



**CLEAN LABEL
CONFERENCE**

Upcycled Ingredients and Food Products: Challenges and Opportunities for Product Developers

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Drexel University, Philadelphia, PA
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DREXEL UNIVERSITY

At the Intersection of Culinary and Research

Drexel is a private research university founded in 1891 with over 25,000 undergraduate, graduate, and online students.

With a focus on experiential learning, Drexel is the only doctoral-granting research university with a culinary arts & science and nutrition & foods in one department.





CREDIT: BRIAN MICHAEL KINNEY



CREDIT: COOK FOR YOUR LIFE / NORA VAUGHAN

DREXEL FOOD LAB

A Food Product Design and Culinary Innovation Lab

We apply culinary arts & science to improve the health of people, the planet, and economies.

We do this through research and programming that help us:

- Understand consumers
- Develop new food products
- Introduce new products to market

Select Clients

STARTUPS



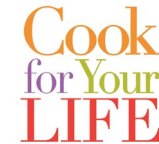
ESTABLISHED FIRMS



MULTINATIONALS



NONPROFITS & GOVERNMENT





OUR PRINCIPLES

Do Good, Feed Well, and Keep Going

Do Good means working on projects that improve the food system.

Feed Well represents our dedication to developing products that are not only nutritious, but tasty and desirable to the consumer.

Keep Going stands for our eye on market-driven, sustainable solutions that can stand on their own.



OUR MISSION

Students Are Our Flagship “Product”

We not only develop new food products and menu items with entrepreneurs, industry, non-profit, and government partners, but also develop our flagship “product”, students across disciplines who are poised to improve the food system.



CREDIT: ARAMARK

OUR NETWORK

Students Become Colleagues

Foodservice & Hospitality



Production



Community & Non-Profit



Background | ReFED Roadmap to Reduce Food Waste

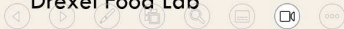
Two Videos Shown Here



The Student
Laboratory
Reinventing Food
To Stop Waste

Video By Freethink

Drexel Food Lab



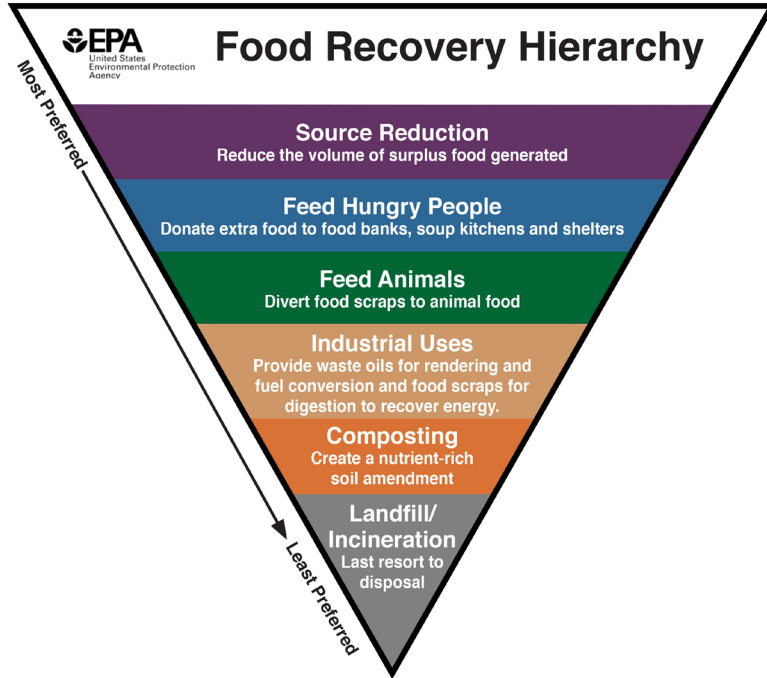


Our pilot began in Philadelphia, Pennsylvania

A vision of capturing all food leaving the city for a landfill and
putting it to good use instead.



Sustainable Surplus Food Systems



ECONOMIC

Jobs

SOCIAL

Hunger Relief

ENVIRONMENTAL

Clear Air

Healthy Soil



Banana “Ice Cream”

Video #2 Shown Here

SparCs In The News



Improving School Food While Diverting Food Waste



COMMONWEALTH KITCHEN
IS DEVELOPING A NUTRIENT-RICH
MIGHTY MUFFIN THAT PACKS
AN ENTIRE VEGETABLE SERVING IN
BREAKFAST FOR PUBLIC SCHOOLS.



Dehydrated fruit & veggie
scraps from industrial
manufacturing process

+



Surplus local produce
(apples, carrots, zucchini,
squash, etc.)

=



High protein, high fiber,
nutrient-dense, delicious
breakfast!





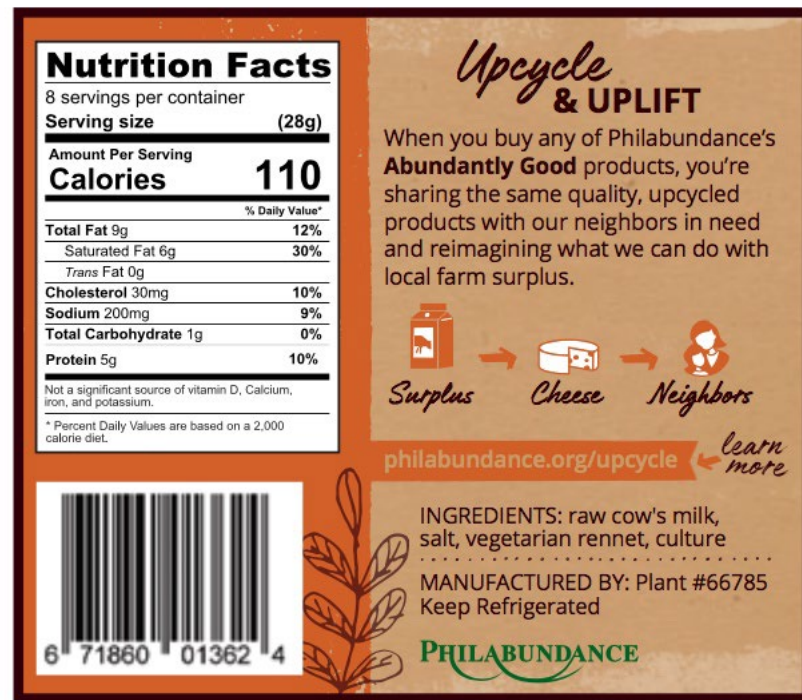
Matriark Foods

Upcycled Vegetable Broth

Retail Introduction



The Evolution of a Brand



CLIENT	Beverage company founded by Drexel Food Lab graduate students with a mission to reduce food waste
OPPORTUNITY	Develop sustainable, upcycled food product to combat food waste in a meaningful way
ACTION	Market research, product development, and formulation refinement along with restaurant partnerships and assistance with GRAS process
OUTCOME	Line of FDA GRAS certified beverages made from avocado seeds complete with antioxidants

Read more: <https://campusphilly.org/2020/04/06/this-team-of-drexel-grads-is-innovating-the-drink-industry-with-upcycled-avocado-seeds/>



Growing the Upcycled Food Economy

CREATE

Nonprofit founded in 2019
by upcycled food
companies themselves

COLLABORATE

Recognized the power
of collaboration in
growing a successful
food category

ELEVATE

Elevating all food
through research,
strategy, networking, and
policy advocacy



Sample UFA Members



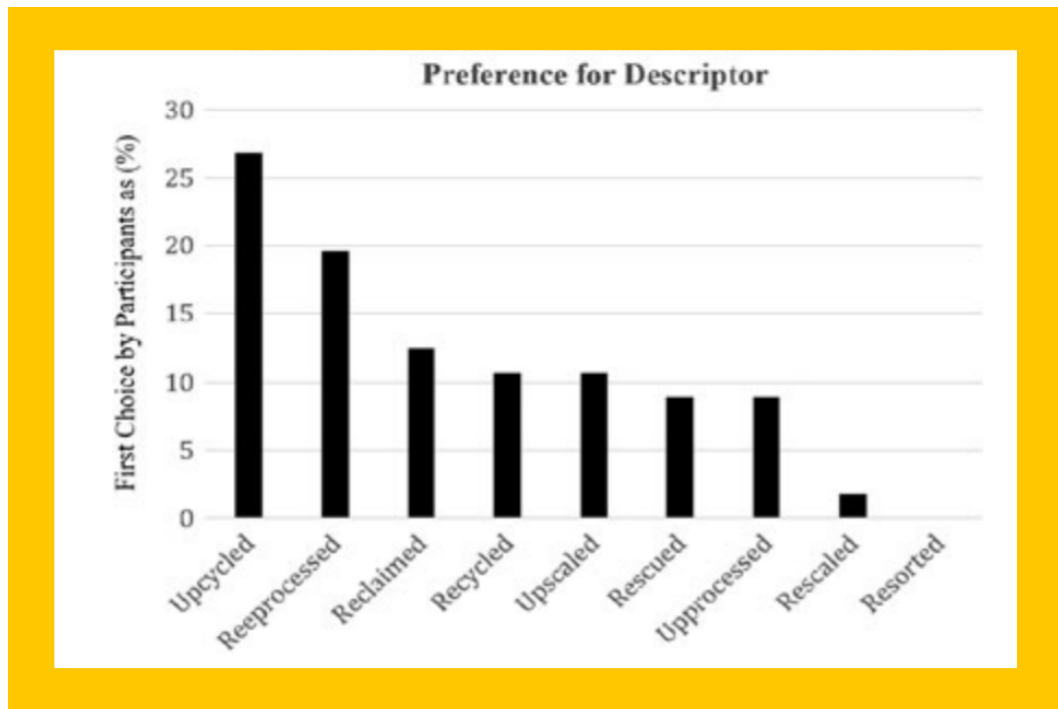


VASP Research | Consumer Preference Study

“FROM FOOD WASTE TO VALUE-ADDED SURPLUS PRODUCTS (VASP):
CONSUMER ACCEPTANCE OF A NOVEL FOOD PRODUCT
CATEGORY” (BHATT ET AL., 2017)

Consumers prefer the term “Upcycled Food”

Explored the extent of consumer discrimination
between conventional, organic, and upcycled



VASP Research | Consumer Preference Study

“FROM FOOD WASTE TO VALUE-ADDED SURPLUS PRODUCTS (VASP): CONSUMER ACCEPTANCE OF A NOVEL FOOD PRODUCT CATEGORY” (BHATT ET AL., 2017)

Examined whether benefits to self or benefits to others have greater influence on consumers' perceptions

VASP seems to fall between “conventional” and “organic”

Perceptions	Food category					
	VASP		Organic		Conventional	
	Mean	SD	Mean	SD	Mean	SD
Being helpful to the environment	5.20	1.99	6.26	1.96	4.64	2.16
Being conventional	6.48	1.32	6.68	1.67	7.24	1.46
Being organic	5.61	2.11	6.29	2.05	4.04	2.25

Upcycling + Research

Phase I: Defining Upcycled Foods (UF)

“Use ingredients that otherwise would not have gone to human consumption, are procured and produced using verifiable supply chains, and have a positive impact on the environment”

Phase II: UF Certification/Verification

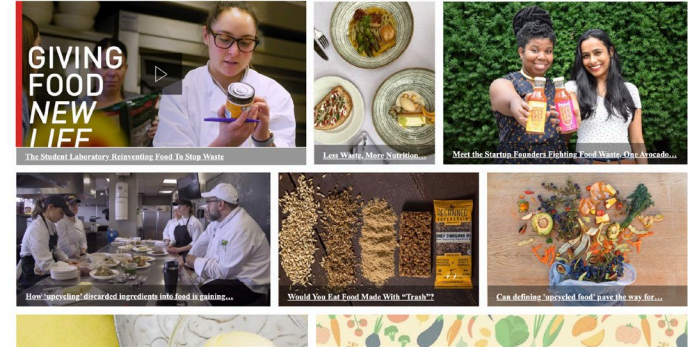
Logo Design
Consumer Testing

Phase III: Consumer Attitudes Toward UF

Rich body of new research

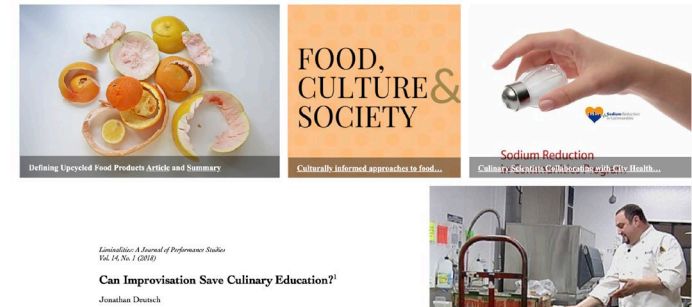
Read more: <https://sway.office.com/f8vo7BX3A2NfDiSL?ref=Link>

Sustainability



Selected Research and Scholarship

Articles



Have you heard about Upcycled

N	Valid	153
	Missing	0

Have you heard about Upcycled Food?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Definitely yes	4	2.6	2.6	2.6
	Probably yes	21	13.7	13.7	16.3
	Might or might not	36	23.5	23.5	39.9
	Probably not	33	21.6	21.6	61.4
	Definitely not	59	38.6	38.6	100.0
	Total	153	100.0	100.0	

Next, participants were shown:

There are different categories of foods being sold in the market.

UPCYCLED foods are manufactured from ingredients that are byproducts from producing another food product.

A minority of foods are produced in this manner.

Upcycled foods are safe for consumption.

Examples:

An upcycled muffin may use ingredients such as flour milled from the leftover grain from beer brewing.

A soup made from carrot peels and scraps would be considered upcycled food.

Are you aware of any Upcycled Food such as those described above available in the market?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Definitely yes	11	7.2	7.2	7.2
	Probably yes	24	15.7	15.7	22.9
	Might or might not	17	11.1	11.1	34.0
	Probably not	51	33.3	33.3	67.3
	Definitely not	50	32.7	32.7	100.0
	Total	153	100.0	100.0	

Have you ever consumed any Upcycled Food?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Definitely yes	8	5.2	5.2	5.2
	Probably yes	25	16.3	16.3	21.6
	Might or might not	40	26.1	26.1	47.7
	Probably not	45	29.4	29.4	77.1
	Definitely not	35	22.9	22.9	100.0
	Total	153	100.0	100.0	

Consumers' Willingness to Pay

Study 1 - Findings

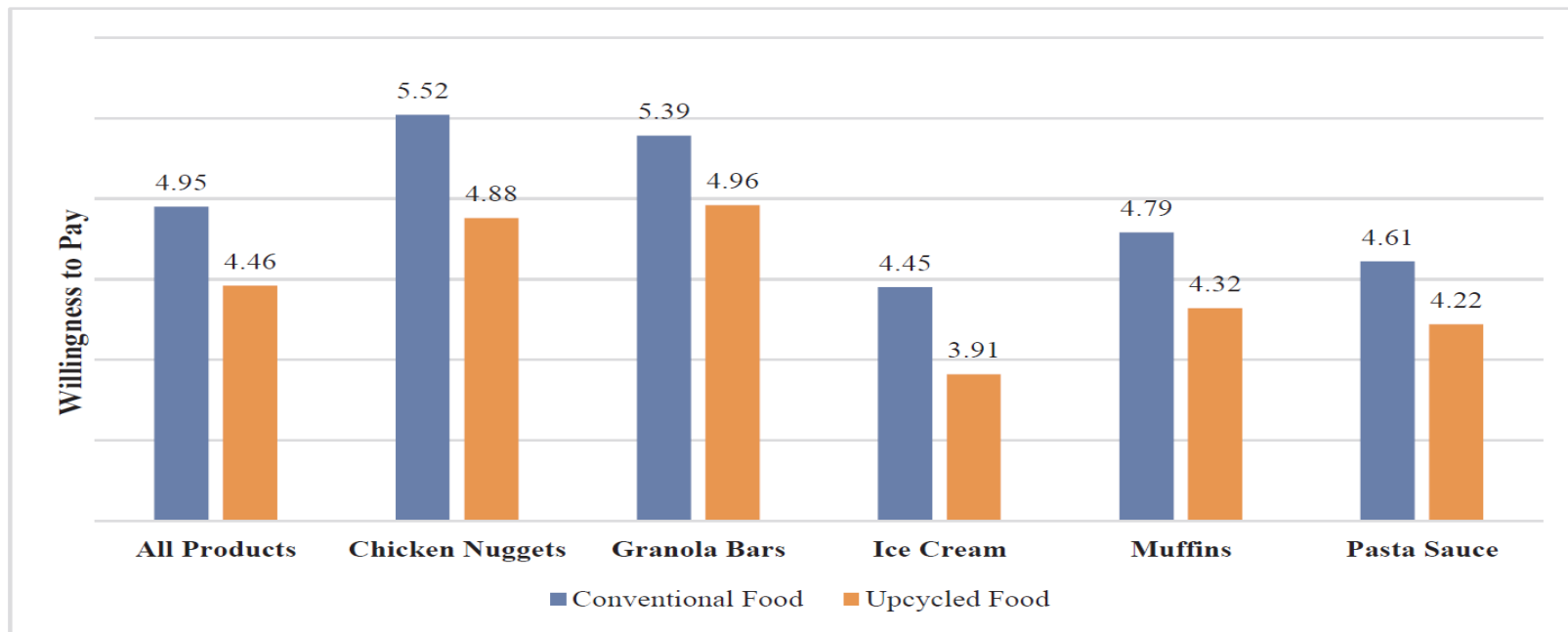


Fig. 1. Willingness to Pay for Conventional and Upcycled Foods (Study 1)

Increase in Consumers' Willingness to Pay

Study 2 - Findings

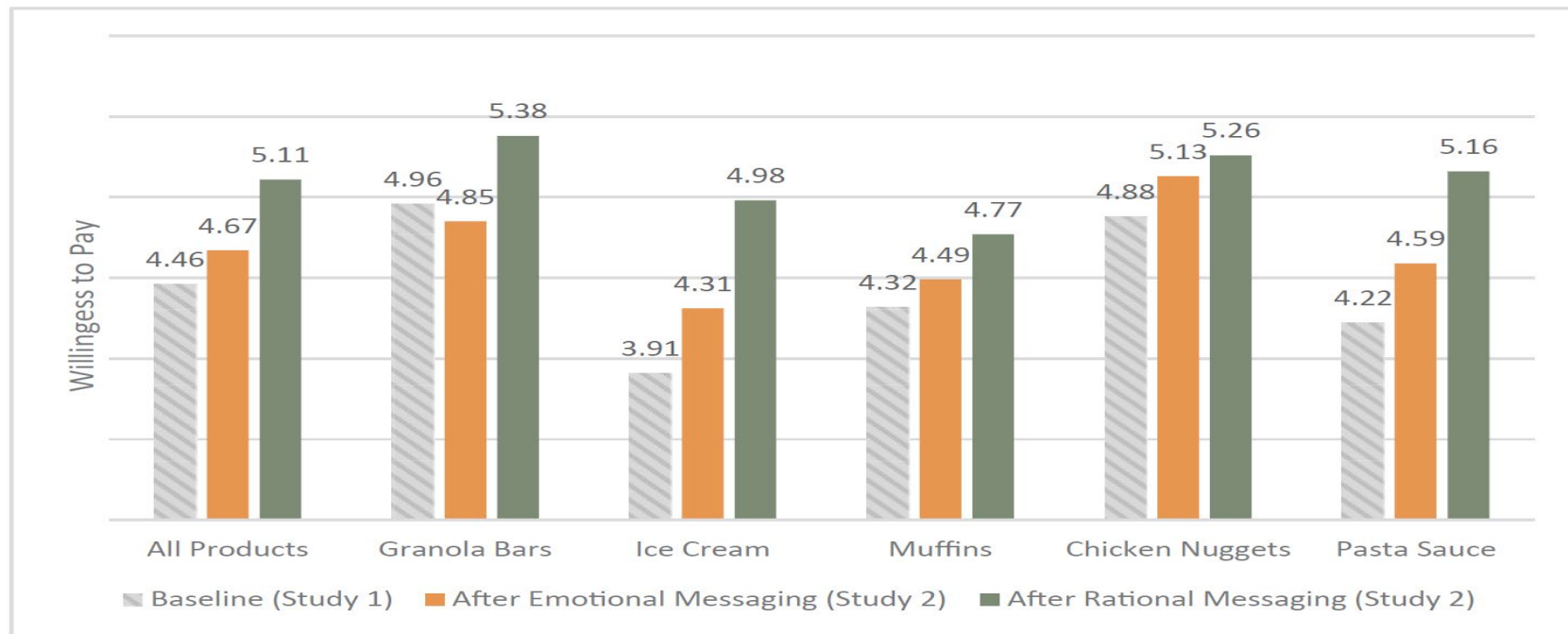


Fig. 2. Increase in Willingness to Pay for Upcycled Foods (Study 2)

Significance of Findings

Consumers are willing to pay less for upcycled foods

Appropriate messaging around these foods can increase willingness to pay

Rational messaging is more effective than emotional messaging

Our findings align with other research on upcycled foods that suggests an industry potential

However, more research on how to make these foods acceptable to consumers is needed

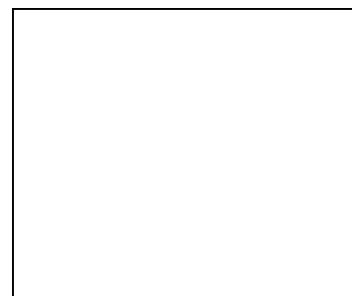
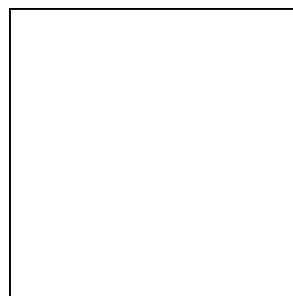
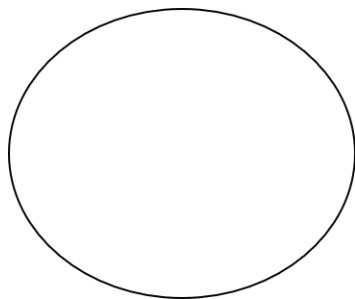
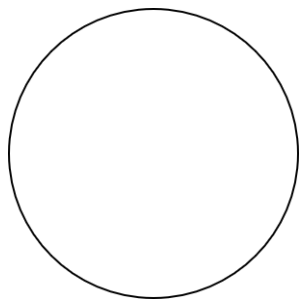
Objective

- Find the right logo elements for an upcycled certification logo
- These elements include –
 - Shape
 - Color
 - Font
 - Symbol

Summary

- **Tested**
 - 4 Shapes
 - 6 Colors
 - 6 Fonts
 - 5 Symbols
- **Method**
 - Association Test
- **Total Sample Size**
 - 1680 Participants

Shapes Tested



Colors Tested



R30, G120,
B60

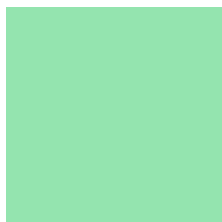


R120, G60,
B30



R30, G60,
B120

Luminosity $\times 2.5$



Fonts Tested

AaBbCc

AaBbCc

AaBbCc

AaBbCc

AaBbCc

AaBbCc

Symbols Tested



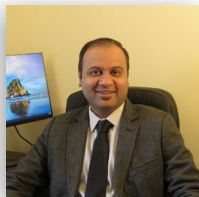
Symbol - Results



Three symbols (plant like) were perceived to be more suitable for the certification logo

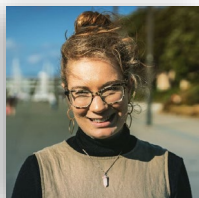


2022 UFF Research Fellows



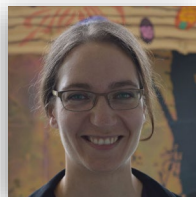
Dr. Siddharth Bhatt

Assistant Professor of Marketing
Pennsylvania State University at Harrisburg



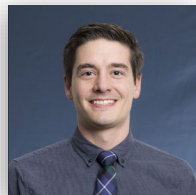
Francesca Goodman-Smith

TRANSFORM Program Leader
*Fight Food Waste Cooperative Research Centre
in Australia*



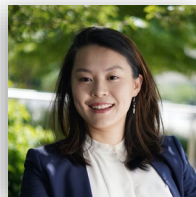
Dr. Simona Grasso

Senior Research Fellow
University of Reading



Dr. Topher McNeil

Postdoctoral Fellow
*Center for Food Innovation and Entrepreneurship at
Santa Clara University's Leavey School of Business*



Dr. Hongjun Ye

Assistant Professor of Marketing
David D. Reh School of Business at Clarkson University

2023 UFF Research Fellows



Siddharth Bhatt
Consumer Awareness



Alissa Bilfield
Consumer Awareness



Ziyet Boz
Impact Measurement



Dean Hauser
Impact Measurement



Derya Kahveci Karıncaoğlu
Ingredient Development



Kamaljit Moirangthem
Ingredient Development



Chetan Sharma
Consumer Perception



Hongjun Ye
Consumer Awareness



Thank You

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