Innovative Animal Feed through Proprietary Methane Fermentation Platform

World Congress on Industrial Biotechnology
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What is Sustainability?

Sustainability is something that improves the quality of human life while living within the carrying capacity of supporting eco-systems (IUCN/UNEP/WWF (1991))

We are also working to reduce humanity's ecological footprint – the amount of land and natural resources needed to supply our food, water, fibre and timber, and to absorb our CO2 emissions.

It's not about keeping people out of nature.

Or turning back the clock.

Or preventing countries or communities from developing.

It is about finding practical solutions for a healthy planet.

A planet where people and nature can thrive together, in a stable environment, now, and for generations to come. (WWF website 2014, emphasis added)
Calysta’s biotechnology makes everyday consumer products sustainable

Methane is

✓ Sustainable
✓ Renewable
✓ Fungible
✓ Scalable
Anaerobic Digestion = Cellulosic Carbon

• Anaerobic digestion is the original treatment for cellulosic biomass
• Almost all organic matter will emit methane through natural decomposition
• Renewable Fuel Standard now recognizes biogas as a cellulosic and advanced fuel pathway
Sustainable Sources for Existing Products

Calysta can replace the supply chain for a wide range of consumer products using sustainable methane sources.
Calysta is Active in Two Industries

**Calysta Nutrition**
- High quality protein for commercial aquaculture and livestock feed
- Developing new animal feed ingredients contributing to better performance and animal health

[www.calystanutrition.com](http://www.calystanutrition.com)

**Calysta Energy**
- Production of essential building blocks for industrial materials and consumer products
- Collaboration with NatureWorks
- DOE funded project converting biogas to lactic acid

[www.calystaenergy.com](http://www.calystaenergy.com)
Food Security is the Issue of the Future

By 2050, 9.6B people will demand 75% more protein than currently available

“Our research shows people will spend one-third of any increase in incomes on a more varied high-protein diet.”

Greg Page, Executive Chairman of Cargill

Source:
UN World Population Prospects: The 2012 Revision.
Large, Growing Demand for Protein Feed

$150Bn Protein Feeds

$15Bn High Protein Feeds for Aquaculture

$1.8Bn Salmon Feed Industry

Source:
Increased Demand and Restricted Supply is Driving Increased Fishmeal Price

- Demand for fishmeal continues to grow while supply is constrained by flat or shrinking wild fish populations
- Supply is highly variable and dependent on Pacific weather patterns
- Feed is the single biggest cost in the production of aquaculture, comprising 40-50% of total production costs for salmon

“Our biggest challenge is how to meet this demand... where to find new raw materials”

- Andrew Jackson, Technical Director, International Fishmeal & Fish Oil Org.

The 2013 Marine Harvest Salmon Industry Handbook
Increased Protein Consumption is Currently Unsustainable

• More than two-thirds of all agricultural land is devoted to growing feed for livestock, while only 8 percent is used to grow food for direct human consumption.

• If the entire world population were to consume as much meat as the Western world does—176 pounds of meat per capita per year—the global land required would be two-thirds more than what is presently used.

Calysta’s single cell protein product provides

• comparable protein content to high-quality fish meal
• minimal impacts on land and water usage
• a source of protein orthogonal to the human food chain
• a safe, validated product already approved for sale

Source:
FeedKind™ is a Proprietary, Natural, non-GMO Protein Feed

• Microorganisms (methanotrophs) metabolize methane as their sole source of carbon and energy, producing a nutritious, high-protein biomass

• Approved for use in the EU
  – >10 years of safety data in salmon farming
  – Safety studies completed in pigs, chickens, calves, rats, mink, and fox

• Supplied dry as powder or pellets; shelf-life >12 months at ambient temperature

Source: Aas et al., 2006. Aquaculture.
Overland et al., 2010. Archives Animal Nutrition.
Validated Commercial Scale Platform

- World’s only commercially validated gas fermentation design
- Proprietary loop reactor technology; already built and validated at scale
- Modular reactor design allowing for a phased rollout
- A FeedKind protein plant generates EBITDA margins in excess of 30% with gas prices at $4.37/MMBtu, compared to under $3/MMBtu today
- Commercial plant siting is underway
- World class team of biologists is actively developing next generation products with improved nutritional and health characteristics
What is Sustainability?

It is about finding practical solutions for a healthy planet [that reduce] the amount of land and natural resources needed to supply our food, water, fibre and timber, and to absorb our CO2 emissions.

We believe methane (and other wastes) provides a clear path to a sustainable and profitable business model that can support a robust, long-term bioeconomy.
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