

Thailand's Biomass Availability and Selection Criteria

Sugarcane Leaves as a Promising Feedstock for Biochar in the ASEAN Context

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The Burning Problem: The True Cost of Agricultural Residues

Open burning contributes to seasonal air pollution and greenhouse gas emissions. Alternative residue management can reduce these impacts

Environmental Impact

- Releases CO_2, CH_4, and N_2O into the atmosphere
- Destroys soil organic matter and beneficial microbiome
- GHG emissions from open burning are a major source within the sugarcane production cycle

Economic Impact

- Total destruction of the carbon value embedded in biomass
- Farmers receive zero income from a potentially valuable by-product

Health Impact

- PM2.5 is associated with respiratory and cardiovascular illness.
- Agricultural workers face direct and repeated exposure

? The core question: If these residues should not be burned — ***where should they go?***



Sources: OCSB via Bangkok Post (2023); Phairuang et al. (2017); OSIR (2024). Full list on the References slide.

Why Biochar? The Case for Biomass-to-Biochar Conversion

Biochar addresses three critical challenges simultaneously:

1. Immediate GHG Reduction

Stopping open burning eliminates a major source of agricultural emissions. Pyrolysis captures carbon instead of releasing it.

2. Long-Term Carbon Storage in Soil

Proper carbon stability, production conditions, application and the accounting method used can store carbon, potentially for more than 100 years

3. Economic and Carbon Market Value

Biochar generates revenue through soil amendment sales and carbon credits (T-VER, Verra VM0044).

Policy & Sustainability Context

Thailand's BCG Model

Bio-Circular-Green Economy

Thailand NDC 3.0
Net Zero 2050
47% net GHG reduction by 2035 vs. 2019

ASEAN Regional Sustainability Goals

Thailand's Biomass Landscape: A National Overview

Over 100 million tonnes of agricultural residues a year; six examples of high-potential biochar feedstocks.

Biomass Type	Estimated Volume (Mt/yr)	Key Region	Biochar Potential
Rice straw / husk	~20	Central, North	Moderate (high silica ash)
Sugarcane leaves ⭐	**~10–20**	**Central, Northeast, North**	**High**
Bagasse	~10	Near sugar mills	High (already used in process)
Corn cobs / stalks	~8	North, Northeast	Moderate
Empty palm bunches	~3	South	High
Eucalyptus residues	~5	Nationwide	Very High

Why focus on sugarcane leaves?

- Among the highest volume residues still lacking a systematic utilization pathway
- Geographically co-located with sugar mill infrastructure
- Bagasse is already consumed within mill operations — sugarcane leaves represent the true untapped waste stream
- Low moisture compared to bagasse — favorable for pyrolysis without heavy pre-drying

Sources: DEDE Biomass Database; OAE crop statistics 2022–2023; Waste and Biomass Valorization (2021). Full list on the References slide.

Scale of the Opportunity: 15 – 19 Million Ton per Year

Thailand's sugarcane sector generates a massive, recurring biomass stream from field harvest residues.

~ 97M

Tonnes Crushed

Sugarcane crushed, Production Year 2025/2026 (96–98 Mt estimated)

15 – 19M

Tonnes of Leaves

Leaves left in fields each year, at 1.5 – 2.5 ton/rai (15 – 20% of cane weight)

~ 8M

Collectible Tonnes

If 50% is collectible: 7.5 – 9.5 million ton/year of biochar feedstock

~ 2 – 3M

Tonnes of Biochar

At 25 – 30% biochar yield: 1.9 – 2.9 million ton of biochar/year (theoretical maximum)

Current utilization status:

🔥 **Open Burning**

Burnt harvested cane fell from 32.8% (2022/23) to 3.8% (2025/26) — but leaves still burn

🌿 **Field Mulch**

Left as field mulch — partial soil benefit, but risks mold, fire, and excess moisture

📦 **Commercial Collection**

Collected for commercial use — still a fraction of total potential

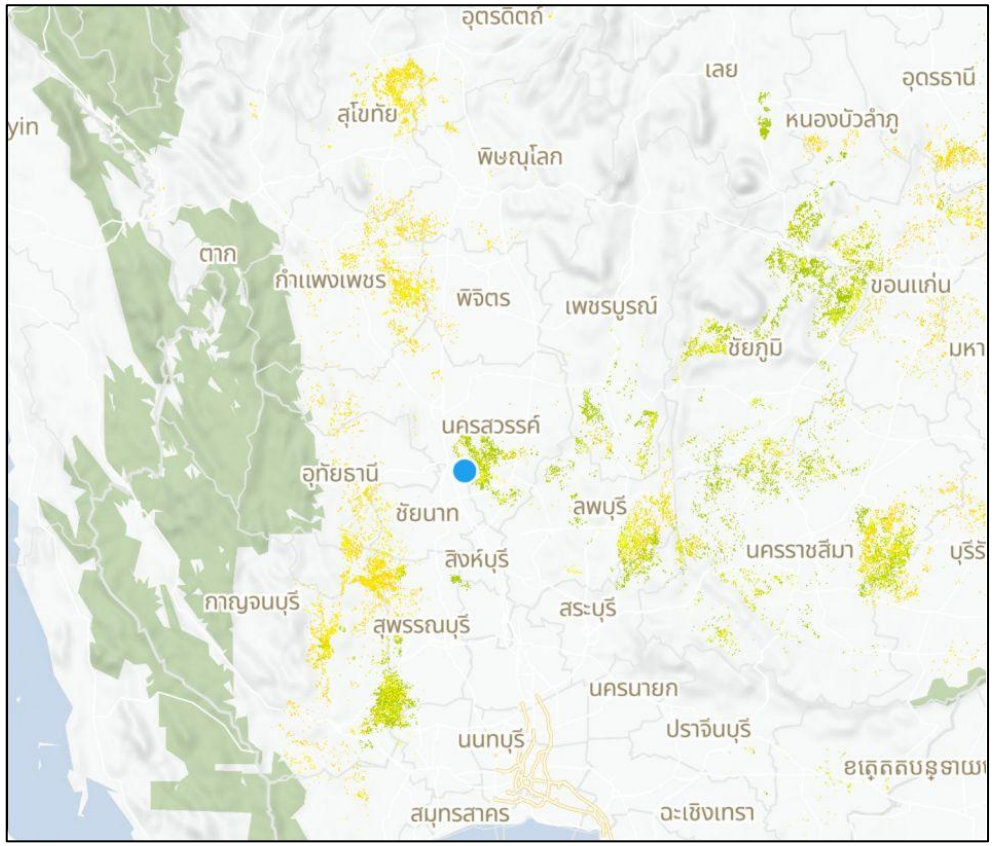
Sources: OCSB crushing reports (2024/25 ≈104 Mt; 2025/26 96–98 Mt). Cane trash 1.5–2.5 t/rai. Burnt-cane share: OCSB via Bangkok Post 2023 and Nation Thailand 2025.

Spatial Distribution and Seasonal Availability

Understanding where and when sugarcane leaves are available is essential for feasible biochar plant siting and supply chain design.

Geographic Distribution

- **Upper Central Plains:** Nakhon Sawan, Kamphaeng Phet, Uthai Thani — highest density
- **Northeast:** Chaiyaphum, Nakhon Ratchasima, Kalasin — high volume
- **Lower North:** Phichit, Phetchabun — moderate volume
- Advantage: sugarcane fields are clustered near sugar mill facilities, enabling shared logistics infrastructure



Seasonal Availability

Period	Sugarcane Leaf Status	Implication for Biochar
Nov – Apr (Crushing Season)	High volume, low moisture	Primary feedstock collection window
May – Oct (Off-season)	Minimal availability	Requires strategic storage from prior season

Source: GISTDA (Geo-Informatics and Space Technology Development Agency); OCSB provincial cane statistics

Selection Criteria Framework: 4 Dimensions for Biochar Feedstock

Selecting the right biomass for biochar is not purely a technical decision. It requires evaluation across four interdependent dimensions.

Physicochemical Quality

Fixed carbon content, moisture, ash content, heating value, and expected biochar yield determine suitability for pyrolysis and the quality of the final biochar product.

Supply Chain & Logistics Feasibility

Bulk density, collection radius, transportation form factor, and storage requirements determine whether feedstock can be delivered cost-effectively at scale.

Economic Viability

The delivered cost of feedstock versus the market value of biochar and associated carbon credits determines whether the business model is commercially sustainable.

Sustainability & Policy Alignment

GHG savings, food vs. fuel competition, soil impact, and alignment with national and international carbon certification standards determine long-term viability and access to premium markets.

A feedstock that excels in one dimension but fails in another may not be viable at commercial scale.
All four must be evaluated together.

Dimension 1 & 2: Technical Properties and Logistics

Physicochemical Comparison — Key Biomass Types for Biochar:

Property	Sugarcane Leaves	Bagasse	Rice Straw	Palm EFB	Rubber Wood
Moisture (%)	**15 – 25** ✅	45 – 55 ⚠️	10 – 15 ✅	60 – 65 ❌	20 – 30 ✅
Fixed Carbon (%)	14 – 16	12 – 14	12 – 15	16 – 19	20 – 22
Ash Content (%)	6 – 10 ⚠️	2 – 4 ✅	12 – 18 ❌	4 – 6	1 – 2 ✅
Heating Value (MJ/kg)	16 – 18	~16	12 – 15	17 – 19	18 – 22
Biochar Yield (%)	**25 – 30**	25 – 32	22 – 28	25 – 30	23 – 26

Sugarcane Leaves Assessment

- ✅ Low moisture (15 – 25%): minimal pre-drying energy required — clear advantage over bagasse
- ✅ Biochar yield 25 – 30%: comparable to most competing feedstocks
- ⚠️ Ash content (6 – 10%): higher than bagasse; EBC, IBI and MTEC set no explicit ash limit
- ⚠️ Low bulk density (~40 – 80 kg/m³): baling or pelletizing required before transport and pyrolysis feeding

Logistics Solutions

- Baling increases density 5 – 8x → reduces transport cost significantly
- Transition from large bales → small bales or pellets improves pyrolysis feeding consistency
- Collection radius should not exceed 50 km from pyrolysis plant
- Target delivered cost: 400 – 700 THB/ton (dried, baled)

Sources: References 12–14. Moisture as received; biochar yields at 450–600 °C. Rubber wood moisture still to be sourced.

Dimension 3: Economic Value & Market Evidence

Product revenue and carbon-credit opportunities depend on project performance.

Biochar Product Revenue

Indicative biochar yield

~250 – 300 kg biochar

per ton of sugarcane leaves

Reported biochar price

THB 9,000–18,000 / t biochar

Biochar Price (est)

THB 2,250–5,400 per ton leaves

Excludes carbon credits and all project costs.

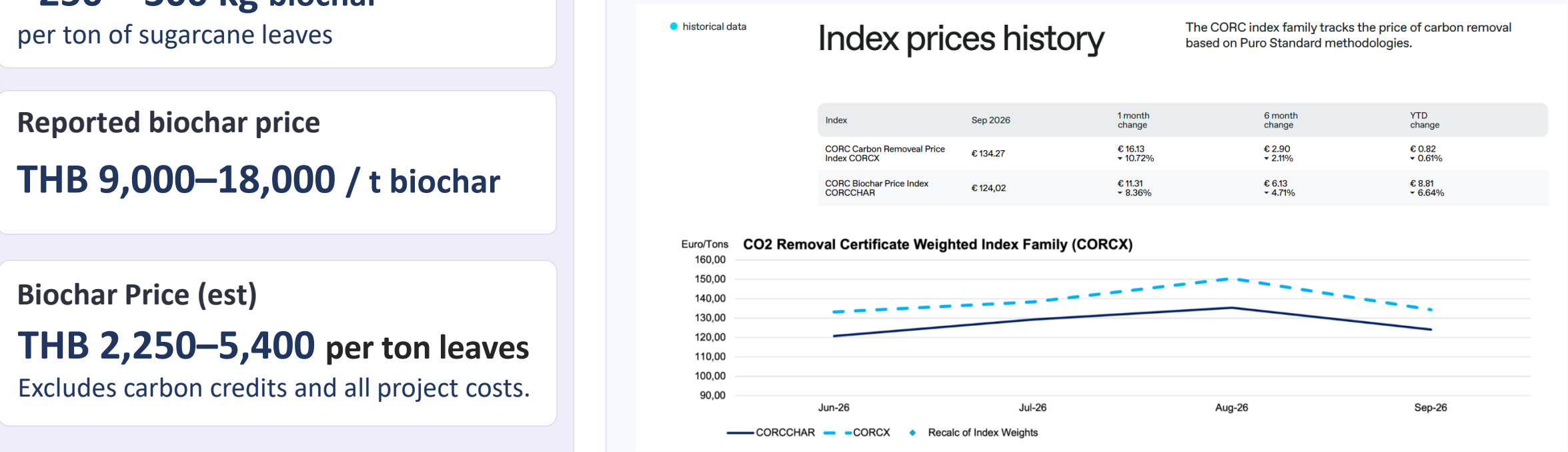
International Carbon-credit Benchmark

€124.02

per tCO_2 removed

CORCCHAR

September 2026, Puro.earth / Nasdaq



Source : Carbon Removal Indexes - Puro.earth

Sources: ERDI-CMU / Chiang Mai University, 10 June 2026; Puro.earth CORC Carbon Removal Indexes, Sep 2026.

Dimension 4: Sustainability & Crediting Readiness

Feedstock selection requires evidence across the value chain.

Sustainability Considerations — Sugarcane Leaves

Criterion	Key Consideration
Food competition	✅ Agricultural residue; assess competing uses.
GHG reduction potential	✅ Compared to open burning baseline
Sustainable residue removal	✅ Retain sufficient residues to protect soil and crop productivity. ✅ Collect 40 – 50%, leave remainder as mulch
Supply chain traceability	⚠️ Field-to-end-use traceability requires development.

Quality & Crediting Pathways

Product Quality

EBC / IBI references
Select requirements for the intended use and destination market.

International Crediting

Verra VM0044 v1.2
Assess eligibility, additionality, net removals and verified end use.

Thailand Crediting

Standard T-VER
T-VER-S-METH-14-02 v.1 (Effective date: 19/03/2026)
Premium T-VER
T-VER-P-METH-14-03 v.1 (Effective date:24/09/2025)

"From Zero to Thousand"

Key Takeaways

1 Thailand holds 15 – 19 million ton of sugarcane leaves per year — still burned or left unused

This is one of the largest untapped biomass streams in Southeast Asia, with the potential to yield 1.9 – 2.9 million ton of biochar annually if even half is collected and converted.

2 Sugarcane leaves have high potential in selection dimensions — with known, solvable limitations

Low moisture gives it an edge over bagasse. Ash content and bulk density are addressable through screening and baling or pelletizing. With supply chain and certification infrastructure in place, the feedstock is commercially viable.

3 Biochar from sugarcane leaves closes the carbon loop in agriculture

Converting a burning liability into a biochar asset delivers triple value: reduced GHG emissions, improved soil health, and access to growing carbon credit markets — all from a material that currently has negative externalities.

What's next

Researchers
Conduct LCA and biochar application studies specific to Thai sugarcane leaves and tropical soil conditions

Policymakers
Reduce barriers to T-VER access for biochar projects; adopt the MTEC Thai Biochar Quality Standard (2025)

Industry
Develop pilot partnerships between sugar mills and biochar technology providers to demonstrate commercial viability at scale

"The carbon in sugarcane leaves doesn't have to go up in smoke. Biochar puts it back in the ground — and keeps it there for a century."

KTIS
More Than Sugar



The sustainability of *KTIS* is dependent on the success of sugarcane farmers