

Abstract:

Technological Innovation for Low-Carbon Food Supply Chain by SME: Case Studies in Thailand

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The transition toward a low-carbon food supply chain is a fundamental shift in how Thailand's agricultural sector operates, particularly for Small and Medium Enterprises (SMEs). Thai SMEs now face the dual threat of climate impact from methane and carbon dioxide emissions and international barriers such as the Carbon Border Adjustment Mechanism (CBAM). To navigate these challenges, the Bio-Circular-Green (BCG) Economy framework serves as a strategic roadmap, transforming environmental liabilities into high-value products and zero-waste systems.

The rice sector serves as a primary example where innovation mitigates significant methane emissions through the adoption of specific technological interventions. These include Laser Land Leveling (LLL) for precise water management and the Alternate Wetting and Drying (AWD) technique to directly cut methane output. Furthermore, site-specific nutrient management ensures soil-tailored fertilization, while sustainable straw management prevents open burning by converting waste into bio-compost and bio-products.

The integration of SMEs into this low-carbon ecosystem is further exemplified by the proactive strategies of industry leaders providing a practical roadmap for supplier empowerment. Through dedicated programs such as sustainability seminars and personnel development initiatives designed to bridge the technical knowledge gap for smaller partners. A crucial component of this support is assisting SME suppliers in achieving Carbon Footprint Certifications. By helping partners undergo rigorous environmental assessments, these initiatives ensure that SMEs can demonstrate their climate credentials to international buyers.

The success of low-carbon ecosystem requires robust collaborative efforts. The Hub of Knowledge provides the essential R&D anchor, translating plant science and climate research into actionable protocols for SMEs. The SCP Network works across sectors to bridge the gap between sustainable production and consumer demand. The Thai Chamber of Commerce facilitates the "Connect the Dots" strategy, mentoring SMEs through large-scale corporate partnerships and advocating for green financial incentives like low-interest BCG loans. Lessons learned indicate that we must still address the certification burden and behavioral resistance. By visualizing the clear return on investment for farmers and SMEs, Thailand can prove that environmental stewardship is the new quality standard for a competitive and sustainable global food supply chain.