



Transforming how the world makes chemicals

# Biomanufacturing impact requires scale

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World Bio Markets 2023  
The Hague

1. Efficiently achieving scale
2. Markets must have scale to have impact

# About

DMC Biotechnologies has built a new kind of biomanufacturing platform that is **Made to Scale™**, offering a path to transforming how the world produces chemicals.

DMC's proven platform enables rapid, predictable, and robust scale-up of a wide variety of chemical products. Biomanufacturing has historically been hampered by the need to develop a new, bespoke fermentation process for each new strain, product and scale – a need that is eliminated by DMC's technology.

DMC is based in Boulder, CO and Durham, NC.

 BOULDER, CO



 DURHAM, NC



# Select achievements by the numbers

**23**

Patents granted across 6 families (60+ pending) and growing

**5+**

Metabolic pathways demonstrated

**9+**

Product chemistries demonstrated

**3**

Products to demo scale

**1**

Product to commercial scale

**2**

Partnerships with Blue Chip companies

**> 200%**

Team growth in last year

**1st**

To standardize fermentation and demonstrate predictability

# The opportunity for decarbonization

- Globalization has driven sharp increases in **emissions**, adversely impacting **climate change**.
- The COVID-19 pandemic and the war in Ukraine have revealed the **fragility of global supply chains**.
- **Chemical manufacturing emissions** are one of the largest shares of industrial emissions – with more than 1 billion tons of direct CO<sub>2</sub> emissions per year forecast by 2030 <sup>1,2</sup>.

Cost-effective, local, and sustainable manufacturing of **bio-based chemicals** is a critical part of the solution to decarbonize.



# Industry commitments to decarbonize

- We are helping make these commitments a reality



● SOLVAY — Carbon neutrality before 2050



● MICHELIN — Net zero by 2050



● SCG — Carbon neutrality by 2050



● TOYOBO — Carbon neutrality by 2050



● PROCTER & GAMBLE — Net zero between 2020-2030



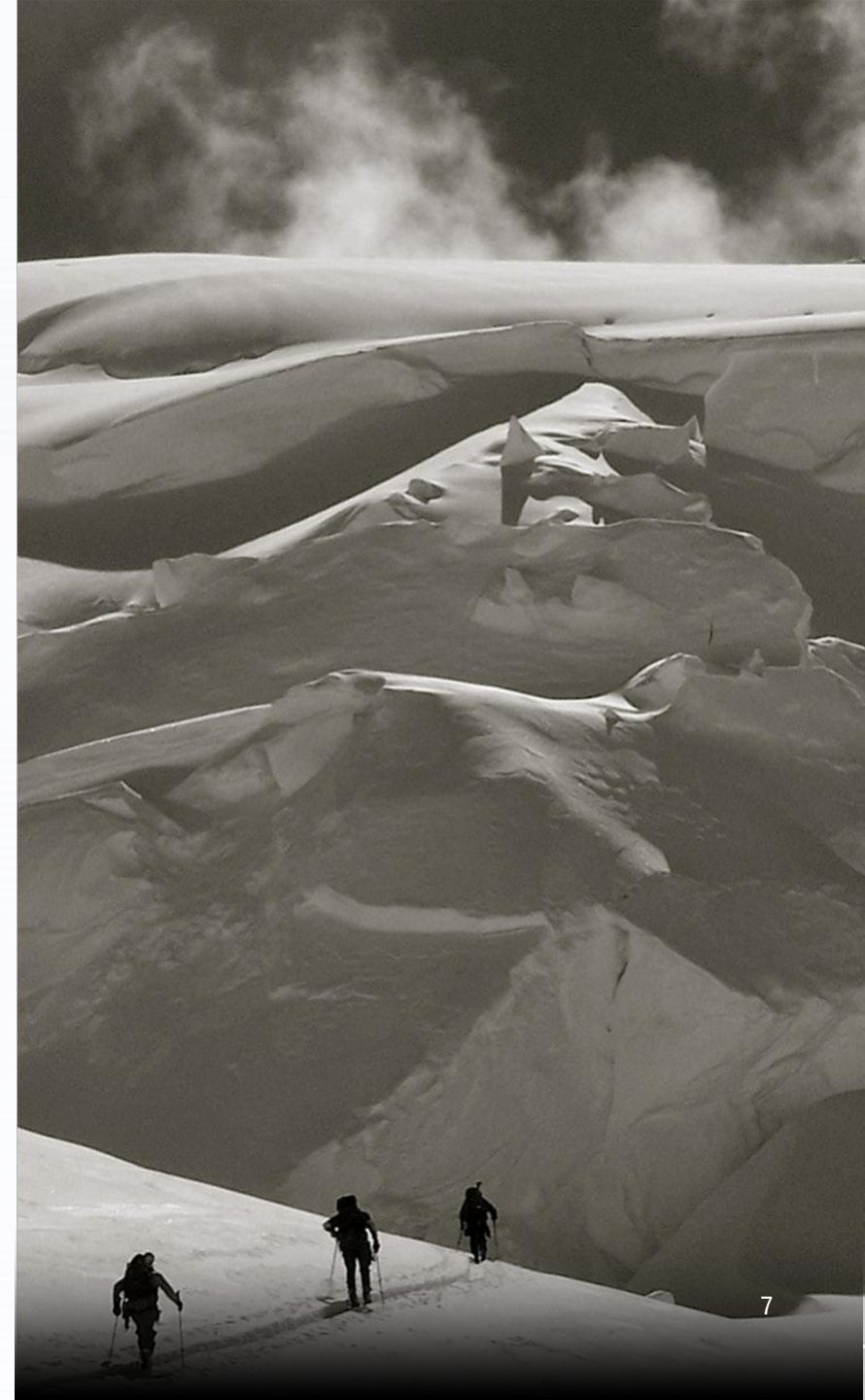
● UNILEVER — Carbon neutral before 2030



# Historical challenges for biotech

- Long and costly development times have made it difficult to cost-effectively utilize fermentation to produce a wide variety of bio-based chemicals.
  - On average, it has taken 7 years and \$75M per product<sup>1</sup> to get to commercial performance metrics (exclusive of building a plant).
- The problem has been that engineering biology is complex and previous approaches have lacked standardization, robustness, and predictability.

<sup>1</sup>Lux Research, 2015



# A platform that is *Made to Scale*<sup>™</sup>



DMC's innovative biomanufacturing platform addresses the barriers that have challenged traditional approaches.

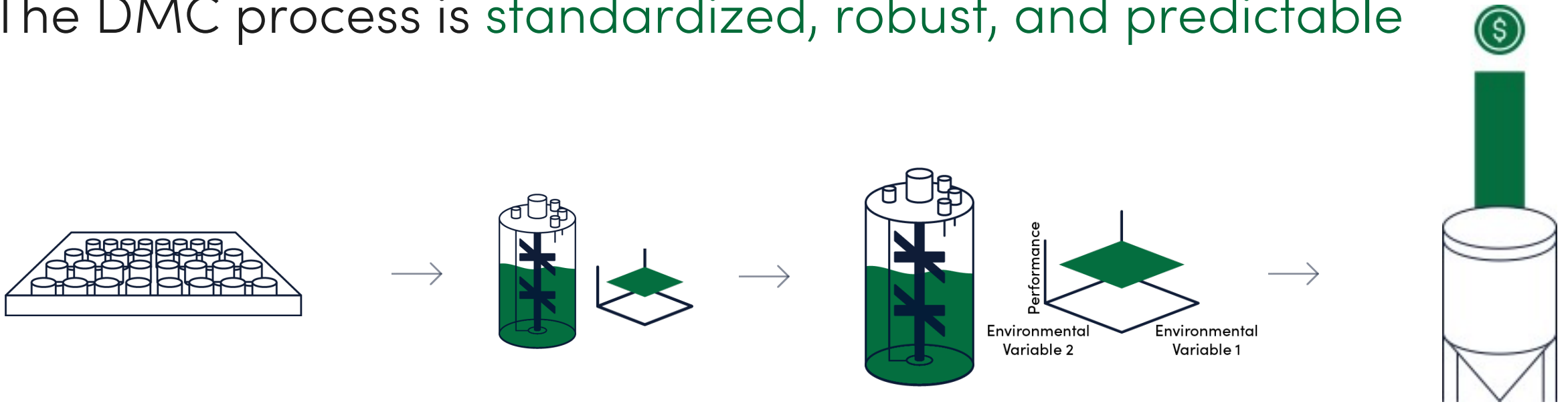
**Standardized** - DMC's platform uses modular chassis strains and a standardized fermentation process that is independent of the product or the scale.

**Robust** - Strains that tolerate a greater range of industrial process conditions, resulting in faster commercialization and significantly lower R&D.

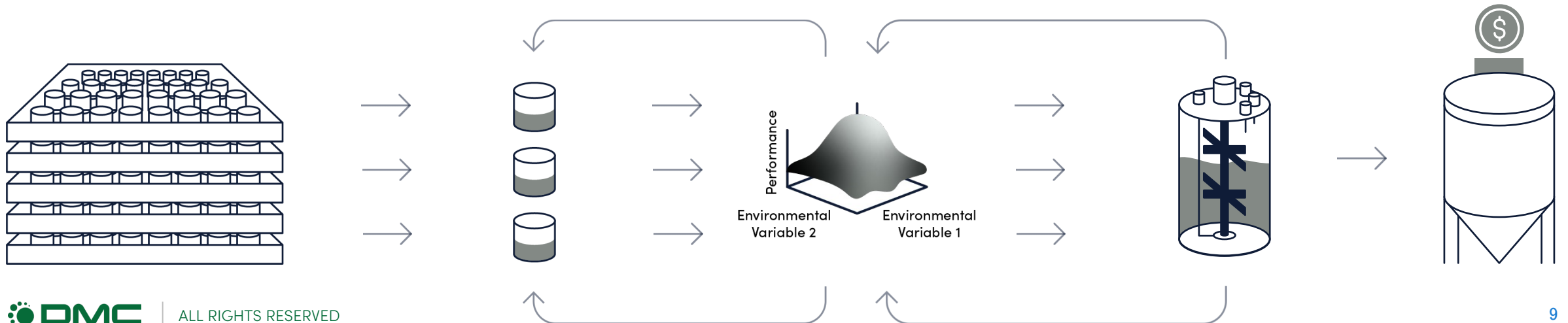
**Predictable** - DMC's platform is the first in the field to demonstrate predictable process performance from the discovery phase to the commercial phase, regardless of the product.



# The DMC process is standardized, robust, and predictable



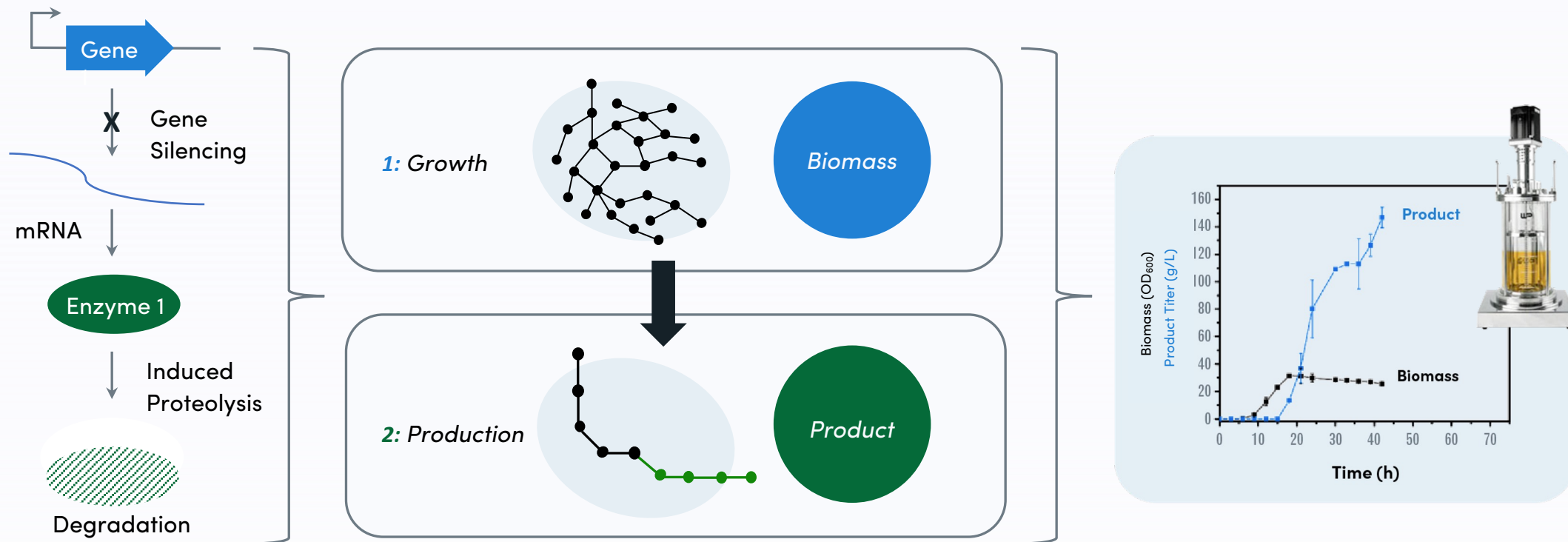
# The traditional process is artisanal, sensitive, and variable



# Enabled by Dynamic Metabolic Control™

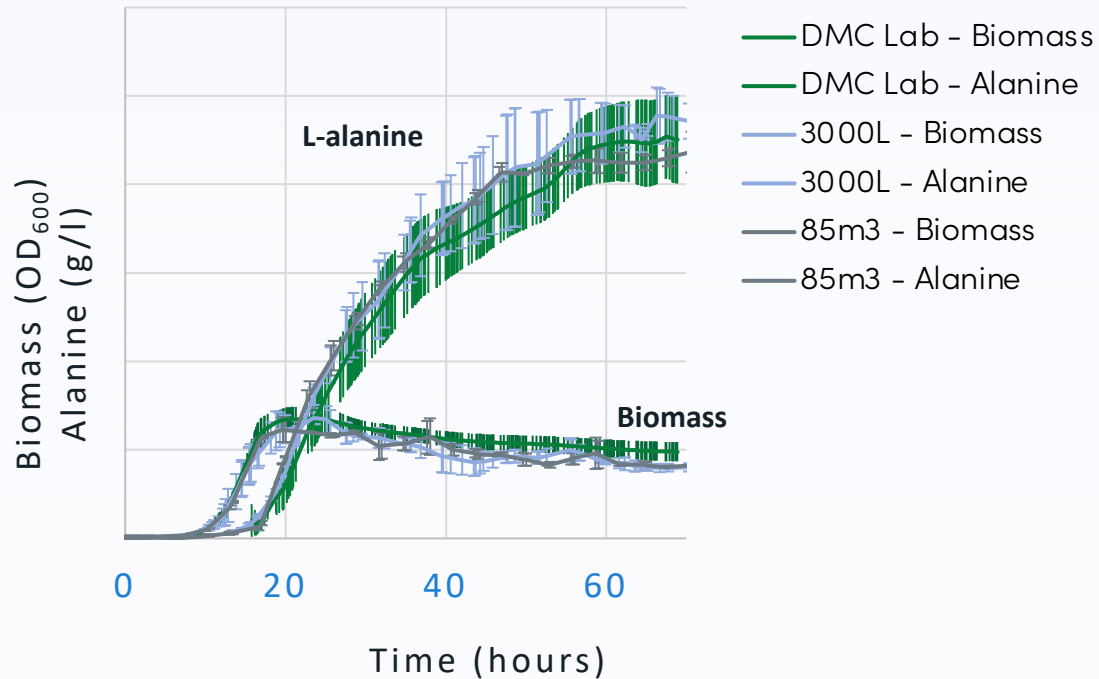
A standardized, 2-stage process that decouples growth from production in combination with gene silencing and targeted proteolysis to dynamically simplify biology.

Simplifying the engineering of biology **reduces development costs and enables robust and efficient bioprocessing.**



# Predictable performance at commercial scale

## PREDICTABLE PERFORMANCE

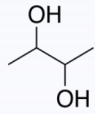


Identical performance from lab to commercial sale

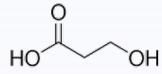
# Platform technology with scalable impact

(Select products made by DMC shown for illustration)

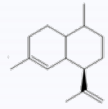
## CHEMICALS



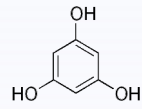
2,3-BDO



3-HP



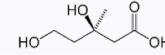
Amorphadiene



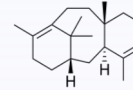
Phloroglucinol



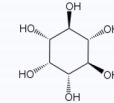
Lactate



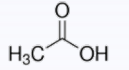
Mevalonate



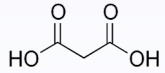
Taxadiene



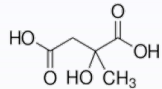
Myoinositol



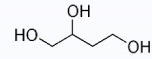
Acetate



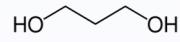
Malonic Acid



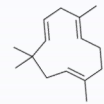
Citramalate



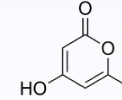
Butanetriol



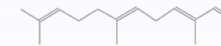
1,3-PDO



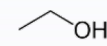
Humulene



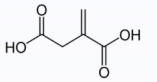
TAL



Farnesene



EtOH

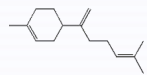


Itaconic Acid

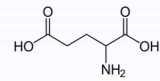
## FOOD, FLAVOR & INGREDIENTS



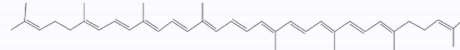
Geraniol



Bisabolene



Glutamic Acid

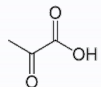


Lycopene

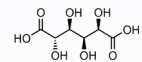
## MULTIPLE MARKET SEGMENTS



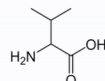
L-Alanine



Pyruvate



Glucaric Acid



Valine



Limonene

An aerial photograph of a tropical island, likely in the South Pacific, featuring a large lagoon with a sandy beach and coral reefs. The water is a vibrant turquoise color, and the island's terrain is a mix of green vegetation and brownish-grey earth. The image is used as a background for the slide.

1. Efficiently achieving scale

2. Markets must have scale to have impact

# Markets must have **scale**

- There is a trend in synbio toward niche markets with very high prices.
- To have a material impact on decarbonization, products must have significant volume.
  - Sufficient market volume **at the target price point** that it substantially reduces carbon emissions
- Hypothetical example:
  - Assume 16 ton CO<sub>2</sub>eq mitigated per ton product

	Price (\$/kg)	Volume (Ton/yr)	TAM (\$/yr)	Decarbonization (ton CO <sub>2</sub> eq/yr)
Niche market	1000	20	20M	320*
Impact market	3	50,000	150M	<b>800,000</b>

\*Can mitigate > 320 ton CO<sub>2</sub>eq/yr by reducing annual air travel



# Delivering on economics, supply chain, and sustainability

## ATTRACTIVE ECONOMICS

- DMC's cost-competitive biomanufacturing platform accelerates product commercialization of bio-based sustainable chemicals with unparalleled predictability and scalability.

## INCREASED SUPPLY CHAIN RESILIENCY

- Localized production and diversified sourcing increases supply chain security for our customers and partners.

## IMPROVED SUSTAINABILITY

- DMC products utilize renewable feedstocks (e.g., dextrose) rather than petroleum-based feedstocks.
- Our production is located near market demand, substantially reducing the economic and environmental costs associated with global shipping and enabling the use of cleaner energy sources.
- e.g., DMC's L-alanine process reduces CO<sub>2</sub> emissions by over 90% relative to the petrochemical based incumbent; this is analogous to removing 62,000 cars from the road each year.
- Compared to a bio-based version and we have a 40% carbon footprint advantage.



98%

reduction in transportation-related CO<sub>2</sub> emissions

1 ton CO<sub>2</sub> savings per ton L-alanine



96%

reduction in manufacturing-related CO<sub>2</sub> emissions

16 tons CO<sub>2</sub> savings per ton L-alanine

“

“Perfection is achieved, not when there is nothing more to add, but when there is nothing left to take away.”

ANTOINE DE SAINT-EXUPERY

Matt Lipscomb, Ph.D.

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