Food and Agriculture Organization
of the United Nations

Activities to build bioeconomies in Asia and the Pacific from a FAO perspective

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FAO's mandate on bioeconomy

- Programme Priority Area on Bioeconomy for 2021-2031
- Only UN entity with a strategic priority on bioeconomy
- Support countries to generate value from their biological resources in a sustainable way
- Promote a *sustainable* bioeconomy



Aspirational Principles and Criteria for a Sustainable Bioeconomy (FAO, 2021)

Promoting the transition to a sustainable bioeconomy is core to FAO's approach

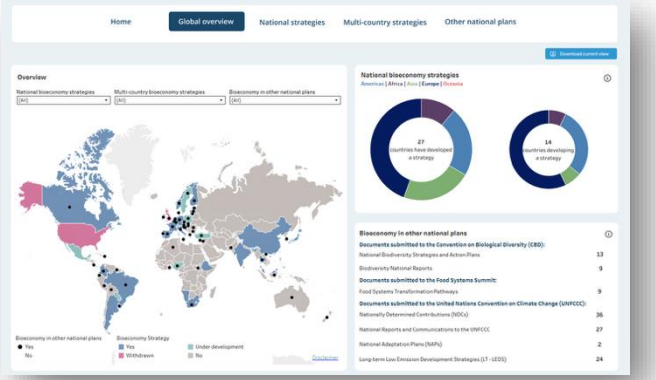
Bioeconomy in figures

Economic value



- The global bioeconomy is valued at US$4–5 trillion, with the potential to grow to US$30 trillion by 2050
- Sustainable bioeconomy solutions could contribute USD$ 40 billion in GDP, create 340,000 jobs and reduce emissions by 230 Mt CO2eq in SEA-6

Policy landscape



- 22 countries have dedicated bioeconomy strategies; 3 of these countries are in Asia-Pacific
- Also counting bioscience/biotechnology strategies, the count rises to 60

Environmental solution



- 24 countries mention bioeconomy in their Long-term Low Emissions Development Strategies (LT-LEDS)
- 13 countries reference bioeconomy in their NBSAPs

The momentum for bioeconomy and interest from countries to develop their bioeconomies is growing

FAO's work on bioeconomy: from global to regional

Policy coherence

- Support countries with strategy development and implementation
- Engage Members through FAO governing bodies
- UN ESCAP bioeconomy Resolution

Partnerships

- Global Bioenergy Partnership (GBEP)
- Bioeconomy for Sustainable Transformation (BEST) Partnership *(under consultation)*
- Bioeconomy Innovations and Investments Forum

Bio-innovations

- Beneficial microorganisms to enhance the rice microbiome in Viet Nam
- Transforming wasted banana stems into textile in Pakistan
- Ecotourism development in line with bioeconomy in Vanuatu
- Biopolymer spray to replace the use of single-use plastic bags to grow mangoes in Thailand

Data, information and knowledge

- Bioeconomy Strategies dashboard
- Advancing towards a core set of indicators
- technology needs assessment for bioeconomy value chains *(under development)*
- Develop a geospatial analysis model to assess biomass availability and inform value chain development

Supporting countries to transition to a sustainable bioeconomy through four key areas of work

Entry points at which FAO operates to promote a sustainable bioeconomy

A sustainable bioeconomy turns underutilised biological resources and residues into higher-value goods and services, creating additional income for producers while protecting ecosystems and the environment



Agricultural biomass as a starting point

Agrifood systems supply feedstock that can also make other sectors more sustainable.

1. **Assess** — Map biomass availability
2. **Prioritise** — Select higher-value end uses
3. **Aggregate** — Organise collection and logistics
4. **Commercialise** — Build viable business models
5. **Enable** — Unlock policy and finance

In support of a strengthened knowledge base, data and evidence to scale up technical support to Members

Crop residues illustrate how an integrated approach can unlock investments and address pollution barriers

Integrated modelling supports intervention targeting to address burning, air pollution and waste while creating new products, incomes and rural enterprises

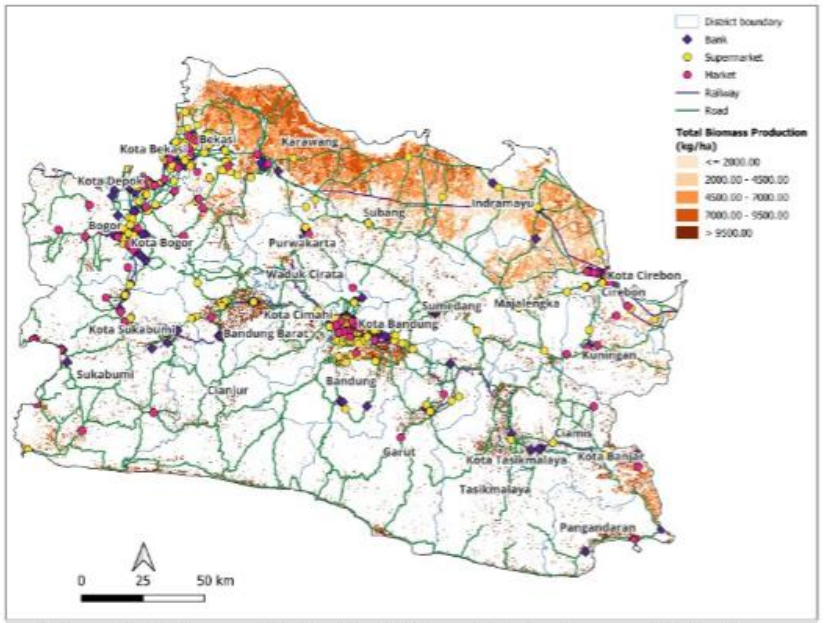


Figure: Total Biomass Production (TBP) masked by rice areas in West Java

Evidence

Biomass mapping combines production, transport and market information to identify high-residue zones and processing locations.

Applications

Options range from biomaterials for textiles and packaging, feed, fertilizer and to biochar and energy, selected for value and feasibility.

Business models

FAO experience includes business models for rice residues, fish silage, and crop residues to textiles.

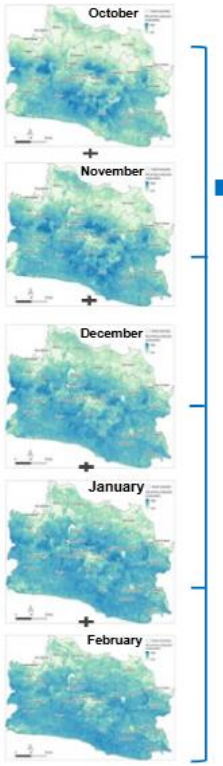
Societal benefits

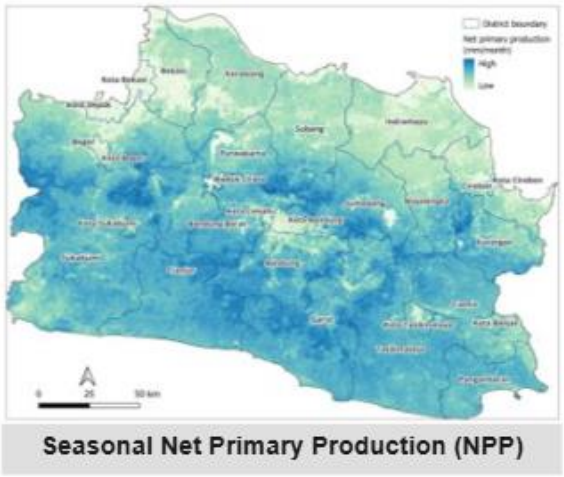
Targeting crop residues allows to reduce burning, leading to reduced air pollution and increased health.

Bioeconomy as an integrated approach to tackle key challenges in agriculture in the region

1. Assess: Biomass availability estimations with different data points

Estimating rice straw potential through NPP-based biomass modelling and harvest index partitioning in West Java





Seasonal Net Primary Production (NPP)

Analytics for biomass modelling through net primary productivity (NPP), yield estimation and biomass and harvest index partitioning



Rice Field

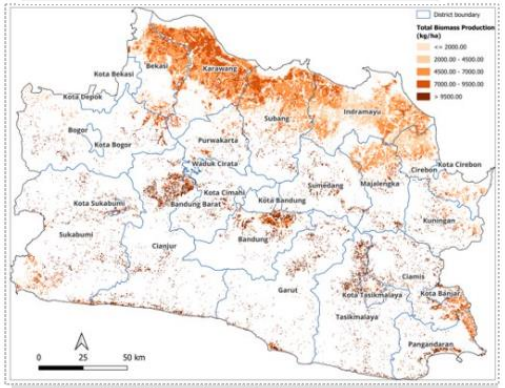


Figure: Total Biomass Production (TBP) masked by rice areas

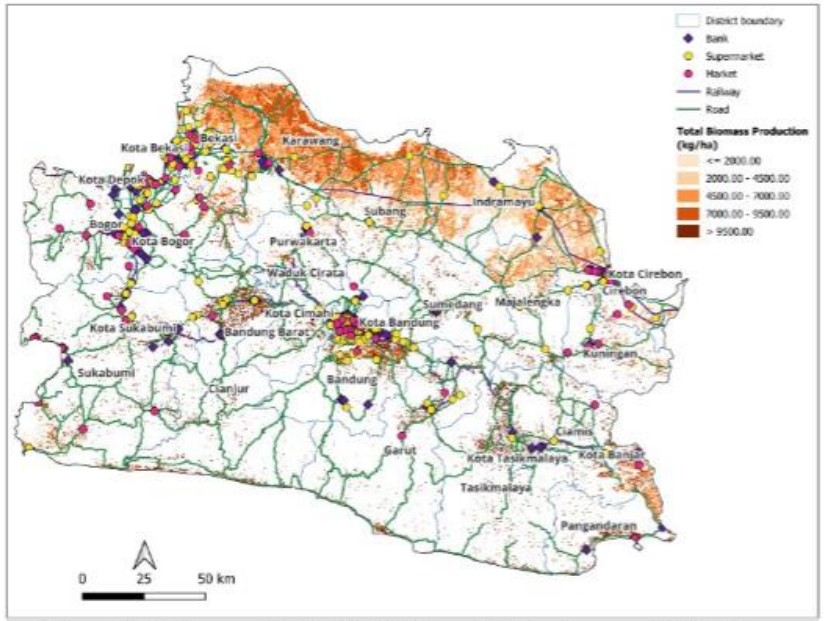
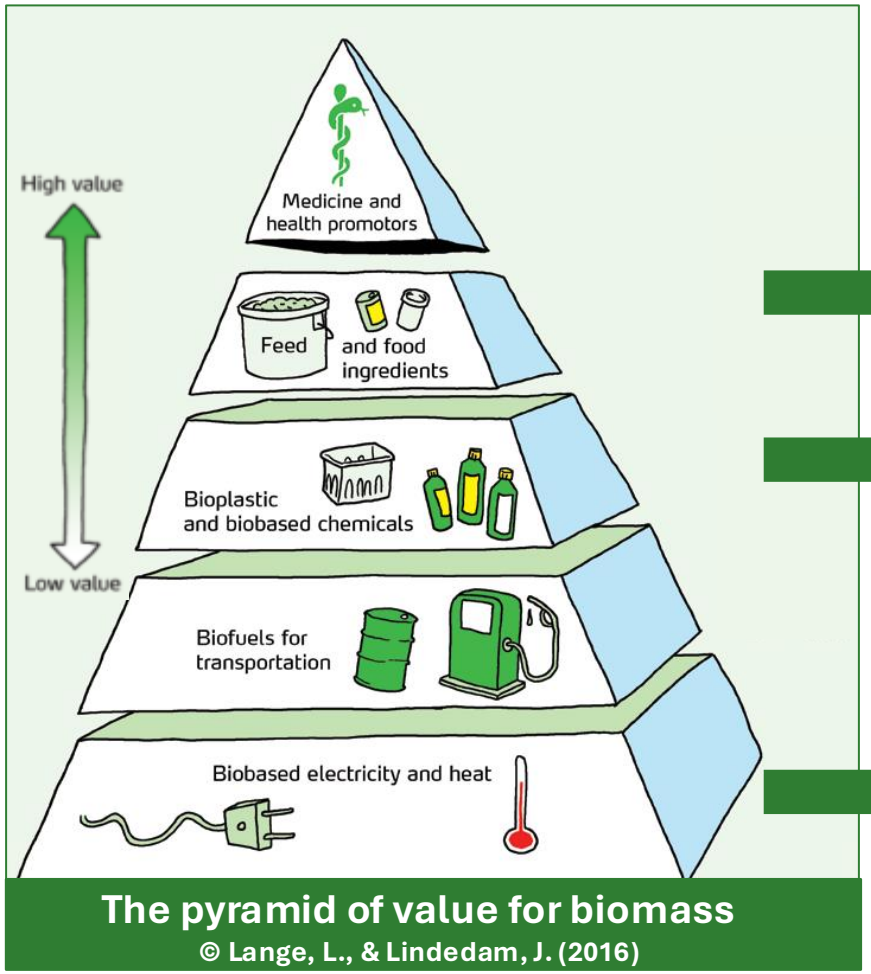


Figure: Total Biomass Production (TBP) masked by rice areas in West Java

Transporation and market networks for residue collection logistics

Step 1: Seasonal NPP Calculation → **Step 2:** Total Biomass Production → **Step 3:** Masking to Rice Cultivation Areas → **Step 4:** Yield & Residue Partitioning → **Step 5:** Triangulation and Validation

2. Prioritise: Applying the pyramid of value to identify high-value end uses



The pyramid of value for biomass

© Lange, L., & Lindedam, J. (2016)



Bioconversion into animal feed and fertiliser



Fish silage technology: animal feed and fertiliser



Biobased plastics



Banana residues to textiles



Fish leather



Waste to energy technologies



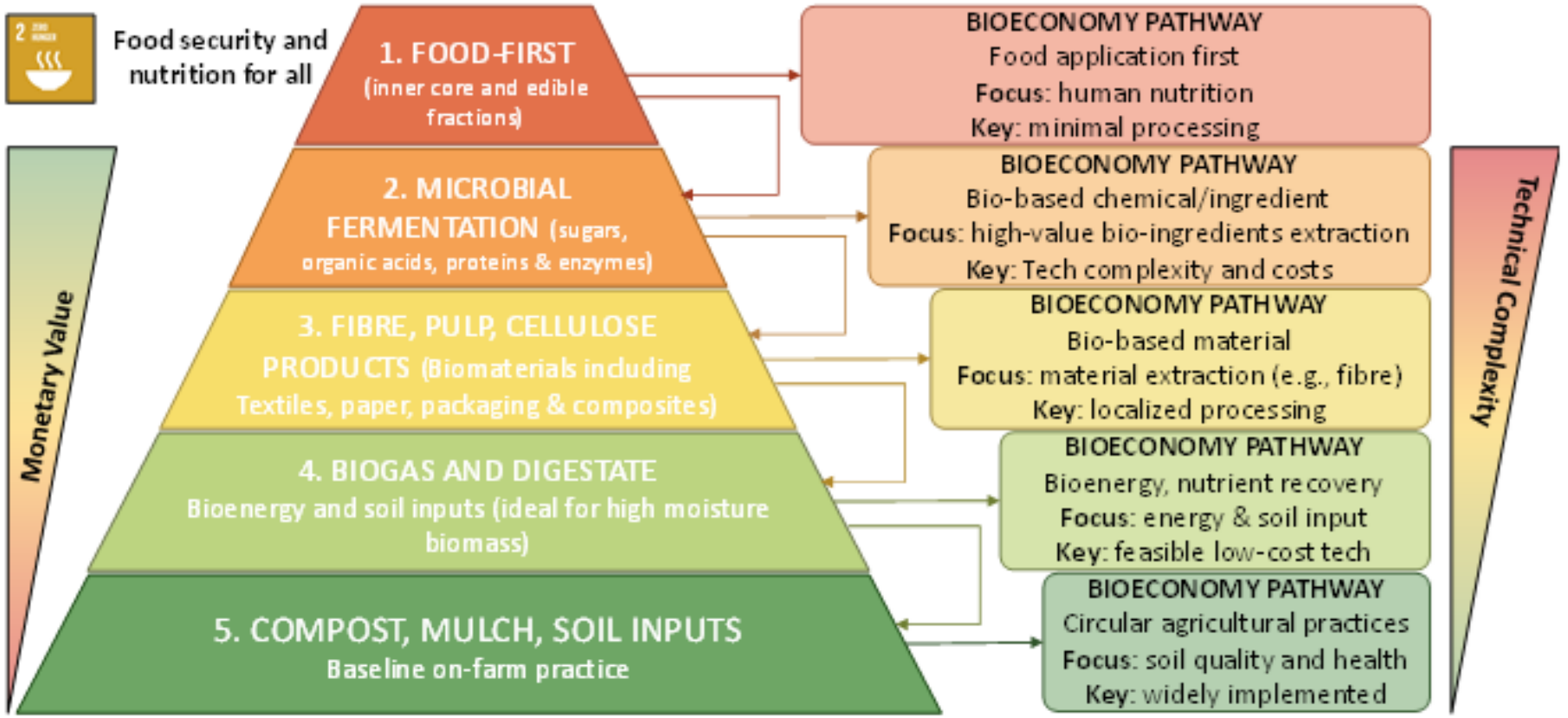
Biochar from rice residues



Sustainably prioritising biomass end use applications, combined with feasibility and considering trade-offs between end uses

2. Prioritise: The pyramid of value applied to one commodity (banana)

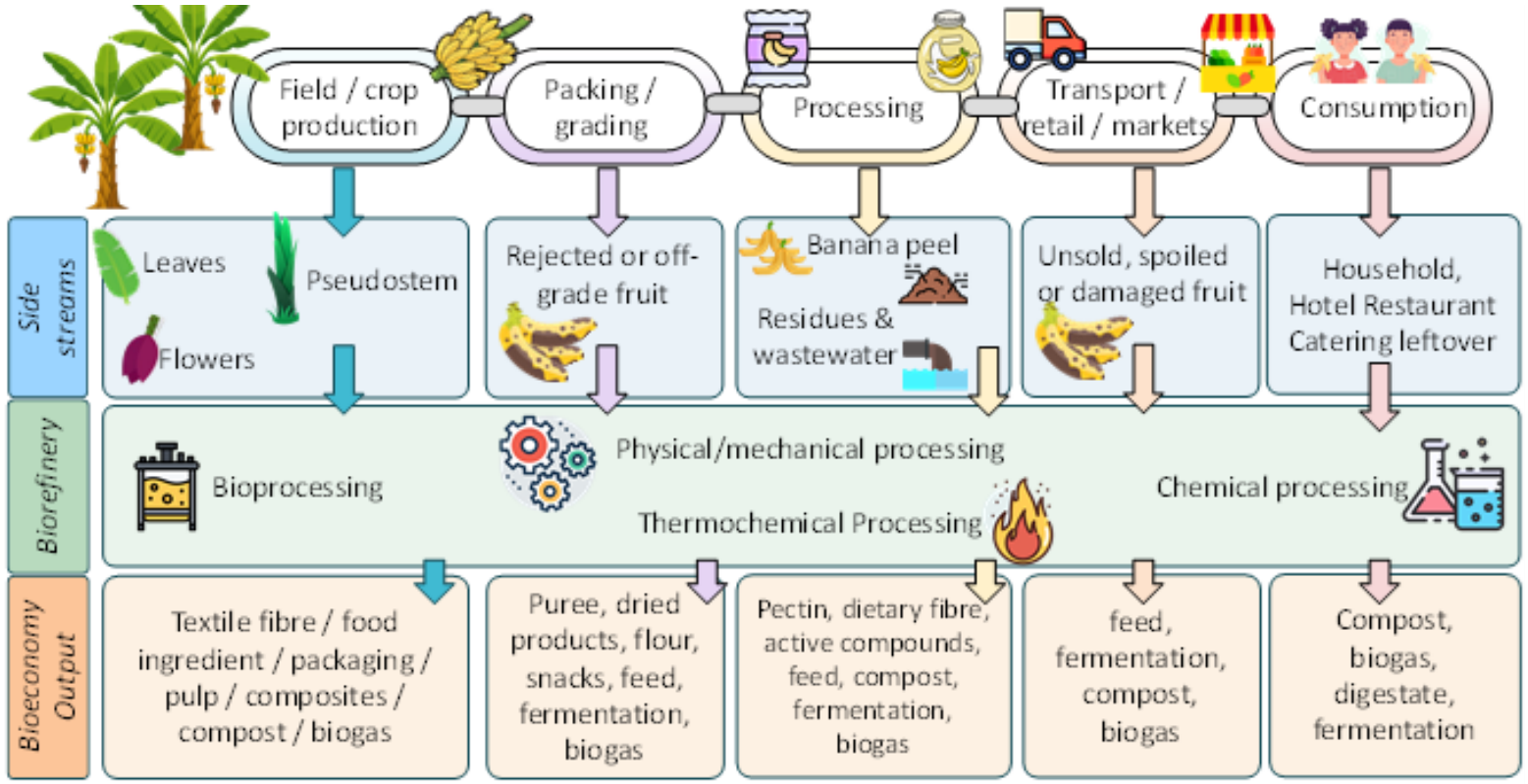
Applying the cascading use principle to one commodity and its different byproducts



A sustainable bio-based value chain approach

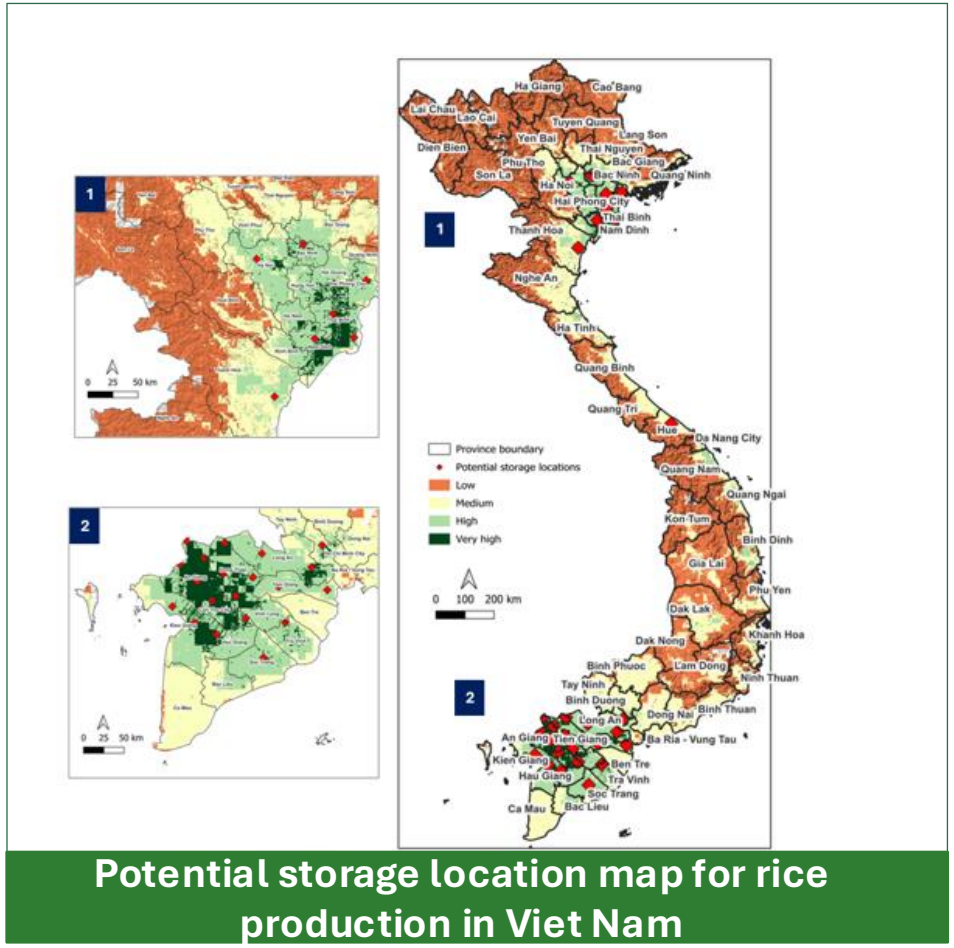
2. Prioritise: Banana bioeconomy opportunities per value chain stage

Shifting attention from a fruit-only perspective to a full-biomass utilization model, where every part of the plant is repurposed, matching each side stream to the most context-appropriate, sustainable use.



A sustainable bio-based value chain approach

3. Aggregate: Identifying suitable locations for processing and storage facilities



Potential storage location map for rice production in Viet Nam

Investment plans

Through inclusive country-level consultations, Climate-Smart Agriculture Investment Plans identify commodities with investment priorities

Investment modeling

Investment modeling combines 1) agricultural potential; 2) technical and economic efficiency gaps; 3) poverty maps; and 4) site location analysis

Applications

Investment modeling combined with spatial analysis can identify suitable aggregation, storage and processing locations

Integrated modeling supports investment planning for biomass collection, storage and aggregation

4. Commercialise: Develop business models for bioproducts

FAO supports the development of business models for targeted biomass and waste streams, identified through assessment and prioritisation exercises



Bananas in Pakistan's Bioeconomy

A sustainable business model transforming banana waste into textile fibre, reducing pollution and generating additional income.

ScalingUpBio

4 countries:	Business models for 5 value chains:
Barbados	Fish silage
Bolivia	Asaí
Côte d'Ivoire	Quinoa
Viet Nam	Organic waste
	Rice

Create market linkages for bioproducts and align with demand for bioproducts

5. Enable: Creating an enabling environment for a sustainable bioeconomy



Policy

Ensure policy alignment among different ministries including alignment of subsidy support.

Finance and investments

Develop innovative financing mechanisms and inform investments in Asia's biobased sectors.

Technological readiness

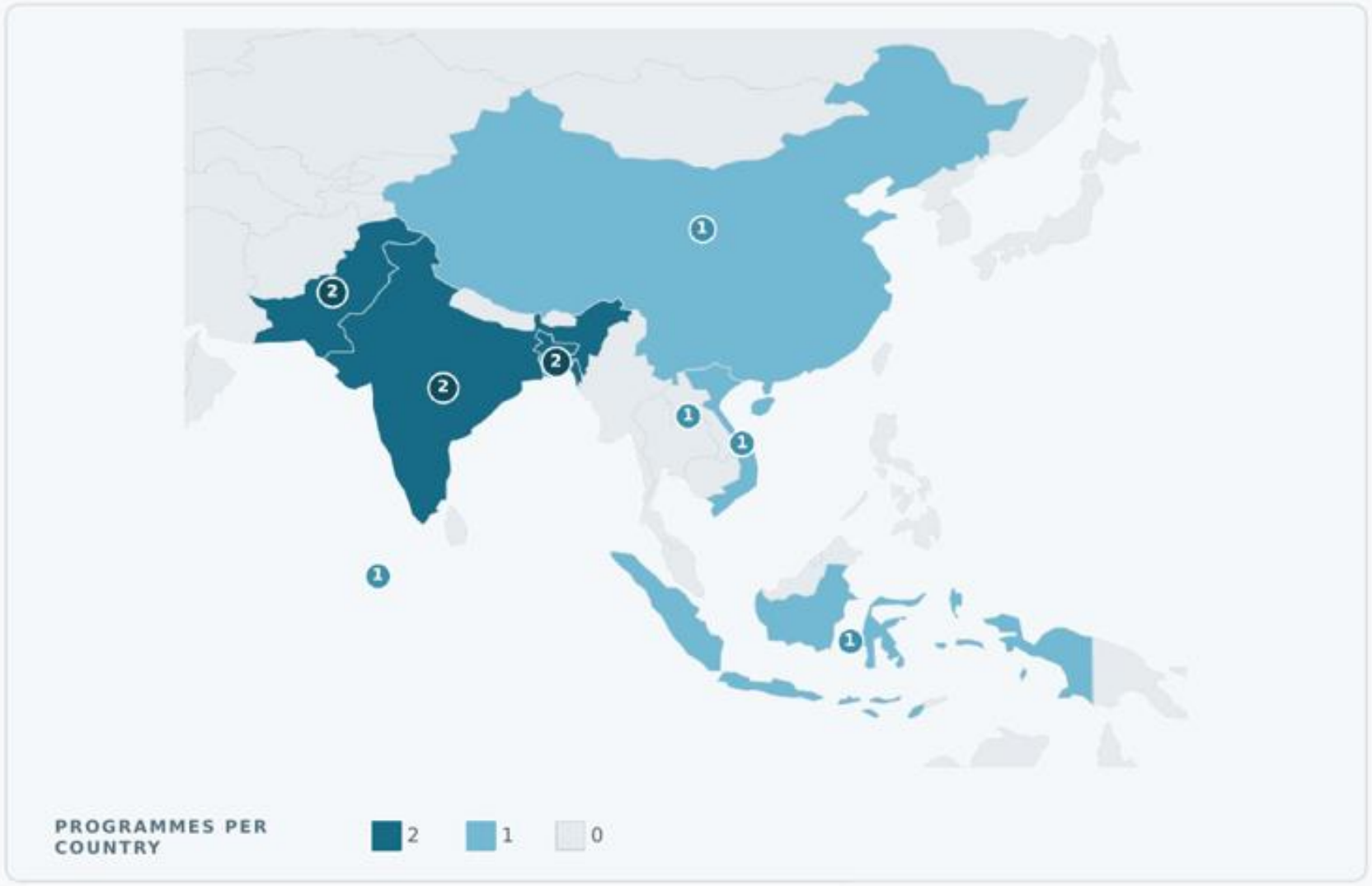
Developing a technology needs assessment for the bioeconomy and support technology transfers.

Regional collaboration

Strengthen regional collaboration for cross-border issues such as crop burning and regional policies.

Enable the transition to a sustainable bioeconomy through policy, finance and investments, technology, and regional collaboration

Looking ahead: Bioeconomy project pipeline for Asia and the Pacific



COUNTRY BREAKDOWN

2 Bangladesh
Textiles MP | Supply Chains IP

2 India
Food Systems IP | Supply Chains IP

2 Pakistan
Food Systems IP | Supply Chains IP

1 China
Supply Chains IP

1 Indonesia
Sustainable Cities IP

1 Lao PDR
Supply Chains IP

1 Maldives
Islands MP

1 Viet Nam
Food Systems IP

Looking ahead: Bioeconomy project pipeline for Asia and the Pacific

COUNTRY	RESOURCE BASE/FEEDSTOCK	TRANSFORMATION ENVISAGED
Bangladesh	Fibre/textile inputs	Field-to-fabric sustainable textile value chain
Bangladesh, China, India	Nature-based dye inputs	Replace polluting textile dyes with nature-based solutions
India	Agricultural by-products	Circular valorisation to reduce chemical pollution and support inclusive growth
Indonesia	Urban waste and rural biomass	Sustainable waste management and urban-rural biomass value chains
Lao PDR	Cassava and maize	Diversified, nutrition-sensitive, circular and nature-positive value chains
Maldives	Solar energy and agricultural land	Agrivoltaics for food security; no biomass feedstock identified
Pakistan	Dry-fruit value chains	Nature-positive production, improved livelihoods and pollution-free supply chains
Pakistan	Wheat	Transform wheat-based food systems for sustainability and climate resilience
Viet Nam	Agricultural biomass	Circular biomass valorisation hubs for pollution-free agriculture

Looking ahead: Partnering to scale bioeconomies in Asia and the Pacific

- Improving the bioeconomy approach and develop decision-making support tools

- Investment analysis to strengthen Asia's biobased industries
  - economic viability of biomass aggregation, investment needs along value chains, investment directions to de-risk, integrate sustainability

- What types of processing technologies are required to better integrate underutilised biomass from farm level in biorefinery value chains
  - Aligned with the major sources of underutilized biomass in the region
  - Allowing farmers to co-benefit

- GBEP: the 14th GBEP Bioenergy Week (2027) will be held in the Asia-Pacific region

How can partnerships support the development of bioeconomies in Asia and the Pacific

Thank you!

Questions? Reach out:
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