



2023

THE ALMOND CONFERENCE

# Connecting the Dots

GROWERS // HANDLERS //  
CUSTOMERS // CONSUMERS

## Value Added Almond Co-Products: Food, Fiber and Energy

*Moderator:* Josette Lewis (ABC)

*Speakers:* Paul Kephart (NutJobs), Roland Laux (RE-NUT), Taylor Heisley-Cook (The Hurd Co.),  
Karen Warner (BEAM Circular)



A photograph of an almond orchard in autumn. The trees are mostly bare, with some brown leaves still clinging to the branches. The ground is covered in fallen leaves, and the overall scene is bathed in warm, golden light. An orange rectangular box is overlaid on the right side of the image, containing the title and speaker information.

# Value Added from Almond Co-Products

Dr. Josette Lewis  
Vice President & Chief Scientific Officer

# ABC Commissioned Market Assessment

	Products	Value	Effort to Implement	Value Stability	Potential Volume Growth	Multiplicative Total	Likely HSW Uptake	
		3 = highest	3 = easiest	3 = most stable	3 = highest potential			
Sorting Platform	Increase Hulls to Animal Feed	1	3	1	1	3	H	
	Industrial Sorbent	2	1	2	1	4	H S	
	Soil Amendment - Bulk	1	3	2	1	6	H S W	
	Soil Amendment - Retail	0	2	2	1	0	H S W	
	Animal Bedding - Bulk	1	3	2	1	6	H S W	
	Animal Bedding - Retail	1	2	2	1	4	H S W	
	Cat Litter	0	2	2	1	0	H S	
	Shell Blast Media	2	2	2	1	8	S	
	Media for Black Fly Larvae	Looks promising, may be ready for scale up, competitive waste feeds affects value						H
Extraction Platform	Neutraceutical Extract	1	1	2	2	4	H	
	Food Grade Almond Hull Sugar Extract Syrup	2	1	2	2	8	H	
	Almond Hull Sugar Neutraceutical Bar	2	1	2	2	8	H	
	Soluable and Insoluable Fiber Nutrition Product	2	1	2	2	8	H	
	Newborn Calf Early Feed Ration Pellet	1	2	2	1	4	H	
	Peat Moss Replacement for Mycellium Production	1	2	2	1	4	H	
	Cosmetic Functional Ingredient	2	2	2	2	16	H	
	Pulp for Thermoformed Containers	2	1	2	1	4	H S	
	Nanocellulose	Looks promising, but may still yet be in "research" phase versus ready for scale up						S
Torrefaction Platform	Carbon Black	3	1	2	2	12	H S W	
	Activated Carbon	3	1	2	2	12	H S	
	Graphitized Carbon Equivalents	Looks promising, but may still yet be in "research" phase versus ready for scale up						H S W
	Syngas Products	2	1	2	2	8	H S W	
	Industrial Sorbent, carbon base	1	1	2	1	2	H S	





# Upcycled Hulls Food Ingredient

Zero Waste & Lower Environmental Footprint

▲ MATTSON *Webinar*

**UPCYCLING:**  
INNOVATION & PRODUCT DEVELOPMENT  
WITH UPCYCLED INGREDIENTS



# Nutritional Bar

Nutrition Facts	
servings per container	
<b>Serving size</b>	<b>(68g)</b>
<b>Amount per serving</b>	
<b>Calories</b>	<b>220</b>
<b>% Daily Value*</b>	
<b>Total Fat</b> 7g	<b>9%</b>
Saturated Fat 6g	<b>30%</b>
Trans Fat 0g	
<b>Cholesterol</b> 0mg	<b>0%</b>
<b>Sodium</b> 55mg	<b>2%</b>
<b>Total Carbohydrate</b> 22g	<b>8%</b>
Dietary Fiber 11g	<b>39%</b>
Total Sugars 14g	
Includes 9g Added Sugars	<b>18%</b>
<b>Protein</b> 11g	

Increased fiber  
by 5g using  
almond hulls

← **Almond Hull**

**Clif Bar** →  
Chocolate Brownie



Nutrition Facts	
Serv. size 1 bar (68g)	
<b>Calories</b> per serving	<b>250</b>
<b>Amount/serving</b>	<b>% DV</b>
<b>Total Fat</b> 6g	<b>7%</b>
Sat. Fat 1.5g	<b>8%</b>
Trans Fat 0g	
Polyunsat. Fat 1.5g	
Monounsat. Fat 2g	
<b>Cholesterol</b> 0mg	<b>0%</b>
<b>Sodium</b> 180mg	<b>8%</b>
<b>Total Carb.</b> 43g	<b>16%</b>
Dietary Fiber 5g	<b>19%</b>
Total Sugars 17g	
Incl. 16g Added Sugars	<b>31%</b>
<b>Protein</b> 10g	<b>19%</b>

# Research

# Development

# Commercialization



Animal Feed  
Hull Food Ingredient  
Biobased products

Educate Manufacturers  
Pilot & Prototype  
Reduce Regulatory Hurdles

Private Financing  
Product design  
Procurement  
Construction





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# NUTJOBS

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Nut-Based Formulations and Products to Replace Single Use Plastics & Polystyrene

# PURPOSE

## To replace single use plastics

- To utilize and optimize a secondary agricultural waste
- To benefit farmers, hullers and shellers
- To benefit manufacturers seeking alternatives to oil-based plastics
- To create bio composite alternatives for agriculture and horticulture





# A GLOBAL PLASTIC PLAGUE

Over the past 70 years, annual production of plastics increased nearly 200-fold to **368 MILLION** metric tons in 2019 (plasticoceans.org).

Plastics can affect soils  
Serve as vectors for chemicals and pathogens harmful to human health  
Disrupt soil biology and production



Nearly **800,000 METRIC TONS** of Annual Plastic Waste in the USA comes from Horticulture

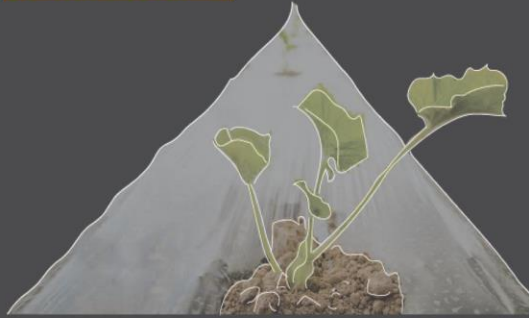


→ we can do better



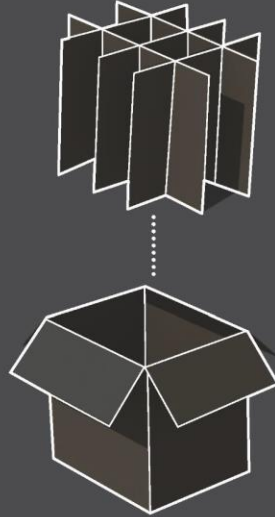
# HORTICULTURAL AND AGRICULTURE APPLICATION

## ALMASHEET



- A natural, renewable, chemical-free, and biodegradable agriculture sheet.
- Prevents weeds, provides soil nutrients, preserves soil moisture, and prevents soil erosion for Specialty Crops

## ALMAPAK



- An insulated carton with a lightweight expanded shipper insert
- Any product that is temperature sensitive can be safely shipped
- Very economical due to its lightweight, reusability and compostable components
- They are made in two pieces: a tight-fitting lid and a seamless molded body or shell

## ALMAPOT



- A biodegradable plant container for applications in Specialty Agriculture and Horticulture industries.



## BENEFITS

Excellent shipping containers for wine, food-grade, fresh fruits and vegetables, and perishables amongst other use cases

All three products create more sustainable operations by lowering plastic use and carbon emissions



# PATENDED FORMULATIONS and PRODUCTS

**US Patent No. 11,046,836. Issued June 29, 2021**

FORMULATIONS AND PRODUCTS TO REPLACE SINGLE-USE PLASTICS AND POLYSTYRENE WITH BIO-BENIGN MATERIALS SUCH AS AGRICULTURAL WASTES

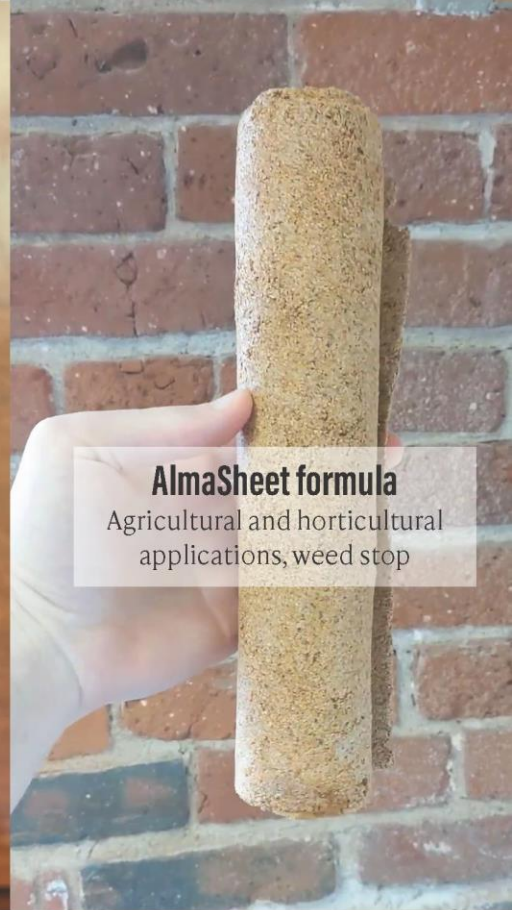
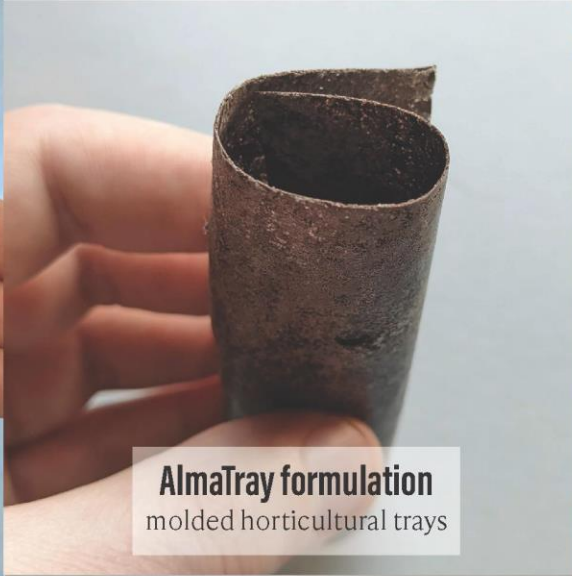
This patent covers the formulation of NutJobs's materials consisting primarily of a nutshell or hull-based composite.

**Notice of Allowance for US. Patent App No. 17/360,278  
received Sept. 23, 2021**

This patent is a continuation application that covers a nut-shell based composite that is extruded, molded, or thermoformed into a pot

**A Continuation in Part of U.S. application No. 17/582,643,  
which is a continuation in part application of U.S. Patent Application No. 17/360,278,  
filed on June 28, 2021, which is a continuation in part application of U.S. Patent  
Application No. 17/074,034, filed on October 19, 2020, which claims the benefit of U.S.  
Provisional Application No. 62/923,044, filed on November 18, 2019, entitled,  
"FORMULATIONS AND PRODUCTS TO REPLACE SINGLE-USE PLASTICS AND  
POLYSTYRENE WITH BIO-BENIGN MATERIALS SUCH AS AGRICULTURAL WASTES"**





**AlmaTray formulation**  
molded horticultural trays

**AlmaPot formulation**  
molded horticultural pots

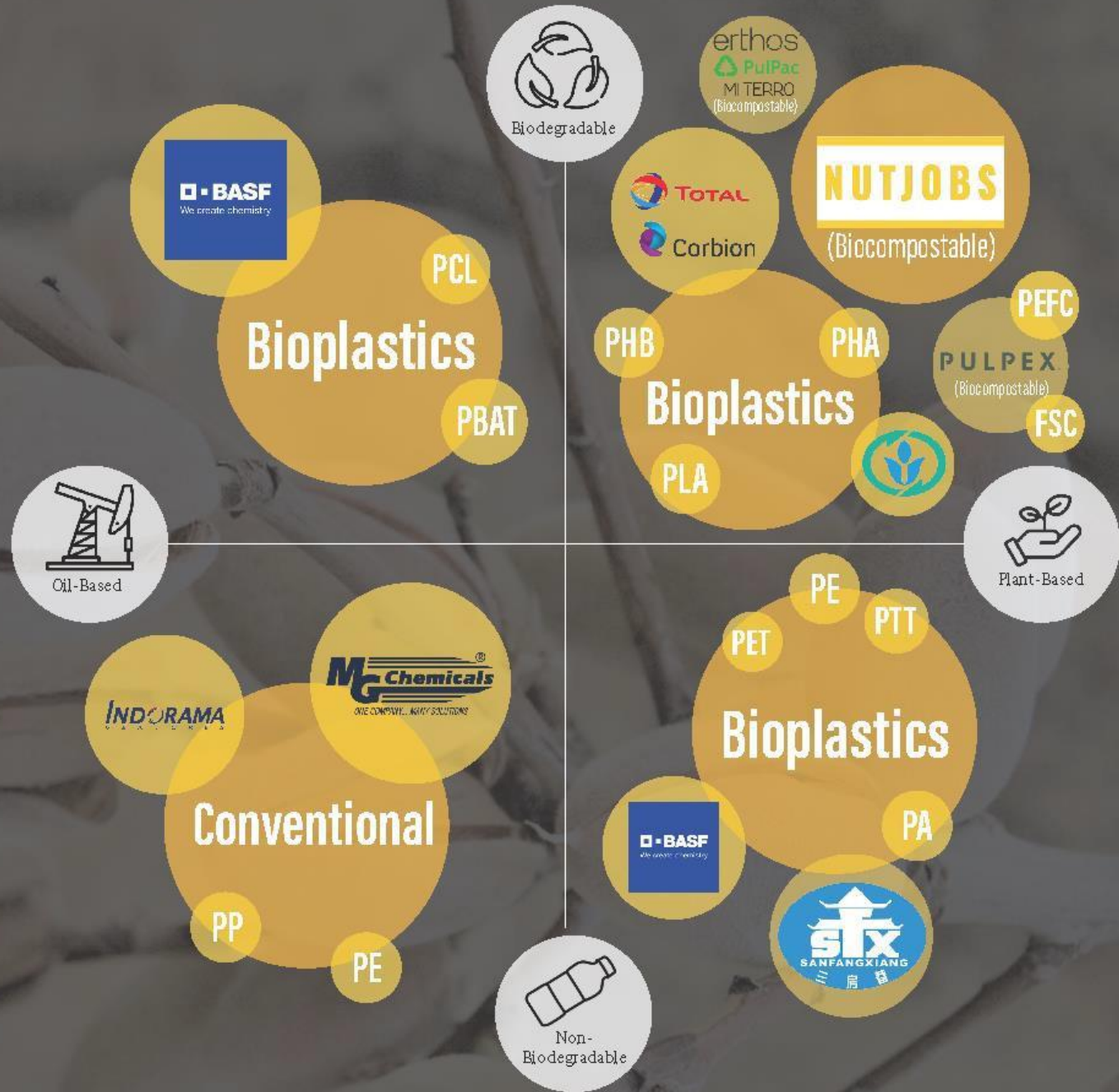
**AlmaSheet formula**  
Agricultural and horticultural applications, weed stop

**Almalose formula**  
replace polystyrene – peanuts, cooler packs, bubble wrap



# VALUE PROPOSITIONS

- Integrates into current manufacturing processes
- Less expensive to produce
- Higher margins vs other bioplastics





# SUPPLY CHAIN

In California, Shells & Hulls are Abundant and Inexpensive





- 
- The background of the slide is a dense, textured pattern of almond shells, some whole and some cracked open, in shades of light brown and beige. The shells are scattered across the entire frame, creating a natural, organic feel.
- Innovative product applications
  - Bio-benign and compostable
  - Derived from secondary ag waste
  - Experienced management team
  - Scalable B2B business model
  - Strong IP portfolio
  - Ongoing R&D partnership
  - Early stage funding received
  - First customer secured
  - Opportunity zone location

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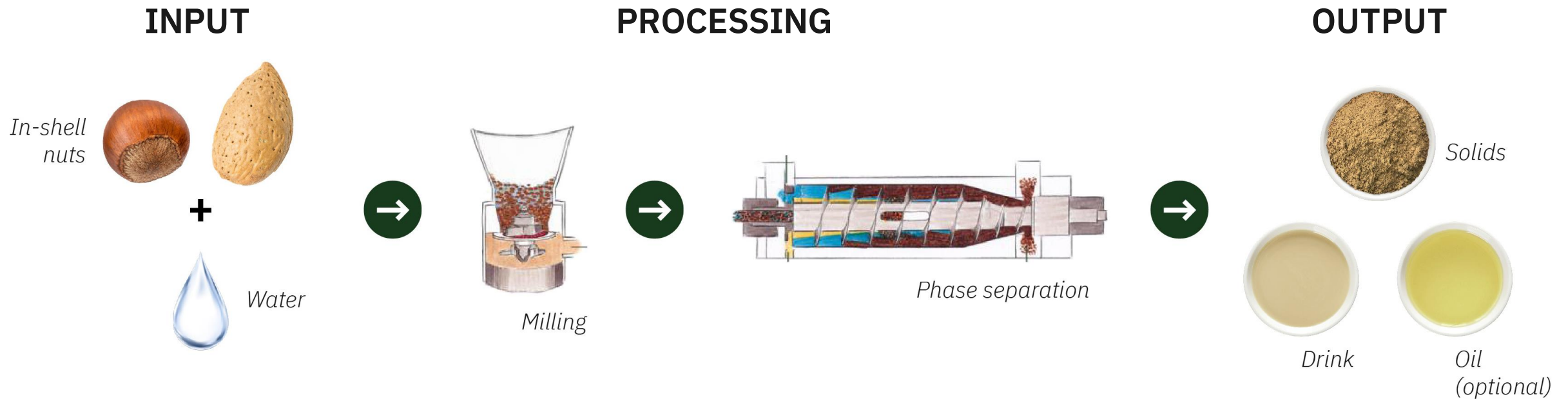


**UNLEASHING THE FULL POTENTIAL OF NUTS.**

PRESENTATION OF ROLAND LAUX AT THE ALMOND CONFERENCE 2023



# SOLUTION: RE-NUT<sup>®</sup> TECHNOLOGY PROCESSES IN-SHELL NUTS INTO THREE VALUABLE NUT PRODUCTS.







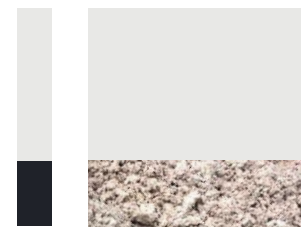
# BOOSTING THE YIELD OF NUTS

## OUTPUT SHELLED NUTS

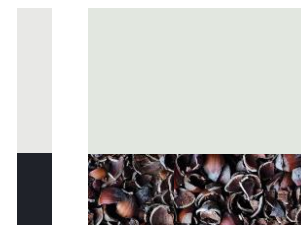
## OUTPUT RE-NUT®



↑  
Drinks



↑  
Solids



↓  
Waste



**2-8% fat**  
70-80% (m/m)



**15-35% fat**  
15-25% (m/m)



# BENEFITS TO NUT PROCESSORS

1

## **Increase of yield**

Boost of yield per pound of raw materials

2

## **Lower costs**

Less raw material and processing costs

3

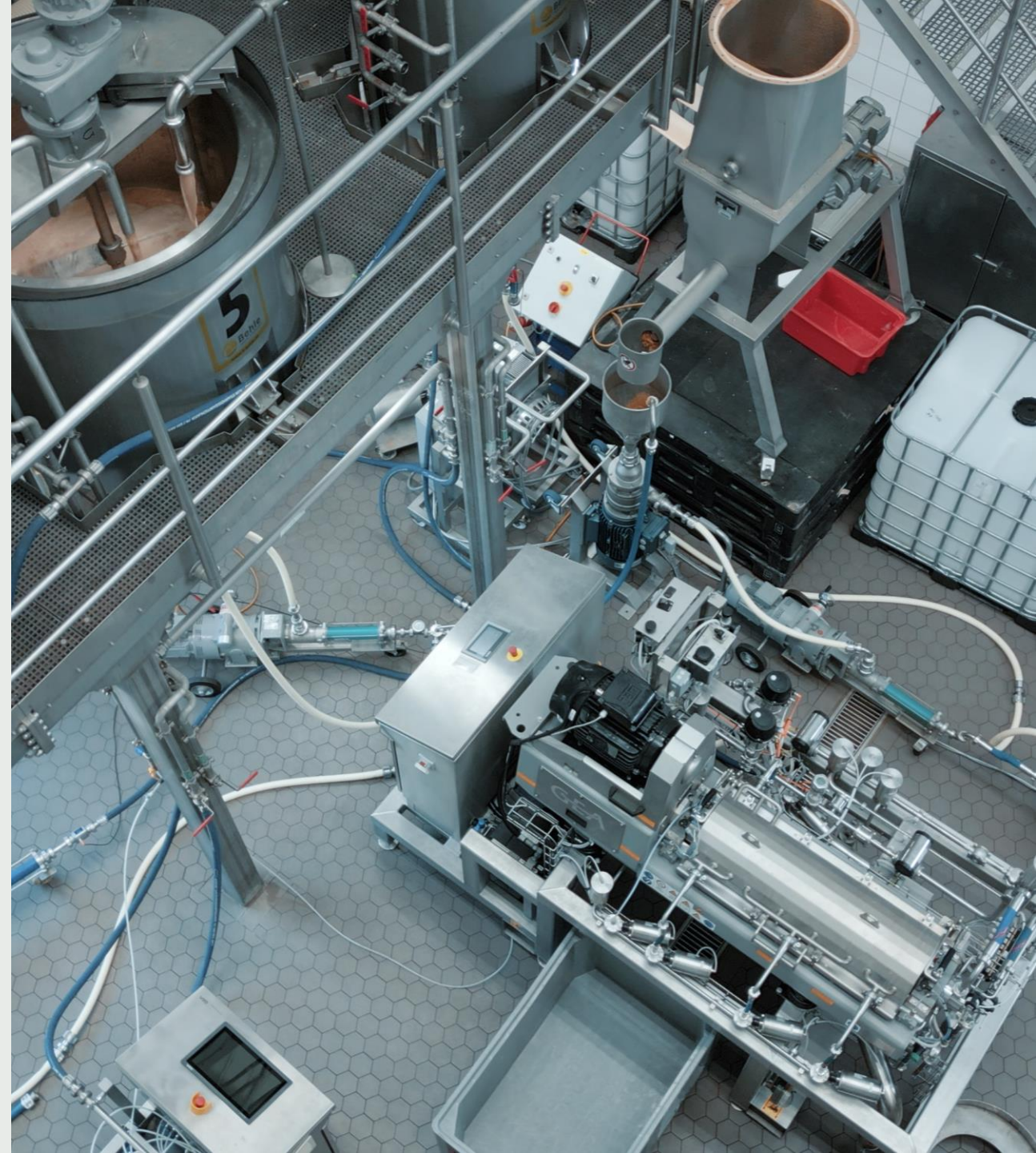
## **Product innovation & renovation**

High-fiber, antioxidants, clean label, sugar reduction

4

## **Environmental sustainability**

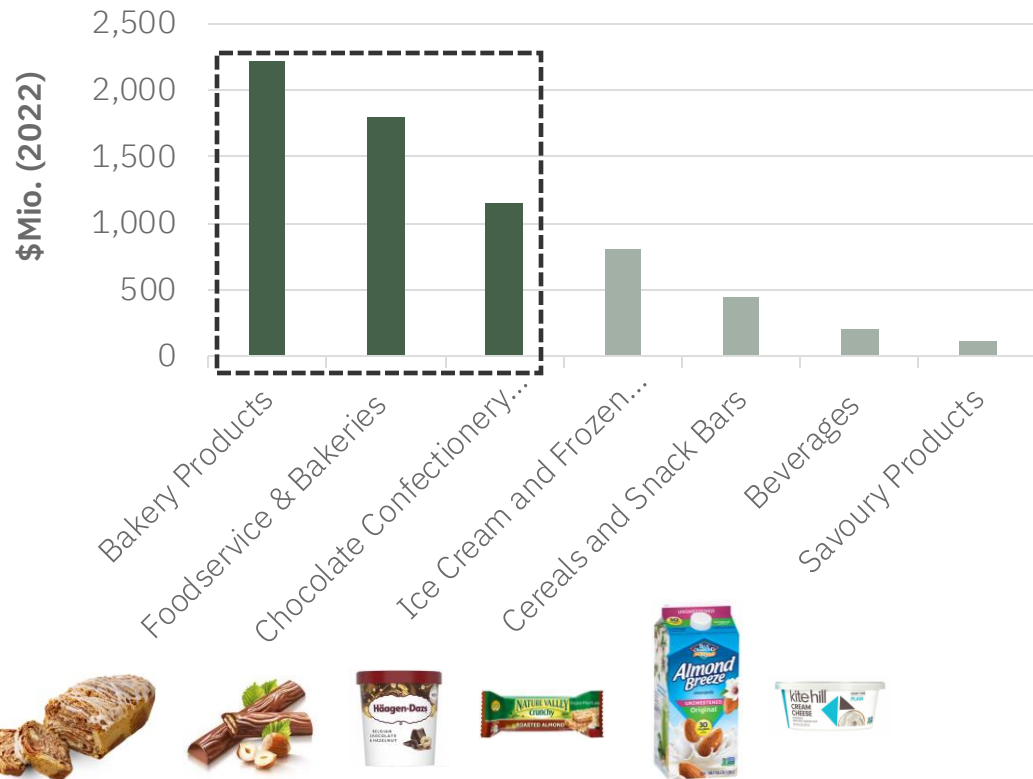
Improvement of sustainability footprint



# MARKET APPLICATIONS

## NUT SOLIDS

GLOBAL MARKET SEMI-FINISHED NUT PRODUCTS \$ 6.7bn. (2022)



## NUT DRINKS

US MARKET \$ 2.8bn. (2022), ALMOND DRINK SHARE 62%





# NUTRITIONAL COMPOSITION

## RE-NUT® ALMOND SOLIDS



	Example 1 Soft Shell Variety Non-Pareil CA	Example 2 Hard Shell Variety Spain
Protein	8%	6%
Fat	12%	19%
Others (mainly Fibers)	79%	73%
Water	1%	2%
Application: Flour (<100 µm) and Paste (<30 µm)		

## RE-NUT® ALMOND DRINKS

	Example 1 Soft Shell Variety Non-Pareil CA	Example 2 Hard Shell Variety Spain
Protein	3%	1%
Fat	8%	1%
Others (mainly Fibers)	2%	1%
Water	87%	97%
Application: RTD Milk and Food Ingredient		

- Composition can be adjusted by adding additional shells or kernels to the process infeed.
- Figures strongly depend on raw material type.

# OUR BUSINESS MODEL: LICENSING



## IP

### WET PROCESS

- 🌀 **EP 3903601 granted**
- 🌀 PCT/EP2021/060907 pending

### DRY PROCESS

- 🌀 EP 4226774
- 🌀 PCT/EP2023/053359 pending

## REGULATORY

- 🌀 **Self-GRAS Almond solids achieved**
- 🌀 Self-GRAS Almond drinks by end of 2024





# OUR PURPOSE

- 🌱 Provision of valuable fibers and antioxidants,
- 🌱 healthy indulgence through sugar replacement,
- 🌱 more efficient use of water and farmland resources in nut cultivation,
- 🌱 less food loss and waste.





# CONTACT

## **RE-NUT Inc.**

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## **USA**

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*RE-defining the value of nuts by unlocking their full  
potential from field to delight.*







**The  
Hurd  
Co.**

**from waste to wear**

we make it possible  
to make clothes from agriwaste





**land + water**  
required for apparel fiber  
**2X by 2030**

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NOT POSSIBLE

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“ Apparel companies are hungry for sustainable & closed-loop materials . . .

”

Director of Global Innovation

Levi's

Representing 250+ brands, including:



ZARA

OUTERKNOWN



STELLA McCARTNEY



*allbirds*

TOAD & CO



EILEEN FISHER

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# FABRICS USED IN APPAREL TODAY

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Natural



Synthetic



Manmade Cellulosic  
(MMC)

*viscose • rayon • modal  
• lyocell • tencel •*



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# FABRICS USED IN APPAREL TODAY

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**\$60B**  
industry

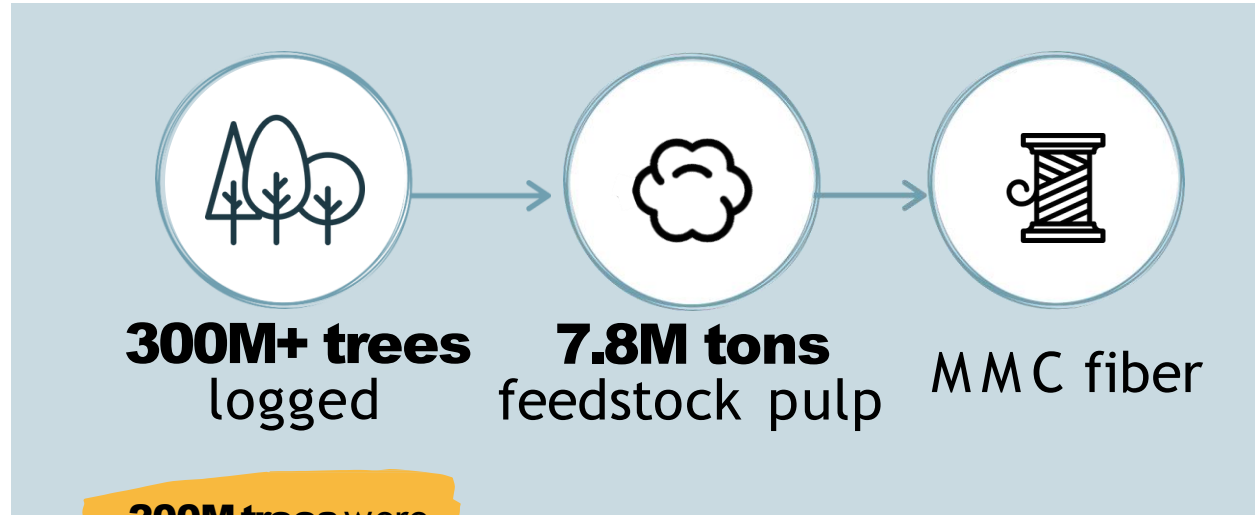
**by 2028**



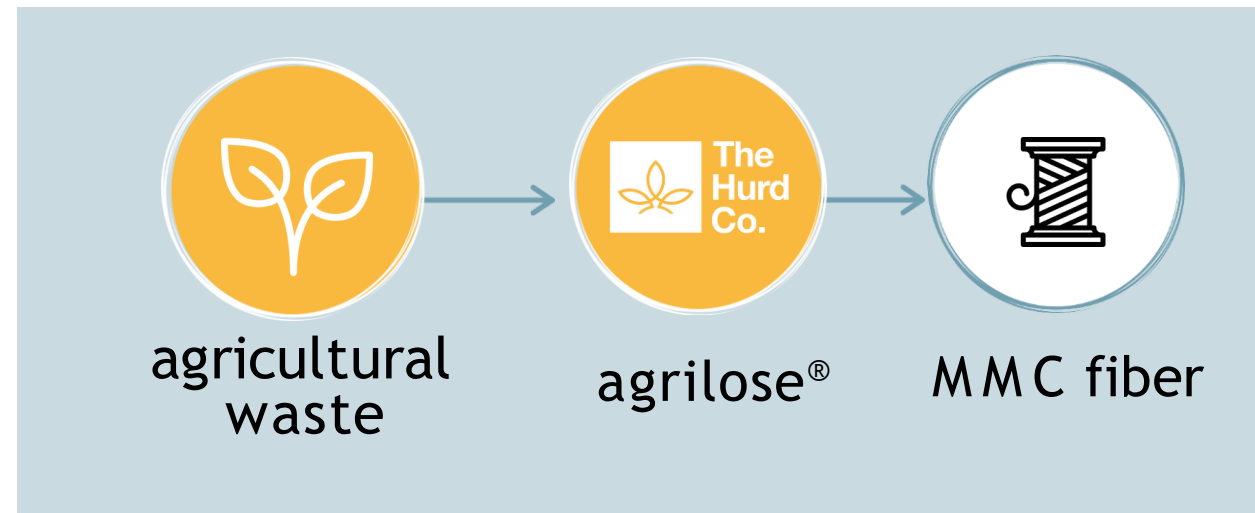
Manmade Cellulosic  
(MMC)

*viscose • rayon • modal*  
*• lyocell • tencel •*

## Last year:



**200M trees** were  
logged in 2021







# agrilose<sup>®</sup>

**MMC pulp**  
made from  
**100% agricultural waste.**

SAME  
QUALITY

SAME  
PRICE

# COMPARED TO TRADITIONAL PULPING TECHNOLOGY



**0**  
**emission**



**1/2**  
**water**



**90%**  
**less energy**



# COST COMPETITIVE WITH INDUSTRY GIANTS

**AGRICULTURAL  
WASTE**

**MMC  
PULP**

**COST  
COMPETITIVE**



Agraloo™  
BIOFIBRE



re:newcell



The  
Hurd  
Co.

sappi



Bracell



The Hurd Co.

TEAM



**Taylor Heisley-Cook**

CEO  
*co-founder*



**David Mun**

COO  
*co-founder*



**Charles Cai, PhD**

CTO  
*inventor*



**Michael Gurin, MBA**

CSO



**Ciara Cates**

VP Business  
Development





# R&D FACILITY







**Lyocell fiber made from agrilose® by the largest fiber extrusion company in the world**



pulp trials supported by

**patagonia**<sup>®</sup>

fiber validation with

**Top 3 Fiber  
Extrusion  
Company**

**Optimization  
Facility  
(10 kg/day)**

**Q1 2024**

debut collections via

**FASHION  
FOR  
D**

# THANK YOU



**from waste to wear**

we make it possible  
to make clothes from agricultural waste

[hello@thehurdco.com](mailto:hello@thehurdco.com) | @thehurdco | thehurdco.com





**BEAM** CIRCULAR  
BIOECONOMY • AGRICULTURE • MANUFACTURING

Almond Conference  
December 7, 2023

Karen Warner, CEO





**WE ARE UNLOCKING THE POWER OF  
AGRICULTURAL COMMUNITIES TO TRANSFORM  
WASTE INTO OPPORTUNITY THROUGH THE  
CIRCULAR BIOECONOMY.**



# Bioeconomy: using biology to create value through diverse inputs, technologies, and outputs



## FEEDSTOCKS (BIOMASS)

agricultural residues, wood & forestry residues, municipal solid waste / green waste, food processing byproducts, wastewater sludge



## CONVERSION

biological (fermentation, anaerobic digestion), chemical, thermochemical (pyrolysis, gasification)



## PRODUCTS

fuels, chemicals, solvents, detergents, plastics, films, fabrics, polymers, ag inputs, food additives, fragrances, alternative proteins, construction materials

# Global bioeconomy has growing cross-industry impact



By the end of the decade, syn-bio could be used extensively in manufacturing industries that account for more than a third of global output—a shade under \$30 trillion in terms of value.

-Boston Consulting Group

Forbes

FORBES > BUSINESS > MANUFACTURING

## White House Unveils Strategy To Grow Trillion Dollar U.S. Bioeconomy

McKinsey  
Global Institute

## The Bio Revolution

Innovations transforming economies,  
societies, and our lives



WORLD  
ECONOMIC  
FORUM

Join us

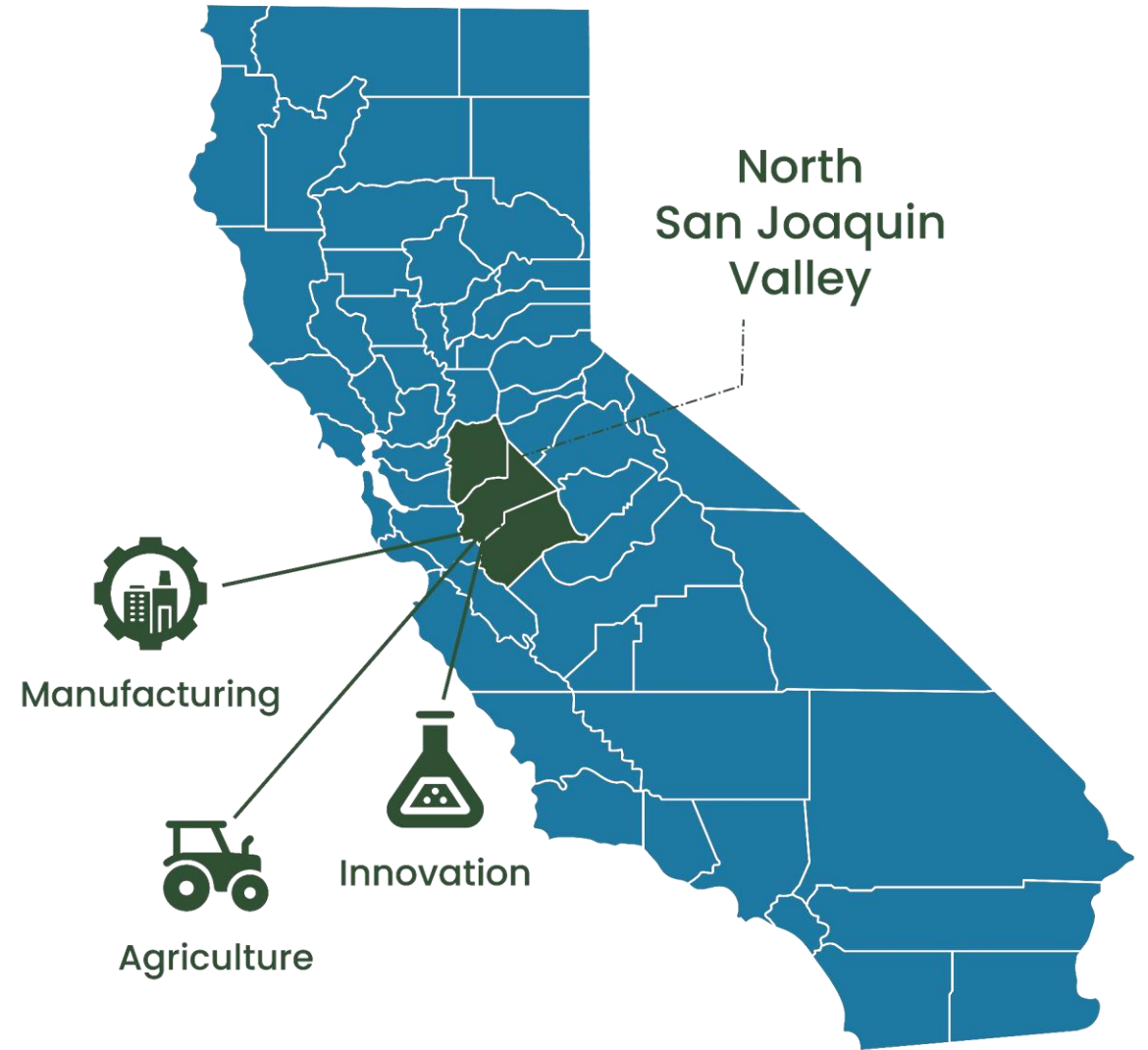
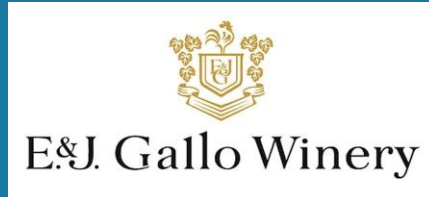
CIRCULAR ECONOMY

## Why the world needs a 'circular bioeconomy' - for jobs, biodiversity and prosperity



## BEAM's strategic anchor region

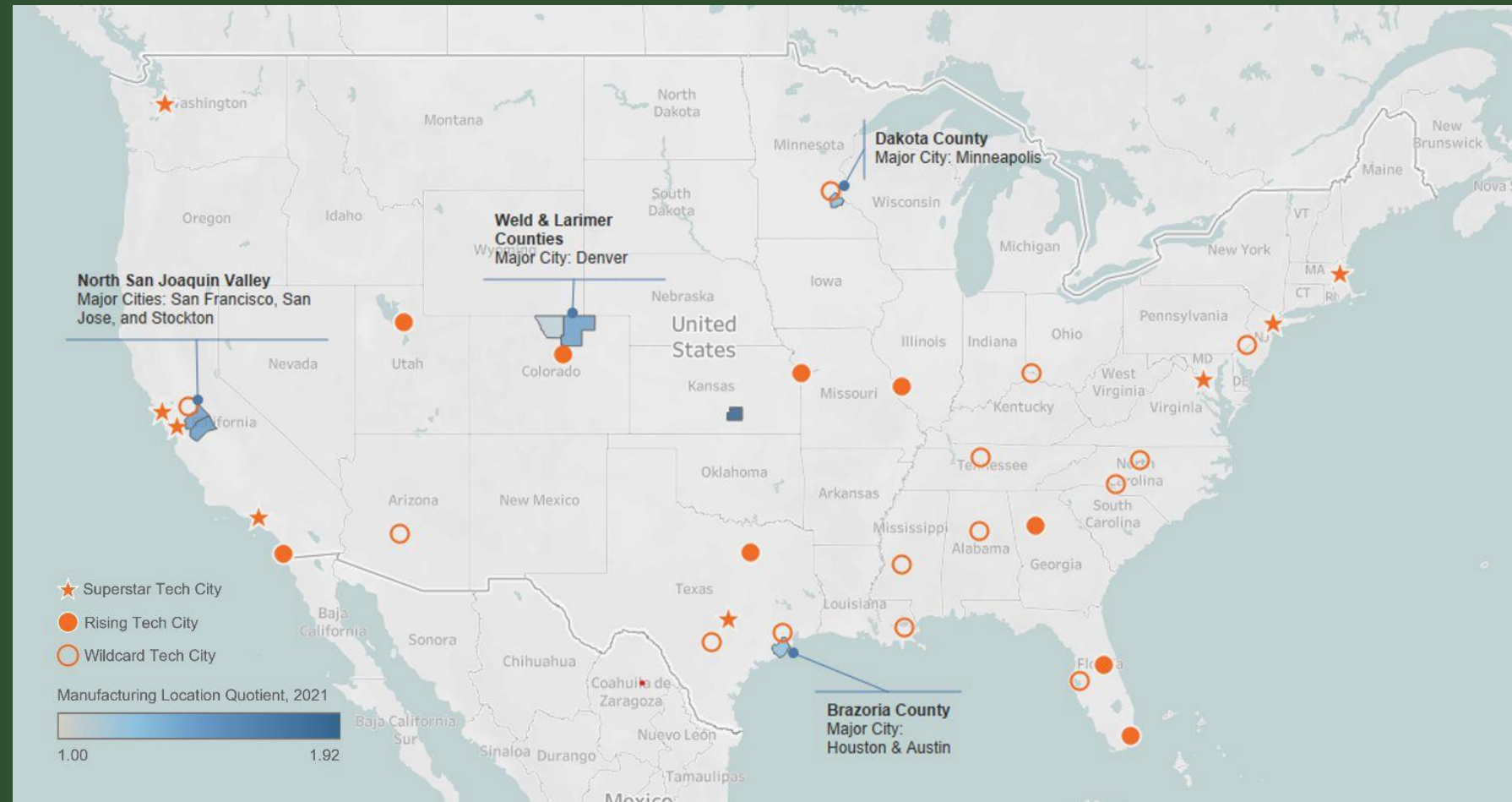
- NSJV = Merced, San Joaquin, & Stanislaus Counties, 1.6 million people
- CA's agricultural heartland, directly neighboring Bay Area biotech hub to West and forested Sierras to East
- Produces 30% of California's almonds
- Global food manufacturing leader across multiple categories



# The North San Joaquin Valley is uniquely positioned to lead the US in bioindustrial manufacturing scale-up

Only region in US with combination of:

- Large-scale ag production
- Leading concentration of manufacturing
- Direct proximity to “superstar” tech hub





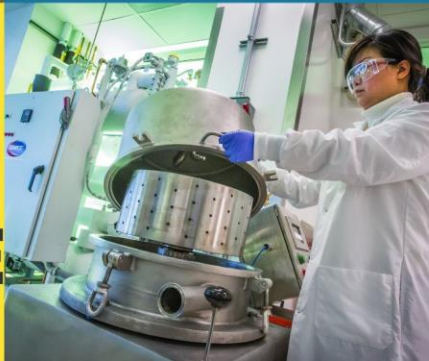
**BIO  
ECO  
NOMY**



**MANU  
FACTU  
RING**



**AGRI  
CUL  
TURE**



**BioEconomy, Agriculture, & Manufacturing (BEAM) Initiative:**  
a regional strategy for global leadership in the circular bioeconomy

**BEAM Portfolio**



**Infrastructure**



**Cross-Cutting Initiatives**



**Talent**

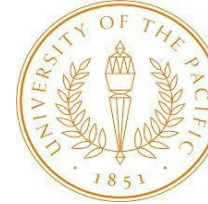
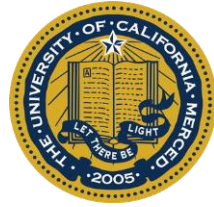


**Innovation**



**Capital**

# Collaborative of Public and Private Partners





# Bioproducts face barriers to scale from Lab to Market

Research & Development



Scale-Up

Manufacturing

**Micro Scale**

< 1 mL, HT



**Bench Scale**

100 mL – 20 L



**Pilot Scale**

50 L – 1000 L



**Demo Scale**

10 m<sup>3</sup> – 50 m<sup>3</sup>



**Commercial Scale**

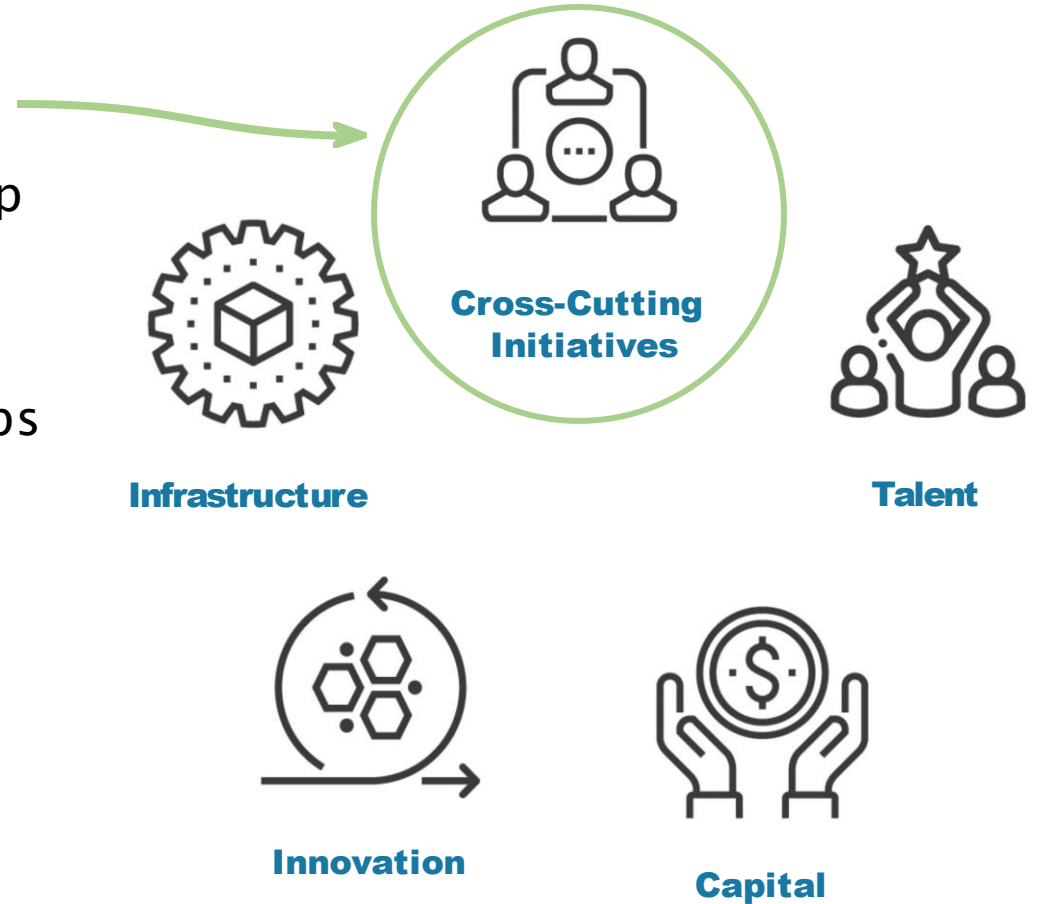
100 m<sup>3</sup> +

**BEAM's Focus**

# BEAM Project Highlight: Innovation Campus

- Testbed contract manufacturing facility to help firms **move from lab-based viability to commercial manufacturing**
- Designed strategically to fill critical market gaps and support diverse feedstocks/products

Phase 1 of facility design completed with leading national biomanufacturing design firm Next Rung Technologies



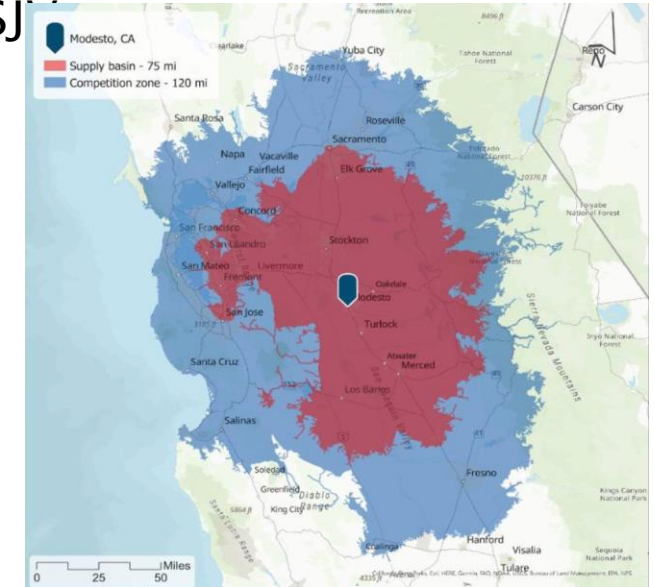


# BEAM Project Highlight:

## BDO Zone Certification- Nut Tree Biomass Supply Chain Assessment

Co-Sponsored by Almond Board of California & Stanislaus County

- Bioeconomy Development Opportunity Zone study will certify NSJ region for reliable supply of nut crop biomass for use as bioproduction feedstock, assessing
  - Feedstock surplus
  - Supply chain strength
  - Sound infrastructure
- Preview of BDO Zone findings:
  - Nearly 900K tons of underutilized woody biomass from orchard recycling at low risk
  - 6,300 Nut Tree growers/suppliers in the BDO Zone
  - Well established processors' network to separate nuts from shells and hulls
  - Majority of feedstock is available for only the cost of transportation
  - Local demand for available residuals continues to go down, opening opportunities for new bioeconomy industries



# BEAM Initiative Progress

## \$15.4 million raised in Year 1 to seed the portfolio

- Stanislaus County **\$10 million seed commitment** in January 2023
- **\$1 million NSF Engines Development Award**
  - Co-leads: Berkeley Lab, UC Merced, BEAM Circular
  - CBIO Collaborative (coalition of 40+ institutions) will submit proposal for **\$160 million** NSF Engines Type-2 Award in 2024
- **\$3.6 million Economic Development Pilot Grant** from State of California (CERF / CA Jobs First)
  - Supports pilot projects across the BEAM portfolio including innovation voucher program, supply chain technical assistance, startup competition and accelerator, supply chain research, and workforce development programs.
- Over **\$850,000 in early private/philanthropic investments**



National  
Science  
Foundation



***“The forward-leaning solutions embodied in this Engine will ensure the long-term viability of agriculture and the vitality of our rural communities.”***

- CA Secretary of Food and Agriculture Secretary Karen Ross



*Sec. Ross meeting with Stanislaus partners to discuss BEAM Initiative at MJC*



*Almond hulls piled high at local huller/sheller - one example of the region's abundant biomass*





# **BEAM** CIRCULAR

BIOECONOMY • AGRICULTURE • MANUFACTURING

**Let's collaborate!**

[www.beamcircular.org](http://www.beamcircular.org)







california  
almonds<sup>®</sup>  
Almond Board of California

# Thank you

