



## The Use of Waste Methane Gas to Manufacture Biopolymers

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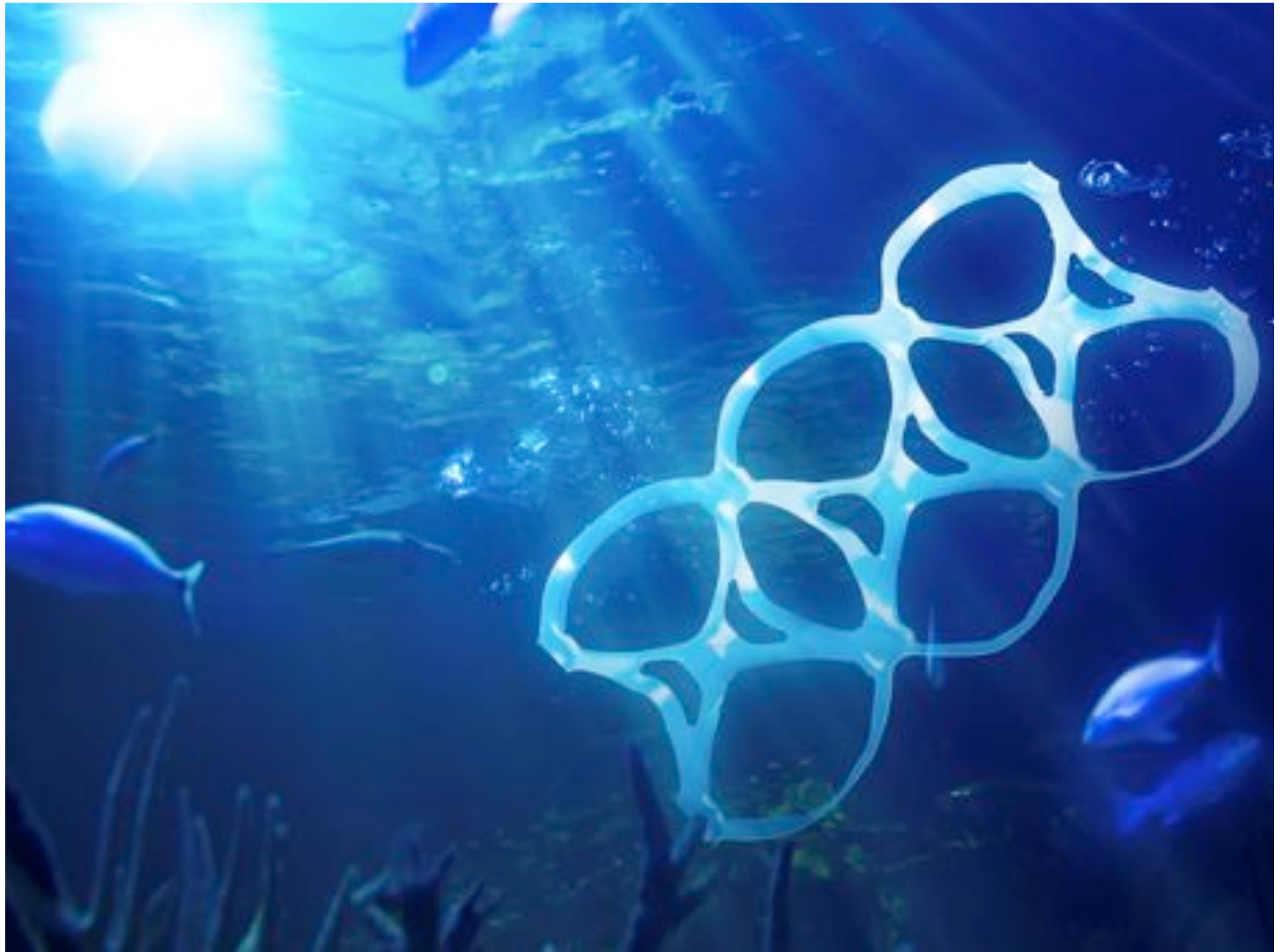
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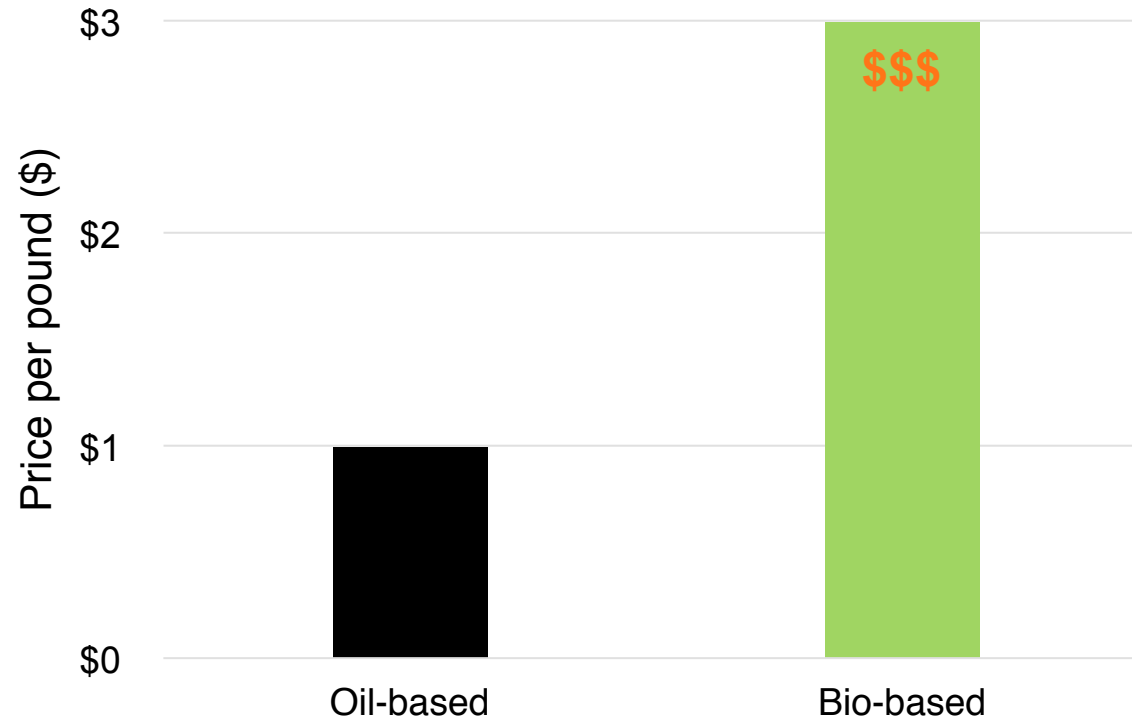






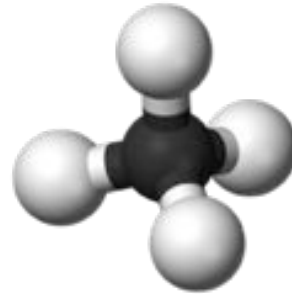
# Opportunity

Current bioplastics are expensive



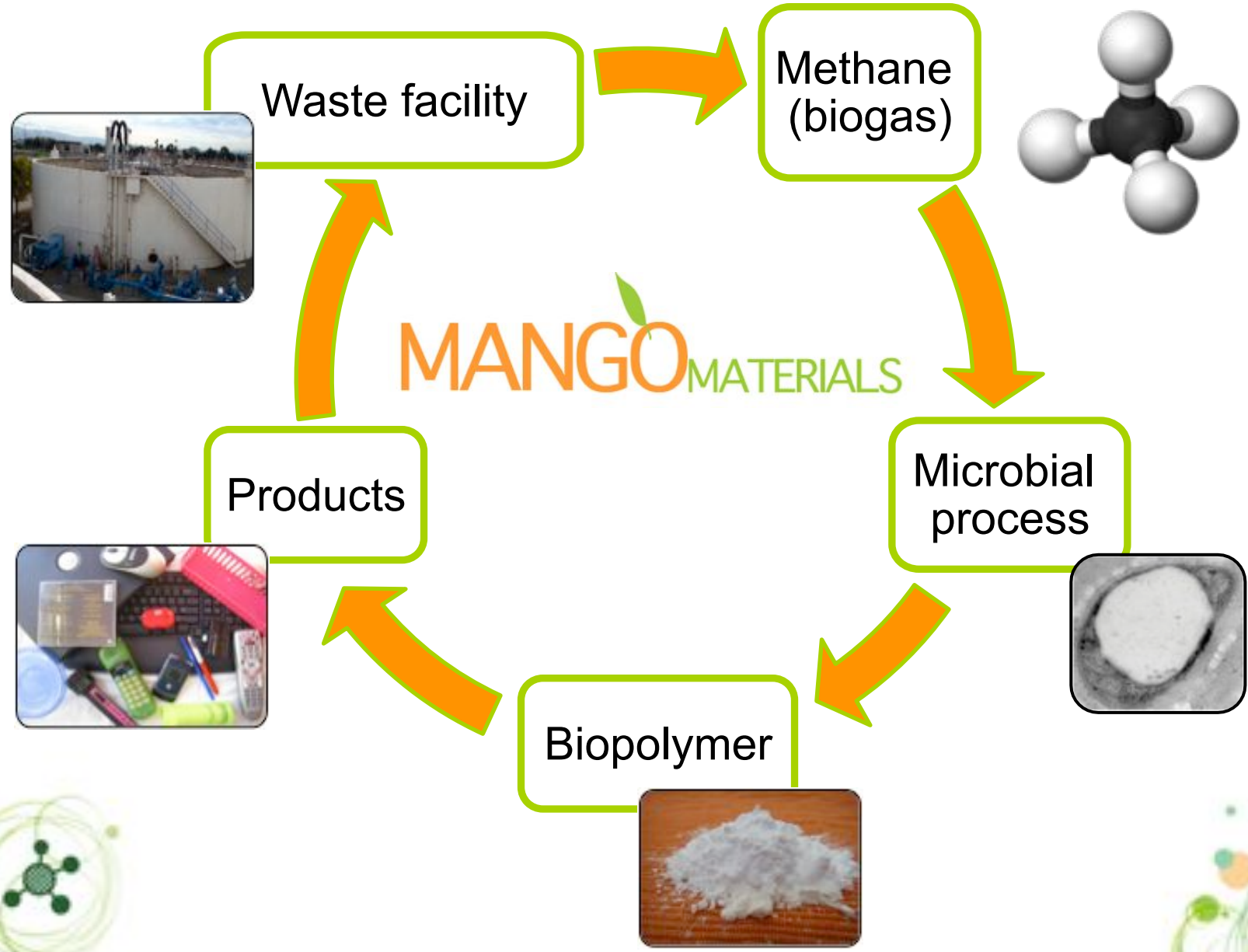


# What is Methane?



A greenhouse gas  
produced by







# MANGO MATERIALS

To turn waste gas streams into  
ecofriendly, biodegradable materials  
at competitive economics

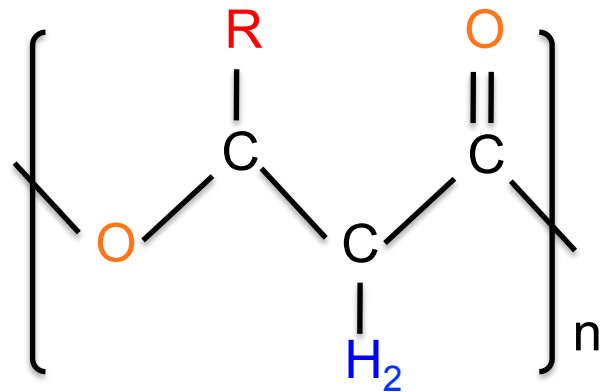


# End-of-Life

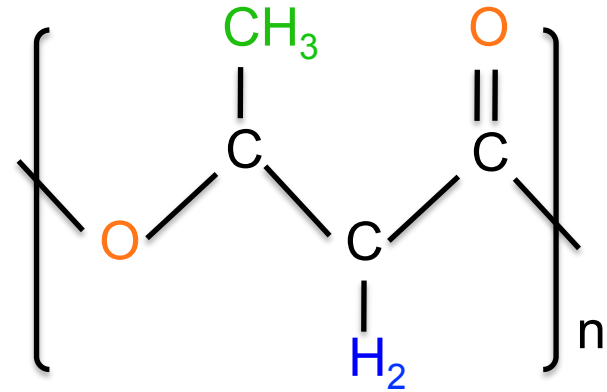


# Biopolymer

## Polyhydroxyalkanoate (PHA)



Polyhydroxyalkanoate  
(PHA)

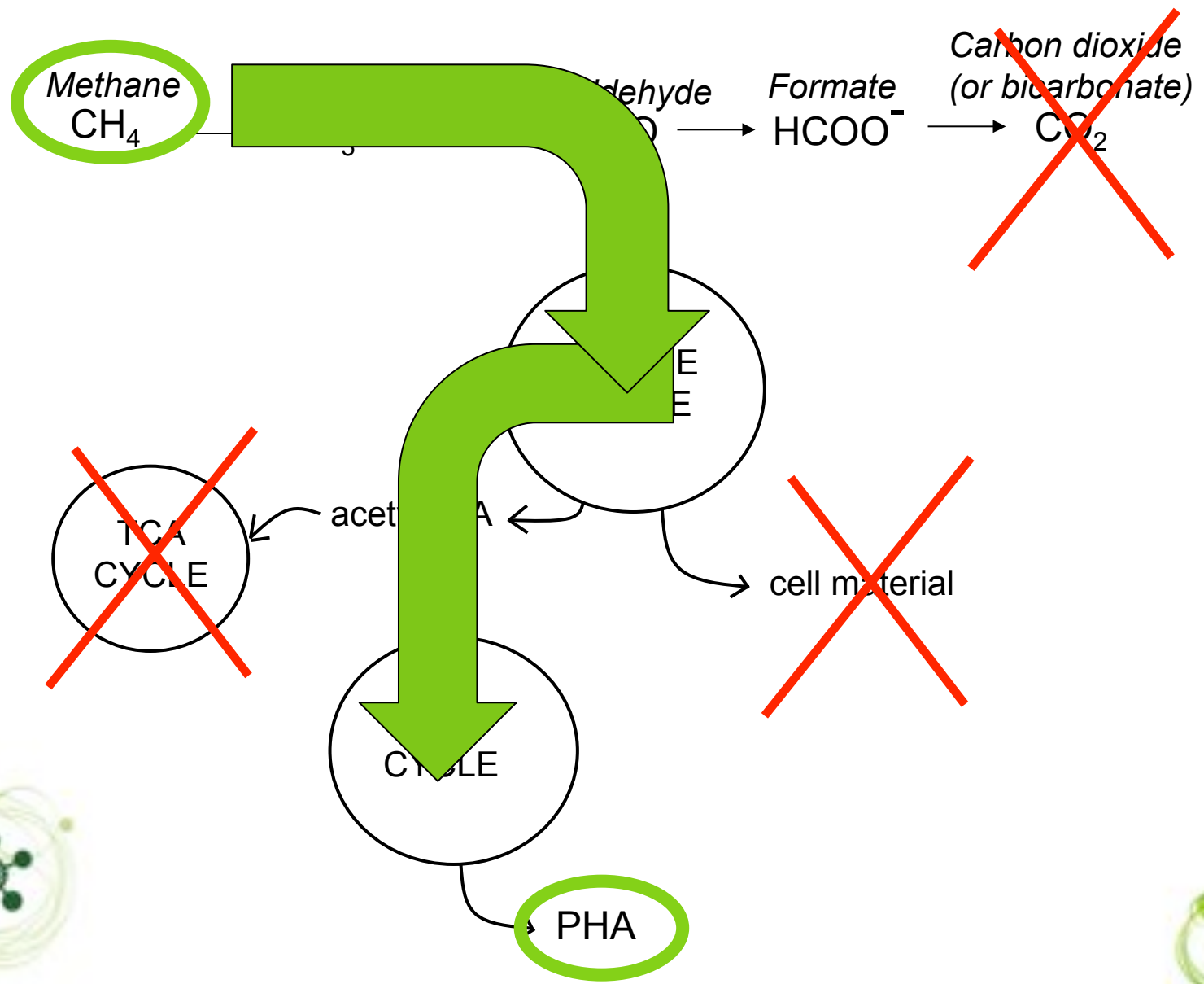


Poly-3-hydroxybutyrate  
(PHB)

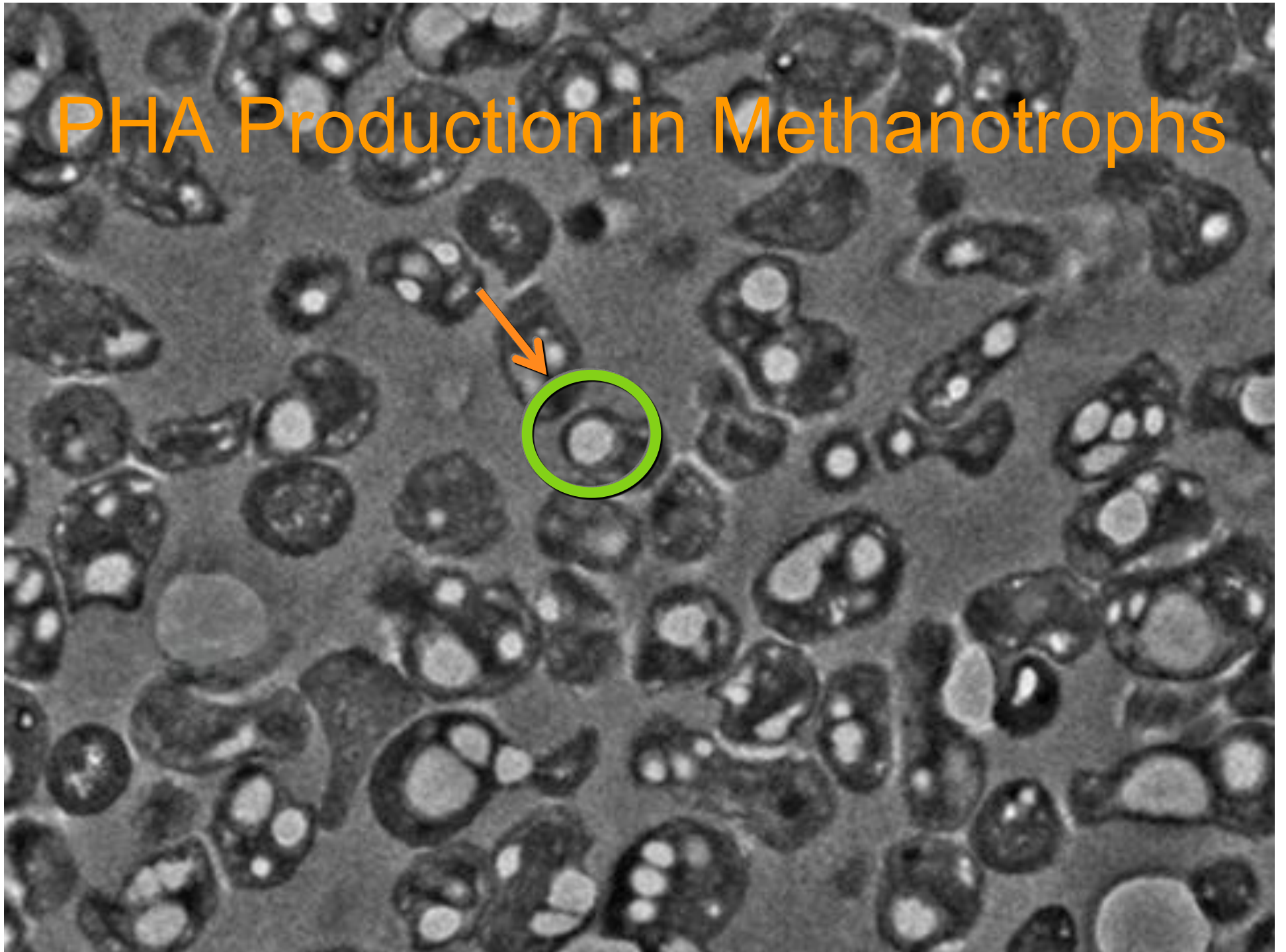
**PHB** is one type of **PHA**



# Mango Materials' Innovative Platform



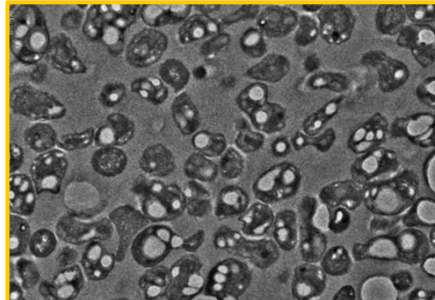
# PHA Production in Methanotrophs



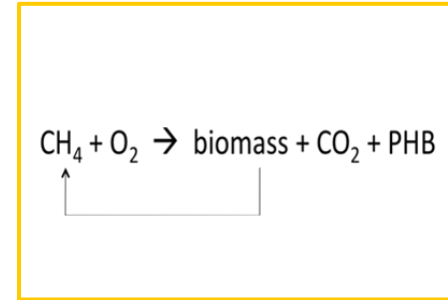
# Why Methane?



Non-toxic



Specific



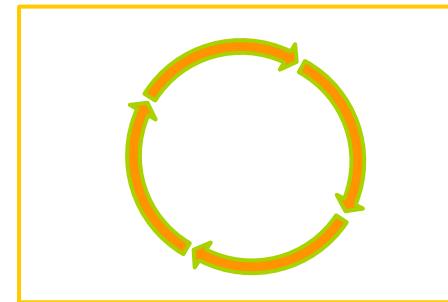
Thermodynamically favorable



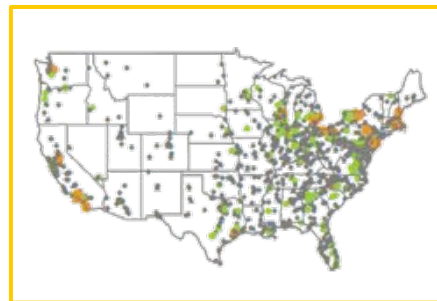
Waste



Crop-free



Closed loop



Widespread

Carbon Feedstock	Cost (\$/pound PHA)
Glucose	\$0.82
Canola Oil	\$0.47
Methanol	\$0.25
Acetate	\$0.18
Methane	\$0.13

Low cost



# Setting Up New Value Chains

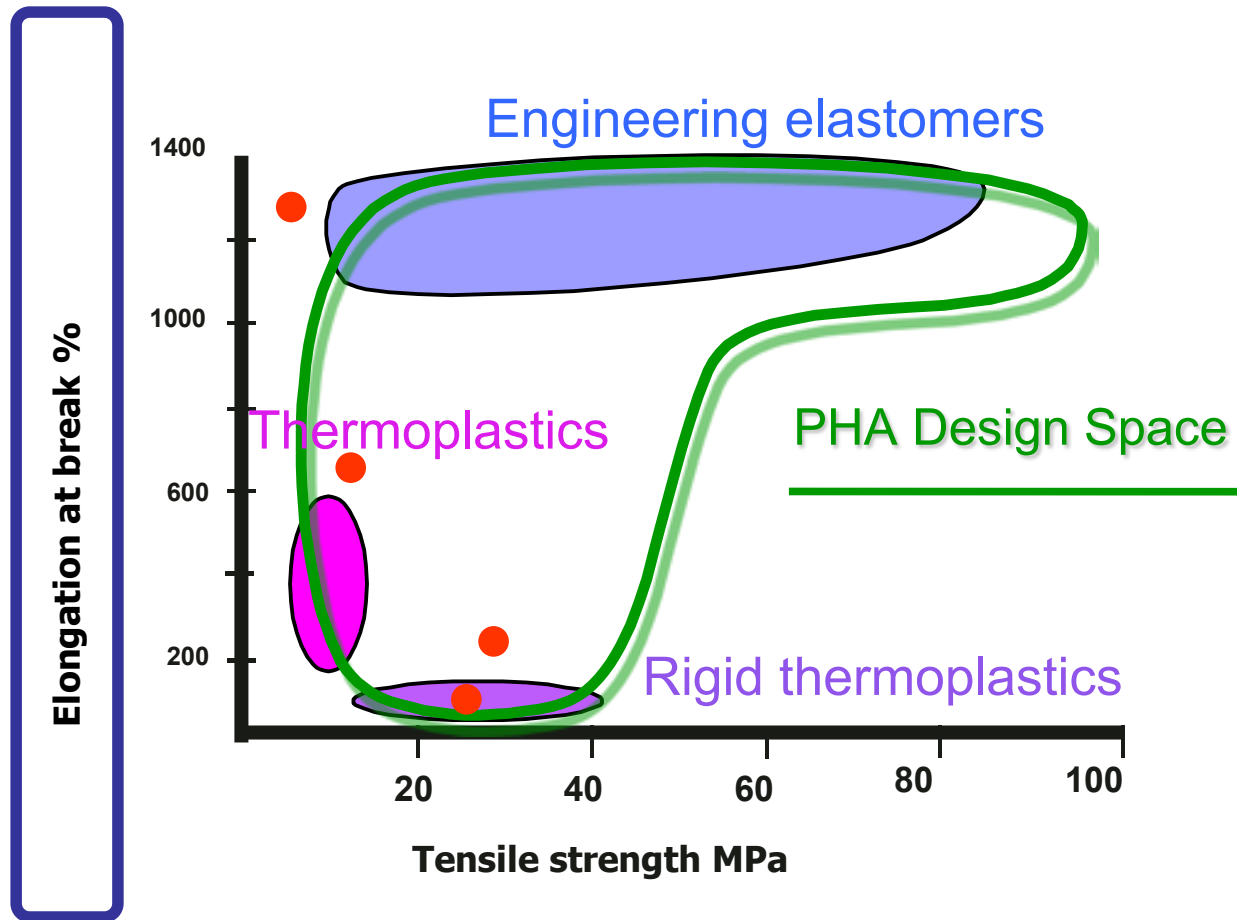
We enable renewable solutions for brand owners



By co-developing and commercializing with customers & partners in a value chain collaboration model



# PHA Performance Biopolymers



Reference: Ravenstijn 2014



# Applications



**Marine**



**Cosmetics**



**Food Packaging & Products**



# Application Considerations

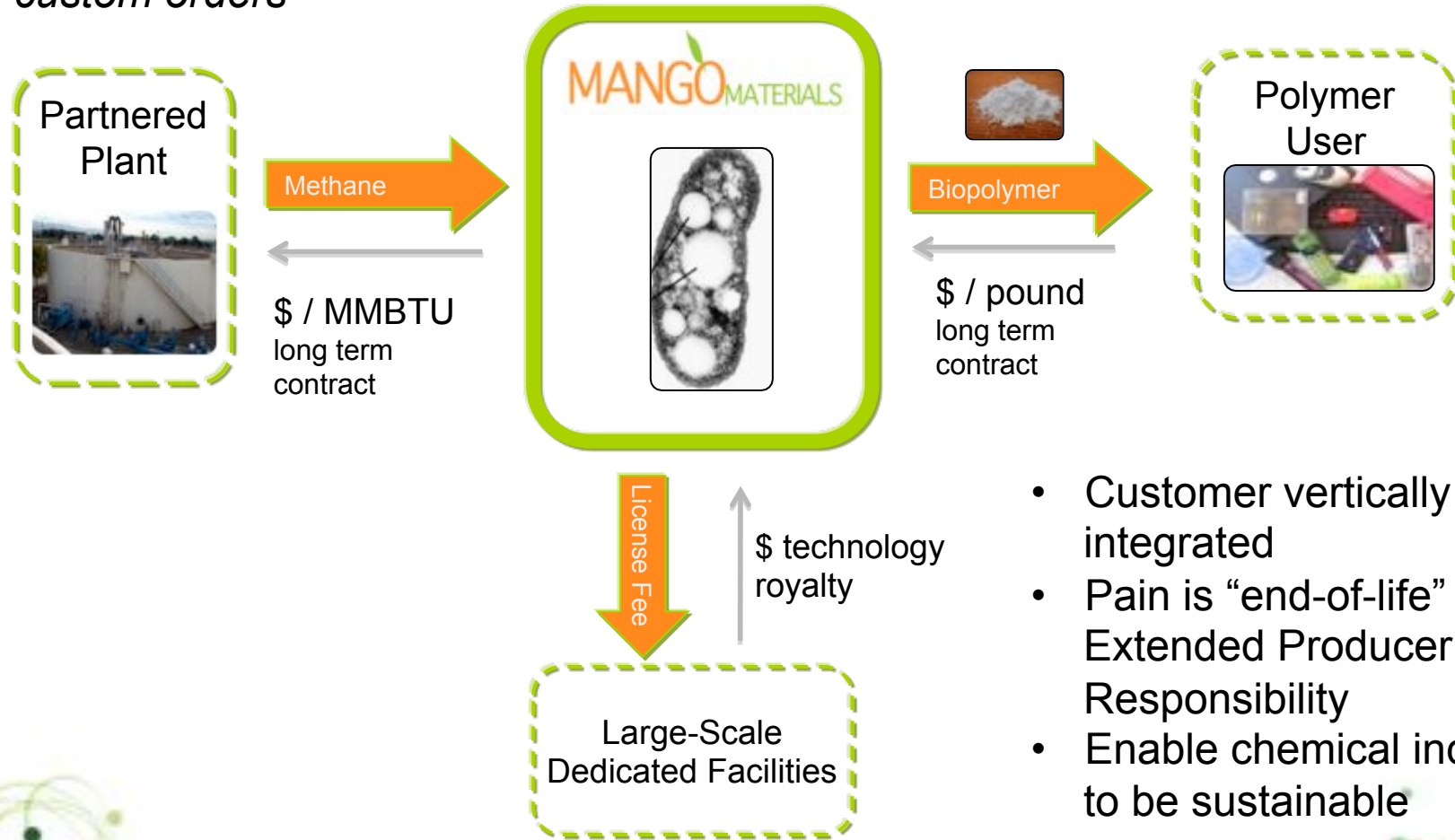


- Biodegradability
- Visibility
- Characteristic tailoring
- Regulatory approvals
- Volumes
- Price point
- Value chain effort



# Flexible Business Model

*Sales by Mango through custom orders*



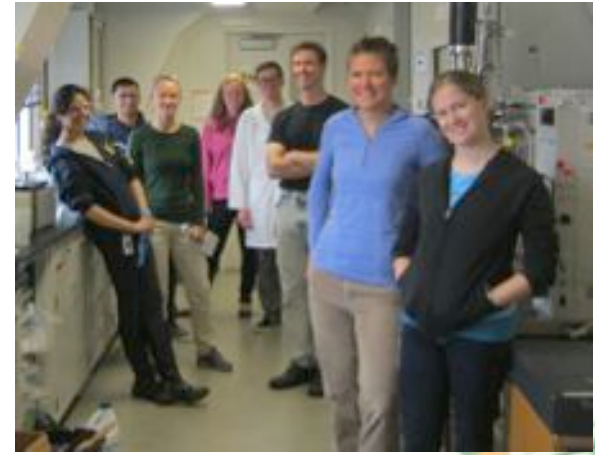
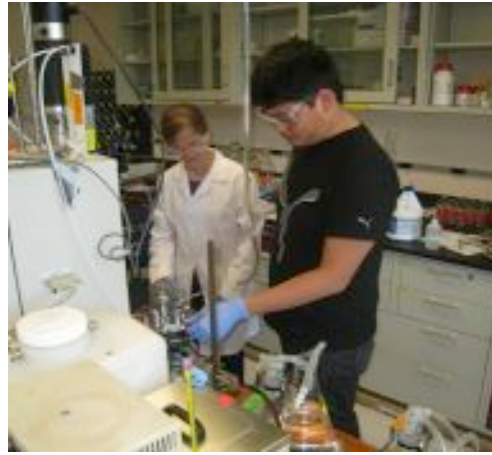
*Licensee captive use*

- Customer vertically integrated
- Pain is “end-of-life” & Extended Producer Responsibility
- Enable chemical industry to be sustainable



# 2016: Pilot Plant in Operation







Candle  
Flare



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Anaerobic  
Digester



# The Mango Materials Team



*Pauchon Foundation*



# Decentralized Production





**IF THE COLLECTED BUT UNUSED  
METHANE FROM U.S. LANDFILLS IS  
USED TO MAKE MANGO MATERIALS'  
BIOPLASTIC:**

**3 BILLION POUNDS OF  
BIOPLASTIC WOULD BE  
PRODUCED EACH YEAR.**





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# A CLOSED LOOP BIOECONOMY IS NOW POSSIBLE

## – LET'S BUILD IT!

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