FINEX RESEARCH AND DEVELOPMENT FOUNDATION, INC.

FIRST EDITION 2025

# SUSTAINABILITY Handbook

Climate Change

Environmental Awareness

Natural Farming

Good Governance

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# SUSTAINABILITY HANDBOOK

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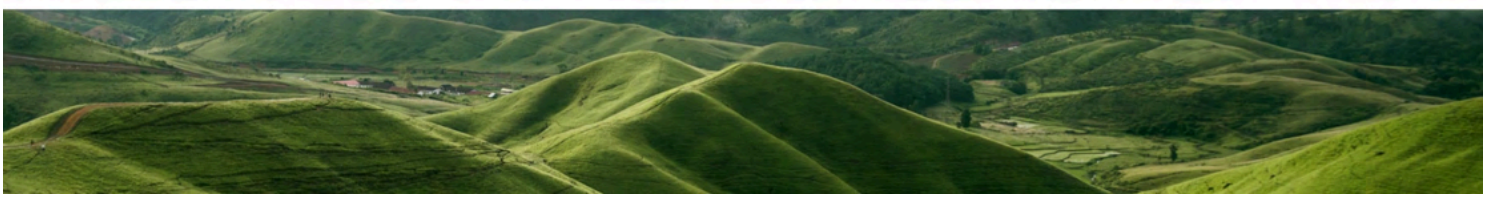

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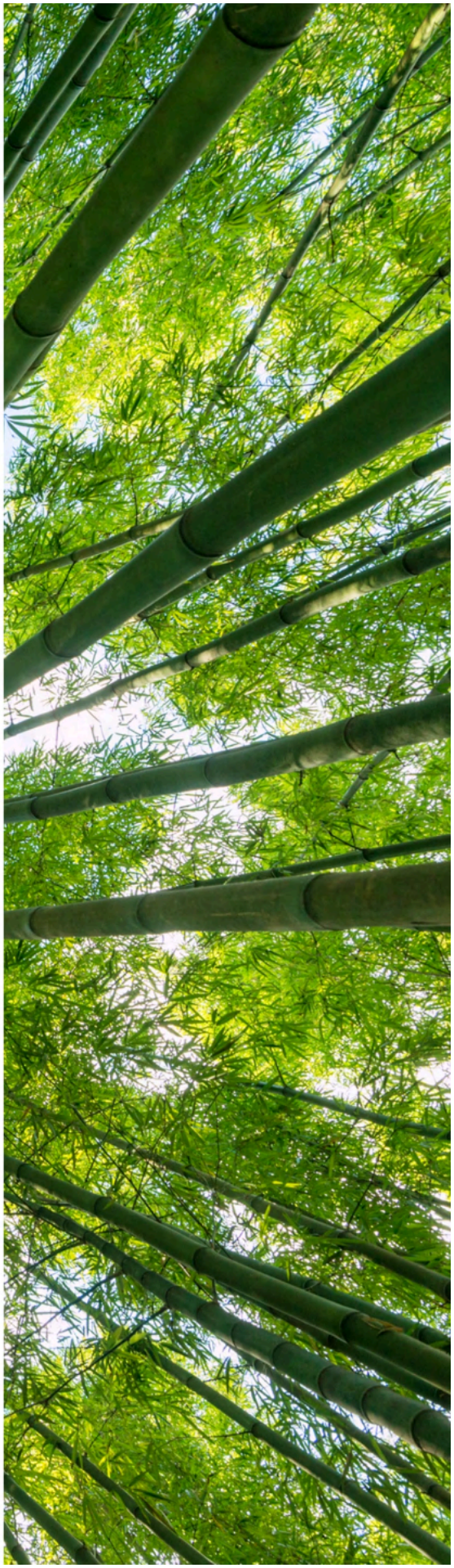


# MESSAGE


**Augusto D. Bengzon**
Chairman, FINEX Foundation


It is with great pleasure that I, on behalf of the FINEX Research and Development Foundation, Inc., commend the development by our Environment Committee of this Sustainability Handbook. This landmark publication is a testament to our Foundation's commitment to enriching knowledge on sustainable solutions and environmental awareness among our members and stakeholders.

As Executives and Chief Finance Officers who steer the most influential organizations in the Philippines, we are at a critical juncture. The integration of sustainability into our core corporate strategy is no longer a peripheral concern. It is a business and national imperative. Companies that embrace Environmental, Social, and Governance (ESG) principles realize compelling positive results: strengthened long-term resilience, enhanced institutional integrity and investor confidence, improved operational efficiency, and the creation of lasting, equitable value for all stakeholders.

This Handbook serves as an invaluable resource to help you embed sustainability principles into your operations, ultimately improving both your company's performance and the environmental stewardship of the Philippines.

I strongly encourage our FINEX members to read, reflect, and embrace the knowledge and lessons contained within these pages. May this Handbook be a transformative experience that sparks actionable steps toward authentic positive change, aligning our commitments to Planet, People, and Profit. Our collective resolve to confront the challenges of environmental degradation defines not only the future of sustainable development but the legacy we choose to build today.

# MESSAGE

**Lynette V. Ortiz**
President, Landbank of the Philippines

Financial institutions play a vital role in shaping a sustainable future. By providing capital and resources, we help businesses and communities adopt practices that reduce climate risks, drive environmental change, and build long-term resilience.

More than stewards of financial growth, financial institutions carry the responsibility of integrating sustainability into their operations and financing decisions.

The topics featured in this Sustainability Handbook remind us that sustainability is a shared responsibility. They highlight how financial institutions can drive meaningful change – by funding green technologies, promoting responsible resource use, and investing in innovations that protect the environment and uplift communities.

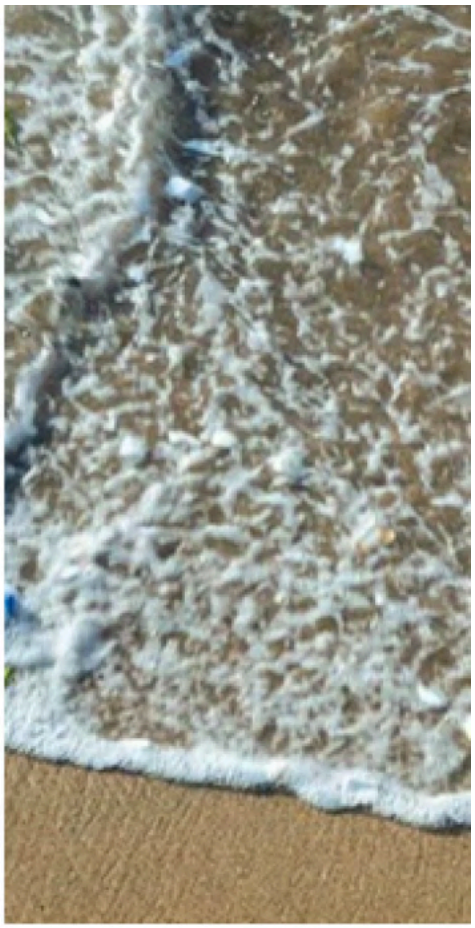
This is a commitment that we, at LANDBANK, fully embrace. Sustainability is embedded in our DNA – from how we manage our resources and operations, to how we design policies, deliver financial services, and finance projects that promote inclusive growth and environmental stewardship.

Through our broad loan portfolio, we continue to advance renewable energy, sustainable agriculture, green technologies, and climate-resilient infrastructure – helping communities, enterprises, and local governments build resilience and adapt to the challenges of climate change.

Beyond financing, financial institutions play a vital role in shaping governance standards that influence how organizations operate and grow. By promoting ethical business conduct, transparent reporting, and responsible risk management, we help strengthen institutional integrity and investor confidence. These practices uphold stability while promoting equitable, sustainable progress.

Together, these principles drive financial institutions to foster a more responsible and resilient economy through strong partnerships that unite business, government, and finance. Our collective resolve to confront the challenges of climate change and environmental degradation defines not only the future of sustainable development but also the lasting legacy we choose to build today.

# FOREWORD



Gaudencio S. Hernandez, Jr.
Chairman, Environment Committee

It is with great pleasure that I write this foreword for FINEX Sustainability Handbook as we continue to embark on this journey of increasing Environmental Awareness. It is important that we contribute to enriching the knowledge on sustainable solutions that align to environmental science, economic policy, and legal frameworks.

This Sustainability Handbook contains value-adding information in line with Natural Farming, Climate Change and Good Governance. We aim to reach out to our beneficiaries, cooperatives, farmers and FINEX members with the hope that this shared knowledge will result in collaborative efforts in creating sustainable solutions across the environmental challenges we are facing today. It is with much expectation that this sparks actionable steps in creating a greener future.

On behalf of the Environment Committee, I would like to thank all the contributors and the sponsors who share this vision. I encourage you to read, reflect, and embrace the knowledge and lessons you will gain. May it be a transformative experience towards authentic positive change in taking care of our planet, people, and profit.

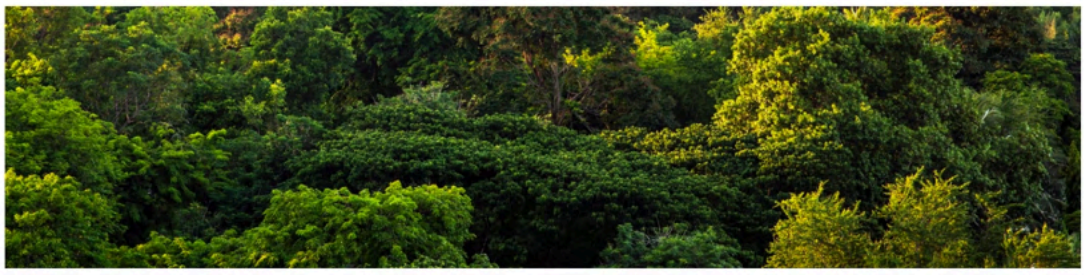
# PREFACE

Florencia G. Tarriela
Liaison Trustee, Environment Committee

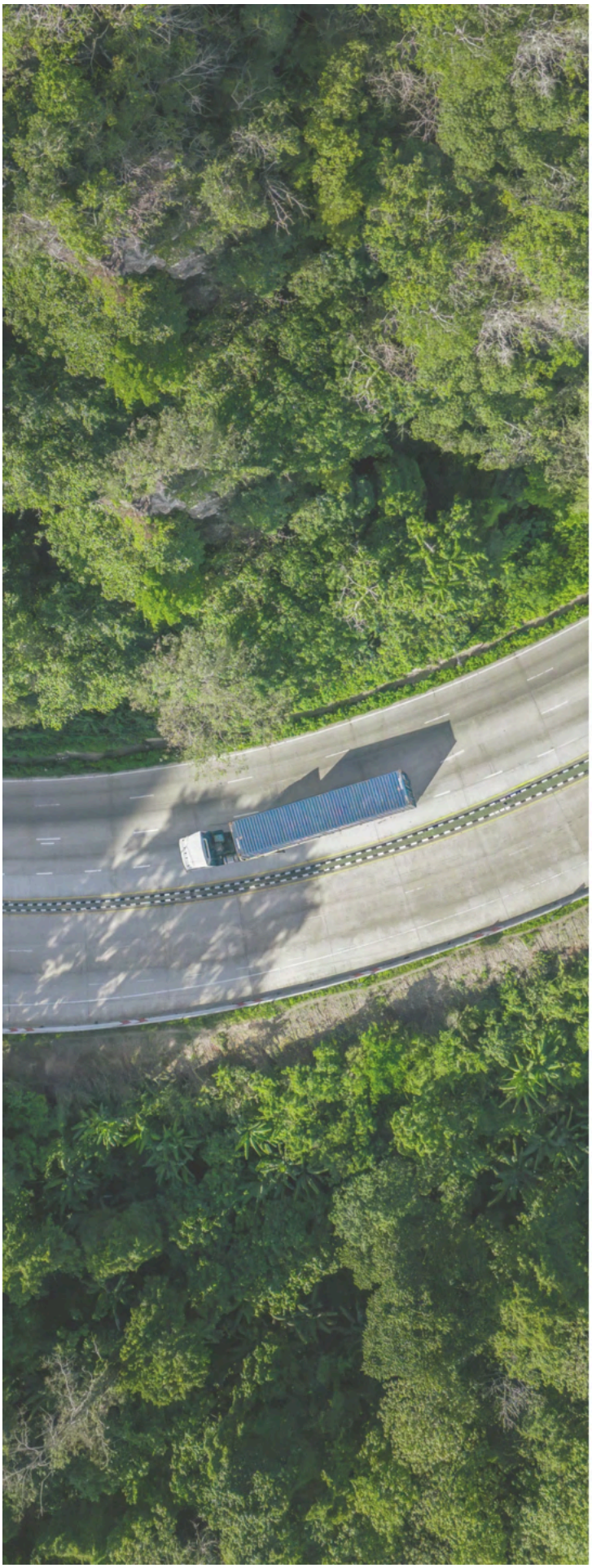
Climate change is real—and it is happening now. Rising temperatures, stronger typhoons, floods, and even volcanic eruptions continue to disrupt lives and livelihoods. These environmental challenges have taken a toll on our agriculture, and with the Philippine population now exceeding 110 million, food availability and security are under increasing threat.

It has been 15 years since the FINEX Foundation Primer on Climate Change and Natural Farming was first published. Since then, new approaches to agriculture have emerged, including low-cost Korean technologies such as JADAM, which follow Nature's own principles. Did you know that the best fertilizer for plants can come from their own leaves? Indeed, God has provided everything we need in nature to sustain our soil, keep our air clean, and maintain our communities' health.

The FINEX Foundation Environment Committee, chaired by Goody Hernandez, recognized the need to update the Primer—expanding it into a Sustainability Handbook. This new edition also introduces the principle of Good Governance, because caring for the Earth goes hand in hand with integrity and accountability.



This Handbook is an invitation to make a difference. Let us care, act, and inspire others to protect our planet. Together, we can build a greener, healthier, and more sustainable future—for ourselves and for generations to come.



# Prologue

## Uniting the World to Promote Sustainability

Wilma I. Miranda
Project Chair
Editor-in-Chief

What we initially planned as just a continuation of the previous climate change and natural farming handbook has evolved into a wider scope which is sustainability.

I was requested by Liaison Director Flor Tarriela to lead this project, which involves developing Volume II of the Handbook on Climate Change and Natural Farming, a document prepared by the Environment Committee years ago. I had been writing about this topic and moderating conferences or technical sessions, which include topics on sustainability, climate change, and environment, and I know this could be another channel to promote my advocacy on this topic and related issues.

I then suggested that, instead of just focusing on environment and natural farming, why not have a handbook on a broader topic, such as sustainability? Thus, FINEX Sustainability Handbook was the final title.

Initially, there were just a few contributors, but I was glad we were able to get more writers to contribute to the focused topics in this handbook.

I had this wrong notion before, which I also shared in one of the newspaper articles I wrote, that only a few really care about sustainability, particularly on climate change.

But I was wrong. In statistics, for instance, on climate change, which I wrote in my article, "89% of the public wanted stronger climate action (weforum.com April 25, 2025), but incorrectly assumed that other people don't support this action, just like my perception. In fact, in another surprising study by Nature Climate Change, it shows that 89% of those who support climate change action do not know that it is the majority because they are the silent majority."

It was noted that the silent majority might have truly cared but is not taking any action at all. This book is our own little way of taking action by promoting awareness not only on climate change, natural farming, environment, governance, but in general – sustainability.

It is a real sharing of views and a sincere desire to spread the need to take care of our planet. The planet may be too big for this small project to really make an impact, but every small step taken is better than nothing at all.

And as individuals, we can contribute in our own little way, however we can and wherever we can, for every single action can make up for a collective effort and can go a long way in inspiring others to do the same.

We hope that this Handbook will not only help our members but also our farmers, our family, and every human being in this world and in all walks of life to move them to contribute and help in every small way they can. We are taking care of our planet now so that future generations will have a better place to live.

Our utmost appreciation to these contributors - **Goody, Flor, Albert, Katrina, Karla, Noemi, Bingo, Elross, and Billie** - for the time and effort spent in writing and helping promote this advocacy to make our readers more responsible in taking care of this only planet we have.

# Climate Change

Science behind Climate Change
The Risks to Climate Change
Increasing Resilience Amidst a Changing Climate

# Understanding Climate Change: Science, Risks and Resilience Strategies

Katrina F. Francisco

## A. The Science Behind Climate Change

### 1. Greenhouse effect

The greenhouse effect is a natural process that warms our planet. It works by trapping heat in the atmosphere, which is essential for keeping Earth habitable. Greenhouse gases, such as carbon dioxide and water vapor, play a key role in this process. They absorb heat from the sun and then re-emit it in all directions, with about half of that heat coming back down to Earth. This "back-radiation" helps maintain the planet's temperature.

Not all greenhouse gases have the same impact. Water vapor is the most significant, but carbon dioxide is also crucial. Other gases like methane and nitrous oxide contribute to warming, but to a lesser extent. As the Earth warms, it can hold more water vapor, which in turn leads to even more warming—a cycle known as positive feedback.

Historically, scientists have studied these processes for over a century. In the late 1800s, Swedish chemist Svante Arrhenius identified carbon dioxide as a major greenhouse gas and predicted that human activities would increase its levels, leading to higher global temperatures. His early estimates of temperature increases due to rising CO2 levels closely match modern predictions, highlighting the accuracy of his work.

*Figure 1. "The Greenhouse Effect" sourced from https://mindthegraph.com/blog/wp-content/uploads/2019/05/greenhouse-effect.png*

## 2. Historical temperature analysis

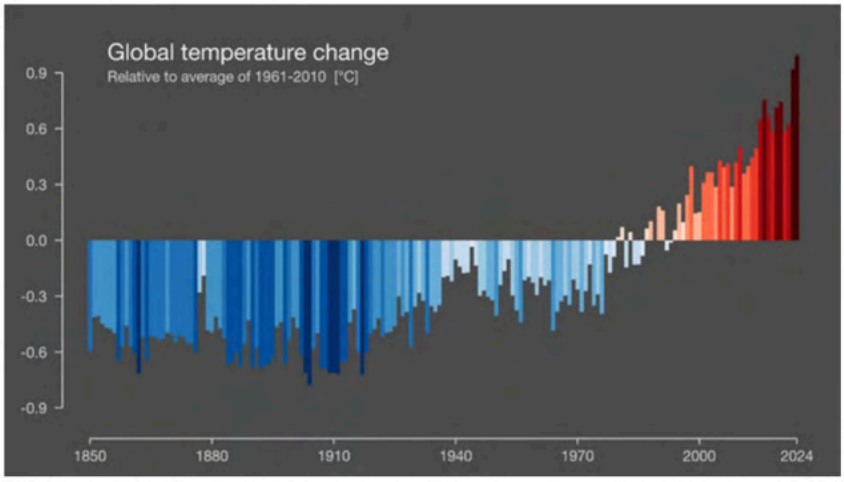



*Figure 2. "Global Temperature Change" by Ed Hawkins from the University of Reading, is licensed under CC BY 4.0.*

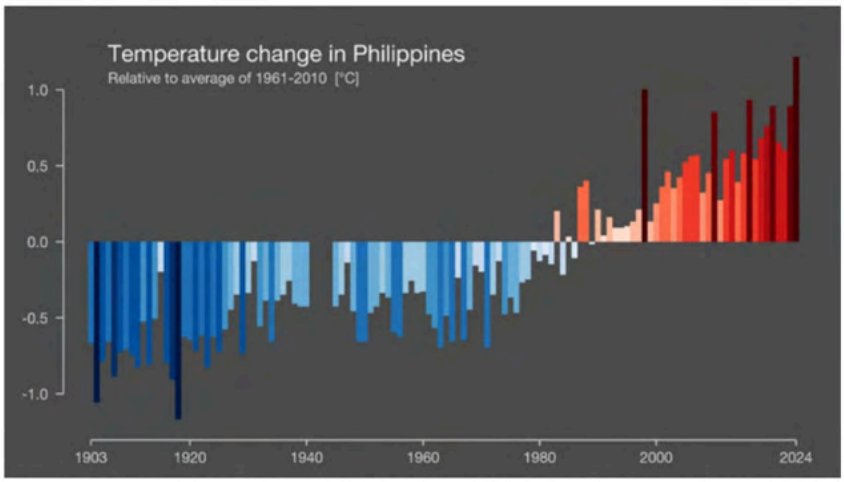



*Figure 3. "Temperature Change in the Philippines" by Ed Hawkins from the University of Reading, is licensed under CC BY 4.0.*

Both Figure 2 and Figure 3 presents a striking visual representation of our planet's warming trend, both from a Global and a Philippines perspective, over the defined time periods.

As we examine the graphs, a clear transformation emerges. In the earlier years, the predominant blue stripes indicate cooler temperatures. However, as we move toward the present, the colors shift dramatically from blue to red, highlighting a concerning trend: the rise in average global and Philippine temperatures.

This transition serves as a powerful visual cue, illustrating not just the gradual increase in temperature but also the urgency of the climate crisis we face today. The predominance of red in recent years starkly contrasts with the cooler tones of the past, emphasizing the rapid pace of warming that has occurred, particularly since the mid-20th century.

These graphs encapsulate the reality of climate change, urging us to recognize the significant shifts in our climate system and the need for immediate action to address the challenges posed by rising temperatures.

**3. A changing climate**

The Earth's climate is not static; it changes over long periods due to natural cycles. These cycles include variations in the Earth's tilt and orbit, which can lead to ice ages or warmer periods. However, despite being in a cycle that should be cooling, we are currently experiencing warming. This indicates that human activities, particularly the burning of fossil fuels, are driving the recent changes in climate.

Historically, the Arctic region has cooled for thousands of years, which would have eventually led to another ice age.

However, since the late 19th century, we have seen a significant rise in temperatures that correlates with increased levels of carbon dioxide and other greenhouse gases from human activities.

*Photo credits to Pinterest*

**4. Linking temperature to CO2 increase in the atmosphere**

Before the industrial revolution, CO2 levels fluctuated naturally, but the dramatic increase we see today is linked to human actions. Scientific evidence shows that the rise in CO2 is primarily due to fossil fuel combustion and deforestation. As we continue to burn fossil fuels, CO2 levels could exceed 1,000 parts per million by the end of this century if current trends persist.
Detailed studies of ice core data reveal that CO2 levels typically lag behind temperature changes during natural cycles. However, the recent surge in CO2 is now the main driver of rising temperatures, indicating a shift from natural to human-induced climate change.

**5. Climate models and its uncertainty**

To understand and predict climate change, scientists use complex climate models. These models help simulate how different factors, like greenhouse gas emissions and solar energy, affect the climate. However, predicting the future is challenging due to the many variables involved.

For example, while weather models can be tested frequently and refined, climate models deal with long-term averages and are harder to validate. This uncertainty is compounded by factors like water vapor and cloud behavior, which can influence temperature and weather patterns in unpredictable ways.

Despite these challenges, scientists have developed scenarios to estimate future emissions and their impacts.

The Intergovernmental Panel on Climate Change (IPCC) has outlined several pathways, indicating that if we continue on a high-emission trajectory, global temperatures could rise significantly by 2100. This increase poses serious risks to humanity and the environment.

In the next section, we will explore the real risks that climate change presents and how they affect our lives and communities.

| Category in WGIII | Category description | GHG emissions scenarios (SSPx-y*) in WGI & WGII | RCPy** in WGI & WGII |
|---|---|---|---|
| C1 | limit warming to 1.5°C (>50%) with no or limited overshoot*** | Very low (SSP1-1.9) | |
| C2 | return warming to 1.5°C (>50%) after a high overshoot*** | | |
| C3 | limit warming to 2°C (>67%) | Low (SSP1-2.6) | RCP2.6 |
| C4 | limit warming to 2°C (>50%) | | |
| C5 | limit warming to 2.5°C (>50%) | | |
| C6 | limit warming to 3°C (>50%) | Intermediate (SSP2-4.5) | RCP 4.5 |
| C7 | limit warming to 4°C (>50%) | High (SSP3-7.0) | |
| C8 | exceed warming of 4°C (>50%) | Very high (SSP5-8.5) | RCP 8.5 |

*Figure 4. "Scenarios and Pathways" by the Intergovernmental Panel on Climate Change in the Climate Change 2023 Synthesis Report.*

## B. The Risks to Climate Change

### 1. Risks to the Philippines

#### *Current Climate Trends*

The Philippines is already feeling the effects of climate change. From 1951 to 2015, the average temperature increased by 0.68°C, with a steady rise of about 0.1°C each decade. Rainfall patterns have also changed, with some areas experiencing a drop of over 20 mm during the dry months (March to May) and an increase of more than 20 mm during the wet months (December to February) in eastern regions. Additionally, the paths of tropical cyclones have shifted southward, making climate change a pressing issue for many Filipinos.

The country faces frequent climate-related disasters, averaging about 20 typhoons each year. In recent years, powerful storms with winds exceeding 170 km/h have struck almost annually. Even less intense storms now bring heavy rainfall, leading to storm surges, severe flooding, and landslides. The economic impact of these typhoons is significant, with losses estimated at 1.2% of the GDP. Extreme events like Super Typhoon Yolanda (Haiyan) in 2013 caused even greater losses, reaching up to 4.6% of GDP.

*[1] Country Climate and Development Report: Philippines, World Bank Group, 2022.*

***Future Projections***

Looking ahead, climate change is expected to worsen in the Philippines. Projections suggest that temperatures could rise by more than 2°C by the end of the century. While average rainfall may not change much, its variability and intensity are likely to increase, resulting in more frequent and severe weather events. Northern and central regions are expected to become wetter, while southern areas may experience drier conditions year-round.

***Sea Level Rise***

With its extensive coastline, the Philippines is particularly vulnerable to rising sea levels. Some areas have already seen sea levels rise by 5.7 to 7.0 mm per year, which is double the global average. By 2100, sea levels could rise by at least 0.2 meters, putting millions of Filipinos at risk of chronic flooding and permanent inundation.

***Water Scarcity***

Climate change, along with rapid urbanization and population growth, is driving water scarcity in the Philippines.

A study by the World Resources Institute predicts that by 2040, the country will face significant water shortages, ranking 57th out of 167 countries in terms of water stress. Agriculture, a vital sector that employs a large portion of the workforce, is expected to be the hardest hit by this water crisis.

***Urban Vulnerability***

The Philippines consists of around 7,600 islands, with over half of the population living in urban areas. While cities are crucial for economic growth, they are also highly susceptible to climate risks like sea level rise and flooding. Urban areas contribute significantly to greenhouse gas emissions through energy use and waste, making it essential to implement strategies that both mitigate these emissions and enhance resilience.

***Labor Productivity and Health Impacts***

The effects of climate change on labor productivity are concerning. Higher temperatures can reduce productivity in outdoor jobs, such as agriculture and construction, by up to 10% for each 1°C increase. Additionally, climate change poses direct health risks, including increased heat-related illnesses and worsened air quality. Vulnerable populations, especially the elderly, are at greater risk, with 61% of heat-related deaths in the Philippines already attributed to climate change.

***Educational Disruptions***

Extreme weather events frequently disrupt education in the Philippines. For example, Typhoon Odette (Rai) in December 2021

Affected nearly 30,000 schools, impacting around 12 million students and causing damages estimated at USD 1.2 billion. Prolonged heat exposure can also lead to health issues that result in missed school days, particularly for young children, hindering their learning and future opportunities.

**Impact on Households and Vulnerable Populations**

Climate change affects households in various ways, with low-income families being particularly vulnerable. Rising food prices due to decreased agricultural yields can strain budgets, as food makes up a larger portion of their expenses. Sudden climate events, like typhoons and floods, can lead to income loss and increased health costs, while ongoing stresses, such as droughts, can reduce job opportunities and resource availability. Additionally, climate change may force people to migrate, with an estimated 25.4 million people displaced annually due to climate shocks, a number expected to rise significantly by 2050.

**Disproportionate Effects on Women**

Women often face greater challenges from climate change due to social and economic inequalities. Limited access to resources and decision-making power makes them more vulnerable to climate impacts. During climate-related disasters, women may fall into debt more frequently as they manage household expenses and strive to ensure resource availability. They may also migrate to seek better opportunities in response to climate challenges.

**Economic Implications**

The economic impacts of climate change in the Philippines are significant and uncertain. The increasing severity of typhoons is expected to be a major source of economic costs, while slow-onset trends will also raise expenses, particularly affecting agriculture and labor productivity. By 2030, the GDP could be 3.2-3.7% lower than it would be without climate change, with potential losses reaching 5.7-7.5% by 2040. In extreme scenarios, losses could escalate to 7.6% of GDP by 2030 and 13.6% by 2040.

*Photo credits to Pinterest*

## C. Increasing Resilience Amidst a Changing Climate

### 1. Concepts of mitigation and adaptation

When it comes to tackling climate change, there are two main strategies: mitigation and adaptation. Mitigation focuses on reducing greenhouse gas emissions and removing these gases from the atmosphere, while adaptation involves adjusting to the impacts that climate change is already causing.

### Mitigation

Mitigation targets the root causes of climate change, making it a key strategy for improving our climate situation. Some mitigation efforts can also provide immediate benefits. For example, investing in energy-efficient cars or upgrading buildings to use less energy can save money over time. However, as countries like China, India, as well as the Philippines grow, simply relying on conservation won't be enough to bring emissions down to safe levels. History shows that economic growth often leads to increased energy use.

While it's important to reduce poverty in developing countries, denying access to energy would go against the goal of creating a better future for everyone.

*Photo credits to Pinterest*

Therefore, the challenge of mitigation is not just about cleaning up our current energy systems but also about providing clean energy on a larger scale than we currently get from fossil fuels.

Interestingly, as people improve their economic situation, they tend to have fewer children, which helps keep future energy demand in check. This shows how climate, energy, poverty, and population growth are all interconnected.

Looking ahead, oil and gas reserves are expected to run out by the end of this century, with coal following soon after. This reality means we need to shift away from fossil fuels quickly. Fortunately, renewable energy sources like solar and wind are becoming more affordable and efficient. However, they currently make up only about 8% of global electricity generation, and their inconsistent nature limits their widespread use unless we make breakthroughs in energy storage and transmission.

Nuclear energy, which provides about 10% of the world's electricity, has also advanced significantly. Modern nuclear reactors are safer and produce less waste, requiring less land and water compared to solar and wind. Countries like Sweden and France have successfully increased their nuclear power output in under 15 years. The main challenge now is political support for expanding nuclear energy.

To speed up the adoption of nuclear power and other mitigation strategies, government actions like carbon taxes, cap-and-trade systems, and subsidies for clean energy can be very helpful. While this primer doesn't go into specific policies, it's clear that these measures could greatly enhance efforts to combat climate change.

Another important mitigation strategy is capturing and storing greenhouse gas emissions. Although this technology exists and is vital for achieving net-zero emissions, it is not yet widely affordable for power plants. However, capturing carbon at its source could be a promising solution, especially since fossil fuels are still abundant and cheap. Capturing CO2 directly from the atmosphere is possible but currently much more expensive due to lower concentrations of CO2 in the air.

**Adaptation**

On the other hand, adaptation strategies are about adjusting to the changes that climate change brings. These costs are shared more broadly across the globe. Countries like the Philippines will need to adapt by changing farming practices, strengthening coastal defenses, and planning for shifts in water and food supplies.

Figuring out the costs and benefits of adaptation versus mitigation can be complicated. The best approach will likely involve a mix of both strategies.

**Are We Acting Fast Enough?**

The science shows that taking quick and decisive action to cut carbon emissions from our energy supply can help prevent serious damage. While some progress has been made, the current pace of emissions reduction is not fast enough to avoid the worst risks. We need to ramp up carbon-free energy sources, improve technologies for capturing CO2 from power plants, and develop methods to extract CO2 directly from the atmosphere. Renewable energy has the potential to meet a large part of our energy needs, especially if we can improve energy storage technology.
Given our current energy consumption rates, fossil fuel reserves are expected to be depleted by the end of this century, making it essential to transition to alternative energy sources. Countries and businesses that successfully develop affordable carbon-free energy solutions will have a competitive advantage in the future

**2. Sectoral Application**

**a. Agribusiness**

To effectively address the impacts of climate change on agriculture, it's crucial to adopt strategies that enhance resilience. These strategies aim to reduce the negative effects of climate change on farming systems. Here are some key actions:

**Emission Reduction Strategies**

Reducing greenhouse gas emissions from agriculture is essential. Here's how:

- **Reduced Tillage Practices:** Conservation tillage helps keep the soil healthy and reduces carbon dioxide emissions. Techniques like no-till farming not only lower emissions but also help retain moisture and prevent soil erosion.

- **Optimized Fertilizer Use:** Farmers can use precision farming techniques to apply fertilizers more efficiently. This means testing the soil to know exactly what nutrients are needed and using slow-release fertilizers to minimize waste. This approach helps cut down on harmful emissions.

- **Improved Livestock Feeding**: Adjusting animal diets to include supplements that reduce methane emissions can make a big difference. For example, adding seaweed to feed can lower methane production during digestion.

**Enhancing Carbon Sequestration**

Increasing the amount of carbon stored in soils and plants is another important strategy. This can be achieved through:

- **Conservation Agriculture:** This method focuses on minimal soil disturbance, maintaining soil cover, and rotating crops. These practices improve soil health and increase carbon storage while making farms more resilient to climate impacts.

- **Cover Cropping:** Planting cover crops during off-seasons helps prevent soil erosion and enriches soil fertility. These crops also retain moisture and suppress weeds, enhancing carbon storage.

- **Agroforestry:** Integrating trees into farming systems captures carbon and boosts biodiversity. It also improves soil health and can provide farmers with extra income from timber and other products.

**Improving Resource Efficiency**

Maximizing productivity while minimizing resource use is key for sustainable farming. Important techniques include:

- **Energy Efficiency:** Utilizing renewable energy sources, such as solar or wind power, helps reduce reliance on fossil fuels. Additionally, using energy-efficient machinery can lower energy consumption and greenhouse gas emissions.

- **Water Efficiency:** Using advanced irrigation systems, like drip or sprinkler irrigation, can significantly reduce water use while ensuring crops get enough moisture. Rainwater harvesting and soil moisture monitoring can further enhance water efficiency.

- **Integrated Pest Management (IPM):** This approach combines various methods to manage pests sustainably, reducing the need for chemical pesticides. IPM helps protect beneficial insects and supports biodiversity while lowering emissions from pesticide production.

By implementing these strategies, the agribusiness sector can significantly contribute to mitigating climate change while enhancing resilience to its effects. These actions not only support environmental sustainability but also promote economic stability and food security.

*Photo credits to Pinterest*

**b. Energy**

**Climate Resilience Strategies**

To protect our energy systems from climate change, we need to implement strong strategies:

- **Financial Resilience:** Developing financial tools, like insurance and investment strategies, can help power systems recover from extreme weather events. These tools provide financial support to manage risks and encourage investments in resilient infrastructure.

- **Improving Power Distribution:** Having solid plans for power distribution during natural disasters is essential. Optimizing how repair crews are dispatched after disasters can help restore power more efficiently.

**Decarbonization Strategies**

- To reduce carbon emissions in the energy sector, we can focus on:

- Managing Data Centers: As data centers consume more energy, efficiently coordinating their energy use is crucial. New algorithms can help balance energy consumption and workload, ensuring these facilities operate sustainably.

- Hybrid Energy Systems: Combining solar power with other renewable sources, like wind and hydrogen production, can optimize energy use and reduce reliance on fossil fuels.

**Policy, Incentives, and Communication**

To support these efforts, we need effective policies and communication strategies:

- Investment in Hybrid Technologies: Developing policies that encourage investments in hybrid energy systems can streamline the integration of renewable energy into existing infrastructures.

- **Energy Pricing Strategies**: Implementing fair pricing for energy and carbon emissions can motivate consumers to reduce their carbon footprint while managing their energy costs effectively.

By focusing on these strategies, the energy sector can enhance its resilience to climate change, ensuring a reliable and sustainable energy supply for the future.

**c. Housing**

This section highlights various strategies aimed at enhancing climate resilience in housing. These initiatives focus on practical solutions that help communities adapt to climate change while improving their living conditions.

**Adapting to Flood Risks**

- **Green Roofs:** Planting vegetation on rooftops not only provides insulation but also helps manage stormwater runoff. In Rio de Janeiro, green roofs have been shown to keep buildings cooler and reduce flooding by absorbing rainwater.

- **Elevated Housing:** Building homes on stilts or using floating or amphibious foundations can protect against flooding and rising sea levels. For instance, in Jamaica, amphibious housing designs allow homes to float during floods and settle back down when the water recedes, reducing damage from extreme weather.

**Managing Heat Risks**

- **Solar-Reflective Paint:** Applying special white paint to roofs can reflect sunlight and keep homes cooler. In some cities globally, this technique has been shown to lower roof temperatures by about 1 degree Celsius, helping residents manage heat more effectively.

- **Insulation Improvements:** Better insulation in homes can help keep them cool in the summer.

For example, using materials like coconut husk for roof panels can significantly reduce indoor temperatures, making homes more comfortable and energy-efficient.

**Water Management Solutions**

- **Rainwater Harvesting:** Collecting rainwater from roofs can provide a reliable water source, especially in areas with limited access to clean water. In some cities, households using rainwater harvesting systems saved up to 20% on their monthly water costs, reducing reliance on expensive water supplies.

- **Bioswales and Rain Gardens:** These landscaped features help manage stormwater by allowing rainwater to soak into the ground, reducing flooding and improving water quality. They can capture a significant portion of rainfall, filtering out pollutants before they reach water bodies.

**Sustainable Building Materials**

- **Permeable Pavements:** Using materials that allow rainwater to soak through can help prevent flooding. These pavements can reduce runoff by 50% to 70%, making them a cost-effective solution for managing stormwater.

- **Bamboo Construction:** Bamboo is a strong, renewable building material that can withstand extreme weather. In the Philippines, organizations are promoting bamboo as a sustainable alternative to traditional materials, helping to build resilient homes that are also environmentally friendly.

*Photo credits to Pinterest*

**Community Engagement and Support**

- **Tree Planting Initiatives:** Planting trees in urban areas can provide shade, reduce heat, and improve air quality.

- **Financial Support for Green Solutions:** Programs that provide financial incentives for adopting green technologies, like solar panels or rainwater harvesting systems, can help households afford these improvements. For example, in Canada, rebate programs have encouraged more families to install rain gardens to manage flooding.

By implementing these strategies, communities can improve their housing resilience against climate change while also enhancing their overall quality of life. These actions not only help manage immediate climate risks but also contribute to a more sustainable and healthier environment for everyone.

**d. Infrastructure**

Infrastructure Decarbonization and Mitigation Strategies

These strategies aim to reduce or eliminate carbon emissions, benefiting the environment, public health, and the economy.

- **Increase the Share of Renewable Energy:** Transitioning to renewable energy sources like solar, wind, and hydroelectric power is essential for reducing carbon emissions. For example, countries like Germany have invested heavily in solar and wind farms, significantly increasing their renewable energy share and transforming their electrical grids to accommodate this change.

- **Phase Down High-Emissions Energy:** Gradually reducing reliance on high-emission energy sources, like coal, is crucial. Countries like the UK have committed to phasing out coal-fired power plants, replacing them with cleaner energy options, which has significantly lowered their carbon footprint.

- **Enhance Building Efficiency:** Retrofitting and modernizing buildings to improve energy and water efficiency can lead to substantial reductions in emissions. For example, many cities are adopting green building standards that require energy-efficient designs and materials, which not only save energy but also lower utility costs for residents.

- **Reduce Carbon Intensity in Steel and Cement Production:** The production of steel and cement is a major source of greenhouse gas emissions. Innovations such as using renewable energy and alternative materials can help lower these emissions. For instance, some companies are exploring the use of recycled materials and low-emission fuels in their manufacturing processes.

- **Promote Low-Emissions Transport:** Encouraging the use of zero-emission vehicles, expanding public transportation, and supporting walking and cycling can help cut down on fossil fuel use. Cities like Amsterdam have successfully integrated extensive bike lanes and public transport systems, reducing reliance on cars and lowering air pollution.

- **Implement Carbon Removal Technologies:** Using carbon capture technology can help capture and store carbon dioxide emissions from large sources, such as power plants. For instance, facilities in Canada are using carbon capture to reduce emissions while still generating energy, demonstrating how technology can play a role in mitigating climate change.

**Infrastructure Resilience and Adaptation Strategies**

These strategies focus on protecting infrastructure and the communities they serve from the impacts of climate change.

- **Restoring Land and Water Ecosystems:** Nature-based solutions, such as restoring wetlands and forests, can enhance resilience against climate impacts. For example, restoring mangroves along coastlines can protect against storm surges while also providing habitat for wildlife.
- **Structural Interventions for Resilience:** Building new structures or modifying existing ones can help communities withstand climate-related shocks. For example, constructing levees and flood barriers in coastal areas can protect against rising sea levels and storm surges.
- **Ongoing Risk Management:** Regularly maintaining and monitoring infrastructure is crucial for identifying potential failures before they occur. For instance, cities can implement smart sensors in bridges and roads to monitor structural integrity, allowing for timely repairs and reducing the risk of catastrophic failures.
- **Increasing Circularity and Minimizing Raw Material Use:** Promoting recycling and reusing materials can help reduce the demand for new resources. For instance, construction projects that use recycled materials, like reclaimed wood or recycled concrete, not only minimize waste but also reduce the environmental impact of new material production.

By implementing these strategies, the infrastructure sector can become more resilient to climate change while also contributing to a reduction in greenhouse gas emissions. These actions not only protect communities but also promote a sustainable and healthier environment for future generations.

*Photo credits to Pinterest*

*Reference:*
*Country Climate and Development Report: Philippines, World Bank Group, 2022.*
*Building Climate-Resilient Agriculture: Pathways to Sustainability • Climate Change Academy, accessed on 31 October 2025.*

# Natural Farming

Agriculture and Food
Natural Farming: Definition, Principles, and Benefits
Healthy Soil / Plants
Methods of Natural Farming

# Natural Farming for Climate Resilience

A Comprehensive Guide to Sustainable Agriculture and Climate Adaptation

Florencia G. Tarriela and Karla H. Rufino

### *What is Natural Farming?*

Natural farming is a method of cultivation that uses natural ingredients and processes. It doesn't rely on expensive chemical fertilizers and pesticides. Instead, it harnesses the power of nature - leaves, roots, indigenous microorganisms (IMO), and other natural resources.
Many traditional farmers already use natural methods such as composting, rice ash, and herbal plants as natural pesticides.

### *Why Choose Natural Farming?*

💰 More Affordable: Use free or cheap materials found locally
🌱 Healthier Food: No harmful chemicals for health
🌍 Protect Nature: Doesn't harm soil, water, and air
🏡 Sustainable: Can be done long-term without depleting natural resources

### *Benefits*

🥥Rich in Natural Resources: Coconut, banana, bamboo, and other trees that can be utilized

🌧️ Tropical Climate: Fast growth of plants and microorganisms

🤠Traditional Knowledge: Many elders have knowledge about natural farming

🍯 Higher yield, lower cost, farmer-friendly, safe, and nutritious

### The Philosophy of Natural Farming

Natural farming is farming with nature, not against it. Instead of fighting pests and diseases with chemicals, we work with natural processes that have existed for millions of years.

The key principle:

Traditional wisdom meets modern science: Our ancestors knew that nature provides everything plants need. Modern research now proves they were right - soil microorganisms are the key to plant health!

The goal: Create a living ecosystem in your farm where plants, soil, and beneficial organisms work together.

## The Hidden World: Soil Microorganisms

### Bacteria

- Convert nitrogen from air to plant food
- Break down organic matter
- Protect plants from diseases
- 1 billion bacteria in 1 gram of soil!

### Fungi

- Create networks connecting plant roots
- Help plants absorb phosphorus
- Improve soil structure
- Share nutrients between plants

### Other Helpers

- Earthworms: Nature's soil mixers
- Protozoa: Release nutrients from bacteria
- Nematodes: Control harmful pests
- Arthropods: Break down organic matter

## Amazing Fact:

In one teaspoon of healthy soil, there are more living organisms than there are people on Earth! These tiny helpers are the real farmers - they feed your plants 24/7.

*Reference:*
*The Essentials of Natural Farming in Philippine Context, Andry K. Lim and Josephine C. Gamboa; c.2018*
*JADAM Organic Farming & Gardening by Youngsang Cho*
*NATURAL FARMING by Andry Lim and Josephine Gamboa*

# Indigenous Microorganisms (IMO): Nature's Local Experts

### *What are Indigenous Microorganisms?*

Indigenous microorganisms (IMO) are the heart of natural farming! These are the beneficial bacteria, fungi and other tiny life forms that naturally live in your local environment. Think of them as your "invisible farm workers" – they feed plants, protect them from diseases and build healthy soil. They are also local experts who know exactly what your soil and plants need to thrive in your specific area. Please refer to the annex on how to prepare IMOs.

### *Why Use Local Microorganisms?*

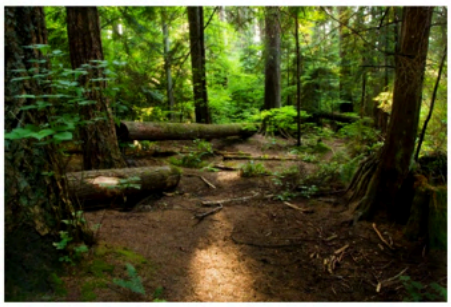
**Perfect adaptation:**
Already suited to your climate

**No competition:**
They belong in your ecosystem

**Sustainable:**
Self-reproducing, no need to buy

**Effective:** Know local plant needs

### *Where to Find the Best Indigenous Microorganisms*



**Forest Floor**
Under fallen leaves, rich in decomposer organisms

**Under Fruit Trees**
Mango, coconut, jackfruit - specialized plant helpers

**Healthy Rice Fields**
Especially fields that don't use chemicals

**Bamboo Groves**
Fast-growing plants = active microorganisms

### *How Microorganisms Help Your Plants*

**Nutrient Delivery Service:**

- Break down organic matter into plant food
- Convert atmospheric nitrogen to usable form
- Release phosphorus from soil minerals
- Make nutrients available when plants need them

**Plant Protection Squad:**

- Crowd out harmful bacteria and fungi
- Produce natural antibiotics
- Strengthen plant immune systems
- Create protective barriers around roots

## Chemical Farming vs. Natural Farming

| ❌ *Chemical Farming Problems* | ✓ *Natural Farming Benefits* |
|---|---|
| Kills beneficial microorganisms: Destroys soil life | Builds soil life: Increases beneficial organisms |
| Expensive inputs: Always need to buy fertilizers | Low cost: Uses free local materials |
| Addiction cycle: Plants become dependent | Self-sustaining: Soil gets better over time |
| Health risks: Residues in food and water | Safe food: No harmful residues |
| Environmental damage: Pollutes soil and water | Heals environment: Improves soil and water |
| Resistance problems: Pests become immune | Natural balance: Pests controlled by nature |

## Transitioning from Chemical to Natural Farming

***Year 1: Soil Recovery***

- Stop chemical inputs gradually
- Start composting and mulching
- Introduce beneficial microorganisms
- • Expect 20-30% yield reduction

***Year 2: Building Life***

- • Soil organisms multiply
- • Plant health improves
- • Pest problems decrease
- • Yields start recovering

***Year 3+: Natural Balance***

- • Soil ecosystem established
- • Yields equal or exceed chemical
- • Minimal external inputs needed
- • Sustainable profitability

💡 Key Message:
Natural farming is not just about avoiding chemicals - it's about building a living, self-sustaining ecosystem that works better than any factory-made fertilizer!

## Natural Farming Method

***JADAM Organic Farming***
Ultra-low-cost farming using ingredients easily accessible to farmers. No expensive chemicals needed - just leaves, water, and nature's wisdom!

***Leaf Mold Solution (JMS)***
What it does: Provides beneficial microorganisms for soil health

Ingredients (Free!):
•A handful of leaf mold from the forest floor
•1 liter of clean non-chlorinated water
•Potato (or other starch source such as cassava and corn/rice), a small amount of natural sea salt

How to make:
Mix the ingredients and let them stand for 24 hours or until foam is formed with the edges clear (peak fermentation). Dilute 10-20 times. Use immediately.

**Liquid Fertilizer (JLF)**
What it does: Provides nutrients using local plants

Ingredients (Almost Free!):
•Crop residues such as leaves (moringa, banana, water spinach) and/or wild grass
-Handful of leaf mold
•Non-chlorinated water (3x the weight of leaves)
•Optional: sea salt (1% of water weight)

How to make:
Fill up container with fresh leaves and wild grass, ill up with water, add 2-3 kg (4-5 lb) of leaf mold, close lid, use after about 3 months. Dilution is 20-300 times.

*References:*
*Jadam Organic Farming, Youngsang Cho; c.2016*
*Pamaagi sa Paghimo ug Organikong Abono Ug Pestisidyo, Pamulaan Center for Indigenous People's Education, p.10; c.2017*
*Malahutayong Pamaagi sa Pagmapnanon ug Cacao, Pamulaan Center for Indigenous People's Education, p.3; c.2017*
*Malahutayong Pagpananom sa Kape, Pamulaan Center for Indigenous People's Education, p.3; c.2017*
*Malahutayong Pamaagi sa Pagpananom ug Camote, Pamulaan Center for Indigenous People's Education, p.3; c.2017*

## Common Plants for Natural Fertilizers

**Moringa**: High in nitrogen, great for leafy vegetables
**Water spinach**: Fast-growing, nutrient-rich liquid fertilizer
**Banana leaves**: Rich in potassium, perfect for fruiting plants
**Madre de Cacao:** Natural pesticide and soil conditioner
**Ipil-ipil:** Fixes nitrogen, improves soil fertility
**Talisay leaves:** Rich in minerals, excellent compost material

## JADAM Benefits for Farmers

- Ultra-low cost: Uses free local materials
- Improves soil health: Increases beneficial microorganisms
- Natural pest reduction: Healthy plants resist diseases
- Environmentally safe: No harmful chemicals
- Easy to make: Simple process anyone can do
- Uses local resources: Everything found in the community

## Composting: Fighting Global Warming, Helping Farmers

Surprising Fact:
Composting is one of the most effective ways to fight climate change!

When we throw organic waste in landfills, it becomes methane gas - 25x more harmful to the ozone than Carbon dioxide. However, with composting, it becomes a carbon storage and natural fertilizer.

Tropical Advantage: 3x faster than cold countries
Fertilizer Savings: 80% savings on chemical fertilizer
Carbon Sequestration: Carbon stored in soil
Climate Resilience: Stronger soil against extreme weather

## Composting's Impact on Climate Change

🚫 Organic Waste Problem in Landfills:
40% of waste: Organic waste that could be composted
Methane emissions: 1 ton of organic waste = 1 ton of carbon dioxide equivalent
Leachate pollution: Harmful to groundwater and rivers
Wasted nutrients: Nutrients that the soil needs

✅ Composting Solution:
Zero methane emissions: Only aerobic decomposition
Carbon storage: Carbon locked in soil organic matter
Reduced need for chemical fertilizers: natural enrichment of the soil with nutrients
Improved soil health: Better drought and flood resistance

## Composting's Impact on Climate Change

Leachate pollution occurs when contaminated liquid is formed from water that filters through solid waste in a landfill. Organic waste, such as food waste, has a high moisture content. This is released as it breaks down, becoming part of the liquid that flows through the rest of the landfill. Leachate can leak into groundwater and soil, impacting drinking water safety and soil health.

Leachate pollution

Aerobic decomposition: In landfills, waste is buried and becomes very compacted and thus decomposes in an oxygen-free or anaerobic environment. This produces harmful gases like methane and carbon dioxide. On the other hand, aerobic decomposition is where microorganisms break down organic matter in the presence of oxygen. This is achieved in composting by turning the compost pile periodically to introduce fresh air throughout.

Aerobic decomposition

**Rice Straw Composting**
Turn harvest "waste" into wealth!

**Materials** (Free from farm):
- Rice straw (10 sacks) - from harvest
- Chicken/carabao manure (2 sacks)
- Rice hull ash (1 sack) - potassium source
- Water and molasses for microorganisms

RHA – fully combusted inorganic residue after burning

**Process:**
Layer rice straw and manure, sprinkle ash, and water thoroughly. Turn monthly. Ready in 3-4 months!

**Climate Benefit:**
1 ton rice straw compost = 1.5 tons carbon dioxide that doesn't become methane!

**Coconut Husk Composting**
Perfect for coconut farming areas!

**Materials** (Abundant in coconut farms):
- Coconut husks: Chopped or shredded
- Copra meal: Nitrogen-rich activator
- Coconut water: Natural growth hormones
- Kitchen scraps: Vegetable peels, fruit peels

**Special Technique:**
Soak husks in a coconut water + molasses mixture for faster decomposition

**Advantage:**
Excellent water retention - perfect for drought-prone areas!

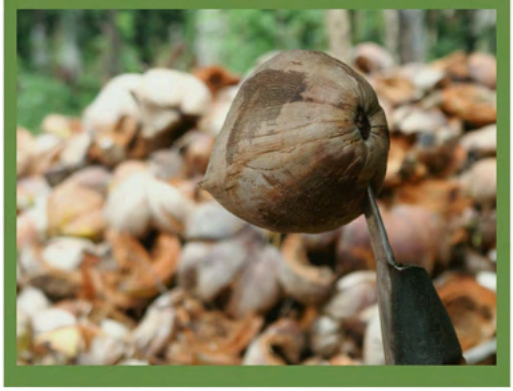
**Materials Abundant in Tropical Areas for Composting**

🥥 Coconut-based
- Coco coir/fiber
- Coconut husk
- Coconut shells (crushed)
- Copra meal

🌾 Rice-based
- Rice hulls
- Rice straw
- Rice bran
- Rice ash

🍌 Fruit waste
- Banana peels
- Mango peels/seeds
- Pineapple crowns
- Citrus peels

🌿 Garden waste
- Fallen leaves
- Grass clippings
- Pruned branches
- Weeds (no seeds)



**Vermicomposting: The African Nightcrawler Method**

***Why African Nightcrawler is best for tropical climate:***

- Thrives in tropical climate
- Fast reproduction
- Large and strong
- Eats lots of organic waste

**Setup:**
Use plastic containers with holes, a layer of bedding (shredded paper/coco coir), add worms, and feed regularly

**Feeding Schedule:**

- Daily: Vegetable scraps, fruit peels
- Weekly: Coffee grounds, tea bags
- Avoid: Meat, dairy, oily food, citrus (too acidic)

**Harvest:**
After 2-3 months, get premium worm castings - the "Rolls Royce" of organic fertilizer!

### 🛡️ Climate Resilience: Protection from Extreme Weather

*Protection from Storms and Floods:*
Better soil structure: Soil doesn't erode easily
Improved drainage: Faster drainage of excess water
Stronger root systems: Plants don't fall easily
Faster recovery: Quick recovery after disasters

*Protection from Drought:*
Water retention: Compost holds 20x its weight in water
Reduced evaporation: Organic matter insulates soil
Deep root growth: Deeper roots for groundwater
Stress tolerance: Plants handle heat stress better

### Common Problems and Solutions in Tropical Composting

*Problems:*
Bad smell: Too wet or a lack of brown materials
Many flies: Exposed food scraps
Not decomposing: Lack of nitrogen or moisture
Rats: Meat or dairy in compost (so avoid this)

*Solutions:*
Add brown materials: Leaves, paper, sawdust
Cover food scraps: Layer brown materials on top
Add green materials: Fresh grass, kitchen scraps
Use a proper container: Sealed or covered compost bin

## Mulching: Protect Soil in Hot Climate

*What is Mulching?*

Mulching is placing materials on top of the soil to protect it. Like putting a blanket on soil so it doesn't get too hot, dry, or weedy.

Materials you can use: Leaves, bark, sawdust, rice hulls, coconut husk, grass clippings, or any organic materials you can find around

How to do it: Just spread the materials around plants, about 2-4 inches thick. Don't let it touch the tree trunk or plant stem.

We're copying nature: Look in the forest - there are always fallen leaves on the ground. That's natural mulch! We're just copying this in our garden.

*Why is Mulching Super Important in Hot Climate?*

In hot weather, our soil quickly dries out and loses nutrients. Mulching is like an umbrella for soil - protects from sun heat, saves water, and feeds the soil as the leaves decompose.

Cooler: Reduces soil temperature by 5-10°C
Saves Water: Needs only 50% of the usual watering
Less Weeds: 80% reduction in weeds
More Fertile Soil: Continuous food for soil

**Coconut-Based Materials**
Easiest to get into tropical areas!

Coconut Coir: Excellent water retention, long-lasting, pest-resistant
Coconut Husk: Large pieces, good drainage, slow decomposition
Shredded Coir: Looks good, long-lasting, great for ornamentals
Good for: Vegetables, fruits, ornamental plants
Thickness: 2-4 inches, replace every 6-12 months

**Rice-Based Materials**
Get from rice mills!

Rice Hulls: Light, good water flow, pest-resistant
Rice Straw: Good insulation, becomes nutrients when decomposed
Chopped Stalks: Fast decomposition, adds organic matter
Good for: Vegetables, around fruit trees, pathways
Tip: Mix with other materials to prevent compacting

**Living Mulch: Ground Cover Plants**

These are plants we use as ground cover - they don't just protect, we can eat them too!

🍀 Perennial Peanut
Provides nitrogen to soil
Drought tolerant
Dense ground cover
Perfect under fruit trees

🌱 Sweet Potato Vines
Fast spreading
Edible leaves and roots
Loves hot weather
Easy to propagate

🌿 Centrosema
Legume ground cover
Fixes nitrogen
Tolerates poor soil
Good for slopes

*How to Mulch According to Season*

🌧️ Rainy Season
Thicker:4-6 inches for drainage
Larger pieces: Coconut husk, wood chips
Avoid: Fine materials that compact
Watch for: Fungal diseases, adjust thickness

☀️ Dry Season
Thickest:6-8 inches thick
Water-holding: Coconut coir, fine organic
Light colors: To reflect heat
Replace often: Add more when depleted

🌱 Season Transition
Gradual: Slowly change thickness
Mix materials: Combine different types
Watch plants: Adjust based on their response
Prepare: Stock materials for next season

**Proper Mulching Techniques for Tropical Climate**

*Correct Method:*

- Clear weeds first before mulching
- Water the soil thoroughly
- Apply mulch 2-4 inches from plant stems
- Create a slight depression around plants for water collection
- Refresh mulch regularly as it decomposes

*What to Avoid:*

- Don't mulch when the soil is wet (fungal problems)
- Don't pile mulch against plant stems
- Don't use fresh grass clippings (will heat up)
- Don't apply too thick (oxygen deprivation)
- Don't forget regular maintenance

**🌿Where to Get Mulching Materials**

Industrial Sources:

- Rice Mills: Rice hulls, rice straw
- Coconut Processing: Coco coir, husk, chips
- Lumber Yards: Sawdust, wood shavings
- Sugar Mills: Bagasse (sugar cane fiber)

Community Sources:

- Tree Trimming: Coordinate with the local government for chipped branches
- Fallen Leaves: Collect from parks, streets (with permission)
- Farmers: Rice straw after harvest, corn stalks
- Neighbors: Grass clippings, garden waste exchange

💡 Pro Tip:
Network with local farming groups and community officials. Many community programs organize mulching materials for sustainable agriculture!

## Climate-Resilient High Value Crops for Tropical Regions

*Adapting to Climate Change*

Tropical regions face unique climate challenges such as typhoons, droughts, and changing weather patterns. These resilient crops help farmers adapt and thrive!

### Cacao

Climate Benefits:

- Thrives in humid tropical conditions (70-85% humidity)
- Grows well under tree canopy, protected from extreme weather
- Deep roots help during drought periods
- Can withstand moderate flooding

Growing Tips: Plant under shade trees, maintain 70-85% humidity, harvest pods when ripe for chocolate production!

### Coffee

Climate Benefits:

- Arabica grows well in cool mountains (1,200-1,800m elevation)
- Robusta tolerates heat and humidity at lower elevations
- Shade-grown coffee protects soil from erosion
- Resistant to many pests and diseases

Growing Tips: Choose variety based on elevation, provide shade, process beans properly for premium coffee!

### Climate-Resistant Rice Varieties

Salt and Flood-Tolerant Varieties:

- IR64-Sub1: Survives submersion and tolerates salt water

Drought-Tolerant Varieties:

- Sahod-Ulan: Traditional drought-resistant variety adapted to local conditions

*Important Note:*
For the latest available flood-resistant rice varieties suitable for your specific area, consult the International Rice Research Institute (IRRI) or your local Department of Agriculture for current recommendations and availability.

### Coconut

Extremely typhoon-resistant due to the flexible trunk. Provides income through copra, oil, and coir products.

### Sweet Potato

A drought-tolerant root crop that can survive in poor soil. Fast-growing emergency food source.

*Why Climate Resilience Matters in Tropical Regions*

- 20+ typhoons annually: Need crops that recover quickly
- Rising temperatures: Important to have heat-tolerant varieties
- Longer dry seasons: Drought-tolerant crops save harvests
- Economic stability: Resilient crops provide consistent income
- Food security: Local production reduces import dependence
- Sustainable farming: Works with nature, not against it

# Native Trees: Key to Climate Resilience

*Why Native Trees Matter?*
*Native* trees have been part of local ecosystems for thousands of years. They are the true "climate warriors" - able to fight typhoons, droughts, and other climate change challenges because they've adapted to local environments.

Typhoon Resistant: Deep roots and flexible branches

Water Management: Helps with flood control and water retention

Biodiversity Hub: Home to native animals and insects

Narra (Pterocarpus indicus) - National Tree of the Philippines

Climate Benefits:
- High carbon sequestration capacity
- Drought-tolerant when mature
- Wind-resistant due to strong wood
- Nitrogen-fixing improves soil

Uses: Furniture, construction, reforestation projects
Growing Tips: Slow growing but extremely durable. Good in areas with high groundwater.

Molave (Vitex parviflora) - "The Tree of Heroes"
Climate Benefits:
- Extremely typhoon-resistant
- Thrives in shallow and rocky soil
- Drought-tolerant, survives long dry seasons
- Fast-growing compared to other hardwoods

Uses: Heavy construction, shipbuilding, posts
Growing Tips: Tolerates difficult conditions. Good on slopes for erosion control.

Kamagong (Diospyros blancoi) - Iron Wood
- Extremely hard wood
- Tolerates saltwater exposure
- Slow-growing but super durable
- Has delicious fruit (mabolo)

*References:*
*Philippine Native Trees 303, Green Convergence, p.192-216; c.2018*
*https://forestry.com/trees/molave-tree/*
*https://forestry.com/trees/kamagong-tree/*
*The Joel Espanol Maturan Blog: The Majestic Dao Tree (Dracontomelon dao): A Giant Worth Preserving*

Dao (Dracontomelon dao) - Fast-Growing Giant
- Fast growth (3-4m/year)
- Large leaves for shade
- Tolerates floods and drought
- Excellent windbreak

Banaba (Lagerstroemia speciosa) - Pride of India Tree
- Beautiful purple flowers
- Medicinal properties (diabetes)
- Moderate growth rate
- Good urban tree

Native Fruit Trees: Food Security + Climate Resilience

Mango (Carabao)
Drought-tolerant, long-lived, world-class taste

Lanzones
Thrives in humid climate, consistent bearer

Java Plum
Flood-tolerant, medicinal, attracts birds

Coconut (Dwarf varieties)
Ultimate typhoon survivor, multiple products

**Agroforestry: Combining Trees and Crops**

Benefits:
- Microclimate control: Cooler under trees
- Water conservation: Reduces evaporation
- Wind protection: Shelter for crops
- Natural fertilizer: Falling leaves = organic matter

Good Combinations:
- Coffee + Dao: Shade-grown coffee underneath
- Cacao + Narra: Perfect shade and nitrogen-fixing
- Vegetables + Banaba: Partial shade for leafy greens
- Rice + Bamboo: Windbreak and water management

# 🌱 How to Start Native Tree Planting

For Small Plots:

1. Plant 2-3 fruit trees in corners
2. Use bamboo as a natural fence
3. Plant banaba for shade and medicine
4. Coordinate with the community for seedling programs

For Large Areas:

1. Design an agroforestry system
2. Plant windbreak trees on borders
3. Combine timber and fruit trees
4. Join community reforestation projects

💡 Tip:
Connect with forestry departments, local government, or NGOs for free seedlings and technical assistance. Many programs help farmers plant native trees!

## Bamboo: The Ultimate Carbon Absorber

Amazing Facts About Bamboo!

🌍 Climate Change Fighter

- 35% more carbon dioxide: Absorbs more than trees
- 35% more oxygen: Produces more oxygen
- 12 tons carbon dioxide/hectare/year: Massive carbon sequestration
- 24-hour oxygen: Doesn't stop producing oxygen

⚡ Super Growth Powers

- 3 feet/day: Fastest growing plant in the world
- Full height in 3-5 years: VS. 25-50 years for trees
- Self-regenerating: No need to replant, grows back
- Harvest every 3-5 years: Sustainable income source

Here are some examples of types of bamboo that are widely cultivated in the Philippines.

Giant Bamboo (Dendrocalamus giganteus) - The "King of Bamboo."

Climate Superpowers:

- Highest carbon dioxide absorption: 15-20 tons/hectare/year
- Typhoon resistant: Flexible, doesn't break in strong winds
- Flood control: Deep roots prevent erosion
- Drought-tolerant: Survives 6 months without rain

Uses: Construction, furniture, handicrafts, shoots for food
Growing Tips: Grows in all soil types, spreads quickly, harvest after 3-4 years

Kawayan Tinik (Bambusa blumeana) - The "Thorny Bamboo."

Climate Benefits:
- Superior erosion control: Thorny branches create a dense barrier
- Living fence: Natural security and windbreak combined
- Water conservation: Large leaves reduce evaporation
- High Carbon dioxide absorption: Fast growth rate sequesters carbon quickly

Common Bamboo (Bambusa vulgaris) - Yellow Bamboo
- Fast propagation and establishment
- High ornamental and landscape value
- Perfect for beginners to bamboo farming
- Multi-purpose use in construction and crafts

Carbon dioxide Absorption Comparison: Bamboo vs. Other Plants

🥇 Bamboo (Winner!)

12-20
tons carbon dioxide/hectare/year
- Continuous growth all year
- Multiple harvests possible
- Regenerates from roots
- Dense planting possible

🥈 Hardwood Trees

6-12
tons carbon dioxide/hectare/year
- Slow initial growth
- Long-term carbon storage
- Single harvest (destructive)
- Requires replanting

🥉 Grass/Crops
2-6
tons carbon dioxide/hectare/year
• Seasonal growth only
• Short-term carbon storage
• Requires annual replanting
• Lower biomass production

Bottom Line: Bamboo absorbs 2-3x more carbon dioxide than regular trees, and 4-10x more than crops.

It's the ultimate climate solution in our backyard!

*Environmental Superpowers of Bamboo*

Erosion control: Deep root system, perfect for slopes

Flood management: Absorbs 30% more water than trees

Biodiversity haven: Home to 1,200+ species of insects and birds

Air purification: Filters pollutants, produces negative ions

Noise reduction: Natural sound barrier, 50% noise reduction

Sustainable harvest: No need to cut the entire plant, regenerates naturally

Bamboo Agroforestry: Combining Bamboo and Farming

Bamboo + Rice System
•Bamboo on borders as windbreak
•Protect rice from typhoons
•Bamboo leaves = organic fertilizer
•Extra income from bamboo shoots

Bamboo + Coconut System
•Intercropping in coconut farms
•Maximize land use efficiency
•Diversified income sources
•Enhanced climate resilience

Bamboo + Vegetables
•Partial shade for leafy greens
•Microclimate improvement
•Natural pest control
•Year-round production

# How to Start Bamboo Farming

📋 Planning Phase:

1. Choose the right species: Based on climate and intended use
2. Site preparation: Clear weeds, improve drainage if needed
3. Spacing design:4-6 meters apart for large species
4. Get quality planting material from reputable nurseries

🌱 Planting and Care:

1. Plant during the rainy season: Better establishment
2. Mulch around plants: Retain moisture and nutrients
3. Water regularly first year: Until well established
4. First harvest: After 3-4 years, then annually

💡 Pro Tip:

Start small with 10-20 plants to learn the process. Join bamboo farming groups online or locally for tips and market connections. Bamboo farming is the future of sustainable agriculture!

Start your natural farming journey today! Every small step helps our planet.

Remember:
The best time to plant a tree was 20 years ago. The second-best time is now.

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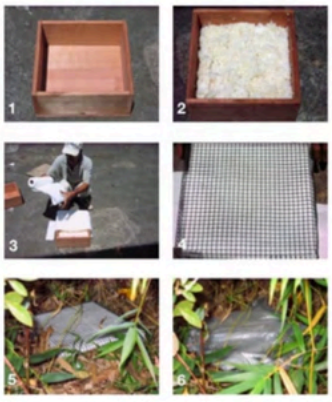
# How to Make IMO

**How to Make IMO-1 (Capturing Wild Microorganisms)**
🍚Cooked white rice: 2-3 cups (room temperature)
📦Wooden box or bamboo basket: About shoebox size
📄White paper or breathable cloth: To cover the box
🧷Rubber band or string: To secure the cover



https://newspaperbokashi.wordpress.com/wp-content/uploads/2010/04/cultivate-indig-microorg.jpg

**Best Places to Collect IMO:**
🌲Forest floor: Under fallen leaves (best!)
🎋Bamboo groves: Rich in beneficial microbes
🌳Under fruit trees: Mango, coconut, jackfruit
🌾Healthy rice fields: Chemical-free areas
👣 Step-by-Step Process:

1. Prepare the rice: Cook rice normally, and let it cool to room temperature. Spread it in the wooden box about 1 inch thick.
2. Cover properly: Place white paper or breathable cloth over the box. Secure with a rubber band. The paper should touch the rice.
3. Place in the forest: Bury the box in the soil (leaving the top exposed) or place it among fallen leaves in your chosen location.
4. Wait 3-5 days: In a tropical climate, usually ready in 3-5 days. You'll see white, fluffy mold growing on the rice.
5. Harvest: When rice is covered with white mold (looks like cotton candy), it's ready!

**This is IMO-1.**
✅ Good IMO-1: White, fluffy, smells sweet like fermented rice
❌ Bad IMO-1: Black, green, or colored mold (discard and try again)

🌱 **How to Use IMO in Your Farm**

📦 IMO-2: Multiply Microbes
- • Mix IMO-1 with equal parts sugar or molasses
- • Store in a container for 7 days:
- • Result: Concentrated microorganism culture
- • Can store for months in a cool place
- • Spray on soil and plants (2tbsp:1L water)

🌾 IMO-3
- • Mix IMO-2 with water (1:10)
- • Pour the mixture into 100kg of rice bran and mix thoroughly
- • Pour into a container and cover, and leave for three days

🌾 IMO-4: Soil Activator
- • Mix IMO-3 with 100kg of farm soil
- • Cover soil with rice straw and leave for one day or overnight
- • Apply directly to soil or compost

# How to Prepare Fermented Bio-Liquids

Fermented Plant Juice (FPJ), Fermented Fruit Juice (FFJ), and Fish Amino Acid (FAA) are prepared through a simple fermentation process using natural ingredients and sugar or molasses. The resulting fermented liquids can be applied during vegetative growth (FPJ), flowering/fruiting stage (FFJ), and as nitrogen/protein supplement (FAA).

**Fermented Plant Juice (FPJ) - Plant Growth Booster**
FPJ extracts growth hormones and nutrients from fast-growing plants. It's like giving your crops a vitamin shot!
🌱 Best Plants for FPJ:
· 🌿Moringa leaves: High nitrogen, promotes leaf growth
· 🌿Bamboo shoots: Young tips, growth hormones
· 🌿Banana shoots: Center of plant, rich in potassium
· 🌿Water spinach: Fast-growing tips, nitrogen-rich
· 🌿Papaya leaves: Young growth, enzyme-rich

📝 **How to Make FPJ:**
Ingredients:
• Fresh plant material: 1 kg (young, vigorous growth)
• Sugar or Molasses: 1 kg (equal weight to plants)
• Glass or plastic container with lid

Process:
1. Chop plants into small pieces
2. Layer: plant, molasses, plant, molasses in container
3. Fill only 2/3 full (needs space for gases)
4. Cover with breathable cloth (not airtight)
5. Ferment 7 days in a cool, dark place
6. Strain liquid - this is your FPJ!

💧 How to Use: Dilute 2 tablespoons per 1 liter of water. Spray on leaves during the vegetative growth stage. Use every 7-10 days for best results.

🍌**Fermented Fruit Juice (FFJ) - Flowering & Fruiting Power**
FFJ is rich in sugars and phosphorus - perfect for flowering and fruiting stages. It helps produce sweeter, bigger fruits!

Best Fruits for FFJ:
· 🍌Ripe banana: High potassium, promotes fruiting
· 🥭Mango: Rich in sugars and minerals
· 🍍Pineapple: Contains enzymes and growth factors
· 🍈Papaya: Enzyme-rich, aids nutrient absorption
· 🍇Overripe fruits: Any local fruits work!

**How to Make FFJ:**

https://www.dagonuniversity.edu.mm

Same method as FPJ, but with ripe fruits:
1. Use very ripe fruits (naturally sweet) : 1 kg
2. Mash or chop fruits well
3. Mix with equal weight sugar or molasses: 1 kg
4. Ferment 7 days
5. Strain and store in cool place

💡 Pro Tip: Overripe fruits from market (usually cheap or free) work perfectly!

💧 How to Use: Dilute 2 tablespoon per 1 liter of water. Spray during flowering and fruiting stages. Apply every 7-10 days for sweeter fruits and higher yields!

**🐟Fish Amino Acid (FAA) - Protein Power for Plants**

FAA provides amino acids and nitrogen - the building blocks of proteins. Perfect for strong, vigorous growth!

What Fish to Use:
· Any fish scraps: Heads, bones, guts, small fish
· Fish market waste: Usually free or very cheap!
· Shellfish/shrimp: Shells and heads work too

⚠️ Important: Use FRESH fish! Rotten fish will smell terrible and attract pests.

**How to Make FAA:**

https://www.researchgate.net/figure/Steps-in-preparing-fermented-fish-amino-acid_fig8_334049810

Ingredients:
• Fresh fish or fish scraps: 1 kg
• Sugar or molasses: 1 kg
• Large container with lid
• IMO-2 (optional but helpful): 2 tablespoons

Process:
1. Cut fish into small pieces
2. Layer: fish, molasses, fish, molasses
3. Add IMO-2 if available (speeds up process)
4. Cover container (not airtight)
5. Ferment 7-10 days; 3-6 months for best results
6. Liquid will separate - use the liquid

💧 How to Use: Dilute 1 teaspoon per 2 liters. Spray on soil or foliage every 7-14 days. Great for seedlings and vegetative growth!

🎯 Best for: Leafy vegetables, seedlings, plants recovering from stress or damage.

# Top 10 Herbal Medicines in the Philippines Approved by the Department of Health

1. ***Akapulko*** • Cassia Alta/"Bayabas-Bayabasan" and "Ringworm Bush."
   Used to treat ringworms and skin fungal infections.

2. ***Ampalaya*** • Momordica Charantia/"Bitter Gourd" or "Bitter Melon."
   Most commonly used as a treatment for diabetes.

3. ***Bawang*** • Allium Sativum/"Garlic"
   Reduces cholesterol in the blood and helps control blood pressure.

4. ***Bayabas*** • Psidium Guajava/"Guava."
   Used as an antiseptic to disinfect wounds. Also, as a mouthwash to treat tooth decay and gum infection.

5. ***Lagundi*** • Vitex Negundo/The "5-Leaved Chaste Tree."
   Its main use is for relieving coughs and asthma.

6. ***Niyog-Niyogan*** • Quisqualis Indica L./"Chinese Honey Suckle Vine."
   It is effective in the elimination of intestinal worms. Only the dried, mature seeds are medicinal. Crack and ingest the dried seeds two hours after eating (5 to 7 seeds for children and 8 to 10 seeds for adults). If one dose does not eliminate the worms, wait a week before repeating the dose.

7. ***Sambong*** • Blumea Balsamifera/"Blumea Camphora"
   A diuretic that helps in the excretion of urinary stones. It can also be used as an edema. Good for sore throat and cough.

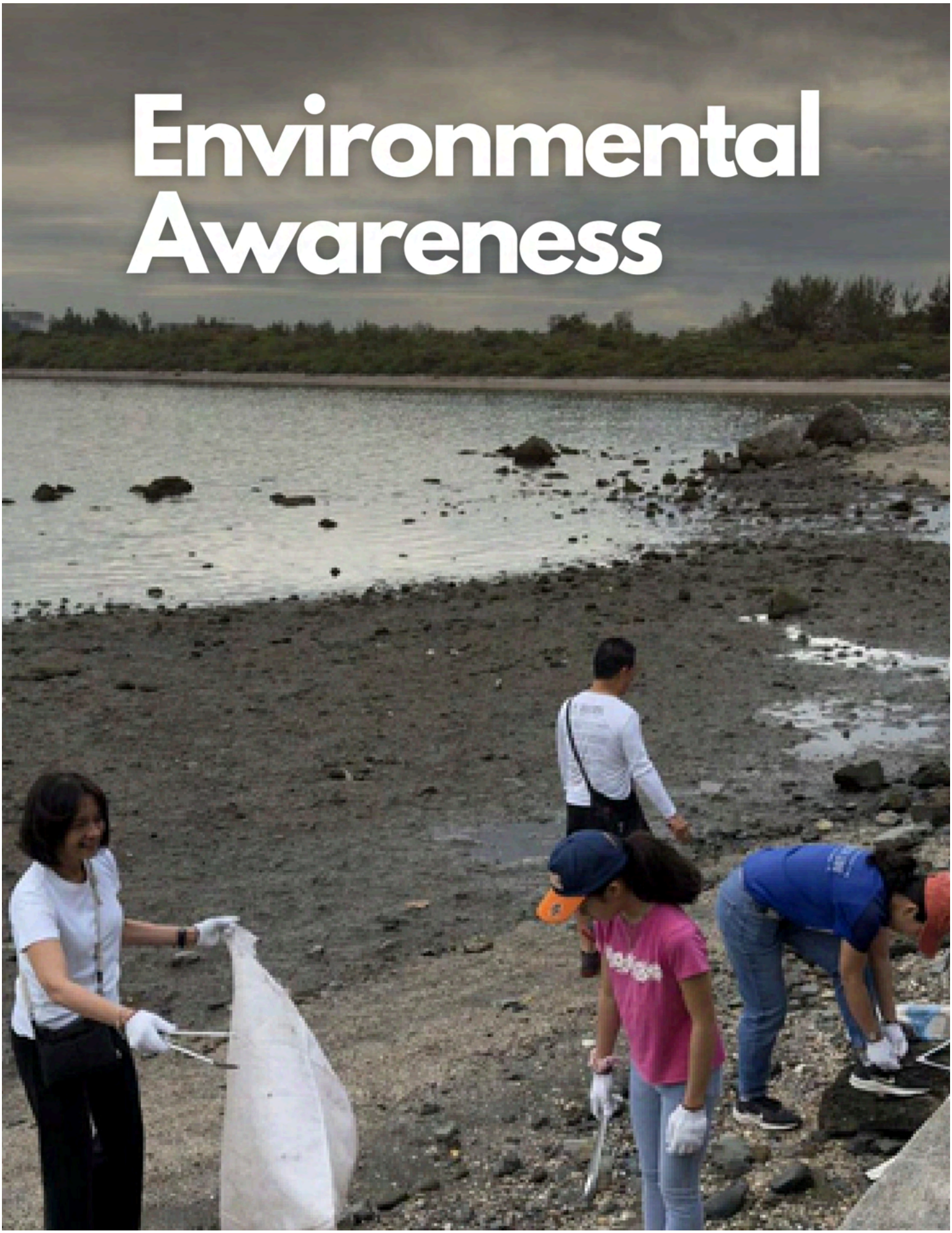
8. ***Tsaang-Gubat*** • Ehretia Microphylla Lam
   Prepared like tea, effective in treating intestinal motility, and also as a mouthwash since the leaves of this shrub have high fluoride content.

9. ***Ulasimang Bato / Pansit -Pansitan*** • Peperomia Pellucida
   Effective in fighting arthritis and gout. Leaves can be eaten fresh (about a cupful) as salad or for tea. Boil a cup of clean, chopped leaves in 2 cups of water. Boil for 15 to 20 minutes. Strain and let cool. Drink a cup after meals.

10. ***Yerba Buena*** • Clinopodium Douglasi/"Peppermint

*Photo Credits from upou.edu.ph*

# Environmental Awareness



# A Clean Environment: Our Collective Responsibility

Dr. Normita L. Villaruz, CPA, ASEAN CPA , CrFA, Ph. D.

The environment sustains every aspect of human life. It is where we draw the air we breathe, the water we drink, and the food that nourishes us. Yet, in our pursuit of growth and convenience, we have often taken it for granted. Pollution, deforestation, waste, and climate change are no longer distant warnings – they are daily realities that threaten lives, livelihoods, and the future of our planet.

The call for a clean environment is not a mere slogan. It is a call for survival, accountability, and collective action. We can no longer separate economic progress from environmental stewardship, nor can we delay the responsibility of change. Each of us – as citizens, professionals, business leaders, and community members – must ACT now.

## Why It Matters

A clean environment is not only about orderliness or aesthetics. It is about life itself. According to the World Health Organization, millions die prematurely each year due to polluted air. Contaminated water continues to spread disease, especially among the poor. Plastic waste suffocates our seas and marine life, while deforestation and carbon emissions worsen the climate crisis.

For the Philippines, the challenge is especially profound. We are blessed with breathtaking natural resources – mountains, forests, rivers, and seas – yet we are among the world's most vulnerable to climate-related disasters. Every storm, flood, and drought reminds us how closely our well-being is tied to the health of our environment. Protecting it is no longer optional; it is essential for our national survival.

## Anchoring on Sustainability

The United Nations' Sustainable Development Goals (SDGs) provide a blueprint for a cleaner, better world. Goals such as Clean Water and Sanitation (SDG 6), Affordable and Clean Energy (SDG 7), Responsible Consumption and Production (SDG 12), Climate Action (SDG 13), Life Below Water (SDG 14), and Life on Land (SDG 15) directly call for environmental protection.

However, sustainability is not the task of world leaders alone. It begins at home, in schools, and in workplaces. It starts when we refuse single-use plastics, save energy, plant trees, or simply dispose of waste properly. When millions of individuals act responsibly, their small efforts create powerful and significant change.

## Empowering the Youth

Young people have the greatest stake in a clean environment. They will inherit the consequences of today's decisions – both good and bad. But they also hold the greatest power to shape the future. By leading clean-up drives, promoting eco-friendly habits, or innovating green technologies, the youth can become the driving force of environmental renewal.

Educational institutions should make sustainability not just a subject but a culture – one that teaches students that caring for the environment is as vital as any academic or professional achievement. Through awareness and advocacy, they can grow into responsible stewards of the planet.

## Rethinking Business and Governance

The private sector plays a decisive role in this transformation. Businesses must go beyond corporate social responsibility and integrate sustainability into their strategies. Reducing waste, using renewable energy, adopting green technologies, and designing circular production systems are not just ethical actions – they are smart investments for the future.

Governments, on the other hand, must lead through strong policies and consistent enforcement. Stricter emissions standards, improved waste management systems, incentives for renewable energy, and education programs can drive the change. Collaboration between the public and private sectors is essential to turn isolated projects into lasting national progress.

## Practical Steps Forward

While systemic reform is vital, every person can contribute through everyday choices:

- Reduce, Reuse, Recycle. Avoid single-use plastics and segregate waste.
- Conserve Energy and Water. Turn off unused lights, fix leaks, and choose energy-efficient appliances.
- Support Clean Mobility. Walk, carpool, or use public transport whenever possible.
- Protect Nature. Plant trees, care for local parks, and support biodiversity programs.
- Educate and Influence. Share environmental knowledge with families and peers.
- Demand Accountability. Urge leaders and companies to honor their environmental commitments.

These may seem simple acts, but when multiplied across communities, they have the power to restore balance to our environment.

## A Time for Courage and Commitment

The fight for a clean environment is not one of convenience; it is one of courage. It demands that we change habits, challenge systems, and choose what is right over what is easy. Every day of delay means more damage – more species lost, more polluted air, and more lives disrupted by disaster.

We must remember that the Earth is not a gift from our ancestors; it is a loan from our children. To neglect it is to betray their future. To care for it is to give them hope, life, and dignity.

Imagine a beautiful Philippines where rivers run clear, where forests thrive, and where communities live in harmony with nature. This vision is within reach – if we act with urgency, compassion, and unity.
The time is now. The responsibility is ours. The future depends on what we do today.

# Preserving the Environment in Bohol

Zoilo "Bingo" P.Dejaresco

*Photo Credits from Pinterest*

Bohol, with 1.4 million people, is aware that tourism is its flagship industry, accounting for half of its local GDP. Preserving its environment, though not necessarily in the Boholanos' DNA, is a matter of existential importance.

Thus, as early as 2018, Bohol Provincial Ordinance No. 2018-005 prohibited the construction of any coal-fired power plant in the province, although there was a long queue of coal proponents at the Capitol. The interest was because Bohol had a lack of adequate power supply then. Today, the province has a stable power supply through its interconnection with the Cebu power grid and the growth of renewable energy sources like solar and wind.

Likewise, two multi-billion-peso reclamation projects that would have severely affected the fabled Panglao Island and the scenic Tagbilaran Bay were stopped before they could take off. Strong citizen opposition led by the Catholic Church put a stop to these environmentally-violative projects that promised gold to the inhabitants in terms of new industries, housing, and employment. It is the same civic-minded consciousness that blocked every attempt to build casinos and any gambling-related activity in the province.

## The Islands

On Pamilican island, about 5.7 kilometers from Baclayon town (home of the country's oldest churches), diving and snorkeling are now very popular. But a long time ago, the island was once a hunting ground for whale sharks and manta rays. Hunters used spears to kill whales, selling them for a lucrative price of P100,000 per whale, which allowed the fishermen to rest from fishing for weeks, enjoying the bounty. Whale hunting is now banned.

Meanwhile, diving has been suspended at the "Holy Place for Diving" known as the Virgin Islands. This mandate was to protect visitors who go for contemplative rest and prayers from disturbance, and after unscrupulous foreign tourists were found to have drawn ugly graffiti on the corals, destroying their beauty and life. Padre Pio, the Healer, is the Island's popular patron saint.

## Environmental Violations

Last year, the construction of a resort with a swimming pool (The Captain's Peak) within the Chocolate Hills' Protected Area caused a noisy Senate inquiry. The Ombudsman was prompted to fire 18 officials and suspend 16 others. Even the mere toppling of three acacia trees to erect a gasoline station within the city raised a big howl, and reportedly, residents are doing a silent boycott of the service of the gasoline station, even though it is ideally situated at the corner of two streets. People do treat the environment seriously.

Bishop Abet Uy, a staunch environmentalist who was appointed by the Pope as the new Archbishop of Cebu, gave a parting mandate to all Boholanos to do a "Tree Park" in every town: his parting legacy to his land of birth.

## Korean Invasion

In the last two years, a mini "Korean Invasion" hit Bohol, with Koreans coming in 1,200 a day from five daily flights directly from Korea. Now that number has shrunk by 30 percent. Aside from the new lure of cheaper Vietnam, the Koreans were resentful of the removal of one of their favorite destinations: watching and feeding whales.

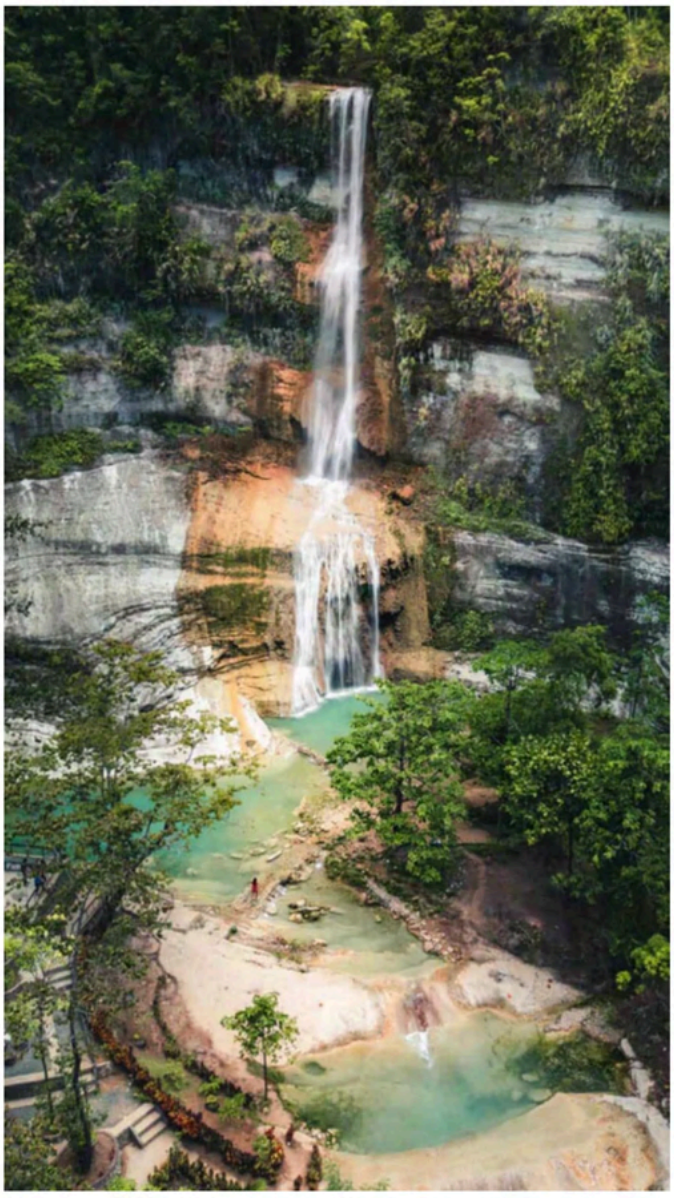
The Koreans used to enjoy these whales in the towns of Lila, Albuquerque, and Dauis. In February, Governor Aris Aumentado suspended these tours due to non-compliance with regulations. The illegal use of the krill to feed the whales violated a joint agreement between Bohol and agencies like the Department of Environment and Natural Resources (DENR), Department of Agriculture (DA), and the Department of the Interior and Local Government (DILG). The krill also emitted a foul odor that spread across the towns.

*Photo Credits from Pinterest*

The practice lured the whales away from their natural migratory paths, a violation of the Convention on Migratory Species of Wild Animals. Disrupting their natural behavior threatens the ecological balance and can lead them to their eventual death, effectively amounting to captivity, which contributes to the extinction of the species. There are steps to revive the favorite tourist activity with plenty of new caveats.

## UNESCO GeoPark

The other important factor that keeps Boholanos on their toes in preserving their God-given environment is the fact that Bohol is the only UNESCO Global Geopark and Regenerative Island in the entire Philippines. This unwritten commitment is rooted in the understanding that UNESCO can revoke the honors for environmental breaches.



*Can-umantad Waterfalls*
*Photo Credits from Pinterest*

# Environmental Conservation and Geotourism: The Masungi Experience

Billie Dumaliang

*(reprinted from The Manila Times)*

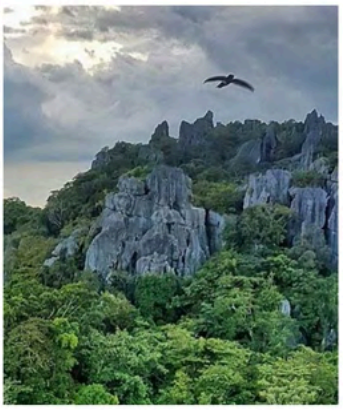
Sustainable development is a buzzword that's thrown around a lot these days. Despite its prevalence, many remain skeptical about what it truly means. Even students exposed to the term in classrooms often struggle to grasp its real-world application. This begs the question: can sustainable development truly exist?

Yes, the Masungi Georeserve – our conservation project in Rizal province – stands as a concrete example of sustainable development because it generates livelihood, fosters economic value, and incorporates low-impact infrastructure. But more importantly, it is sustainable because its core purpose is to conserve the landscape. At Masungi, tourism serves environmental conservation–not the other way around.

However, the vision for Masungi Georeserve was not realized overnight. I often think of it as a product of serendipity – a fortunate intersection of timing, luck, and determination.

Conservation efforts at Masungi began in the late 1990s when the Department of Environment and

Natural Resources (DENR) initiated a joint venture project. The goal was to create affordable housing for government employees, with a caveat: only 30% of the project site could be developed, while the remaining 70% had to remain as forests, parks, and green spaces. The project became even more urgent due to the threat of professional squatting in the area. Blue Star, a construction and engineering company, won the bid.



At the time, the karst landscape of Masungi was underappreciated. The magnificent limestone formations, now recognized as a natural heritage, were seen as mere rocks. As a child, visiting Masungi with my father–who was a director in the joint venture–felt like stepping into a barren, desolate scene straight out of Dune. Despite this, my father and his team took great care to protect the area from intruders and threats. Their dedication bore fruit. After **two decades, the site transformed into a thriving secondary rainforest, home to over 800 species of plants and animals, many of which are rare and endemic.**

In 2016, my sister and I joined our father to establish the Masungi Georeserve Foundation (MGF). Our aim was to professionalize conservation efforts and ensure their sustainability for the long term. After all, what's the point of protecting a place if the efforts won't last? From the beginning, our mission has been to protect Masungi forever.

To achieve this, MGF introduced low-impact trails that brought people closer to nature. Rope bridges, unique trail features, and world-first innovations–such as the iconic spiderweb viewing deck atop limestone pinnacles and an 80-meter-long hammock–made exploring the reserve a magical experience. These trails didn't just showcase biodiversity; they fostered a deeper appreciation for it.

The impact has been profound. Over the years, the project has received global recognition for its innovative approach to conservation financing, sustainable tourism, and environmental stewardship. In 2022, Masungi Georeserve won the United Nations Sustainable Development Goals Action Awards in the Inspire category, out of 3,000 nominations worldwide. Raising a truly world-class Filipino project that embodies sustainable development has been both an honor and a privilege.

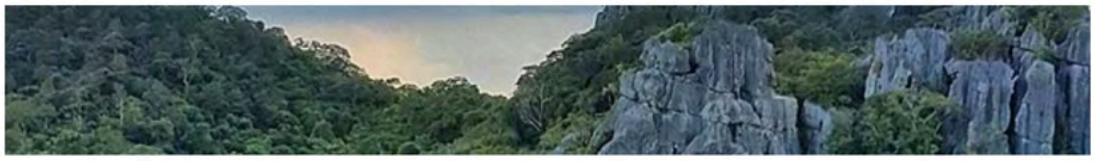


*Photo Credits from Pinterest / Masungi*

Yet, our journey has not been without challenges. From combating destructive projects to resisting political interference, we've faced significant risks. People often ask why we continue despite these obstacles. My answer is simple: I see the change this project brings. Masungi is a living, breathing example of what's possible–a template for survival in the face of an uncertain future. The impact we've achieved is worth any risk.

To move forward, we must challenge ourselves–and our leaders–to embrace and support innovation. Accelerating our journey towards a sustainable future requires creating an enabling environment where the private sector and civil society can actively contribute to land restoration and the fulfillment of our constitutional right to a healthful ecology. This means engaging in meaningful dialogue, implementing forward-thinking policies, and fostering partnerships that allow us to thrive together.

Development and sustainability are not contradictions. They are the ultimate win-win scenario. Sustainable development is not just a possibility–it is a necessity for the survival and well-being of our planet and future generations. Let Masungi be an inspiration for what can be achieved when we dare to dream and act boldly for the greater good.

# Practical Ways to Save the Earth @ Home

Elross Pangue

Sustainability begins at home, and small actions can collectively make a significant impact on our planet. Here are five practical tips to help you live a more eco-friendly lifestyle and contribute to saving the earth from the comfort of your own home.

*Photo Credits from Pinterest*

## Build a Materials Recovery Facility (MRF) for Your Community

A Materials Recovery Facility (MRF) is a specialized plant that receives, separates, and prepares recyclable materials for marketing to end-user manufacturers. Setting up an MRF in your community can significantly reduce the amount of waste that ends up in landfills.

But how can you get started with such an ambitious project? The first step is to gather support from your neighbors and local organizations. A community effort can make the project more manageable and increase participation.

Once you have community support, the next step is to develop a plan. This plan should outline the facility's operations, required equipment, and potential funding sources. Local governments and environmental grants can provide financial assistance.

With a plan in place, it's time to focus on education and awareness.

Educating the community about the benefits of recycling and how to properly sort materials is crucial for the success of your MRF. Workshops and informational pamphlets can be effective tools for this purpose.

An MRF not only helps in waste management but also creates jobs and promotes a circular economy within the community. It's a big step towards sustainability, but what about day-to-day waste management at home?

*Photo Credits from Pinterest*

## Segregation: Plastics, Recyclables, and Biodegradable Materials

Proper segregation of waste is crucial for effective recycling and composting. But how can you implement a segregation system at home?

The answer lies in the three-bin system. Use three separate bins for plastics, recyclables (like paper and glass), and biodegradable materials (like food scraps). This ensures that each type of waste is correctly processed.

But what about plastics specifically? Before disposing of plastic items, it's important to wash them to remove any food residue. Clean plastics are easier to recycle and less likely to contaminate other recyclables.

To make the segregation process easier for all household members, clearly label each bin and provide instructions on what items go where. This can help ensure everyone participates in proper waste segregation.

By segregating waste, you can significantly reduce the amount of trash that ends up in landfills and improve the efficiency of recycling processes. But what about plastic waste that doesn't make it into your home recycling bin?

## Plastic Collection for Proper Waste Diversion

Plastic waste is a major environmental concern, but proper collection and recycling can mitigate its impact. So, what can you do to address this issue beyond your household?

One effective approach is to organize regular plastic collection drives in your community. Partner with local recycling centers to ensure collected plastics are properly processed.

To make plastic collection more accessible, consider establishing designated drop-off points for plastic waste. Ensure these points are accessible and well-publicized to encourage participation.

But how can you motivate people to participate in these efforts? Consider offering incentives like discounts at local stores or community recognition to motivate people to participate in plastic collection efforts.

Effective plastic collection and diversion can significantly reduce plastic pollution and promote a cleaner environment. But what about reducing plastic waste at the source?

## Using Refilled Goods with Personal Containers

Refilling goods instead of purchasing new ones can drastically cut down on plastic waste. But how can you incorporate this practice into your daily life?

Start by identifying local stores that offer refill stations for household goods like detergents, cooking oils, and personal care products. These stores are becoming increasingly common as awareness of plastic pollution grows.

Once you've found these stores, the next step is to use your own containers when shopping at these refill stations. Make sure your containers are clean and appropriate for the products you're purchasing.

*Photo Credits from Pinterest*

But how can you ensure these refill stations continue to operate? Support businesses that offer refill services by regularly purchasing from them and spreading the word to your friends and family.

By using refilled goods, you reduce the demand for single-use plastics and contribute to a circular economy. But what about the organic waste that can't be refilled or recycled?

## Biodegradable Bokashi Composting

*Photo Credits from Freepik.com*

Bokashi composting is an efficient way to handle kitchen waste and create nutrient-rich soil for your garden. But how do you get started with this method?

The first step is to purchase or create a Bokashi bin. These bins are designed to be airtight and compact, making them perfect for indoor use.

Next, you'll need to acquire Bokashi bran, a mixture of bran and beneficial microbes that ferment organic waste. You can buy this or make it at home.

But how does the composting process work? Add kitchen scraps to the bin and sprinkle them with Bokashi bran. Once the bin is full, let it sit for a couple of weeks to ferment. After fermentation, bury the contents in your garden or mix them with your compost pile.

Bokashi composting not only reduces food waste but also enriches your garden soil, promoting healthier plant growth.

# Good Governance

Good Governance Matters for Sustainability
What Defines Good Governance?
How Governance Supports a Sustainable Future
Practical Tips: Becoming an Active Stakeholder

# Good Governance Matters for Sustainability

Gaudencio S. Hernandez, Jr.

In the crucial journey toward a more sustainable future, public discourse often highlights visible actions like reducing carbon emissions or switching to renewable energy. However, behind these efforts is a less-celebrated yet equally powerful force: good governance. Whether a private company, a non-profit, or a government agency, good governance is the essential foundation that allows sustainability to flourish, ensuring decisions are made responsibly, ethically, and with the long-term health of the planet and its people in mind.

## What Defines Good Governance?

Good governance is the framework of rules, practices, and processes through which an organization is directed and controlled. It's not just about compliance; it's about making better decisions. At its core, good governance is defined by four principles:

- Transparency: The organization shares information openly and honestly, allowing stakeholders to understand its decisions and performance.
- Accountability: It takes responsibility for its actions and outcomes, particularly regarding environmental and social impact.
- Ethics & Integrity: Decisions are guided by a commitment to fair dealings, human rights, and respect for the environment.
- Strategic Focus: It plans beyond short-term profits or political cycles, prioritizing long-term goals that ensure well-being for future generations.

These principles act as a safeguard against practices that undermine sustainability, such as corruption, environmental negligence, or social exploitation.

# How Governance Supports a Sustainable Future

When governance is robust, it creates an environment where sustainability initiatives can thrive and become core to the organization's mission. It becomes the compass that supports environmental efforts, like reducing emissions, conserving resources, and protecting/preserving ecosystems. Social responsibility and accountability are promoted by ensuring fair practices, community engagement, and ethical policies. It is important in nurturing values that build trust through honest communication and transparent leadership to avoid harmful practices like corruption, pollution, or exploitation.

## For Private Sector

Strong corporate governance–often referred to as ESG (Environmental, Social, and Governance)–integrates sustainability into the business model, offering both a moral and competitive advantage.

- Risk Mitigation: Good governance helps companies identify and manage environmental risks (e.g., climate change impacts) and social risks (e.g., supply chain labor issues), protecting their reputation and financial stability.

- Enhanced Innovation: By focusing on long-term sustainability goals, companies are driven to develop resource-efficient products and circular economy solutions. For example, Unilever publicly commits to reducing plastic waste and integrates this goal into its global product development and sourcing, demonstrating long-term planning (1).

- Trust and Investment: Transparent reporting on social and environmental performance attracts investors who increasingly favor sustainable investments and builds strong public trust.

## For Government Agencies

Good public governance is crucial for effective policy-making and service delivery that supports sustainability at a macro level.

- Effective Policy Implementation: Ethical and accountable governance ensures that environmental and social regulations, such as pollution controls or resource conservation policies, are fairly enforced without undue influence. Singapore, known for its strong anti-corruption framework, is a global model for transparent and efficient urban planning, which includes ambitious sustainability targets (2).

- Citizen Participation: Open governance allows citizens to participate in decision-making, leading to more inclusive and locally appropriate sustainability outcomes. Estonia's advanced digital governance system increases transparency and facilitates citizen feedback on public programs (2).

- Resource Management: Transparency in budgeting and procurement prevents corruption and ensures public funds are directed toward sustainable infrastructure and social programs, such as renewable energy projects or public health initiatives.

# Practical Tips: Becoming an Active Stakeholder

Good governance and sustainability aren't just the responsibility of CEOs or Presidents; they require active engagement from the general public.

| Action | Practical Application |
| --- | --- |
| Ask Questions | When supporting a company or government program, inquire about its ethics policies, supply chain practices, or long-term environmental goals. Demand specific, measurable answers. |

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| Support Ethical Organizations | Use your purchasing power or your vote to support companies and leaders that demonstrate genuine commitment to social and environmental responsibility, such as outdoor retailer Patagonia, known for its environmental activism and focus on product longevity (1). |
| Stay Informed | Review a company's Sustainability Report or a government agency's public transparency data. Don't rely on marketing claims; look for verified data and third-party certifications. |
| Speak Up | Use public feedback mechanisms–whether through petitions, direct communication, or social media–to voice your values and concerns, influencing both corporate boards and political decisions. |

# Final Thoughts

Good governance is about responsibility; it is not just about implementing rules. It's the invisible framework that turns good intentions into meaningful, lasting change. As someone involved in governance, I've seen how leadership decisions shape real-world outcomes. Sustainability starts with Leadership, by setting the tone and modeling good examples in making sustainability a priority in everyday decisions -- big or small. Every Action has Impact, leaders must align their actions with sustainability goals. Transparency builds trust when organizations share clear and honest information, people feel confident and engaged. Long-term thinking is Key in good governance to stay focused on lasting impact because sustainability is about planning for the future.

When organizations– whether corporate or government – are governed well, they become powerful forces for a just, green, and resilient world. By understanding, supporting, and demanding good governance, the public becomes a critical partner in achieving true sustainability.

*References:*
*World Economic Forum. (2020). The New Paradigm of Corporate Governance: A Blueprint for the Future of Business. (General reference for corporate ESG examples).*

*United Nations Development Programme (UNDP). (2017). Sustainable Development Goal 16: Peace, Justice, and Strong Institutions. (General reference for public sector governance examples).*

# EPILOGUE

## Sustainability Beyond Environmentalism

J. Albert Gamboa

When Filipinos hear the word "sustainability," the first thing that comes to mind is usually environmental protection. Images of tree planting, clean-up drives, and renewable energy projects often dominate the conversation. While these are vital, sustainability as a principle must be understood in a much broader context. It is not limited to environmentalism; rather, it encompasses three inseparable pillars: environmental, social, and economic.

The late 20th century introduced the concept of the "triple bottom line," which evaluates performance not only in terms of profit but also of people and the planet. Many companies in the Philippines have adopted this framework in their annual reports, highlighting corporate social responsibility alongside financial results. Yet the practice often remains cosmetic unless applied with depth and sincerity.

Consider social sustainability. The floods that recently paralyzed Metro Manila revealed how poor urban planning,

inadequate housing, and inequitable access to basic services exacerbate environmental risks. A sustainable approach would address not just drainage systems and flood control, but also the welfare of informal settlers, public health, and disaster preparedness. Environmental solutions cannot stand alone if social issues remain neglected.

Economic sustainability is equally crucial. Industries that rely solely on short-term gains tend to exploit natural and human resources at unsustainable levels. This results in boom-and-bust cycles that undermine national progress. On the other hand, businesses that practice long-term planning, efficient resource management, and fair labor relations tend to create more resilient enterprises. They also generate multiplier effects for their communities and the broader economy.

In today's interconnected world, a purely environmental definition of sustainability is outdated. The pandemic illustrated how health systems, supply chains, and financial markets are deeply intertwined with environmental shocks. Climate change, social inequality, and economic instability cannot be addressed in isolation. They require systems thinking, cross-sector collaboration, and visionary leadership.

As the Philippines navigates its development challenges, sustainability must go beyond being a buzzword for environmental compliance. It should be a guiding principle for nation-building. This means balancing ecological preservation with inclusive growth and institutional resilience. Only by embracing all three dimensions can we hope to secure a future that is not just livable, but prosperous and just.

## *Flood Control Scandal: A Failure of Sustainability*

The ongoing flood control scandal is a stark reminder of how sustainability collapses when governance and accountability are absent. Over the years, trillions of pesos have been funneled into projects meant to shield communities from the destructive force of floods. Instead, corruption and negligence have rendered much of these investments ineffective. Substandard work, ghost projects, and questionable procurements have turned what should have been a foundation for resilience into a monument of waste.

From the lens of sustainability, this debacle represents a systemic failure. Environmentally, flood mitigation projects are designed to protect ecosystems and urban areas from extreme weather events that are intensifying due to climate change.

Their failure has only increased risks to lives and property. Socially, the scandal deepens inequities, since it is often the poorest Filipinos – those living in informal settlements near waterway – who suffer the most during calamities. Economically, the misuse of trillions in public funds diverts resources from essential infrastructure, education, and healthcare, thereby weakening national development.

Sustainability cannot thrive in an environment where corruption prevails. What is needed is not just more spending but transparent processes, strong institutions, and a culture of accountability. Without these, sustainability will remain an empty promise drowned by every habagat.

## *The Myth of Resilience as a Substitute for Governance*

Filipinos are often praised for resilience in the face of calamity. Images of families smiling despite waist-deep floods or rebuilding their homes after typhoons are celebrated as testaments to the Filipino spirit. While resilience is admirable, it must never be romanticized as a substitute for effective governance. To do so would risk normalizing poverty and lowering expectations of accountability.

True sustainability is not about how many times communities can bounce back from adversity, but how often government prevents avoidable disasters from happening in the first place.

When leaders invoke resilience, it should not mask systemic failures in planning, infrastructure, and service delivery. Communities should not be forced to resiliently endure floods caused by faulty drainage systems or corruption-ridden projects. Nor should they be praised for adapting to recurring power outages, water shortages, or health crises that are preventable with competent leadership.

Resilience without reform only perpetuates a cycle of vulnerability. It shifts the burden from institutions to individuals, from the state to the citizen. Sustainability demands breaking this cycle through foresight, accountability, and decisive action. If not, resilience becomes an empty mantra – one that excuses government ineptness rather than solving the root problems. In the end, sustainability is not about slogans or survival. It should focus on building systems that prevent crises before they strike. Environmental stewardship, social equity, and economic prudence must converge under accountable governance – otherwise, resilience alone becomes empty, and nation-building remains forever unfinished.

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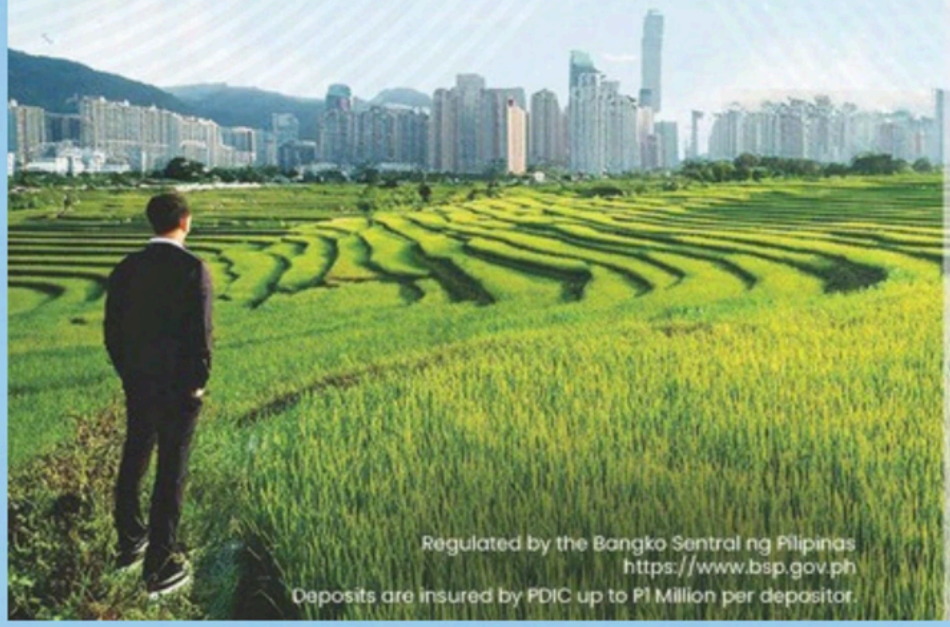

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