NEXTGREEN GLOBAL BERHAD

RESEARCH & DEVELOPMENT (R&D)

ANNUAL REPORT

Summary of Nextgreen's R&D Activities in 2024

2024

Green Technology Park, Pekan, Pahang Darul Makmur

www.nextgreenglobal.com

NEXTGREEN'S VISION

To be the most innovative green technology company with sustainable zero waste industry model that ultimately lead us to a greener future

NEXTGREEN'S MISSION

To accelerate the world's transition to green and sustainable products

R&D DEPARTMENT'S AIM

To develop and deliver innovative products and processes, besides improving existing technology for company's future growth

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Message from the MANAGING DIRECTOR

Reflecting on 2024, Nextgreen has achieved remarkable milestones that underscore our dedication to innovation, sustainability, and strategic partnerships. This year has been marked by continuous strides in research, development, and collaboration, as we advanced new products and services while deepening our commitment to sustainable practices. Nextgreen's close partnerships with esteemed institutions—including Universiti Putra Malaysia (UPM), Universiti Malaysia Pahang Al-Sultan Abdullah (UMPSA), Universiti Teknologi Petronas (UTP), Taylor's University, Universiti Teknologi Malaysia (UTM), and the National Farmers' Organization (NAFAS)—have been instrumental in our progress and have significantly shaped our sustainable business model. These collaborations have empowered us to create impactful initiatives aligned with our vision for a greener, more resilient future.

A notable highlight of 2024 was our Memorandum of Understanding (MoU) with UTP and Taylor's University, marking the start of a five-year collaboration focused on academic research, joint publications, internship and corporate social responsibility programs. This partnership underscores our support for Sustainable Development Goals (SDGs), particularly SDG 4, Quality Education, by promoting inclusive and equitable learning opportunities, and SDG 17, Partnerships for the Goals, by enhancing knowledge sharing and cooperation in sustainable development. By aligning with these SDGs, Nextgreen is committed to cultivating an environment that nurtures future-ready talent, encourages knowledge exchange, and drives sustainable learning for Malaysians.

Our commitment to sustainability remains central to Nextgreen's business strategy, particularly through our use of Malaysia's abundant oil palm biomass, such as empty fruit bunches (EFB). By transforming these by-products into sustainable products—including EFB pulp, paper, and biofertilizer—Nextgreen is directly addressing Malaysia's waste management challenges in the palm oil industry. As an affiliate member of the Roundtable on Sustainable Palm Oil (RSPO), Nextgreen upholds

Dato' Lim Thiam Huat
Managing Director
Nextgreen Global Berhad

principles of responsible business. Our flagship Green Technology Park (GTP) in Pekan, Pahang, embodies our zero-waste concept, where every by-product is recycled, repurposed, or reinvented, reflecting our dedication to sustainability and innovation.

This year, our innovation efforts were recognized at the prestigious International Invention, Innovation, Technology Competition and Exhibition 2024 (ITEX 2024), where Nextgreen received two Gold Awards for our groundbreaking projects: the **Biofertilizer from Empty Fruit Bunch Biomass and Pulping Liquor for Circular Economy**, and the **Preconditioning Refiner Chemical-Recycle Bleached Mechanised Pulp (PRC-RBMP) Technology for Oil Palm Fibre-Pulp Production**. These awards affirm our role as a leader in sustainable technology and highlight the positive impact of our contributions to a more sustainable environment and society, further inspiring us to drive meaningful change and support a sustainable future.

In 2024, we made significant advancements in biofertilizer production through our subsidiary, Nextgreen Fertilizer (NGF). Nextgreen successfully developed two biofertilizers, NexBooster™ and NexCompost®, designed to enhance soil fertility and boost plant growth, supporting sustainable agriculture and improving crop yields. We commenced the commercialization of NexBooster™ in partnership with NAFAS, officially launching it at the National Bioeconomy Showcase (NBiOSHOWCASE) 2024 and presenting our products at Malaysia Agriculture Horticulture & Agrotourism Show (MAHA) 2024. These efforts underscore our commitment to empowering local agriculture with innovative, sustainable solutions that enhance productivity and environmental stewardship.

In alignment with our commitment to sustainability and collaborative efforts, I am proud to highlight the recognition of Nextgreen at the UN Global Compact Network Malaysia & Brunei (UNGCMYB) Sustainability Celebration Night 2024, held on 29th November 2024. At this prestigious event, Nextgreen was honored with the **Partnership for the Goals Recognition under the Forward Faster Sustainability Awards**, an acknowledgment of our outstanding contribution to advancing sustainability initiatives and fostering partnerships that drive positive environmental and social impact, aligned with United Nations Sustainable Development Goal 17. Nextgreen's dedication to fostering meaningful partnerships that drive lasting, positive change in the realm of sustainability sets a high standard for others to follow. This recognition reinforces our collective commitment to working together towards a more sustainable future, and we look forward to continuing to lead by example in these vital efforts.

As part of our ongoing commitment to sustainability, we are pleased to announce that Malaysia's first science newspaper, The Petri Dish, has transitioned to using Nextgreen's NeuWhite® paper for its print materials. This eco-friendly choice reflects our dedication to reducing our environmental footprint while maintaining the highest standards of quality. NeuWhite® paper, certified with the SIRIM Eco Label and MyHIJAU mark, ensures that our publication supports sustainable practices and adheres to rigorous environmental criteria.

As we step into 2025, Nextgreen's priorities include further commercializing our biofertilizers, expanding our product offerings to include agrofeed and tissue paper, and establishing Biomass Hub as outlined in our business model featured in the National Biomass Action Plan 2023-2030. The achievements and recognitions we received in 2024 are testament to our dedication to sustainability, inspiring us to continually innovate, create value-added products, and enhance existing solutions. Our commitment to environmental stewardship, strengthened by collaborations with our valued partners, drives us forward in building a greener, more prosperous future for Malaysia and beyond.

Message from the EXECUTIVE DIRECTOR

As we reflect on the achievements of 2024, Nextgreen's R&D department has made remarkable strides in advancing sustainable innovation and technological progress. Our mission has always been to drive the long-term growth of Nextgreen Group through research. This commitment not only creates value for our customers but also drives constant growth and improvement. To enhance our impact across society, industry, and education, we have continued fostering strong partnerships with academia, government agencies, and industry in other applications this year. This is also one of the approaches to accelerate the adoption of green technologies.

Throughout 2024, we deepened our relationships with academic institutions by welcoming delegations from UTP, UMPSA, UTM, Universiti Pertahanan Nasional Malaysia (UPNM) and Taylor's University to our GTP in Pekan. We have explored the latest research and technologies in the application of biomass from the oil palm industry and engaged in their focus group discussion on the economic impact. We were also honored to host delegates from The Institution of Engineers, Malaysia (IEM), showcasing our innovative use of oil palm biomass to create value-added products. These visits offered valuable opportunities to connect with industry professionals and highlight our commitment to sustainable industrial practices. We believe the synergy between industry and academia is vital in driving innovation, advancing research, and creating solutions to real-world challenges.

Ts. Dr. Lim Kah Yen
Executive Director
Nextgreen Global Berhad

Recognition on Nextgreen's Products and Technology

This year was particularly notable as we secured two Gold Awards at the 35th ITEX 2024 for our innovative **Biofertilizer from Empty Fruit Bunch Biomass and Pulping Liquor for Circular Economy**, as well as our **Preconditioning Refiner Chemical-Recycle Bleached Mechanised Pulp (PRC-RBMP) Technology for Oil Palm Fibre-Pulp Production**, were recognized for their groundbreaking potential. These achievements accentuate our dedication to providing impactful solutions for a sustainable environment and society. Additionally, our efforts were further acknowledged through certifications such as SIRIM ECO 009:2019, and MyHIJAU for our EFB-woodfree pulp, reaffirming our commitment to high standards and sustainable practices.

The by-product manufacturing sector presents significant roles in advancing our resource efficiency and sustainable production process. We conducted extensive trials of our NexCompost® and NexBooster™ biofertilizer on various crops, including paddy, melon, and oil palm. These trials are crucial in providing data for us to develop and validate optimal commercial usage methods to maximize soil fertility, promoting healthy plant growth, and increasing crop yields. The insights gathered are helping us refine our biofertilizers to offer a sustainable solution to food security by increasing crop yields, promoting environmentally-friendly agricultural practices while minimizing environmental impact.

In line with our mission, Nextgreen's R&D team actively participated in local and international exhibitions to showcase innovations such as NeuWhite® EFB-based packaging paper, PurePalm eco-friendly food packaging, and NexBooster™ and NexCompost® biofertilizers. Our presence at the International Greentech & Eco Products Exhibition and Conference Malaysia (iGEM) 2024, NBiOSHOWCASE 2024, Pakar Pertanian Expo, and MAHA 2024 highlighted our advancements in sustainable agriculture, packaging, and oil palm biomass utilization.

Looking forward

The year 2025 presents an opportunity to further build on these successes. We are working towards ISO 14067 certification for NeuWhite® Pulp and Paper to quantify our Product Carbon Footprint. This aligns with our goal of the GTP achieving zero waste and reduction of carbon footprint. Moreover, we continue our efforts to advance the development and expand the commercialization of biofertilizers in the agrofeed sector. Achieving ISO Integrated Management System (IMS) certification, encompassing ISO 9001 and ISO 14001, will maintain our quality, efficiency, and environmental compliance, aligning with both regulatory and customer expectations.

As we wrap up 2024, we reflect on a year of reaching our goals, delivering impactful achievements, fostering innovation, and strengthened partnerships. With a renewed commitment to sustainability, innovation, and resilience, we eagerly anticipate 2025 and our continued efforts to drive positive change and shape a greener future.

NEXTGREEN'S R&D TOWARDS SUSTAINABLE DEVELOPMENT GOALS

The 2030 Agenda for Sustainable Development, adopted by all United Nation Member States in September 2015, offers a comprehensive framework to address significant economic, social, and environmental challenges through 17 SDGs and 169 targets, aimed at fostering a more sustainable and equitable future for people and the planet. Recognizing the private sector's pivotal role in this global effort, Nextgreen's R&D has identified 5 specific SDGs and corresponding targets that align with its business strategies and research initiatives, underscoring the company's commitment to sustainable development.

8 DECENT WORK AND ECONOMIC GROWTH

Production of sustainable, value-added products:

- **Nextgreen's biofertilizer for sustainable agriculture** *(refer to page 11-15)*
- **Evaluating the biodegradability of commercial wood-free packaging** *(refer to page 18-19)*
- **Evaluating empty fruit bunches and oil palm fronds blend ratios for sustainable paper production** *(refer to page 20-21)*

These research initiatives support SDG **Target 8.2** by enhancing economic productivity through diversification, technological upgrades, and sustainable innovation in production processes. R&D efforts in biofertilizers, sustainable wood-free paper, and biodegradable packaging demonstrate a strong commitment to environmentally responsible growth. Furthermore, these projects support **Target 8.3** by promoting policies that encourage productive activities, job creation, entrepreneurship, and innovation, thereby strengthening the growth of micro, small, and medium-sized enterprises with improved access to financial services. Aligned with **Target 8.4**, these efforts also contribute to global resource efficiency and environmental preservation by decoupling economic growth from environmental impact. Collectively, these projects make a significant contribution to sustainable economic productivity, efficient resource use, and environmental protection.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Research & development innovation and expenditure

Nextgreen's R&D initiatives align with **Target 9.4** by focusing on upgrading infrastructure and retrofitting industries by 2030 to improve resource efficiency and adopt clean, environmentally sound technologies. These projects emphasize sustainable practices in industrial processes, with each country contributing according to its capabilities. Additionally, Nextgreen supports **Target 9.5** by strengthening scientific research and enhancing technological capacities, particularly in developing nations, through sustainable product development, increasing R&D professionals, and allocating more resources to research, thereby stimulating both public and private R&D investment. Additionally, Nextgreen's R&D aligns with **Target 9.b** by promoting the development of domestic technologies and products that address environmental challenges, enhancing local capacity for sustainable industrial growth.

Utilizes, recycles and reuse sustainable resources which includes but not limited to:

- **Nextgreen's biofertilizer for sustainable agriculture** *(refer to page 11-15)*
- **Evaluating the biodegradability of commercial wood-free packaging** *(refer to page 18-19)*
- **Evaluating empty fruit bunches and oil palm fronds blend ratios for sustainable paper production** *(refer to page 20-21)*

Nextgreen's R&D initiatives focus on sustainable resource use through biofertilizers, biodegradable packaging, and sustainable paper production, supporting multiple SDG 12 targets. By converting pulp by-products into biofertilizers, Nextgreen reduces waste and enriches soil without synthetic chemicals, advancing **Target 12.5**'s goals of waste reduction and resource efficiency. The development of biodegradable packaging offers eco-friendly alternatives to plastic, supporting **Target 12.4** by promoting responsible chemical management throughout the product lifecycle and reinforcing circular economy principles. Additionally, blending oil palm empty fruit bunches (EFB) and oil palm fronds (OPF) pulps in paper production decreases reliance on wood pulp, conserving resources and improving resource efficiency in line with **Target 12.2**. By ensuring minimal reliance on harmful chemicals and adhering to international standards for safe production and disposal, Nextgreen's efforts underscore its commitment to sustainable production, waste reduction, and environmental stewardship.

Integrate climate change measures into national policies, strategies and planning:

- **Carbon footprint assessment, verification & certification for empty fruit bunches-based products** *(refer to page 16-17)*

Nextgreen's pursuit of CFP certification for its EFB-based products demonstrates a proactive commitment to reducing its environmental impact and aligns closely with Malaysia's climate goals. This initiative supports **Target 13.2**, which emphasizes integrating climate strategies into broader planning frameworks, and aligns with Malaysia's pledge to reduce greenhouse gas emissions intensity by 45% by 2030. As part of a comprehensive national strategy, Malaysia aims to expand forest cover, promote renewable energy, and improve energy efficiency across sectors. Through its R&D, Nextgreen contributes to these national climate objectives, strengthening Malaysia's commitment to a sustainable, climate-resilient future and positioning itself as a key player in the nation's transition toward low-carbon, sustainable development.

Building strategic partnerships with multiple stakeholders to strengthen sustainable development

Nextgreen's R&D initiatives closely align with SDG **Targets 17.6** and **17.7** by fostering partnerships that promote sustainable development through knowledge sharing, technological innovation, and capacity-building. Collaborating with academic institutions, Nextgreen advances sustainability-focused education via training programs, internships, and guest lectures, equipping future generations with practical skills in environmental stewardship. Partnerships with government and industry further strengthen institutional and technical capacities through joint training, technology transfer, and knowledge exchange, empowering stakeholders to adopt sustainable practices and drive innovation. These collaborations enable Nextgreen to disseminate sustainable technologies and enhance implementation strategies, engaging diverse stakeholders across sectors to achieve shared sustainability goals.

NEXTGREEN'S R&D STRATEGY & POLICY

R&D POLICY

In line with our corporate philosophy, we aim to contribute to the **realization of a sustainable society** and the **improvement of corporate value** through research and development by creating **safe and environmentally friendly** new products, new processes, and **competitive intellectual property** with technological innovation.

R&D TARGET

1. To develop and deliver safe and environmentally friendly innovative products and processes with a Technology Readiness Level (TRL) at least two levels higher than the initial, within 3 years of research and development.
2. To evaluate and assess the utilization of waste and by-products at GTP into value-added products that meet GTP needs and market demand.
3. To actively acquire new technologies and collaborate with third-party companies, organizations, and research institutes to access technologies not available in-house and achieve ongoing growth as an R&D-oriented corporate group.

R&D STRATEGY

1. To leverage our core technologies, strengthen the utilization of renewable resources through the creation of value-added products, and realize new growth, in circular economy and green technology.
2. To ascertain our R&D strategies, the selection of appropriate projects and new development are made based on market and environmental needs, along with the abundance of untapped valuable resources and by-products.

TECHNOLOGY PLATFORM & MAIN PRODUCT

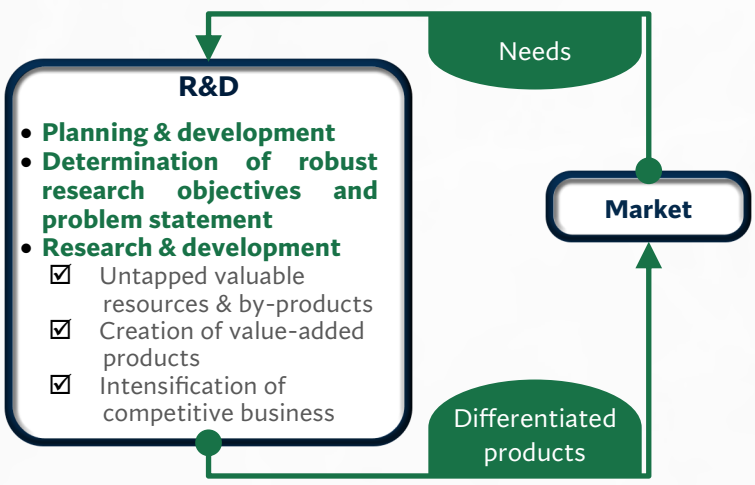
- **Patented Technology**
  - *PRC-RBMP (EFB Pulping Technology)*
- **Green Technology Park**
  - *"Bio-integrated zero waste concept"*

EFB-based products *i.e.*–
- NeuWhite® woodfree pulp
- NeuWhite® woodfree paper
- EFB unbleached pulp and paper
- NexBooster™ biofertilizer
- NexCompost® biofertilizer

R&D STRATEGY

R&D GOALS & TARGET

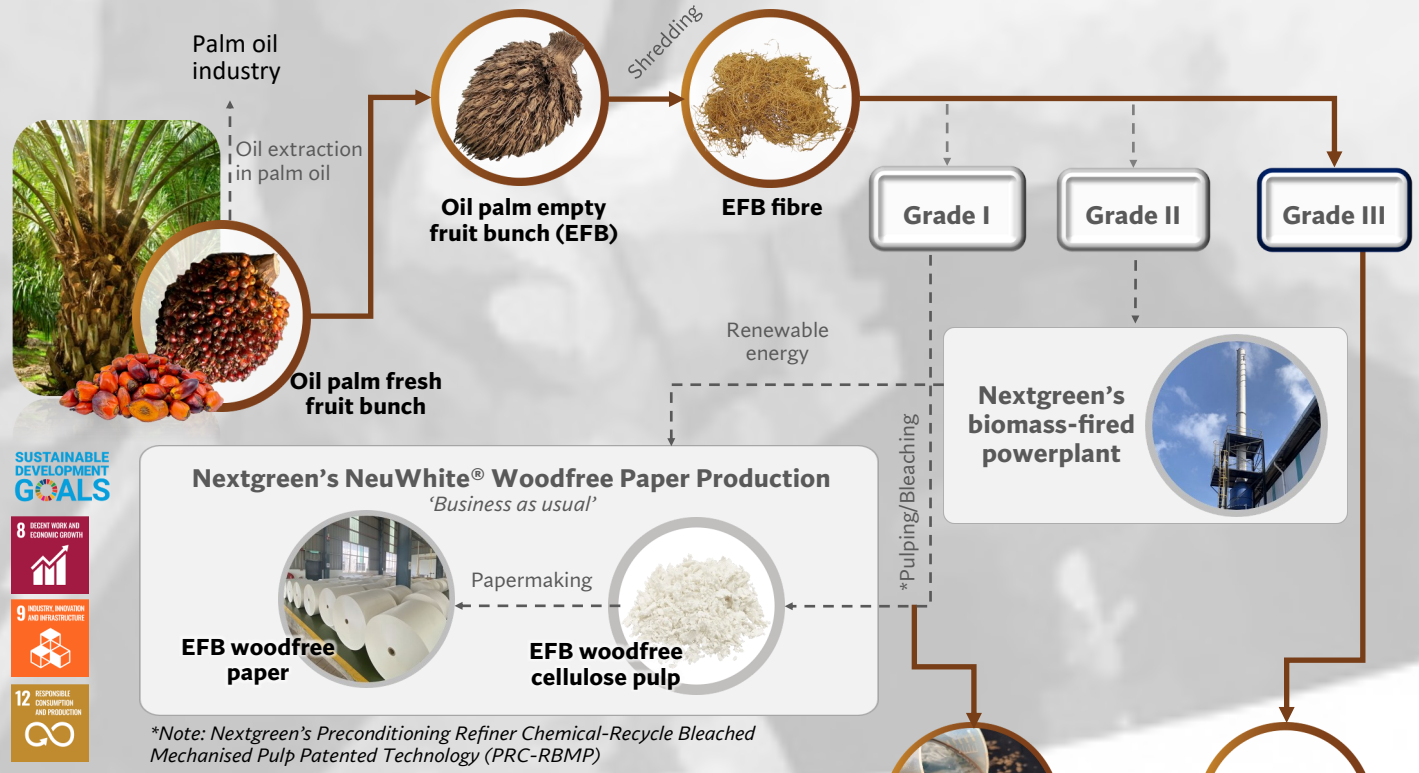
- Creation of business based on **circular economy** & **sustainable green technologies**
- Strengthen the **utilization of renewable resources** through **zero-waste concept**



Nurturing the Future with Biomass

Nextgreen's Biofertilizer for Sustainable Agriculture

Tengku Arisyah Tengku YASIM-ANUAR[1] & Nur Elia Nadhirah MOHD ASMADI[2] & CHIANG Li Shan[2]
[1]Research & Development Department, Nextgreen Global Berhad, [2]Research & Development Department, Nextgreen Fertilizer Sdn. Bhd.



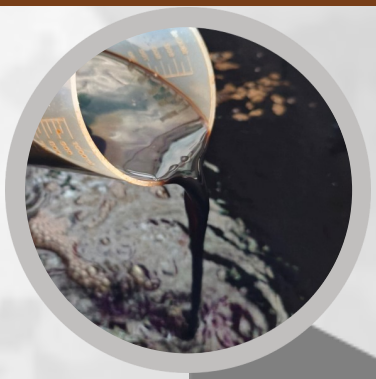
Sustainable agriculture is farming that meets the needs of the present without harming the environment or depleting resources, ensuring future generations can continue to produce food. Its importance lies in protecting ecosystems, preserving soil health, reducing pollution, and ensuring long-term food security for growing populations.

At Nextgreen, we believe that biofertilizers are essential for advancing sustainable agriculture by improving soil health and decreasing dependence on synthetic chemicals. Using biofertilizers can reduce environmental impact by lowering chemical runoff and enhancing long-term soil fertility. This approach aligns with sustainable agricultural practices that aim to maintain productivity while safeguarding ecosystems.

Biofertilizers may also help farmers achieve higher yields, promote healthier soils, reduce greenhouse gas emissions, and support biodiversity. By embracing biofertilizers, agriculture can progress towards a regenerative system that benefits both farmers and the planet.

NexBooster™ & NexCompost®
Nextgreen's Biofertilizer Products

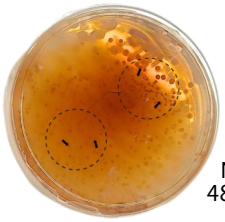
NexBooster™: Feed the Soil, Boost the Plant



NexBooster's main ingredient, **Recovered Pulp Solution Residue**, contains **elements similar to commercial fulvic acid** extracted from leonardite (a non-renewable material), including lignin, pectin, and hemicellulose[1].

NexBooster™ acts as a **plant booster**, with the primary function of promoting plant growth and providing additional nutrients to the plants.

***Disclaimer: NexBooster™** is distributed by PELADANG.



Bacteria colonies in plates containing NexBooster™ after 48h, at 80°C.

NexBooster™ demonstrates impressive bacterial growth even under extreme conditions, sustaining activity at temperatures as high as 100°C.

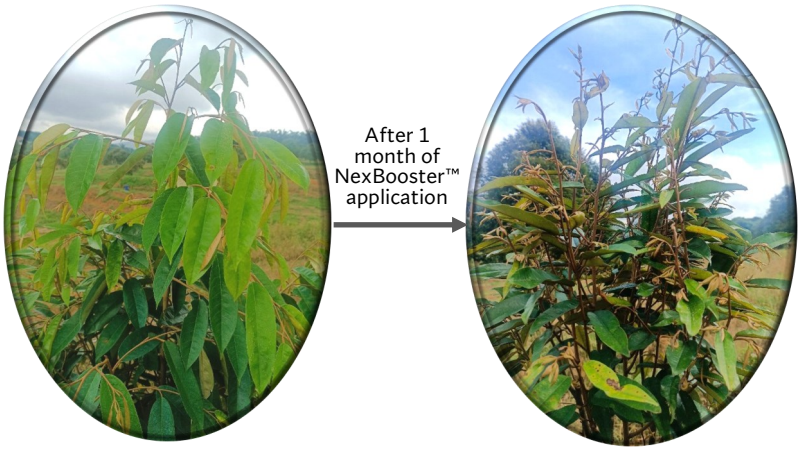
NexBooster™ contains ***Bacillus* spp.** as one of its effective microorganisms.

Bacillus spp. spores enhance soil health and promote plant growth by germinating under favorable conditions, thereby **improving nutrient availability in fertilizer**[2].

NexBooster™ Application on Durian

Melaka: 1 Year of NexBooster™ Application

Objective: To test the efficiency of NexBooster™ on durian trees



Sources:
1. Wang, Z. et al. (2020). *Journal of Cleaner Production*, 243, 118585.
2. Mahapatra, S. et al. (2022). *Journal of Applied Microbiology*, 132(5), 3543–3562.

NexBooster™ Application on Paddy

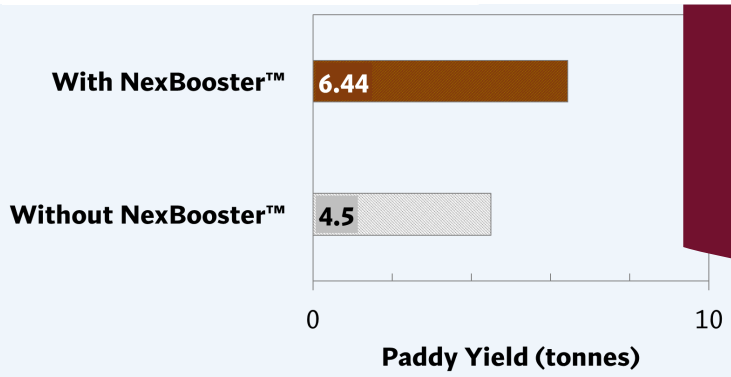
Seberang Perak, Perak (Season 1): Day 110 of NexBooster™ application

Objective: To evaluate the effectiveness of NexBooster™ as a supplemental semi-organic liquid fertilizer on paddy (variety: MR315).

✗ Without NexBooster™ ✓ With NexBooster™

Paddy treated with NexBooster™ shows **faster plant growth**, particularly **root development**, compared to untreated paddy.

Paddy treated with NexBooster™ **outperformed** the control plants in **overall growth performance** from Day 40 to Day 110 (harvest day).



43% increased in yield*

*compared to the control (without NexBooster™ application)

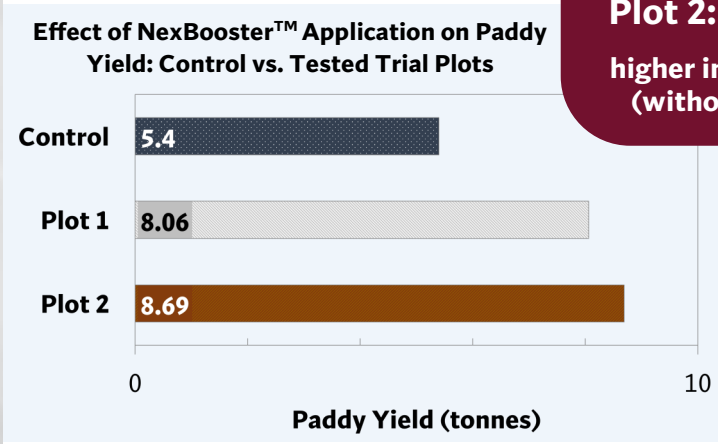
Sekinchan, Selangor (Season 1): Day 107 of NexBooster™ application

Objective: To evaluate the effectiveness of NexBooster™ as a supplemental semi-organic liquid fertilizer on paddy (variety: MR297).

Bulky & longer roots

More paddy internodes

Bigger stems



Plot 1: **49%**

Plot 2: **61%**

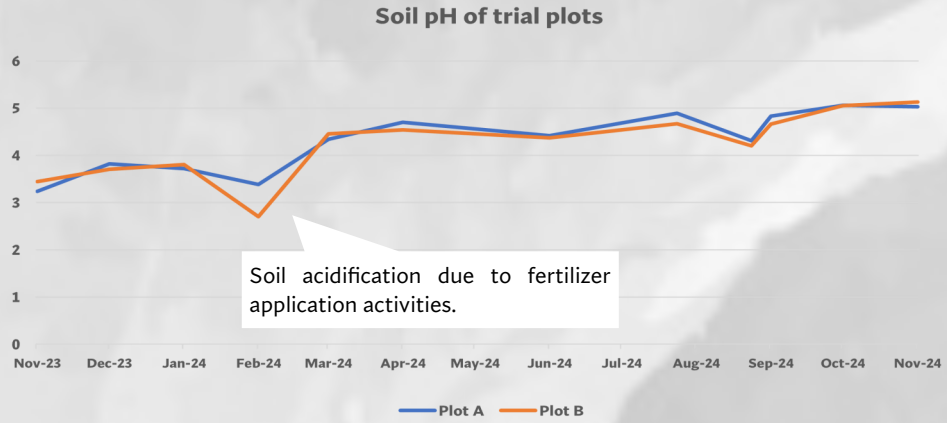
higher in yield than control (without NexBooster™)

**Data of control plot is provided by Integrated Agriculture Development Area (IADA) Barat Laut, Selangor*

NexBooster™ Application on Oil Palm Plantation

Pekan, Pahang: 1 Year of NexBooster™ Application

Objective: To evaluate the effectiveness of NexBooster™ in enhancing soil pH in oil palm plantations



The optimum pH range for the growth of oil palm tree is pH 4.0 to pH 5.5[1]. Soil pH appears to be increasing and approaching pH 5 after 12 months of NexBooster™ application on the trial plot. This increment proves the effectiveness of NexBooster™ in enhancing the soil pH.

NexBooster™ Application on Bok Choy

Paloh Hinai, Pahang: 1 Month of NexBooster™ Application

Objective: To determine the heavy metal content in NexBooster™ treated Bok Choy

LIST OF HEAVY METALS	VALUES OF HEAVY METALS (mg/kg)	MAXIMUM PERMISSIBLE VALUES OF HEAVY METALS/ METAL CONTAMINANT (mg/kg)	
	In Bok Choy treated with NexBooster™	In vegetables	In vegetable product and fruit product
	Skim Akreditasi Makmal Malaysia (SAMM) No. 900	Food and Agriculture Organization (FAO)/ World Health Organization (WHO) of the United Nations[2]	Food Regulations 1985, Regulation 38, Fourteenth Schedule [Am.PU.(A) 162/88]
Lead (Pb)	ND (<0.002)	0.3	2
Arsenic (As)	ND (<0.002)	-	1
Cobalt (Co)	ND (<0.002)	-	-
Cadmium (Cd)	ND (<0.002)	0.2	1
Mercury (Hg)	ND (<0.01)	-	0.05
Nickel (Ni)	0.005	67.9	-
Chromium (Cr)	0.005	-	-
Copper (Cu)	0.06	73.3	-
Iron (Fe)	1.46	425.5	-
Zinc (Zn)	1.52	99.4	-

NexBooster™-treated Bok Choy complies with the **FAO/WHO** and **Malaysia Food Regulation 1985**, guaranteeing it is **safe for consumption**.

Sources:
1. Applied Agricultural Resources. (n.d). *Changes in soil properties: Conclusions.* https://aarsb.com.my/category/agro-management/oil-palm/page/4
2. Mensah, E. et al. (2009). Appropriate Technologies for Environmental Protection in the Developing World: Selected Papers from ERTEP 2007, July 17–19 2007, Ghana, Africa, 9-14.

NexCompost®: Feed the Soil, Boost the Plant

Multi-purpose organic soil conditioner

Increase soil aeration

Improve soil structure

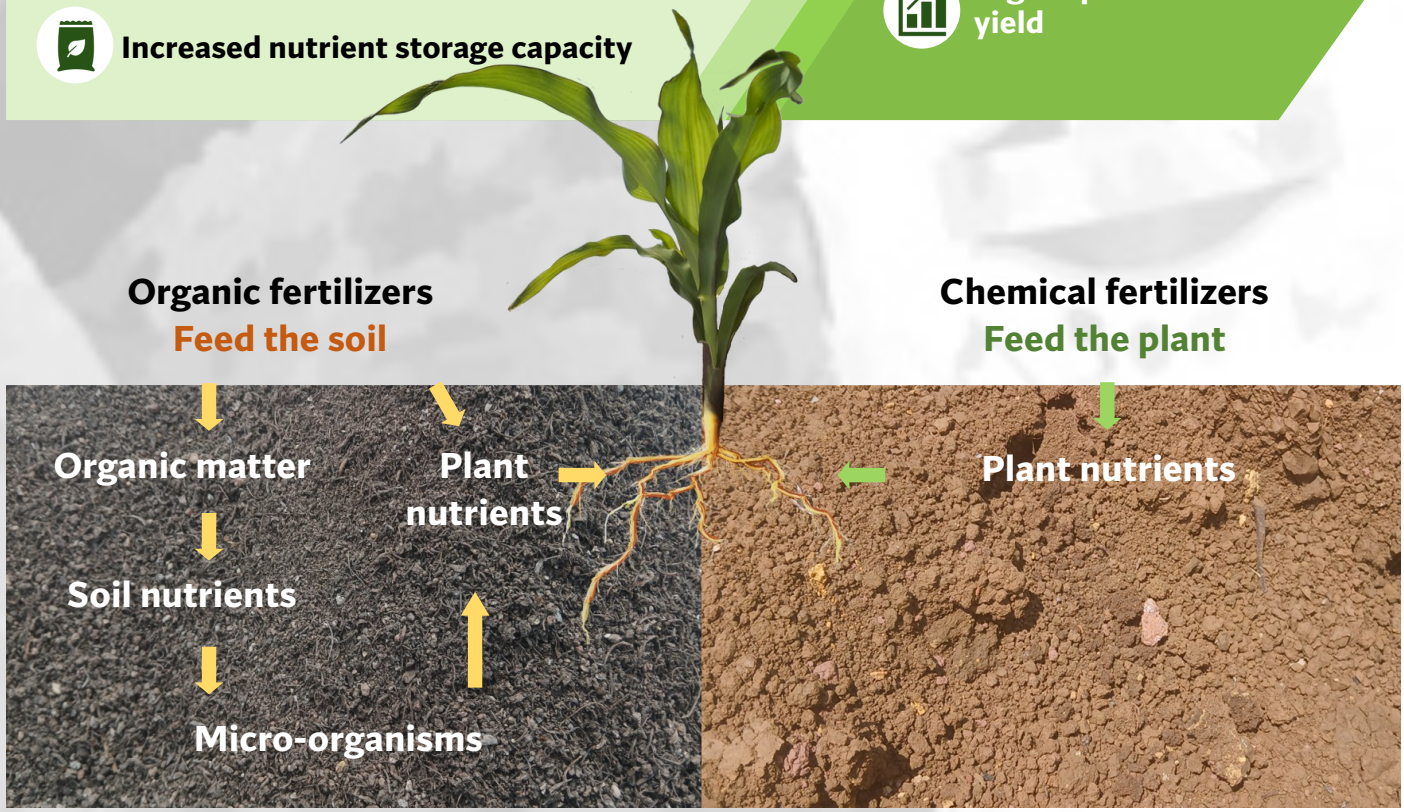
Improve water holding capacity

NexCompost®

- Increase microorganism activity in soil
- Improve soil physiochemical & biological properties
- Increased nutrient storage capacity

Results in

- Improve growth characteristics of plant
- Higher performance & yield



Comparison of organic fertilizer and chemical fertilizer

Source: Amiri, M.B. et al. (2022). *Scientific Reports*. 12 (1), 1881

Mapping Our Footprint:

A Commitment To The Planet

Carbon Footprint Assessment, Verification & Certification For Empty Fruit Bunches-Based Products

Tengku Arisyah Tengku YASIM-ANUAR & Hazwani HUSIN
Research & Development Department, Nextgreen Global Berhad

As part of Nextgreen's commitment to sustainability, we have implemented a carbon footprint (CFP) assessment for our EFB-based products, in accordance with the internationally recognized ISO 14067:2018 standard for quantifying and reporting greenhouse gas (GHG) emissions throughout the product life cycle.

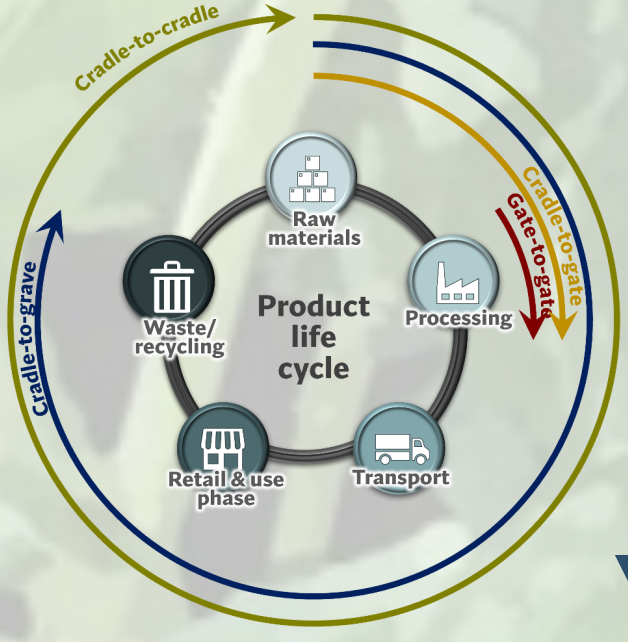
This standard provides a transparent framework for calculating carbon emissions in CO_2 equivalents across all stages — from raw material extraction to production, transportation, and usage.

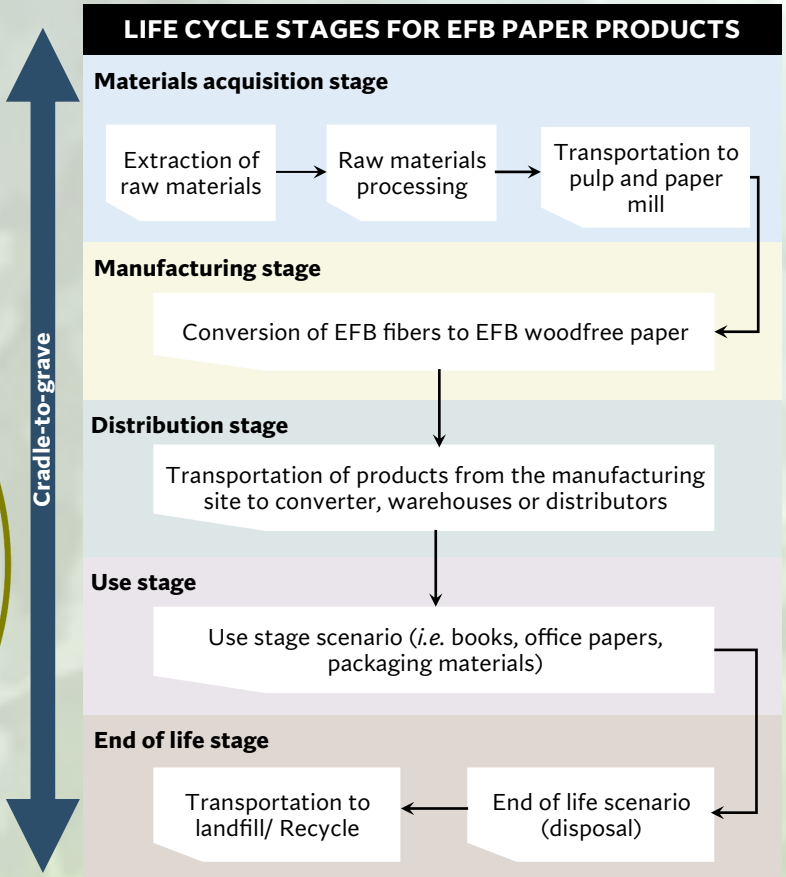
This approach ensures accurate and transparent CFP calculations, offering a clear view of our products' environmental impact. It allows us to identify key areas for improvement, implement emission reduction strategies, and stay compliant with evolving environmental regulations.

The CFP assessment underscores our commitment to environmental accountability, reinforces our role as a sustainability leader, and builds trust with stakeholders.

Product Life Cycle Assessment & CFP Quantification

Life Cycle Assessment (LCA) is the compilation and evaluation of the inputs, outputs, and potential environmental impacts of a product system or process, considering the entire life cycle[1].





Strategic Importance of CFP

REGULATORY LANDSCAPE

As environmental regulations tighten, proactively assessing and reporting carbon emissions ensures Nextgreen stays compliant with current and future requirements. This reduces non-compliance risk, enhances credibility, and enables the company to adapt to regulatory shifts, avoiding penalties and aligning with best practices.

MARKET RELEVANCE

As climate change awareness grows, the demand for Malaysian companies to report carbon emissions increases. Stakeholders value sustainability and transparency, and by adopting transparent CFP reporting, Nextgreen strengthens its position as a sustainability leader, boosting market relevance and competitiveness.

STRATEGIC PLANNING

Understanding the CFP of our products enables Nextgreen to identify opportunities for operational efficiencies and cost savings. By analyzing key emission sources across our product lifecycle, we can develop strategies to reduce environmental impact, optimize resource use, and enhance sustainability.

CORPORATE RESPONSIBILITY

The CFP assessment reflects Nextgreen's commitment to environmental stewardship. Transparent carbon reporting builds stakeholder trust, strengthens our brand reputation, and supports our broader sustainability goals, fulfilling our responsibility to the environment and society.

Current Progress of CFP-Based Products

Current Status

Nextgreen is in the data collection phase, gathering key information for the LCA of EFB-based products, which is essential for an accurate and comprehensive CFP assessment.

Future Action

The next phase will focus on generating the CFP report to confirm our product's carbon footprint. Future updates will share a detailed report with findings and planned actions based on the assessment.

Comparison of Product CFP and Corporate GHG Accounting

Metric	Product CFP	Corporate GHG accounting
Description	Measures how much **CO_2** equivalents were generated in the **life cycle** of **a product**.	Measures sum of **all** product carbon footprints and the additional **CO_2** emissions of an **organization**.
Scope	**Product** or service **life cycle**	Direct operations and/or an organizations **entire value chain**
Standards	**ISO 14067:2018** Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification[2]	**ISO 14064-1:2018** Greenhouse gases — Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals[3]

Sources:
1. Lena Nickel. (2024, July 15). *Cradle-to-grave in LCA: What is it & how does it work?* Ecochain. (https://ecochain.com/knowledge/cradle-to-grave-in-lca/
2. International Organization for Standardization. (2018). *Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification.* (ISO Standard No. 14067:2018). https://www.iso.org/standard/71206.html
3. Dea Marovic. (2023, March 1). *Corporate Carbon Footprint and product carbon footprints.* https://s-peers.com/en/wiki/corporate-carbon-footprint-product-carbon-footprint/#23_definition_product_carbon_footprint_und_corporate_carbon_footprint

Carbon Return, Clean Getaway

Evaluating the Biodegradability of Commercial Wood-Free Packaging

Tengku Arisyah Tengku YASIM-ANUAR & Hazwani HUSIN
Research & Development Department, Nextgreen Global Berhad

This study evaluates the biodegradation performance of packaging materials derived from EFB combined with nanocellulose (EFB + nanocellulose-based packaging), comparing their effectiveness to conventional commercial packaging options.

This research promotes sustainable packaging solutions by leveraging agricultural residues, specifically EFB, and integrating natural additives like nanocellulose, offering significant potential to reduce waste and minimize environmental impact.

Aligned with SDG 9 (Industry, Innovation, and Infrastructure) and SDG 12 (Responsible Consumption and Production), the study emphasizes the role of bio-based packaging in promoting circular economy practices.

Replacing traditional materials with renewable, fast-degrading alternatives, EFB + nanocellulose-based packaging reduces reliance on non-renewable resources and promotes responsible consumption and production in the packaging industry.

SDGs Impact

Innovation in Sustainable Packaging

The development of EFB + nanocellulose-based packaging marks a breakthrough in sustainable materials, offering an alternative to petroleum-based, slow-degrading packaging.

Advancing Circular Economy Practices

Biodegradable packaging encourages a transition to circular production models, reduces waste, and decreases reliance on non-renewable resources.

Resource Efficiency

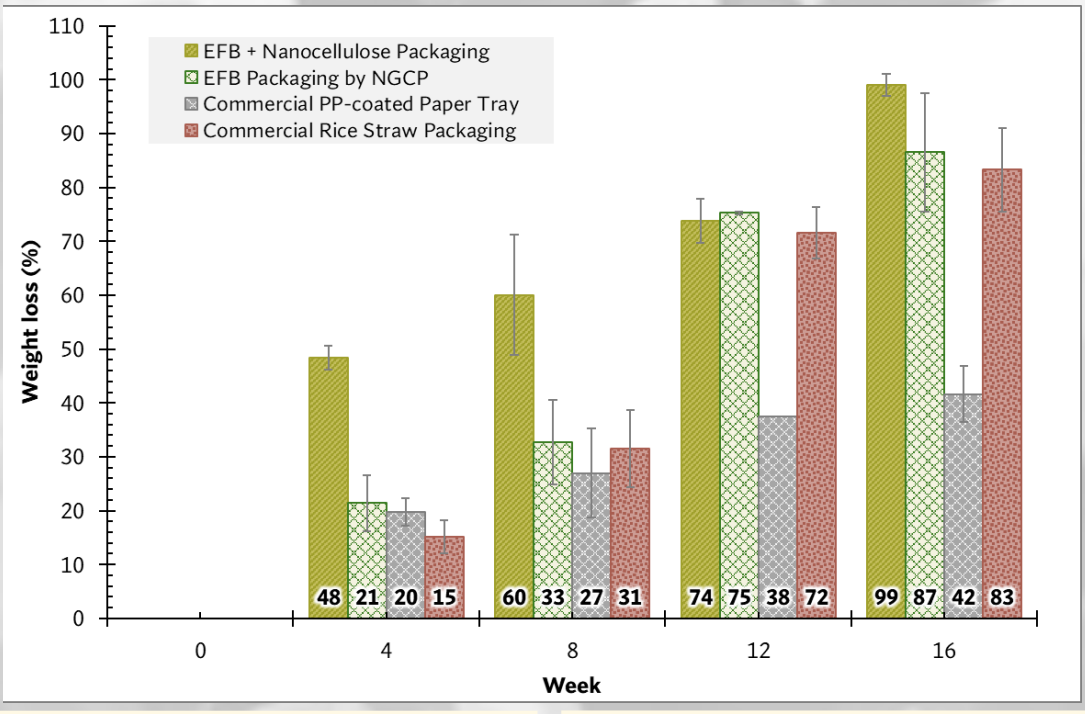
Repurposing agricultural residues, such as EFB, and incorporating natural additives like nanocellulose to create biodegradable packaging promote waste valorization and reduce reliance on virgin raw materials.

Minimizing Environmental Impact

The high biodegradability of EFB + nanocellulose-based packaging helps decrease waste accumulation, alleviate landfill pressure, and support carbon return through natural decomposition.

KEY FINDINGS

WEIGHT LOSS (%) COMPARISONS OF DIFFERENT PACKAGING MATERIALS OVER TIME (WEEK)



Biodegradation Performance

The experimental **EFB + nanocellulose** packaging showed a **99% weight loss** in **16 weeks**, with a **9.1% average degradation rate**, outperforming commercial alternatives in biodegradability.

Conventional materials like Polypropylene (PP) - coated paper trays (42%) and commercial rice straw packaging (83%) degraded more slowly, highlighting their environmental burden.

Role of Nanocellulose

Incorporating nanocellulose into EFB packaging **not only increase tensile strength, tear index, folding capacity, and oil resistance**, but also significantly **improved its degradation rate**, making it a viable option for sustainable, high-performance packaging.

BIODEGRADATION RATE COMPARISONS OF DIFFERENT PACKAGING MATERIALS PER WEEK

	Retrieved packaging sample	Average degradation per week (%)
EFB + Nanocellulose Packaging		9.1
EFB Packaging by NGCP*		5.5
Commercial PP-coated Paper Tray		4.4
Commercial Rice Straw Packaging		4.7

*__NGCP__ stands for **Nextgreen Crowning Package Pulp Molding Sdn Bhd.**, a collaborative effort between Nextgreen Global Berhad and Crown Package Co., Ltd.

Leveraging
The Value of Oil Palm Biomass
Evaluating Empty Fruit Bunches and Oil Palm Fronds Blend Ratios for Sustainable Paper Production

Tengku Arisyah Tengku YASIM-ANUAR & Nur Huda Syazwani JAFRI & Hazwani HUSIN
Research & Development Department, Nextgreen Global Berhad

The study explores sustainable alternatives in paper manufacturing by optimizing the use of two oil palm by-products — EFB and OPF. It aims to determine the ideal blend ratios for producing high-quality paper, reducing reliance on wood pulp, and mitigating deforestation. This approach seeks to promote eco-friendly manufacturing practices aligned with sustainability goals.

Inspired by the upcoming establishment of Nextgreen's Biomass Hub, which will boost biomass availability, the study highlights the potential to repurpose materials like fronds, trunks, and EFB into valuable products. This initiative replaces traditional methods like open burning and landfill disposal, tackling environmental issues such as pollution and greenhouse gas emissions.

Repurposing EFB and OPF for paper production supports sustainable resource management and a circular economy, transforming agricultural residues into valuable resources for environmental and socio-economic sustainability.

Advantages of Using Oil Palm Biomass (EFB and OPF) for Paper Production

Reduced Chemical Use and Energy Efficient

- *Uses fewer chemicals and less energy in pulping, reducing costs and pollution.*

Versatile in Manufacturing

- *Oil palm biomass can be processed into various paper types, from packaging to printing, offering production versatility.*

Enhanced Biodegradability

- *Paper from oil palm biomass is more biodegradable than conventional papers, reducing waste and speeding decomposition.*

High Fiber Content

- *EFB and OPF, rich in cellulose fibers, provide strength and durability for paper products.*

Environmental Benefits

- *Using agricultural residues reduces wood demand, curbs deforestation, and minimizes landfill waste and greenhouse gas emissions.*

Chemical Composition in Oil Palm Biomass

Oil Palm Biomass	Cellulose (%)	Holocellulose (%)	Hemicellulose (%)	Lignin (%)
Oil palm empty fruit bunches	43-65	68-86	17-33	13-37
Oil palm kernel shell	27-35	40-47	15-19	48-55
Oil palm mesocarp fibre	43-44	70-71	33-35	22-24
Oil palm frond	40-50	80-83	34-38	20-21
Oil palm trunk	29-37	42-45	12-17	18-23

Source: Maluin, F. N. et al. (2020). *Agronomy*, 10(3), 356.

Proposed Nextgreen's Biomass Hub in Malaysia

Overview of Nextgreen's Biomass Hub

Nextgreen's Biomass Hub model, highlighted in Chapter 7 of the National Biomass Action Plan 2023-2030, is a pioneering example of setting up a biomass hub in Malaysia. As the first of its kind globally, the Biomass Hub aims to collect and process oil palm biomass, especially EFB.

Nextgreen plans to establish 20 Biomass Hubs across Malaysia, strategically located within a 25 km to 100 km radius of oil palm plantations and mills.

This strategic placement takes advantage of the biomass clusters identified in the Sustainable Energy Development Authority's (SEDA) Malaysia Renewable Energy Roadmap (MyRER) 2035, ensuring efficient and cost-effective transportation of biomass.

Recognized for its leadership in sustainable practices and green technologies, Nextgreen's Biomass Hub model sets a benchmark for innovative biomass solutions in Malaysia.

Yearly Availability of Different Types of Oil Palm Biomass

Oil Palm Biomass	Production Site	Estimated Biomass in 2022 (tonnes)
Oil palm empty fruit bunches	Mill	20,859,180 [1]
Oil palm mesocarp fibre	Mill	12,799,952 [1]
Oil palm kernel shells	Mill	5,214,795 [1]
Palm kernel cake	Mill	2,355,983 [2]
Palm oil mill effluent	Mill	63,525,686 [1]
Oil palm frond	Plantation	59,593,762 [1]
Oil palm trunk	Plantation	10,548,826 [1]

Nextgreen Goals for Biomass Hub

Sustainable Transportation

By centralizing oil palm waste collection, the Biomass Hubs lower greenhouse gas emissions and promote a more efficient transportation system, making raw material transport more cost-effective.

Social Benefits

Biomass Hubs create social benefits by generating local employment, promoting decent work, and improving access to education.

Enhance Infrastructure

Biomass Hubs are essential for upgrading local industries and enhancing infrastructure and transportation systems, which improve the well-being of surrounding residents.

Create green products

Nextgreen aims to convert the collected biomass into commercializable green products such as paper, fertilizers, animal feed, and bioenergy.

Sources:
1. Ministry of Plantation and Commodities. (2023). *National biomass action plan 2023-2030.* Ministry of Plantation and Commodities.
2. Ministry of Plantation and Commodities (2023) Data Statistics on Commodities 2022 Palm Oil. Ministry of Plantation and Commodities.

Research Partners

Universiti Putra Malaysia (UPM)

Nextgreen is committed to the UPM CEO @ PTJ Program, which connects industry leaders with students and the university community to share knowledge and expertise. In close collaboration with the Faculty of Biotechnology and Biomolecular Sciences, Nextgreen participates in various activities, including joint research initiatives, to advance industry-relevant knowledge. The company also provides industrial training opportunities, industry-focused talks, and site tours to nurture local talent, fostering the development of future industry-ready leaders and experts. As a key partner, Nextgreen is proud to sponsor the Majlis Anugerah Pelajar Cemerlang, Pemakaian Hood Graduan PhD & Biotech Star 2024, organized by the Faculty of Biotechnology and Biomolecular Sciences, UPM.

Universiti Teknologi Malaysia (UTM)

Nextgreen's collaboration with UTM includes various initiatives, such as industrial training opportunities and industry visits. This partnership aims to facilitate knowledge exchange and strengthen students' practical skills, preparing them for real-world challenges.

Universiti Malaysia Pahang Al-Sultan Abdullah (UMPSA)

Nextgreen's ongoing partnership with UMPSA includes various initiatives, such as industrial training, matched funding, and industry -focused talks. Additionally, UMPSA supports Nextgreen's R&D efforts by providing laboratory testing services, further strengthening the collaboration.

Universiti Teknologi Petronas (UTP)

Nextgreen and UTP have embarked on a five-year collaboration under an MoU to advance educational and sustainable development initiatives. This partnership includes academic research, joint publications, mobility programs for students and staff, and industrial visits, fostering knowledge exchange in science, technology, and innovation while nurturing young talent for a more sustainable future.

& Collaborators

Taylor's University

Nextgreen and Taylor's University have partnered through an MoU to strengthen education-industry collaboration, with a focus on talent development, research innovation, and sustainable growth. This partnership includes industry-focused talks and visits, making Taylor's University the first private institution to collaborate with Nextgreen. Together, we are committed to fostering innovation, excellence, and a shared vision for a sustainable future.

Bioeconomy Corporation

Through our collaboration with Bioeconomy Corporation, Nextgreen accelerates its business growth by securing vital government funding for R&D initiatives. Bioeconomy Corporation further strengthens this partnership by facilitating connections with key government bodies and industry players, creating a supportive ecosystem for bio-based projects.

Department of Agriculture (DOA) Malaysia

Nextgreen is collaborating with the Department of Agriculture (DOA) to conduct trials of Nextgreen's biofertilizer, assessing its effectiveness and benefits across a range of plant species. This partnership aims to validate and optimize the biofertilizer's impact on plant growth and productivity.

National Farmers' Organization (NAFAS)

NAFAS provides consultation to Nextgreen on fertilizer development and production, as well as on the trials and application processes for Nextgreen's biofertilizer.

SIRIM QAS International Sdn. Bhd.

Nextgreen obtains technical expertise and certification from SIRIM QAS International Sdn. Bhd. to secure verification of our company's processes and products, ensuring compliance with both regional and global standards.

EVENTS & AFFAIRS

JANUARY 2024

30th January 2024
Training workshop, "How to Work with Bosses, Customers, Peers, and Subordinates" at Nextgreen Global Berhad, Kuala Lumpur

31st January 2024
Nextgreen's R&D Team visit to Universiti Pertahanan Nasional Malaysia (UPNM) at Sungai Besi Camp, Kuala Lumpur

FEBRUARY 2024

21st February 2024
A visit by researchers from PETRONAS Chemicals Group Berhad and Petronas Research Sdn. Bhd. to GTP Pekan, Pahang

21st February 2024
A visit by researchers from Universiti Malaysia Pahang Al-Sultan Abdullah (UMPSA) to GTP Pekan, Pahang

Events & Affairs cont...

MARCH 2024

1st – 3rd March 2024
Participation in the Pakar Pertanian Expo 2024 at the Malaysia Agro Exposition Park Serdang (MAEPS), Selangor


7th March 2024
SIRIM QAS International Sdn. Bhd. audit for SIRIM Eco Labelling 009:2019 of NeuWhite® EFB Pulp Slurry and EFB Pulp Sheet


APRIL 2024

1st – 2nd April 2024
Nextgreen Pulp & Paper (NGPP) Basic Lab Skills Training at GTP Pekan, Pahang


22nd April 2024
A visit by lecturers and students from Institut Latihan Perindustrian (ILP) Kuantan to GTP Pekan, Pahang

24th – 25th April 2024
Nextgreen's R&D representatives participated as judges in the Defense, Security, and Sustainability Exhibition 2024


Events & Affairs cont...

MAY 2024

16th – 18th May 2024
Participation in the 35th International Invention, Innovation, Technology Exhibition & Competition (ITEX 2024) at the Kuala Lumpur Convention Centre (KLCC)

23rd May 2024
Reappointment of Nextgreen Global Berhad's Managing Director as CEO @ Faculty of Biotechnology & Biomolecular Sciences (FBSB), Universiti Putra Malaysia (UPM)

JUNE 2024

7th June 2024
MOU signing between Nextgreen Global Berhad and Universiti Teknologi PETRONAS (UTP) delegates

10th June 2024
Industrial talk session at Centre for Advanced Intelligent Materials, UMPSA

11th June 2024
A visit by delegates from UPNM to GTP Pekan, Pahang

Events & Affairs cont...

26th June 2024
ISO & Sustainability (Embarking ESG Journey with SIRIM Academy) at SIRIM Pahang

JULY 2024

2nd July 2024
Inspiring Future Engineers: Nextgreen Global's Circular Economy Lecture at Taylor's University

15th July 2024 – 4th October 2024
Industrial training of Universiti Teknologi Malaysia (UTM) students at GTP Pekan, Pahang

17th July 2024
Participation in the National Bioeconomy Showcase (NBiOSHOWCASE) 2024 at World Trade Centre (WTC) Kuala Lumpur

AUGUST 2024

8th August 2024
A visit by UTP researchers to GTP Pekan, Pahang

Events & Affairs cont...

SEPTEMBER 2024

2nd September 2024 – 14th February 2025
Industrial training of UMPSA student at GTP Pekan, Pahang

11th – 22nd September 2024
Participation in the Malaysia Agriculture Horticulture & Agrotourism Show (MAHA) 2024 at MAEPS, Serdang

12th September 2024
A visit by UPNM researchers to GTP Pekan, Pahang

23rd – 24th September 2024
Participation in the Nextgreen Knowledge Fair at GTP Pekan, Pahang

26th – 28th September 2024
Participation in the 7th Malaysia International Agriculture Technology Exhibition (AGRI® Malaysia) 2024 at Setia City Convention Centre (SCCC), Selangor

OCTOBER 2024

9th – 11th October 2024
Participation in the International Greentech & Eco Products Exhibitions and Conference Malaysia (iGEM) 2024 at KLCC, Kuala Lumpur

17th October 2024
A visit by registered engineers from the Institution of Engineers, Malaysia (IEM) visit to GTP Pekan, Pahang

26th October 2024
"All-in-one Organic Biofertilizer for Sustainable Crop Care" talk at NONGYEH SHOP, Jementah, Johor

29th October 2024
Continuous Agricultural Education session with members of Pertubuhan Peladang Negeri (PPN) Perak at Ipoh, Perak

Events & Affairs cont...

NOVEMBER 2024

6th November 2024
Organizational Carbon Footprint Assessment: Half-Day Workshop for Nextgreen Global Berhad by Eco Thinkers Solutions, Malaysia

DECEMBER 2024

3rd December 2024
Nextgreen sponsored the Majlis Anugerah Pelajar Cemerlang, Pemakaian Hood Graduan PhD & Biotech Star 2024, organized by the Faculty of Biotechnology and Biomolecular Sciences, UPM

11th December 2024
Guardian Independent Certification Ltd audit for ISO 9001 & ISO 14001 of pulp and paper manufacturing.

THROUGHOUT 2024

Consultation provided by Novo Quality Services (M) Sdn. Bhd. (NQS) to Nextgreen Pulp & Paper Sdn. Bhd. on:

- ISO 9001 Quality Management Systems
- ISO 14001 Environmental Management Systems

RECOGNITIONS

35TH INTERNATIONAL INVENTION, INNOVATION, TECHNOLOGY COMPETITION AND EXHIBITION 2024 (ITEX 2024)
INVENTION & DESIGN COMPETITION GOLD MEDAL AWARDS

Gold Medal Awards:

- Preconditioning Refiner Chemical-Recycle Bleached Mechanised Pulp (PRC-RBMP) Technology for Oil Palm Fibre-Pulp Production
- Biofertilizer from Empty Fruit Bunch Biomass and Pulping Liquor for Circular Economy

FORWARD FASTER SUSTAINABILITY AWARDS 2024
PARTNERSHIP FOR THE GOALS RECOGNITION

by UN Global Compact Network Malaysia & Brunei (UNGCMYB)

highlighting Nextgreen's dedication to fostering Partnerships for the Goals in alignment with United Nations Sustainable Development Goal 17.

Recognitions cont...

Trademark of NexBooster™, NexCompost® and NexFeed™

Trademark No: TM2024001562

Trademark No: TM2024001563

Trademark No: TM2024037836

ECO 009 : 2019 Certification

SIRIM
ECO-LABEL
BIODEGRADABLE
Certified to: SIRIM ECO 009 : 2019
Certification number: EL000327

SIRIM ECO 009:2019 certification **by SIRIM QAS International** for:

- NeuWhite® EFB Pulp Slurry
- NeuWhite® EFB Pulp Sheet

Eco-labelling claim:
Biodegradable Biomass Product
Certification Number: EL000327

Produk Malaysia Certification

PRODUK MALAYSIA

Produk Malaysia certification **by Ministry of Domestic Trade and Cost of Living** for:

- NeuWhite® EFB bleached pulp
- NeuWhite® EFB bleached paper

Serial no.: KPDN/LBM/2024/1532-17093

MyHIJAU Certification

MALAYSIA
MyHIJAU
MyHP00559/24

MyHIJAU certification **by Malaysian Green Technology & Climate Change Corporation (MGTC)** for:

- NeuWhite® EFB Pulp Slurry
- NeuWhite® EFB Pulp Sheet

ISO 9001:2015 & ISO 14001:2015 Certification

GICG
ISO 9001:2015
Cert No.: 709323

GICG
ISO 14001:2015
Cert No.: 763237

ISO certification **by Guardian Independent Certification Ltd** for **Manufacture of Pulp and Paper:**

- ISO 9001: 2015 (Certificate No. 709323)
- ISO 14001: 2015 (Certificate No. 763237)

R&D Recap 2024

Events

- **Organized events**
  - ☑ Nextgreen Knowledge Fair
  - ☑ Basic Lab Skill Training Course
- **Participation in exhibitions**
  - ☑ Pakar Pertanian Expo 2024
  - ☑ ITEX 2024
  - ☑ NBiOSHOWCASE 2024
  - ☑ MAHA 2024
  - ☑ Agri® Malaysia 2024
  - ☑ iGEM 2024

Achievements

- **Innovation Awards (ITEX 2024)**
  - ☑ 2 Gold Medal Awards (ITEX 2024)
- **Certification for NeuWhite®**
  - ☑ SIRIM Eco 009:2019
    (NeuWhite® EFB Pulp Slurry and Pulp Sheet)
  - ☑ MyHijau
    (NeuWhite® EFB Pulp Slurry and Pulp Sheet)
  - ☑ Produk Malaysia
    (NeuWhite® EFB Bleached Pulp and Paper)
- **Trademark of NexBooster™, NexCompost® & NexFeed™**
- **ISO 9001:2015 & ISO 14001:2015 Certification**

Completed Projects

- **Internal project**
  - ☑ Development of various NPK formulations of NexCompost®
  - ☑ Trial application of NexBooster™ on Apollo melon
  - ☑ Thermal stability and survival of *Bacillus* spp. in NexBooster™: Survival Rate and Boiling Point Analysis
- **External project**
  - ☑ Field trial application of NexBooster™ on paddy (Seberang Perak & Sekinchan) - Season 1

R&D Projection 2025

EFB Woodfree Pulp and Paper

Carbon foot print (report generation & verification)

Evaluating the biodegradability of commercial wood-free packaging

Leveraging the value of oil palm biomass: Evaluating empty fruit bunches and oil palm fronds blend ratios for sustainable paper production

Collaboration with UPM x BEC: Mass production and life cycle assessment of locally produced advanced bionanomaterials

Field trial application of NexCompost® and NexBooster™ on several crops around Malaysia. The projects include collaboration between Nextgreen with private farmers, government and private agencies.

Biofertilizer

Agrofeed

Evaluating the potential of oil palm biomass as a sustainable animal feed resource

Formulation of animal feed made from biologically treated oil palm biomass for ruminants

Formulation of animal feed using Malaysian local resources for ruminants

Meet the team

RESEARCH & DEVELOPMENT (R&D) DEPARTMENT

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Muhammad Fadhli Haikal Mohammad Jalaludin
R&D Junior Technician

INTERNSHIP TRAINEE

Universiti Teknologi Malaysia (UTM)

Nazlianie Amilia Binti Neu Jan Tan @ Atan
Bachelor of Science Biology with Honours

Nur Zawani Binti Mohammad Arrifin
Bachelor of Engineering (Hons.) Chemical Engineering

15th July 2024 – 4th October 2024

Universiti Malaysia Pahang Al-Sultan Abdullah (UMPSA)

Nurul Atiqah Najiha Binti Khairul Anuar
B. Appl. Sc. (Hons.) Industrial Biotechnology

2nd September 2024 – 14th February 2025

RESEARCH & DEVELOPMENT (R&D) ANNUAL REPORT 2024