** For generations, families have collected floating mangrove seeds for fuel, unknowingly cutting off the forest's most basic method of regeneration and turning survival practices into long-term ecological harm.
- **Over-Exploitation:** Illegal logging, fuelwood collection, and unregulated resource extraction have thinned protective green belts, leaving coastal communities exposed to storm surges and tidal waves

- **Shrimp Farming Expansion:** Commercial shrimp aquaculture has replaced vast stretches of mangroves, increasing salinity intrusion and permanently degrading soil quality, making natural forest recovery nearly impossible.
- **Weak Governance & Enforcement:** Limited monitoring, corruption, and lack of community-based forest management allow illegal activities to continue unchecked.
- **Human Displacement:** As livelihoods collapse, climate refugees are forced to migrate, increasing urban poverty and breaking cultural ties that once bound people to forest stewardship.
- **Loss of Traditional Knowledge:** With each displaced generation, centuries-old ecological wisdom about living sustainably with mangroves fades away.

Leading the Green Rebellion

Nomita did not just plant a few trees; she built an economy around conservation.

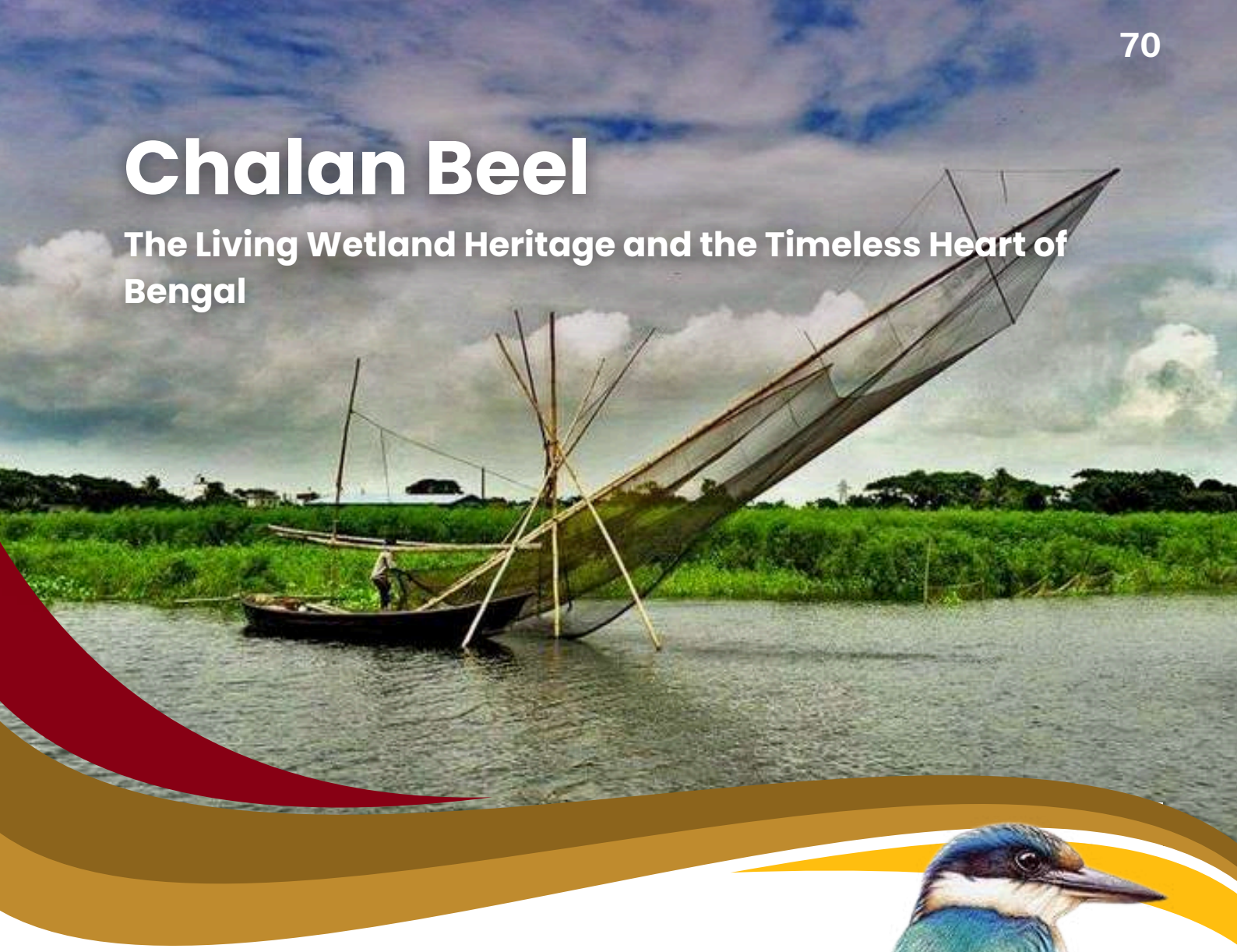
- **Economic Empowerment:** In 2021, her nursery group earned 200,000 BDT. Nomita alone brought home 60,000 BDT—a life-changing sum. By 2023, she scaled her success, selling saplings worth 4 lakh BDT ($3,400) to the Forest Department and NGOs like BRAC.
- **Resilience:** When Cyclone Sitrang destroyed 15,000 of her saplings, she didn't quit. She rebuilt with new shading and watering techniques to ensure her "babies" survived the next dry season.

The Numbers of Hope: Her Global Goal

- **Individual Impact:** Nomita produces over 30,000 mangrove saplings annually.
- **The Million-Seed Vision:** As the president of a local nursery association, she is now part of a movement that has successfully planted 1,000,000 (one million) mangrove trees across the riverbanks of Dacope and Shyamnagar.

Chalan Beel

The Living Wetland Heritage and the Timeless Heart of Bengal



Introduction

Chalan Beel, often regarded as the largest beel (wetland) in Asia, stands as one of Bangladesh's most ecologically rich and culturally profound landscapes. Spreading across Natore, Pabna, Sirajganj, and parts of Rajshahi, this vast wetland stretches nearly 70 kilometers in length and expands dramatically during the monsoon, covering close to 375 square kilometers at its peak. Yet Chalan Beel is far more than a geographical expanse—it is a living cultural landscape where water, people, memory, and history flow together like its countless canals.

Author: Dipto Paul

A Name Born from Movement

The name Chalan Beel is believed to derive from the word "Challan," meaning movement or flow. In earlier centuries, rivers such as the Baral, Gumani, and Atrai crisscrossed the region, creating a constantly shifting hydrological system. This continuous circulation of water shaped both the land and its people. Historically, Chalan Beel functioned as a natural reservoir, an inland trade route, and a floodplain that sustained settlements and civilizations long before modern infrastructure emerged.

Lives Shaped by Water

The people of Chalan Beel live in intimate harmony with nature. Their daily lives shift with the seasons, adapting fluidly to changing water levels and agricultural cycles. Fishing, boat-making, farming, honey collection, and jaggery production are deeply woven into everyday existence. Life here is defined by simplicity, resilience, and community—where survival depends not on conquering nature, but on understanding it.

Waters Rich with Indigenous Life

Culturally and nutritionally, Chalan Beel has always been inseparable from fish. During the monsoon, when the beel swells into a vast inland sea, it becomes a natural breeding ground for countless indigenous (deshi) fish species. Bayem, Veda, Kayikla, Chapila, Shol, Gojar, Baila (bele fish), Gochi, along with mrigel, shing, magur, koi, pabda, tengra, mola, punti, and chital thrive in these waters. Fishing here is not merely an occupation—it is an inherited way of life that shapes food culture, rituals, and seasonal rhythms.


Kayikla Fish


Gochi Fish


Veda Fish


Byem Fish


Bele Fish


Shol Fish


Gojar Fish


Koi Fish


Chapila Fish


Mola Fish

The Seasons of the Beel

In summer, Chalan Beel reveals a quieter, introspective face. As water recedes, fertile land emerges. Cracked soil and open horizons speak of endurance, while farmers prepare fields for cultivation. The monsoon transforms everything. Villages

appear to float, roads vanish, and boats replace pathways. Wooden boats carry people, fish, produce, and stories from one place to another. During this season, the beel feels alive—breathing, moving, expanding—its waters defining the pulse of life.

Winter Gold:

Mustard, Honey, and the Landscape of Yellow

Winter brings one of Chalan Beel's most iconic cultural landscapes. Vast fields of mustard flowers bloom in radiant yellow, covering thousands of hectares and producing an estimated 8,000–10,000 metric tons of mustard annually. These fields support thriving beekeeping practices, yielding approximately 250–300 metric tons of natural honey each season. The sight of bees hovering over endless mustard fields creates both economic security and visual poetry.

Garlic from the Flooded Earth

Another remarkable practice rooted in Chalan Beel's culture is zero-tillage garlic cultivation. After floodwaters recede, farmers plant garlic cloves directly into moist soil without ploughing. This climate-adaptive method conserves moisture, reduces cost, and maximizes efficiency. Garlic yields in the region average 8–10 metric tons per hectare, making Chalan Beel one of Bangladesh's most productive garlic-growing zones. It is a quiet example of indigenous innovation born from centuries of living with water. Bangladesh's most productive garlic-growing zones. It is a quiet example of indigenous innovation born from centuries of living with water.

Boats: More Than Transport

In Chalan Beel, boats are not merely vehicles—they are lifelines. Fishermen, traders, farmers, and children depend on them daily. As locals say,"The boat is our road, our home, and our livelihood."From carrying fish to ferrying

schoolchildren during floods, boats symbolize adaptation, continuity, and survival.

Threats to Chalan Beel

Threats to Chalan Beel Chalan Beel is increasingly under threat due to unplanned development and human neglect. Roads, embankments, land encroachment, and uncontrolled pond excavation have disrupted its natural water flow, while pollution and excessive use of agrochemicals continue to degrade water quality. The absence of fish sanctuaries has led to unregulated fishing, causing a rapid decline and local extinction of indigenous fish species; however, through artificial breeding of nearly extinct native fish, these species can be gradually reintroduced into the beel. As the beel shrinks, its biodiversity, local culture, traditions, and wetland-based livelihoods are gradually disappearing. To address these challenges, strict regulation of pond excavation and land use is essential, along with restoring natural water connectivity and controlling pollution. Establishing fish sanctuaries, enforcing sustainable fishing practices, promoting artificial breeding programs, and encouraging community participation are crucial to conserving Chalan Beel as both a natural and cultural heritage.

Conclution

Historically, Chalan Beel served as a vital inland waterway connecting northern Bengal, enabling trade, cultural exchange, and settlement. Today, folk traditions, seasonal practices, and everyday rituals continue to preserve this layered history shaped by water and land.

Chalan Beel is not just a wetland—it is a feeling. It is the smell of wet soil after rain, the steady rhythm of oars cutting through water, the glow of mustard fields under winter sun, and the quiet dignity of people who live with nature rather than against it. In an age of rapid urbanization, Chalan Beel reminds us that true beauty lies in balance, patience, and coexistence. It remains a living poem—written not in words, but in water, land, and human lives.

Cosmos: A Universe in a Petal

Introduction

Flowers perhaps the most inexpensive way to affect your subconscious mind, boost your mood, and enhance happiness in your life. "Cosmos" an amazing flower whose literal meaning is “universe”. The prime highlight of this flower is that it has a symmetrical petal arrangement. This vibrant and playful flower is a treat to the eyes and soul. Cosmos is a genus, with the same common name of cosmos, consisting of flowering plants in the daisy family.

Authors: Mashruba Proma & Rifatul Islam Kanon

History & Origin

According to Plants of the World Online this plant is native to Mexico. However, other sources list it as native to the United States and Canada. The cosmos' spiritual meaning is deeply connected to alignment and mindfulness.

The generic name Cosmos derives either from the Greek κόσμος (cosmos) '(ordered) world' -in reference to the neat, orderly arrangement of the floral structures - or the Greek κόσμημα (kósmima) 'jewel' - in reference to the jewel-like colors of the capitula (composite flowers). This is a direct derivative of the Greek word "kosmos," which means world order.

The word "cosmos" is a name given to the flower by Spanish priests who originally grew the flowers during their missions abroad. They were blown away by the flower's petals, which are quite stately and evenly placed. As a result, they gave the flower the name "cosmos" to symbolize its order and harmony with the rest of the universe.

Botany

Cosmos is an annual ornamental flowering plant belonging to the family Asteraceae. The plant is upright, bushy, and fast-growing, usually reaching 60–150 cm in height. Leaves are opposite, finely divided, feathery and light green, giving the plant a soft, airy appearance. The flower is a capitulum (head) typical of the Asteraceae family, with ray florets on the outer edge and disc florets in the center. Flowers are single or semi-double, borne on long slender stalks. Cosmos flowers are available in white, pink, red, magenta, purple, yellow, orange, and bi-coloured forms. Seeds are usually sown in early spring (February–March) in warm climates. Flowering starts 45–60 days after sowing and continues from late spring to autumn.

Ray florets surrounding central disc florets. Petals are broad, flat, and spoon-shaped to oval. Arranged in a single circular whorl around the center disc. Petal tips are usually rounded or slightly notched.

Scientific Classification

Kingdom	Plantae
Order	Asterales
Family	Asteraceae
Class	Magnoliopsida
Genus	*Cosmos*
Species	***Cosmos bipinnatus***

Global-scale industrial use

Cosmos flowers (Cosmos bipinnatus and Cosmos sulphureus) have several industrial, agricultural, and commercial applications, largely driven by their high pigment content, medicinal properties, and role as ecological enhancers.

Key Industrial and Commercial Uses:

1. Natural Dye Industry:
Cosmos sulphureus (Yellow Cosmos) is a valuable natural source of orange-yellow dyes. It is used mainly in Japan, with additional applications in China, Mexico, Thailand, and India, particularly in traditional dyeing, food coloring, and natural pigment production industries.

2. Pharmaceutical and Nutraceutical (Medicinal) Uses:
Cosmos species contain bioactive compounds such as butein and quercetin that provide strong antioxidant protection against oxidative stress. Extracts from *Cosmos caudatus* and *C. sulphureus* have shown promising therapeutic potential, including anti-diabetic, anti-hypertensive, anti-inflammatory, and anti-microbial activities. Research also suggests bone-protective effects that may help in osteoporosis management, while their anti-inflammatory properties make them useful in skin care, particularly for conditions like eczema.

3. Agricultural and Horticultural Industry:
Cosmos plants play an important role in sustainable agriculture by acting as refuge plants that attract beneficial insects such as lacewings, syrphid flies, and parasitic wasps, which naturally control crop pests. Cosmos sulphureus also shows potential as a bioherbicide for managing weeds like purple nutsedge. In addition, Cosmos species are widely cultivated to support pollinators, helping sustain bee and butterfly populations.

4. Food and Culinary Industry:
Cosmos flowers are valued in the food industry as edible flowers, commonly used as garnishes in salads and for decorating cakes and desserts. *Cosmos caudatus* (Ulam Raja) leaves are traditionally consumed in Thailand as salads and herbal teas, while their extracts help inhibit lipid oxidation, improving **food**

BD Opportunity

In Bangladesh, Cosmos bipinnatus and Cosmos sulphureus are increasingly popular in commercial floriculture because of their fast growth, climate adaptability, and strong demand in floral arrangements. Beyond ornamental value, C. bipinnatus is being studied as a source of essential oils with antimicrobial properties, offering potential for pharmaceutical and natural preservative use. C. sulphureus is also utilized as a natural source of orange-yellow dyes for textile applications. Additionally, Cosmos plants are widely used in landscaping, urban gardening, and public spaces due to their hardiness, while in agriculture they serve as companion plants that attract pollinators and beneficial insects, supporting eco-friendly pest management.

Conclusion

The cosmos flower is far more than a garden ornamental. From its symbolic roots in ancient Greece to its growing role in modern agriculture and medicine, it truly lives up to its name. Ecologically, it supports pollinators and strengthens sustainable farming systems; medicinally, it bridges traditional knowledge with modern scientific research. Economically—particularly in Bangladesh—cosmos is steadily transforming from a simple roadside flower into a promising commercial crop with potential in floriculture, natural dyes, and bio-based industries.

Cosmos bipinnatus

Cosmos sulphureus

C. atrosanguineus

C. caudatus

C. radiance

Quantum Computing:
Revolutionizing the Future of Agriculture

Agriculture, the linchpin of global food security, is in the throes of a silent revolution. Though traditional agriculture has fed humanity for millennia, it is no match for the combined effect of a rapidly growing global population and warming climate. Along came Quantum Computing a concept that has potential to change the way we grow food; manage and sustain our crops.

What is Quantum Computing?

Unlike binary system based classical Computers, Quantum Computers are built using qubits, which can process several states simultaneously. That property, known as superposition when combined with entanglement, allows quantum computers to solve vastly more complex problems than classical ones in centuries of processing time.

Nowhere is this capability more transformative than in agriculture. The behavior of crops, pests, soil nutrients, weather patterns and irrigation needs is a dynamic problem involving millions of interdependent variables. Quantum computers can chew through all of those factors and look at them simultaneously, offering insights that were once beyond the pale.

Author: Md. Nahid Mahmud

Practical Applications in Agriculture

Optimized Crop Rotation Planning

- Good crop rotation is important for soil fertility, pest control and long-term yield. Quantum algorithms could crunch years of historical data about crops, soil content, weather patterns and disease history to design the most optimal rotation schedules. This is not just environmentally friendly but also leads to a higher yield per hectare. For example, a wheat-rice-vegetable rotation could be engineered for both nutrient balance and pest resistance so that the need for chemical fertilizers and pesticides can be minimized.

Precision Irrigation Management

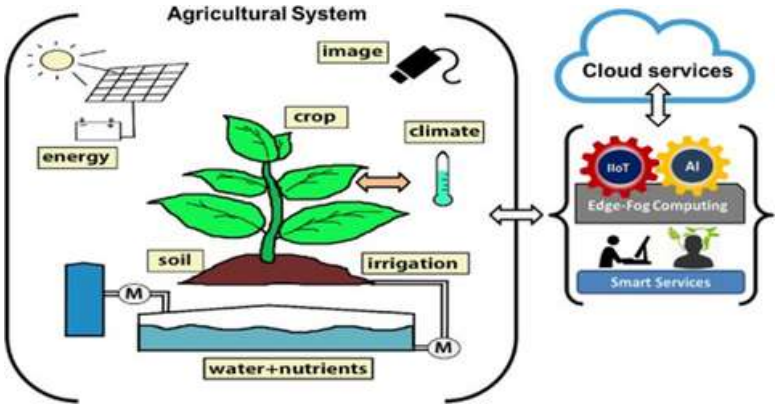
- Lack of social awareness of water scarcity is one of the big issues in agriculture. Quantum computing helps to combine real-time weather data, soil moisture sensors and crop water needs into precise irrigation prescriptions. Farmers can deliver exactly as much water as they need in the location where crop roots are developing, with no waste and minimal drought stress.

Predictive Pest and Disease Control

- Pest management historically has been reactive. These same quantum algorithms are applied to these patterns in environmental conditions, crop growth rates, and pest migration, such that outbreaks of disease or infestation by pests weeks ahead of time can be predicted. This predictive capability allows early action, which lowers crop losses and reduces pesticide application.

Resource Optimization

- By considering several factors together, Quantum Computing assists in the efficient distribution of fertilizers, pesticides as well as labour among other things. Farmers can save resources, cut their costs of production and protect the environment.



Practical Applications in Agriculture

Quantum computing offers transformative advantages for agriculture by dramatically reducing computation time, completing complex analyses in minutes

rather than days or months. Its machine-controlled precision supports environmentally friendly practices by minimizing chemical residues, water use, and energy consumption. Improved data-driven decisions enhance productivity, leading to higher yields and better crop quality, while quantum-informed insights also enable policymakers to make more effective national and regional agricultural planning decisions.

Potential Impact in Bangladesh

Bangladesh has unique agricultural challenges the vagaries of monsoon, floods, salinity, droughts and unforgivingly shrinking arable land. Quantum computing could transform farming here in several ways:

Flood and Drought Management: Quantum-assisted predicting modeling could enable farmers to plant the right crops in areas which are least likely to flood or be water stressed.

Urban and Vertical Farming: In land-scarce cities like Dhaka or Chittagong, quantum algorithms can help maximize efficiency of crop placement, growth cycles and resource allocation in vertical farming.

Small farmers: Farmers with little resources can indirectly benefit if regional agricultural policies are driven by quantum-based insights, bringing better pricing, supply chain planning and risk management.

Future Possibilities

The convergence of Quantum Computing, Artificial Intelligence (Machine Learning), and the Internet of Things (IoT) is set to redefine the next generation of smart agriculture, moving the sector from intuition-based practices to hyper-precise, predictive systems. Autonomous farms could emerge where AI-driven robots and drones act on quantum-accelerated forecasts to optimize pest control, irrigation timing, nutrient delivery, and harvesting with minimal human intervention. In climate-smart farming, quantum-enhanced simulations can model rare and extreme weather events—such as compound drought–flood cycles—helping identify climate-resilient crop varieties and adaptive cropping calendars far earlier than classical models allow.

At a global scale, Food-Energy-Fertilizer (FEF) optimization could be

evolutionized by quantum-powered systems capable of simultaneously modeling supply chains, soil fertility, water availability, energy inputs, and market dynamics. This would enable early detection of food shortages, stabilization of volatile markets, reduction of post-harvest losses, and smarter allocation of resources across regions. Quantum-enhanced genomics and breeding research may also accelerate the discovery of traits linked to yield stability, pest resistance, and nutrient efficiency, significantly shortening breeding cycles.

As the technology matures, quantum-enabled cloud platforms and decision-support applications could become accessible to individual farmers, even in developing countries. These tools would integrate real-time IoT sensor data with AI and quantum predictions to recommend crop selection, planting schedules, irrigation plans, and risk mitigation strategies. Such democratization of advanced computation would shift agriculture from reactive crisis management to proactive, anticipatory decision-making, strengthening food security, environmental sustainability, and economic resilience worldwide.

Challenges Ahead

The promise is vast, but Quantum Computing into Agriculture remains elusive. The price is high, availability limited and there's a lack of know-how. What's more, AI interfaces that successfully translate quantum outputs into meaningful tasks for farmers already exist on the market and work in-field. However, there are some cracks developing in this barrier as research, pilot projects and private-public partnerships close these gaps.

Conclusion

Quantum computing changes the way our agricultural future looks. And it could even transform farming into a precision industry, driven by data and equally environmentally friendly. It raises many more opportunities, from optimizing crop rotation through predicting pest outbreaks and maximizing yields. For nations like Bangladesh, adopting this technology of the future could secure food, improve farmers' lives and make them climate-resilient. The age of quantum agriculture is not just a fanciful dream it's an almost-here reality, waiting in the wings to revolutionize how we feed the world.

The Interconnected Pillars:
Building a Resilient Agricultural Ecosystem in Bangladesh

Introduction

A Battlefield of Mud and Tides

In a rapidly changing world, it has become increasingly clear that isolated solutions are insufficient to address complex societal issues. A comprehensive approach that integrates various sectors and perspectives is essential for creating sustainable and effective change. The agricultural sector forms the backbone of the economy and food security in Bangladesh. But this sector has several structural problems, such as land tenures that are broken up, subsidies that don't work, climate shocks that are getting worse, and markets that are difficult to access to. We cannot simply have piecemeal solutions to these problems. We require a policy framework where we have reforms that have a continuation effect in bringing about real change.

Author: Shahriar Mannan Imon Talukder

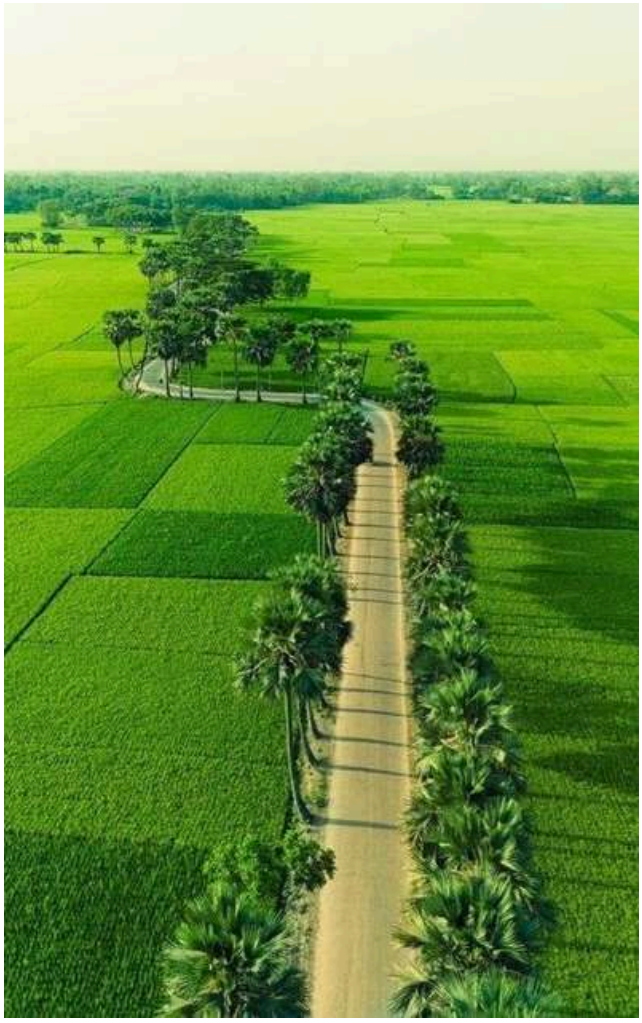
Pillar 1: Securing Land Tenure

The most significant thing is secure land tenure. Bangladesh has a lot of highly fragmented landholdings and poorly defined property rights, especially for women and tenants. Such an environment makes it less likely that people will invest and that things will not get done well. A farm run by the owner is always more productive and profitable compared to the tenant system. The data suggests that the limited application of modern technologies stems from tenure insecurity.

A solution would be to make a fully functional digital land titling system based on successful examples from Rwanda and India. Such an arrangement would make rights official, cut down on disputes, make it easier to use land as collateral for a loan, and make it easier to combine property. This solid foundation of security is still lacking, and future investments in productivity and resilience remain at stake.

Pillar 2: Strategic Repurposing of Subsidies

This foundation of tenure security enables the strategic repurposing of input subsidies and the use of input subsidies strategically. The existing blanket subsidies of seeds and fertilizers in Bangladesh harm the population that is most in need and promote environmentally harmful practices. By changing how vouchers are sent out with the help of digital tools, it will be possible to not only focus the support on households led by women, young people, and areas that are vulnerable to climate change, but also to add important conditions. Subsidies can be changed to help farmers confront climate change by turning general subsidies into things like resilient varieties with vouchers that can be used to buy certified climate-smart inputs, like Swarna-Sub1 rice that can withstand floods or BRRI dhan66 varieties that can withstand drought. This approach, coupled with extension services, ensures that the farmers receive not only low-cost inputs but also the expertise in their proper application.



Pillar 3: Integrating Climate Resilience

We have to discover ways of introducing climate resilience into the production system itself. Bangladesh cannot sit back and wait to see what is to come since the

the sea levels are rising and the climate is becoming increasingly severe. The proven technologies are already in place. They include flood-tolerant varieties deployed across 2.5 million hectares of flood-prone land, with approximately 1 million hectares highly susceptible to regular flooding. These technologies include alternate wetting and drying irrigation, which conserves water, and early-maturing cultivars that can evade adverse weather windows. To speed up its adoption, we need to make innovation less risky by using weather index-based insurance and improving localized climate advisory services that can be accessed through mobile networks and trusted extension agents.

Pillar 4: Market Access and Financial Inclusion

Ultimately, higher productivity should lead to better lives by giving farmers better access to markets. Even when there are excellent harvests, farmers remain in circles of defeat due to poor infrastructure, post-harvest losses, and the exploitation of them by middlemen. The establishment of Farmer Producer Organizations can help the small farmers to pool their crops, obtain better deals, and save money. We can introduce warehouse receipt financing, which lets farmers use stored grain as collateral for a loan. This way, they can sell the grain when prices are high instead of right after harvesting.

Conclusion

A Battlefield of Mud and Tides

The interconnected nature of these pillars is essential. For example, farmers can invest in climate-smart inputs when they have secure tenure. Stable practices ensure that the yields stay the same, and stable yields can help the business stay in the market. Higher incomes can help farmers make future investments. Bangladesh finds itself at a pivotal juncture. The country can turn its agricultural sector into a strong, productive engine of inclusive prosperity that can feed its people through the changing climate by bringing these parts together into one ecosystem based on digital infrastructure and gender-sensitive design.

Mixed Pigeon Rearing System:
A Profitable Agribusiness Opportunity in Bangladesh

Introduction

Pigeon rearing has recently emerged as a promising agribusiness in Bangladesh due to its low initial investment, short generation interval, high reproductive efficiency, and adaptability to diverse agro-ecological conditions. The increasing market demand for squabs and fancy pigeons of different colors has further enhanced the economic importance of this sector. Commonly reared pigeon breeds exhibit a wide range of plumage colors, including white, black, brown, ash, red, and mixed patterns, which significantly influence farmer preference and market value, particularly for ornamental and fancy pigeons. Generally, pigeons attain sexual maturity at 4–6 months of age, enabling early breeding and continuous production under a mixed pigeon rearing system. The present study was undertaken to characterize the phenotypic traits and body biometry of different pigeon breeds available in northern Bangladesh and to assess their suitability under a mixed pigeon rearing system. For this purpose, 30 pigeon farms having more than 20 breeding pairs were selected from Rajshahi, Natore, and Pabna districts. Fifteen pigeon breeds were evaluated for phenotypic characteristics such as coloration of bill, eye, skin, shank, and feathers, along with the shapes of bill, body, and egg. In addition, key biometric parameters including bill length, head length, body length, wingspan, shank length, middle toe length, and mature body weight were recorded. The findings of this study are expected to provide valuable information on breed diversity and performance, which can support breed improvement, conservation strategies, and the sustainable development of

Author: Md. Golam Hossain Ove

mixed pigeon rearing as a profitable agribusiness in Bangladesh.

Significance of Pigeon Rearing in Bangladesh

Pigeon rearing holds significant importance in Bangladesh as a low-cost and sustainable livestock enterprise that supports income generation, employment, and nutritional security. Due to minimal space and housing requirements, pigeon farming is suitable for both rural households and urban settings. Pigeons have a short generation interval and high reproductive capacity, enabling farmers to obtain quick returns with relatively low investment. The growing market demand for pigeon meat and fancy pigeons further enhances its economic value. In addition, pigeon manure serves as a valuable organic fertilizer, contributing to environmentally friendly agricultural practices. Moreover, pigeon rearing provides psychological and social benefits, as farmers often do not feel alone and can spend quality and enjoyable time while caring for pigeons, which enhances mental well-being and satisfaction. Overall, pigeon rearing plays an important role in improving livelihoods and promoting small-scale agribusiness development in Bangladesh.

Pigeon Breeds & Housing Management

Selecting suitable breeds and providing proper housing are essential for successful pigeon farming. Commonly reared breeds in Bangladesh include Strasser, Giribug, King, Gola, Indian Fantail, Lahore, and Racing Homer, each valued for meat, breeding, or fancy purposes. Pigeons exhibit a variety of colors such as white, black, brown, ash, red, and mixed patterns, which influence market preference. Proper housing ensures health, productivity, and protection from predators and extreme weather. A well-ventilated loft or shed with nesting boxes, perches, and clean floors is recommended. Housing should allow separation of breeding pairs, growing squabs, and adult pigeons to improve management efficiency. Adequate space, cleanliness, and shelter are key factors that directly affect growth, reproduction, and overall profitability in a mixed pigeon rearing system.

In addition, breeds like Damascene and Modena are preferred for ornamental purposes due to their attractive feather patterns, while Strasser and Giribug are mostly used for meat production. Properly managed housing reduces stress and improves the survival rate of squabs. Farmers can also provide perches at different heights to mimic natural roosting behavior, enhancing bird comfort. Overall, selecting the right breeds and maintaining suitable housing is critical for maximizing productivity, profitability, and sustainability in pigeon farming.

Types of breeding

In cross breeding when there is no relationship in previous five generations within the pigeons and such type of breeding in very common in Bangladesh. Line breeding defines the crosses between grandfather to granddaughter, grandmother to grandson and cousin to cousin. In-breeding defines mating between father to daughter, mother to son and brother to sister. In-breeding system is good for storage the purity of the breeds.

Table 1: Cross breeding among fancy pigeons in Bangladesh

Male × Female	**Squab characteristics**	**Rearers' comments**	**Location**
Homer × Tumbler	Mixed type	Good foster	Saidpur
Capuchine × Tumbler	Mixed type	Bad foster	Saidpur
Homer × Pouter	Homer type	Bad foster	Dhaka
Homer × *C. l. domestica*	Large sized	Bad foster	Dhaka
Satinette × Owl	Mixed type	Bad foster	Dhaka
Lahore × *C. l. domestica*	Large-sized *C. l. domestica*	Good foster	Kushtia
Lotan (shaking tumbler) × Tumbler	50% resemblance to both parents	Bad foster	Kumarkhali
Short-faced tumbler × Tumbler	Mixed type	Bad foster	Saidpur
Indian Fantail × Tumbler	Slightly expanded tail	Bad foster	Kushtia
Lahore × Indian Fantail	Blue parents → blue squab with slight expanded tail(2) White parents → white squab with slight expanded tail	Good foster	Bheramara Saidpur
Pouter × Lahore	Large sized, pouter type but crop not enlarged	Bad foster	Saidpur
Tumbler × Satinette	Satinette type; irregular breast feathers (~50%)	Good foster	Saidpur

Management of Pigeon Feeding

For proper management of pigeon feeding, a balanced diet is essential to support growth, reproduction, and overall health. Common feed types include whole grains such as maize (energy-rich), wheat (carbohydrates and moderate protein), rice (easy digestibility), barley (fiber), and millets like bajra and jowar (minerals and energy). Pulses such as peas, lentils, and soybean provide high-quality protein necessary for muscle development and egg production. Oilseeds like mustard seed, sunflower seed, and groundnut supply essential fats and fatty acids. In addition, grit (crushed shells, limestone, and small stones) is vital for digestion and calcium supply, while green feed and mineral–vitamin supplements help prevent deficiencies. Together, these feed components provide carbohydrates (energy), proteins (growth and repair), fats (energy and feather quality), minerals (bone strength and eggshell formation), and vitamins (immunity and metabolism), ensuring healthy and productive pigeons.

Pigeon Disease Management

Pigeon disease management focuses on prevention, early detection, and proper treatment to maintain flock health and productivity. Common pigeon diseases include paramyxovirus (PMV), salmonellosis, coccidiosis, canker (trichomoniasis), respiratory infections, and parasitic infestations. Effective management involves maintaining good loft hygiene, regular cleaning and disinfection, proper ventilation, and avoiding overcrowding. A balanced diet with adequate vitamins and minerals strengthens immunity, while clean drinking water helps prevent the spread of infections. Vaccination (especially against PMV), routine deworming, and control of external parasites are essential preventive measures. Early isolation of sick birds, prompt veterinary care, and regular health monitoring reduce

disease transmission and mortality in pigeon flocks.

Nutritional Value of Pigeon (Meat)

Pigeon meat, also known as squab, is highly nutritious and valued for its rich protein and mineral content. It is an excellent source of high-quality protein, which supports muscle growth, tissue repair, and overall body development. Pigeon meat contains moderate amounts of healthy fats that provide energy while being lower in cholesterol compared to many other red meats. It is rich in essential minerals such as iron, phosphorus, potassium, zinc, and calcium, which are important for blood formation, bone strength, and proper metabolic functions. In addition, pigeon meat provides important vitamins,

especially B-complex vitamins like B12, niacin, and riboflavin, which support nerve function, energy metabolism, and red blood cell production. Due to its high nutrient density and easy digestibility, pigeon meat is considered beneficial for children, elderly people, and individuals recovering from illness.

Management and Care Practices

Successful rearing of different pigeon breeds in a mixed system requires proper housing, balanced nutrition, and effective health management to optimize productivity and bird welfare. Separate housing sections for meat-type, fancy, and local pigeons help reduce competition and stress, while providing adequate nesting space promotes breeding efficiency. A balanced diet including grains, legumes, minerals, and clean water supports growth, reproduction, and feather quality. Regular health care —such as vaccination, parasite control, and prompt isolation of sick birds—prevents disease outbreaks. Careful monitoring of squabs and adults, combined with good sanitation and record keeping, ensures sustainable and profitable pigeon farming under mixed rearing systems.

Profitability

The mixed pigeon rearing system offers a profitable and sustainable agribusiness opportunity in Bangladesh due to its low investment requirement, short production cycle, and high market

demand. Pigeons require minimal housing space and simple management, while feed costs remain comparatively low because they efficiently utilize locally available grains and agricultural by-products. Breeding pairs can produce multiple clutches per year, and squabs reach marketable weight within 28–30 days, ensuring quick returns and continuous income flow. Meat-type breeds contribute to regular cash earnings through squab production, while locally adapted breeds enhance system stability and reduce management risks.

Incorporating fancy and ornamental pigeon breeds further increases profitability by diversifying income sources. Fancy pigeons have high market value as breeding stock and are in demand among hobbyists and exhibitors, often yielding higher returns than meat production alone. The mixed system reduces dependence on a single market, minimizes economic risk, and supports year-round income generation.

With proper breed selection, scientific management, and basic health care, mixed pigeon rearing can generate attractive profit margins and serve as a viable livelihood option for smallholder, landless, and youth farmers in Bangladesh.

Conclusion

The present study demonstrates that a mixed pigeon rearing system has strong potential as a profitable and sustainable agribusiness opportunity in Bangladesh. Significant variation in phenotypic traits and body biometry among the studied pigeon breeds indicates the presence of substantial genetic diversity, which can be effectively utilized for both commercial production and breed improvement. Heavy breeds showed superior performance for meat production, while medium and light breeds contributed to breeding efficiency, adaptability, and ornamental value.

The integration of different pigeon breeds within a mixed rearing system allows diversification of income through squab production, sale of breeding stock, and fancy pigeons, thereby reducing economic risk and ensuring year-round returns. Due to low initial investment, minimal space requirement, and high reproductive efficiency, pigeon farming is particularly suitable for smallholder, landless, and youth farmers. With proper management, scientific breeding practices, and institutional support, mixed pigeon rearing can contribute significantly to income generation, employment creation, and nutritional security, making it a viable component of sustainable livestock development in Bangladesh.

Unlocking Ginger's Golden Potential: Empowering Farmers and Securing Domestic Supply

Introduction

Ginger is more than simply a mainstay in the kitchen; it's the zesty, fragrant root that gives our curries, drinks, and pickles a kick. From the spice markets of ancient China and India to the tables of Europe, where it was formerly regarded as a luxury, this cash crop has a history spanning more than 3,000 years. Ginger is still one of the most popular spices in the world today, with output reaching around 5 million tons worldwide in 2023, with China, India, and Nigeria leading the way. Bangladesh imports tens of thousands of tons annually to satisfy our spice-loving country, but despite its popularity, it still finds it difficult to meet domestic demand. Large areas of fertile land and careful protection from pests and waterlogging were once necessary for the growth of ginger. However, ginger production in sacks is a novel and creative technique that is subtly changing how farmers cultivate this valuable commodity. Farmers may produce ginger in bags filled with a rich soil-manure mix in backyards, under orchards, or even on vacant land thanks to this straightforward but ground-breaking method. 1.5 to 3 kg of fresh ginger can be produced from each sack, transforming little areas into tiny spice factories.

This approach's accessibility is what makes it so beautiful. Farmers from Khulna to Bogura are now making substantial earnings from previously unproductive places by picking ginger

Authors: Atiqur Rahman, Shyikh Ahmed Alif, Sadia Islam Saime & Janifa Islam Juthi

without having to worry about floods or heavy machinery. It's more than just a farming method; it's a lifeline that helps rural people grow a product that has been used to flavor human cuisine for millennia, increase revenue, and lessen reliance on imported ginger.

With a long history and an eye toward the future, ginger in bags is more than just farming; it's a small-scale revolution that is changing how Bangladesh produces its spices.

Morphological Characteristics

Ginger is a marvel of nature, not simply a spice. The rhizome, a thick, knobby underground stem full of nutrients and fragrant chemicals like gingerol, is at its core. We use this component in both medicine and cookery.

Green shoots emerge from the rhizome to form flexible, reed-like stems that sustain long, thin leaves that absorb sunlight and feed the rhizome beneath. Fibrous roots anchor the plant and absorb water and nutrients, which is why well-drained soil in sacks is crucial. Flowers are inconspicuous and rarely required for cultivation.

Ginger is a perennial herb that takes eight to ten months to reach maturity. Even in tiny sack systems, farmers may nurture each plant to its greatest potential by understanding its shape, from delicate leaves to knobby rhizomes, transforming little areas into pockets of fragrant treasure.

Bangladesh Perspective

In Bangladesh, ginger is a daily need, with an estimated 300,000 tones consumed annually. On the other hand, there is a significant supply gap because local output has historically been far lower, averaging between 80,000 and 85,000 tonnes per year. As a result, imports account for between 40 and 50 percent of the nation's entire demand.

Bangladesh imports large amounts of ginger annually, mostly from China, India, Myanmar, and Indonesia, to close this imbalance. Imports have cost millions of dollars in foreign cash in recent years, ranging from 100,000 to over 150,000 tonnes annually. Recent data, however, indicates a positive change: imports of ginger decreased from over 166,000 tonnes in 2021–2022 to roughly 90,000 tonnes in 2023–2024, primarily as a result of improved domestic output.

Bangladesh now exports very little ginger because almost all of its crop is consumed domestically. However, analysts see significant potential to further reduce reliance on imports and perhaps re-enter regional export markets in the future due to the growing use of high-yield practices like sack cultivation.

Bangladesh's Ginger Production Situation (2024–2025)

Ginger was grown on over 10,000 hectares in Bangladesh during the 2024–2025 season, with a total yield of almost 80,000 tonnes. The Chattogram Hill Tracts, Tangail, Sylhet, and Nilphamari produced the most. These areas have loamy, well-drained soils and moderate rainfall, emphasizing how crucial good drainage and moisture balance are to the success of ginger farming.

Production Technology

Sack Preparation

In Bangladesh, where land scarcity and waterlogging are frequent problems, growing ginger in sacks is a novel approach. Preparing the sacks is the initial step, which creates the conditions for healthy rhizomes. To avoid waterlogging, use strong sacks or polythene bags that are 45–50 cm in diameter and 50–60 cm high, with the appropriate drainage holes. For aeration and nutrient supply, prepare a mixture of 50% topsoil, 30% compost or decomposed cow dung, and 20% sand. Ginger grows best in well-drained, fertile soils. Fertilizers are administered prior to planting and left to settle for two to three weeks for best growth. With temperatures between 20 and 30°C and moderate annual rainfall of 1000 to 1500 mm, the post-monsoon season (September to November) is the best period to plant in Bangladesh. Young shoots can establish without being stressed by direct sunlight in partially shaded situations. For optimal results, plant healthy rhizome sections (2–3 cm with at least one bud) in the prepared bags at a depth of 5–7 cm.

Fertilizer Dose per Sack (~50 kg soil mix):

Fertilizer Name	Amount per Sack	Application Timing
Cow Dung / Compost	10 – 12 kg	Mix with soil 15 days before planting
Vermicompost	2 – 3 kg	Mix with soil 15 days before planting
TSP	50 – 60 grams	Mix with soil 15 days before planting
MOP (Potash)	40 – 50 grams	50% at planting; 50% in two splits (day 80 & 110)
Urea	60 – 80 grams	Split into 3 doses (at 50, 80, and 110 days)
DAP	20 – 30 grams	Split into 2 doses (at 65 and 130 days)
Gypsum	15 – 20 grams	Mix with soil during preparation
Zinc & Boron	5 grams each	Mix with soil during preparation

Planting & Intercultural Operations:

Ginger was grown on over 10,000 hectares in Bangladesh during the 2024–2025 season, with a total yield of almost 80,000 tonnes. The Chattogram Hill Tracts, Tangail, Sylhet, and Nilphamari produced the most. These areas have loamy, well-drained soils and moderate rainfall, emphasizing how crucial good drainage and moisture balance are to the success of ginger farming.

Intercultural Operations Schedule:

Operation	Time / Frequency	Notes / Guidelines
Watering	Every 3–4 days (adjust for rainfall)	Maintain moderate soil moisture; avoid waterlogging
Weeding	2–3 times during early growth	Hand-remove weeds or use mulching to suppress growth
Mulching	At planting, repeat if needed	Use dry leaves or straw to retain moisture and control weeds
Loosening soil / Aeration	Every 3–4 weeks	Gently loosen soil around rhizomes to improve root growth
Side-dressing (Urea)	60–70 days after planting	~10 g per sack to promote vegetative growth
Pest Monitoring & Control	Throughout growing season	Check for shoot borer, leaf blight; apply neem extract or mild insecticide if needed

Harvesting and Management After Harvest

When the leaves start to turn yellow and dry eight to ten months after planting, ginger cultivated in sacks is typically ready for harvest. Waiting too long can cause the rhizomes to become harsh and fibrous, while harvesting too soon can lower output. To prevent bruising, which can reduce storage life and quality, farmers gently remove the entire rhizome from the sack.

Following harvest, the rhizomes are gently cleaned to remove dirt, and then they are dried in the sun for one to two days or in an airy, shaded place to reduce the moisture content to around 12 to 15%. Ginger can be stored safely if it is properly dried, which also stops fungus growth.

Dried rhizomes can be stored temporarily in ventilated baskets or sacks. They should be kept in a cold, dry room for extended periods of time, and occasionally they should be lightly packed in sand to preserve freshness. Even in Bangladesh's small-scale or flood-prone locations, ginger from sack farming can retain its high quality and flavor with proper harvesting and post-harvest management.

Conclusion

For Bangladeshi small-scale farmers, growing ginger in sacks is more than just a farming method; it's revolutionary. Even backyard spaces can be turned into successful, high-yielding spice farms with a small amount of land, well managed soil, and regulated circumstances. This approach boosts local agriculture by lowering reliance on imported ginger and increasing revenue.

Every stage, from well prepared sacks to cautious planting, prompt watering, and deliberate harvesting, enables farmers to produce high-quality ginger effectively, especially in regions that are vulnerable to flooding or have limited resources. Innovative methods like bag cultivation provide a route toward sustainability, profitability, and food security while the demand for ginger keeps growing.

Growing ginger in sacks is essentially about more than simply producing a crop; it's about opening doors, generating opportunities, and bringing a little income to Bangladesh's rural areas.

Saving Bangladesh's Jackfruit: From Wastage to Wealth

Introduction

Fruit that feeds the nation, but fails to survive the journey from farm to market. Jackfruit (*Artocarpus heterophyllus*), the national fruit of Bangladesh, holds a special place in the country's agriculture, culture, and food system. Jackfruit is a multiple fruit formed from a cluster of flowers in a single inflorescence. It is also recognized as the world's heaviest tree-borne fruit, with individual fruits weighing from 2–5 kg and sometimes reaching up to 30–50 kg, depending on variety and growing conditions.

Jackfruit plays a crucial role in food security, nutrition, and rural income. It is highly nutritious, widely consumed during summer, and provides seasonal earnings for thousands of rural households. In Bangladesh, major jackfruit-producing areas include Gazipur, Tangail, Mymensingh, Rangpur, Dinajpur, and the Chattogram Hill Tracts. The crop follows a clear seasonal pattern, with flowering

Author: Kamrul Hassan Rabbi

occurring from December to February, fruit development from March to May, and harvesting from May to August, making it one of the most important summer fruits.

Despite high production, Bangladesh faces a paradox of significant post-harvest losses. In the 2024–25 financial year, jackfruit production was estimated at 1.02 Million metric tons, even though the cultivated area declined by about 4,000 acres due to urbanization, land conversion, and limited farmer incentives. Gazipur district, particularly Sreepur and Kapasia remains a major production hub. Jackfruit post-harvest loss occurs due to poor handling, storage, and harvesting that can lose up to 45-50% of the total fruit during the peak seasons.

Post-Harvest Processing System

Post-harvest processing refers to the series of operations that begin immediately after harvesting and continue until the product reaches the consumer. These processes include cleaning, grading, sorting, storage, processing, packaging, and transportation, all aimed at maintaining quality, extending shelf life, and minimizing post-harvest losses. In Bangladesh, where jackfruit is highly seasonal and often produced in surplus, the absence of proper post-harvest management leads to significant wastage at the farm and market levels.

After harvesting, jackfruit is exposed to controlled low temperatures to slow physiological deterioration and microbial activity. The fruits are washed to remove latex, dirt, and surface contaminants, then graded based on size, maturity, and quality to ensure uniformity in processing and marketing. Proper handling at this stage is crucial, as rough transportation and lack of cushioning common in rural Bangladesh often cause mechanical damage and rapid spoilage.

Processing fresh jackfruit into value-added, long-lasting products plays a vital role in reducing losses and increasing farmer income. Techniques such as pulping, drying, freezing, canning, and fermentation are increasingly relevant in the Bangladeshi context, where demand for jackfruit chips, flour, pickles, frozen bulbs, and meat alternatives

is growing in both domestic and export markets. These processes must be supported by hygienic packaging, cold-chain facilities, and efficient transportation systems, which remain limited in many production regions.

Strengthening decentralized processing units, promoting small and medium agro-enterprises, and improving access to cold storage and modern logistics can transform jackfruit from a highly perishable seasonal fruit into a year-round economic resource for Bangladesh. Effective post-harvest processing is therefore not only a technical necessity but also a strategic pathway to food security, rural employment, and sustainable agricultural development.

Value Added Jackfruit Products

Jackfruit can be refined into extremely wide and diversified value-added products that will add premium to the market and prolong shelf life.

Jackfruit pulp:
Jackfruit pulp is produced from ripe bulbs after removing seeds and fibrous parts, followed by mechanical pulping and pasteurization. This process inactivates spoilage microorganisms and enzymes. The pulp can be stored frozen or aseptically packed. It is widely used in beverages, ice cream, bakery fillings, and desserts, adding market value.

Jackfruit chips:
Jackfruit chips are prepared by slicing mature or semi-ripe bulbs into thin pieces and blanching them. The slices are then deep-fried or vacuum-fried to improve crispness and shelf life. Vacuum frying helps retain color and nutrients. These chips have strong commercial demand as a healthy snack.

Dehydrated jackfruit:
Dehydrated jackfruit is made by drying sliced bulbs using solar or mechanical dryers. Drying reduces moisture content, thereby inhibiting microbial growth. This significantly extends shelf life and reduces storage volume. The product is suitable for export and off-season consumption.

Jackfruit flour:
Jackfruit flour is produced from dried, unripe jackfruit that is milled into fine powder. It is naturally gluten-free and rich in dietary fiber. The flour is used in bakery and functional food products. It also creates new market opportunities for unripe jackfruit.

Jackfruit chips

Dehydrated jackfruit

Jackfruit flour

Canned jackfruit:
Canned jackfruit is prepared by blanching raw or ripe jackfruit pieces and packing them in brine or sugar syrup. The cans are then heat-sterilized to ensure long shelf life. This method prevents seasonal losses and allows year-round availability. Canned jackfruit has growing international demand.

Jam and jelly:
Jackfruit jam and jelly are made from ripe pulp mixed with sugar, pectin, and acid. The mixture is cooked to achieve proper gel formation and preservation. These products improve fruit utilization during peak seasons. They are popular in domestic and small-scale commercial markets.

Pickled jackfruit:
Pickled jackfruit is prepared from raw jackfruit using vinegar, oil, salt, and spices. Acidification and salting inhibit microbial growth and enhance flavor. This traditional product has good storage stability. It is commercially viable for cottage and SME industries.

Jackfruit seed flour:
Jackfruit seed flour is produced by drying, roasting, and milling the seeds. It is rich in starch and moderate protein content. The flour is used as a functional ingredient in bakery and snack products. This process adds value to a commonly wasted by-product.

Fermented jackfruit products:
Fermented jackfruit products include vinegar and wine produced through controlled microbial fermentation. Fermentation improves shelf life and creates high-value niche products. These products have potential in specialty food markets. Proper processing ensures safety and quality.

Frozen jackfruit bulbs:
Frozen jackfruit bulbs are prepared by cleaning, cutting, and quick-freezing ripe bulbs. Freezing preserves texture, flavor, and nutritional quality. This method allows long-term storage and export. It helps stabilize prices during peak production seasons.

Canned Jackfruit

Jackfruit Jam

Jackfruit Seed Flour

Jackfruit Pickle

Developed Countries Practices

In developed countries, the post-harvest processing is based on the use of mechanised technologies such as integrated cold chains, refrigerated transportation, controlled-atmosphere storage and high-tech packhouses. Vacuum frying, freeze drying, aseptic pulping and automated canning are common technological methods. Through the strict observance of food safety standards (HACCP, ISO), the product quality is high, and the competitiveness of products in the export market is excellent; the losses at the post-harvest do not exceed 10-15%.

Challenges

Improper Harvesting:
Many farmers harvest jackfruit too early or too late, or use rough methods. This causes mechanical damage, sap leakage, and fruit spoilage, reducing market value and shelf life.

Lack of Storage Facilities:
Most farmers and traders in Bangladesh do not have cold storage or proper warehouses. Jackfruit is highly perishable, so without storage, fruits rot quickly, especially during peak season.

Poor Transportation:
Transportation is often slow and unprotected, with fruits stacked together. Bruising and pressure damage occur during long road travel from farms to markets.

Limited Processing and Value Addition:
There are few processing units for jackfruit in Bangladesh. Without pulp, chips, or canned products, surplus fruits cannot be preserved, leading to high post-harvest losses and lost income.

Conclusion

Proper post-harvest management of jackfruit is essential to reduce losses and ensure full utilization of the fruit. By adopting better harvesting, storage, and processing methods, farmers can increase their income and contribute to national food security. Improved jackfruit production and processing can create job opportunities for youth, helping them engage in agriculture and related industries. It can also support women empowerment, as women are often involved in harvesting, processing, and marketing of jackfruit products. Government involvement is crucial to provide infrastructure, cold storage, and market support, while enhancing technical knowledge through training programs can help farmers and entrepreneurs adopt modern post-harvest practices. Together, these measures can transform jackfruit from a seasonal crop with high losses into a sustainable source of nutrition, income, and economic development for Bangladesh.

The Dairy Renaissance:
Merging Tradition with Tech for a Wealthier Rural Bangladesh

Introduction

In the heart of rural Bangladesh, where the morning mist clings to the lush greenery of the delta, a new economic anthem is being written—one that trades the uncertainty of low-yield crops for the steady, "white gold" of the dairy industry. For centuries, the ultimate aspiration of the Bengali household was captured in the timeless prayer of Ishwari Patuni: "May my child live on milk and rice." Today, that cultural sentiment is being transformed into a high-octane engine for growth. With a national cattle population exceeding 24.5 million and a market value projected to soar to $6.5 billion by 2032, the dairy sector has evolved far beyond a simple backyard activity. It has emerged as a strategic frontier for rural financial

Author: Shahoriar Sabbir Tulon

independence and a powerful catalyst for youth empowerment, turning traditional farming into a modern pathway for national prosperity.

Financial Freedom Through the Milk Way

In regions like Rangpur and Gazipur, small-scale dairy farming has transitioned from a subsistence activity to a sophisticated financial strategy. With Benefit-Cost Ratios (BCR) reaching as high as 1.84, the sector offers a level of economic resilience that traditional agriculture often lacks. While a single flood or drought can wipe out a season’s worth of paddy, a healthy cow remains a consistent productive asset, generating liquid cash every single morning.

This "daily dividend" is the bedrock of rural financial freedom. However, the true leap from poverty to prosperity occurs when farmers move up the value chain. Currently, 80% of Bangladesh's milk market is informal, often leaving smallholders at the mercy of traditional middleman networks (Dudh-Bepari) who dictate low prices. By organizing into cooperatives and utilizing modern infrastructure like community chilling units, farmers can maintain the quality of their milk for longer periods. This allows them to sell directly to large processors or engage in the production of value-added goods—such as ghee, yogurt (Bogura’s famous Doi), and paneer—which command significantly higher margins than raw milk.

Furthermore, the integration of dairy with organic farming creates a "circular economy" at the household level. The byproduct of the dairy—cow dung—is no longer just waste; it is a source of biogas for clean cooking and high-quality vermicompost for crop fields. This reduces the family's expenditure on expensive chemical fertilizers and fuel, effectively increasing their net savings. For a rural family, this holistic approach means that financial freedom is not just about earning more, but about building an integrated system that reduces risk and maximizes every available resource.

Youth Empowerment

From Job Seekers to Job Creators

The shift from traditional "job seeking" to "job creating" is not merely a survival tactic; it is a professional revolution led by a

generation that refuses to be sidelined by a stagnant corporate job market. For these young entrepreneurs, the dairy sector offers something a desk job cannot: the chance to build a tangible, scalable asset that serves the community's nutritional needs while ensuring personal financial autonomy.

The involvement of organizations like IAAS Bangladesh and its chapter at IUBAT acts as the crucial "knowledge bridge." These platforms are transforming how youth perceive agriculture. Instead of viewing dairy as a labor-intensive chore of the past, students are being trained to see it as a data-driven business. Through professional exchange programs and technical workshops, they are learning about genetic improvement, precision nutrition, and the economics of the "Cold Chain." This academic infusion is vital because it brings scientific rigor to rural farms—improving milk yields per cow, which currently remains a bottleneck in national production. Furthermore, youth empowerment in this sector is increasingly taking the form of "Service Entrepreneurship." Not every young person needs to own a cow to profit from dairy. **Many are carving out niches as:**

Mobile Veterinary Technicians: Providing on-call health checks and artificial insemination (AI) services using digital tracking.

Feed Innovators: Starting small-scale processing units that produce high-protein balanced rations, which are often unavailable in remote villages.

Digital Market Linkers: Using social media and e-commerce apps to connect rural clusters directly to urban consumers, ensuring "Farm-to-Table" fresh delivery.

This wave of youth involvement is also tackling the "image problem" of agriculture. When a university graduate like Mahmudul Hasan succeeds, it sends a powerful message to the 2 million young people entering the workforce annually: success doesn't just happen in Dhaka's skyscrapers—it can be built in the green pastures of Rangpur. By leveraging their digital literacy and networking capabilities, these young leaders are not just milking cows; they are milking the potential of a $6.5 billion industry to create a more equitable, self-reliant Bangladesh.

The High-Tech Herd

From Job Seekers to Job Creators

The future of Bangladesh's dairy industry is no longer written in manual ledgers; it is being encoded in the cloud. The integration of Artificial Intelligence (AI) and the Internet of Things (IoT) is acting as a great equalizer, dismantling the traditional barriers that once kept smallholder farmers in the shadows of large-scale industrial operations.

- **Precision Health & "Fitbit for Cattle":** The adoption of wearable IoT sensors—ranging from smart ear tags to neck collars—has revolutionized animal husbandry. These devices monitor rumination patterns, movement, and body temperature in real-time. By utilizing predictive analytics, farmers can identify "silent heat" cycles or early-stage mastitis days before physical symptoms appear. For a smallholder, this 15-20% boost in conception rates—supported by data-backed apps like e-Gopala—is the difference between a stagnant farm and a profitable enterprise.
- **Blockchain:** The Trust Architecture: A major hurdle for rural farmers has always been the "trust gap" in milk quality, which middleman networks often exploit to drive prices down. Emerging digital supply chains are now utilizing blockchain technology to create an immutable record of the milk's journey. From the moment of milking to the final chilling unit, every quality check is timestamped and verified. This ensures that a youth entrepreneur in a remote village can prove the premium quality of their product, securing a "quality-premium" price that was previously unattainable.
- **The Biogas Revolution & Circular Economy:** Technology is also solving the industry's environmental footprint. Educated youth are leading the charge in installing advanced biogas digesters that convert bovine waste into methane for clean energy and high-grade organic slurry. This "Climate-Smart Agriculture" (CSA) model allows a farm to be 70% energy-independent. By turning a waste product into a source of fuel and bio-fertilizer, farmers are significantly slashing their operational overhead, making the dairy business resilient against the fluctuating prices of global energy and chemical fertilizers.

his digital leap is driven by tech-savvy youth, nearly ten times more likely to adopt Smart Farming Technologies. By leveraging machine learning to optimize feeding, these "agri-preneurs" prove that the size of your barn matters less than the strength of your data.

Strategic Roadmap

Scaling the Dairy Frontier

To bridge the gap between subsistence farming and a modern value chain, Bangladesh must transition toward an integrated, data-driven ecosystem through three critical pillars.

1. Productivity Growth: The Biological Leap Bangladesh faces a significant "yield gap" where indigenous cows produce only 1.5–2.5 liters daily, compared to over 9 liters from crossbred varieties. Closing this gap through Artificial Insemination (AI) is the fastest route to meeting the WHO-recommended 250 ml/day intake. However, genetics alone are insufficient; success requires precision nutrition—moving from rice straw to high-protein fodder—and community-based veterinary services to lower the current 12.28% calf mortality rate.

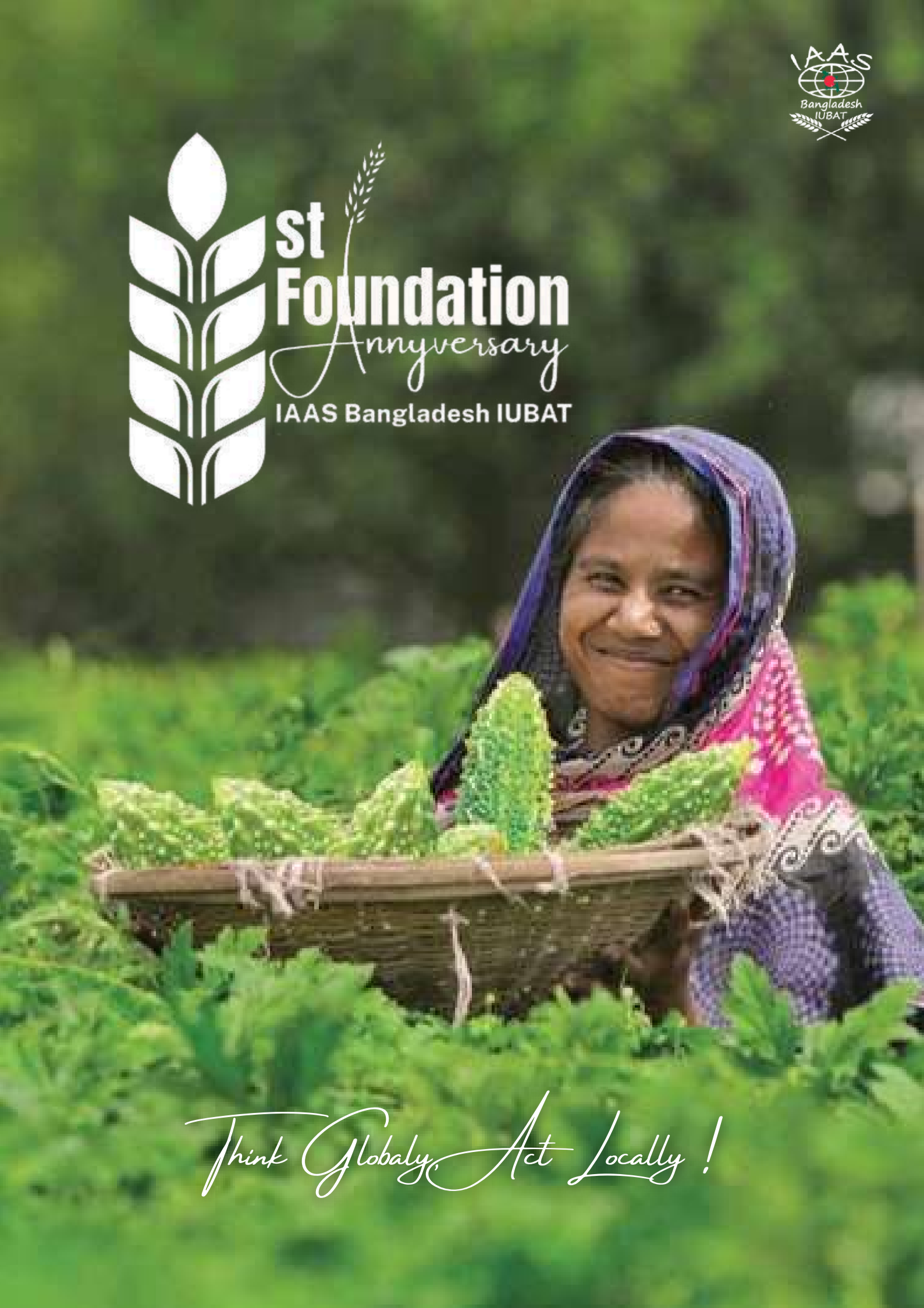
2. Infrastructure Modernization: The "Cold Chain" Shield Extreme perishability forces rural farmers to sell milk at low prices to avoid spoilage, with only 7–9% of production currently reaching formal processors. Establishing a robust "cold chain"—including solar-powered rural chilling units and refrigerated transport—is essential for market stability. By forming village cooperatives, smallholders can aggregate volume and bypass predatory intermediaries, allowing them to capture higher margins through value-added products like ghee and yogurt.

3. Financial Inclusion: Fueling the Youth Engine With only 9.1% of rural micro-entrepreneurs accessing formal credit, financial barriers stifle youth-led expansion. Empowering the next generation requires "smart agri-finance" models, such as collateral-free micro-loans and livestock insurance, to mitigate the risks of scaling from a single animal to a commercial herd. Integrating Mobile Financial Services (MFS) allows these "agri-preneurs" to build the digital credit histories necessary to transform dairy into a sustainable vehicle for national wealth.

Conclusion

The dairy industry represents a unique intersection where tradition meets technology. For the rural youth of Bangladesh, a cowshed is no longer a symbol of the past; it is a modern laboratory for financial independence and national nutrition security. By embracing innovation, strengthening cooperatives, and providing the youth with the tools to lead, Bangladesh can turn the "Doodh-e-Bhaat" dream into a permanent reality.

As the sectors modernize, the message to the youth is clear: the path to empowerment isn't always through a corporate office—sometimes, it flows directly from the farm to the table.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The name "Nabom Pallob" translates to "New Leaf", symbolizing growth, renewal, and sustainability in agriculture. "Nabo" signifies new beginnings, while "Pallob" represents fresh leaves, indicating the continuous evolution of agricultural knowledge, Agricultural Heritage, Traditions and practices.

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