



Beyond the Bean: How the USDA and Community BioRefinery Redefined Protein for the 21st Century

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“The destiny of nations depends on how they feed themselves.”

~Jean Anthelme Brillat-Savarin

1. Introduction

In the early 19th century, as Europe teetered on the edge of revolution, famine, and industrial transformation, Jean Anthelme Brillat-Savarin captured a timeless truth: food is not merely sustenance—it is civilization. His insight emerged not from political ideology but from the lens of gastronomy, revealing that food systems influence economic stability, social structures, and even the outcomes of war.

Today, his prophetic words resonate once again.

The 21st century presents its own set of food-related crises: population surges, global instability, climate change, dietary diseases, and widening nutrition gaps. Feeding ourselves—nutritionally, ethically, and equitably—is no longer a logistical challenge but a defining issue of our era. If food systems once underpinned empires, they now undergird public health, sustainability, and resilience.

This white paper responds to Brillat-Savarin’s call for a new paradigm in nourishment. It presents the groundbreaking work of the Community BioRefinery (CBR) and the United States Department of Agriculture (USDA): a patented, ultra-pure protein isolate derived from USDA’s “Heart Healthy” heirloom maize. This unique, non-GMO hybrid, has opened many doors. Marrying traditional agriculture with modern biotechnology, this innovation represents not just an evolutionary step—but a revolution.

How we feed ourselves is no longer just a matter of diet. It is a matter of destiny.

In collaboration with the USDA, the Community BioRefinery has pioneered the world's first 90%+ purity ‘True Plant Protein Isolate’ (TPPI) derived from this heirloom maize. Unlike conventional plant proteins of lesser purity that rely on soy or pea sources using heat and/or chemical solvents to secure them, CBR’s Pure Plant Protein

isolate is developed through a zero-waste, no use of heat or chemicals, solvent-free biorefinery process. This protein is hypoallergenic, highly bioavailable, and fully intact—meeting the rigorous standards for both clinical nutrition and clean-label consumer products.

Concurrently, USDA scientists Dr. Linda Pollak and Dr. Susan Duvick, in partnership with Iowa State University, developed high-oleic maize varieties through traditional plant breeding, complete with all the Branch Chain Amino Acids needed for human survival, incorporating traits from the wild prairie grass ‘Tripsacum’. These novel corn lines are rich in heart-healthy oleic acid—a monounsaturated fat known for reducing LDL cholesterol without compromising HDL levels. This creates new pathways for healthy oils, premium animal feeds, and shelf-stable food formulations, all achieved without genetic modification.

Together, these parallel innovations redefine the role of corn in the American diet and economy. Once a symbol of commodity excess, maize—when approached through scientific stewardship—becomes a platform for health, sustainability, and economic opportunity.

2. Executive Summary

In partnership with the USDA, the Community BioRefinery has achieved a world-first: the successful patenting and commercial deployment of an ultra-pure (90%+) true plant protein isolate from traditional corn. Simultaneously, USDA scientists developed non-GMO high-oleic corn varieties with superior nutritional profiles. These dual breakthroughs signal a transformative shift in food science and agricultural economics.

“This groundbreaking work reflects a significant leap forward in plant-based nutrition. The protein isolate derived from heirloom maize, developed through the partnership between Community BioRefinery and the USDA-ARS, demonstrates our joint commitment to advancing clean, high-quality food technologies that meet the nutritional needs of a growing population.”

~Dr. Peggy Tomasula, USDA Agricultural Research Service

Breakthrough Innovation

World’s First USDA-Patented 90%+ True Plant Protein Isolate

Developed by Community BioRefinery using heirloom maize:

- * Solvent-free
 - * Zero heat application
 - * Zero-waste
 - * Allergen-free
 - * Clinically relevant amino acid profile
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3. Human Impact Stories

- **Food Security:**

With the help of the Community BioRefineries, underserved food deserts, school lunch programs could include fortified meals with digestible, complete CBR-TPI—providing essential amino acids to children with limited access to quality nutrition.

- **Rural Empowerment:**
A Midwest farmer could begin to transition from commodity corn to heirloom maize, earning premium margins while restoring soil microbiota through regenerative practices.
- **Entrepreneurship:**
A first-time founder could launch a clean-label, allergen-free protein shake line tailored for athletes and children using CBR’s TPI as the core ingredient.

4. Why This Breakthrough Matters Now

- **Global protein demand** projected to rise by >70% by 2050 (Godfray et al., 2010)
- **Allergen-free nutrition** is no longer a luxury—it’s a baseline
- **Personalized, clinical-grade protein** is driving new health protocols
- **National food security** depends on decentralized, clean-label solutions

5. USDA + Community BioRefinery Timeline

Year	Milestone
2012	Initial collaboration on heirloom corn isolate
2015–2021	Bioprocess optimization + R&D trials Joint USDA-CBR patent awarded for protein isolation and recovery process
TBA	Market launch of CBR-TPI + high-oleic corn oil

6. Nutritional Comparison

Metric	<u>CBR-TPI</u>	<u>Fermentation-Derived Protein (FDP)</u>	<u>Conventional Plant Protein (CPP)</u>
PDCAAS	1.00	1.00	0.70–0.95
DIAAS	1.10–1.25	1.00–1.15	0.45–0.80
BCAA Content	High	Moderate	Variable

Note:

- PDCAAS: Protein Digestibility-Corrected Amino Acid Score
- DIAAS: Digestible Indispensable Amino Acid Score
- BCAA: Branched-Chain Amino Acids (Leucine, Isoleucine, Valine)

7. Sustainability Comparison

Metric	CBR-TPI	FDP	CPP
Land Use (m ² /kg)	2.0	1.5	5.0
Water Use (L/kg)	400	800	1800
GHG Emissions (kg CO ₂ e)	1.2	2.0	3.5

8. SWOT Summary

Category	CBR-TPI	FDP	CPP
Strengths	USDA-patented, 90%+ isolate, allergen-free	Precision-engineered, consistent supply	Affordable, established market
Weaknesses	Low awareness, premium positioning	High CapEx, “lab-grown” perception	Allergenic potential, digestibility limits
Opportunities	Clean-label CPG, clinical nutrition	Pharmaceutical and wellness markets	Reformulation in value brands
Threats	Scaling challenges, policy inertia	Regulatory scrutiny, consumer skepticism	Increasing demand for clean labels

9. Call to Action

To realize the full impact of this innovation, we call for:

- **Public-Private Partnerships**
To expand access to TPI for school lunch programs, hospitals, and global nutrition aid.
 - **CPG Innovation**
For clean-label brands to incorporate heirloom-based proteins into shakes, snacks, and ready-to-eat meals.
 - **Research Investment**
Into clinical studies validating TPI’s efficacy in medical nutrition, allergen-safe formulations, and sustainable agriculture.
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For more in-depth information please see our website. [Community BioRefineries](#)

10. References

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Closing Reflection

“You cannot build peace on empty stomachs.”

~*Dr. Norman Borlaug, Father of the Green Revolution*

CBR enjoyed the singular privilege of having Dr. Borlaug as one of its principal R&D advisors. At the intersection of heirloom tradition and 21st-century science, the Community BioRefinery and the USDA have planted the seeds of a new food future. This isn't just about protein. It's about sovereignty, equity, and resilience. And it begins with how we choose to feed ourselves—today.