

## From Emissions to Edible Protein: Thailand's Bold Play for Leadership in the 'Future Food' Market

The Ministry of Commerce reveals plans to deploy CCU technology, turning carbon emissions into high-value protein to meet a \$391bn global demand.



Thailand is positioning itself to lead a radical shift in global agriculture by transforming industrial carbon emissions into high-value edible protein. The Trade Policy and Strategy Office (TPSO), an arm of the Ministry of Commerce, has identified "carbon protein" as a key frontier industry that could simultaneously address food security and accelerate the kingdom's transition to a low-carbon economy.

Nanthapong Jiralertpong, director-general of the TPSO, revealed that global development has rapidly advanced beyond laboratory trials into full commercial-scale production.

He noted that the technology represents a vital mechanism for driving future export growth as global trade regulations tighten around environmental sustainability.

The core technology relies on Carbon Capture and Utilisation (CCU). Carbon dioxide (\$CO\_2\$) is captured directly from large-scale emitters—such as power stations and heavy manufacturing plants—and fed to specialised microbes in closed fermentation systems.

These microbes convert the gas into a protein-rich biomass, which is then processed into ingredients for human food, animal feed, and alternative protein products.

Data from the Ministry of Energy indicates that Thailand's energy sector emitted 239.6 million tonnes of \$CO\_2\$ in 2025. While Thailand accounts for just 0.79% of total global greenhouse gas emissions, this volume provides an abundant, continuous supply of circular carbon raw material.

Unlike traditional agricultural commodities, which compete heavily on raw material and land costs, the CCU sector represents a high value-added (HVA) industry.

Competition is driven by biotechnology, intellectual property, and rigorous safety standards, offering early innovators lucrative, long-term patent opportunities.

The state's push comes at a time when conventional farming faces severe headwinds from climate volatility, prolonged droughts, and shrinking arable land.

Market data from international research firm SkyQuest Technology indicates that the global alternative protein market is on track to balloon from over \$100 billion in 2025 to \$391 billion by 2033, expanding at a compound annual growth rate (CAGR) of 8.5%.

This growth is heavily supported by shifts in consumer preferences, with buyers increasingly prioritising health, climate metrics, and clear supply-chain traceability over price alone.

The TPSO views carbon-derived protein as a cornerstone of Thailand's Net Zero 2050 mandate. Co-locating bioreactors next to industrial emission sites drastically reduces land and water footprints, cuts down chemical usage, and eliminates the heavy pollution footprints associated with commercial livestock.

Nanthapong emphasised that Thailand already possesses the foundational industrial infrastructure required to scale this technology immediately.

With targeted state research funding, clear regulatory frameworks, and foreign investment incentives, the country can quickly pivot from a supplier of basic agricultural commodities to a high-tech hub for future food ingredients.

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<https://www.nationthailand.com/business/trade/40068032>