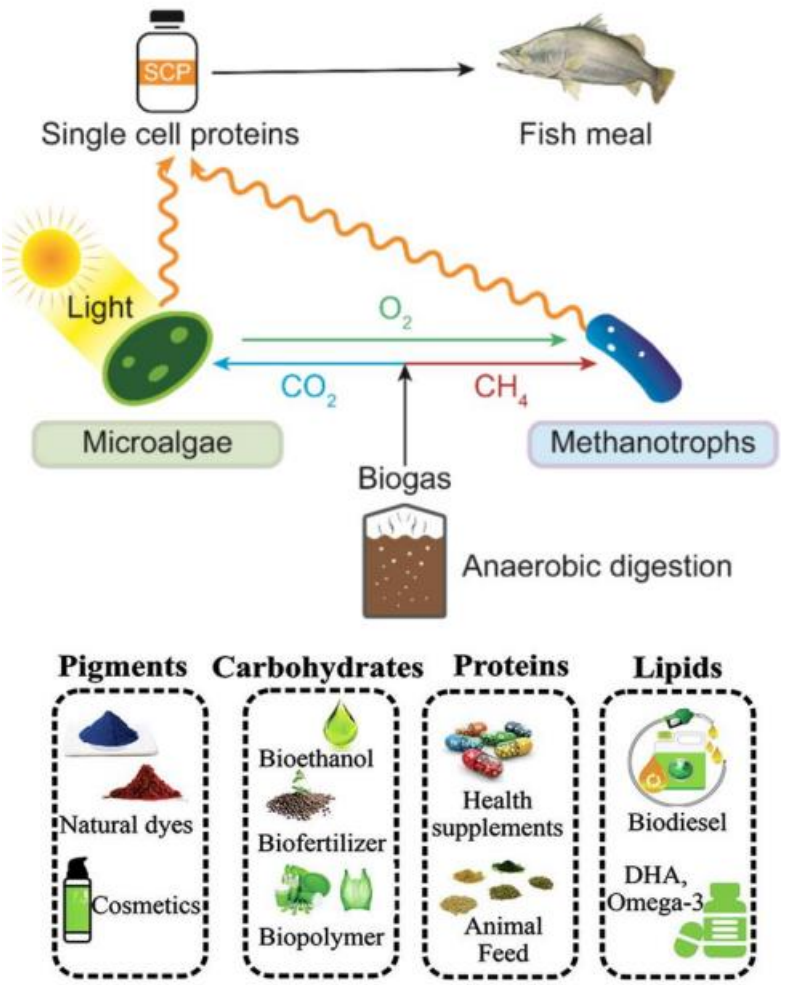
NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE
Nanyang Environment and Water Research Institute

# CARBON CAPTURE, RESOURCE RECOVERY, AND HIGH-VALUE BIOMASS PRODUCTION THROUGH A METHANOTROPH-MICROALGAE

## Abstract

Producing single-cell protein (SCP) by valorizing greenhouse gases (GHGs) such as biogas represents a sustainable approach that both mitigates emissions and generates value-added products. A coculture system of methanotrophs and microalgae offers a synergistic platform for effective carbon capture and resource recovery. This symbiotic system enables more complete utilization of carbon while reducing the need for external oxygen and energy inputs, making it an efficient strategy for transforming GHGs into useful biomass.

The biomass generated from the methanotroph–microalgae coculture contained approximately 50 wt% protein on a dry weight basis, with its essential amino acid profile comparable to that of plant-based proteins. In addition to high-value protein, the coculture biomass also contained omega-6 fatty acids, polyhydroxyalkanoates (PHA), phytohormones, and carotenoids, further enhancing its nutritional and biotechnological value. Together, these findings highlight the potential of methanotroph–microalgae cocultures as a multifunctional platform for carbon capture, resource recovery, and the production of high-value bioproducts.







*PI Prof Yan Zhou*

**Co-I Dr Baorui Zhang**