
UFF Research Fellowship Spring 2022 Presentation

UpcycledFood.org #BuyUp

UPCYCLEDTM
FOOD ASSOCIATION

Speakers



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AGENDA

1. Upcycled Food Supply Chain + Case Studies + Q&A
2. Upcycled Food Consumer Awareness in US & China + Q&A

Upcycled Food Supply Chain

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Upcycling our way to a circular economy: A research case study

Upcycling our way to a circular economy: A research case study

Study overview:

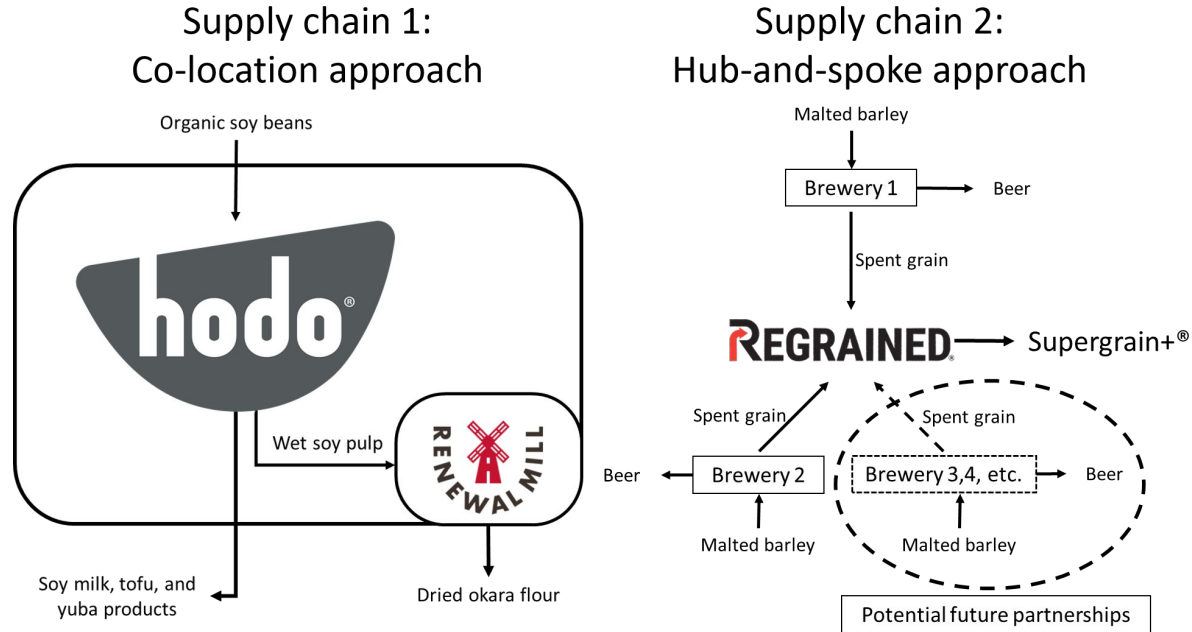
Method: Detailed interviews were conducted with Dan Kurzrock of ReGrained and Claire Schlemme and Caroline Cotto of Renewal Mill in July 2021. Environmental impact of current upcycling processes at each company were estimated using the ReFED impact calculator.

Interview topics:

- Company history
- Supply chain dynamics
- Unique challenges within their organization
- Growth strategies and concerns

Upcycling our way to a circular economy: A research case study

Figure 1: Comparing Supply Chain Structures



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Table 1: Pros and cons of different business partnerships for upcycling

Co-location approach	Hub-and-spoke approach
<p>Pros:</p> <ul style="list-style-type: none">• No transportation costs/impacts• Minimal holding time before processing minimizes food safety risks• Reduced real estate expenses	<p>Pros:</p> <ul style="list-style-type: none">• New suppliers can be found to meet market demand or lower cost• Ability to change manufacturing line layouts/make changes to the physical space
<p>Cons:</p> <ul style="list-style-type: none">• Inability to change line layouts• Supply chain tied to just one partner/inherently less able to adapt to changes in the market and cost	<p>Cons:</p> <ul style="list-style-type: none">• Transportation costs/impacts/challenges• Extra food safety consideration needed for holding and transportation• Higher real estate costs

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Table 2: Estimated CO₂ equivalent (CO₂-eq) emissions prevented in 2020 using ReFed's Impact Calculator

	If used as animal feed	If sent to be composted	If sent to landfill
ReGrained (~400,000 lbs.)	537.76 metric tons	506.89 metric tons	589.11 metric tons
Renewal Mill (~260,000 lbs.)	362.99 metric tons	342.15 metric tons	397.65 metric tons

(Note: all emission calculations were performed using a "standard mix" for food waste because no other categorization closely represented the properties of BSG or wet okara)

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Key takeaways for upcycled food companies

1. Various successful upcycling partnership structures exist
2. Current tools can help estimate the benefits of upcycling (although current models are imperfect)
3. Reducing waste handling cost is likely a major motivating factor for companies to partner with upcycled food companies.



REGRAINED

SuperGrain+®

An Upcycled Sprouted Ancient Grain

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When developing new partnership, upcycled food companies should consider the following:

1. Which partnership arrangements make the most sense for this particular product?
2. Do partners produce enough byproduct to meet demand?
3. Where are partners located?
4. Does the upcycling process add value in some way?
5. Which attributes of the upcycled product add the most value? Nutritional benefits? Functionality? Novelty? Reduced impact on the environment?

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Limitations of this case study:

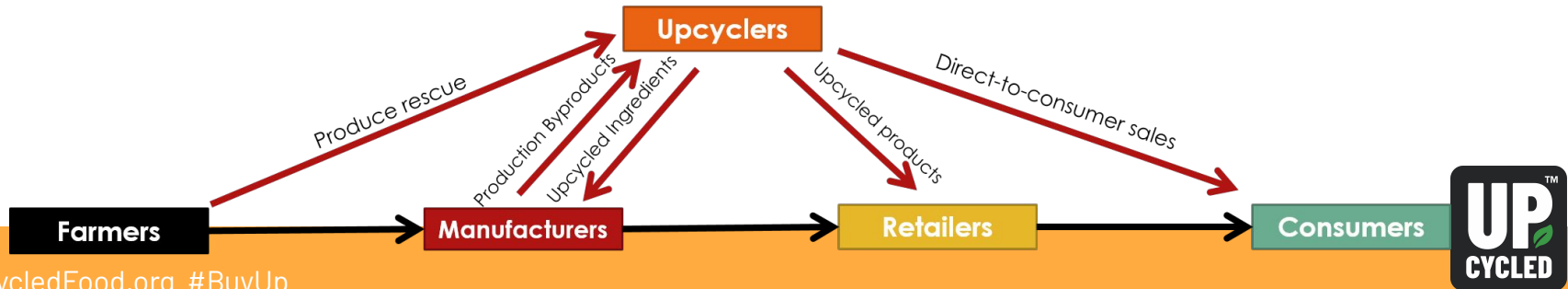
1. Only 2 upcycled food companies were examined
2. Both companies are located in the same geographic area
3. Both companies are primarily producing baking ingredients
4. The current models for estimating the environmental benefits of upcycling are imperfect

Exploring Challenges in Upcycled Food Supply Chains: A Survey of Upcycled Food Companies

Exploring challenges in upcycled food supply chains: a survey of upcycled food companies

Study overview:

- A Qualtrics survey was distributed to UFA members to complete in Nov/Dec 2021
- Questions focused on:
 - Organizational history and structure
 - Involvement in upcycling and products/services
 - Supplier relationships
 - Concerns about potential supply chain issues
 - Strategies for growth



Exploring challenges in upcycled food supply chains: a survey of upcycled food companies

Respondent overview:

25 complete or partial respondents

- 23 were US-based companies, 1 was UK-based, and 1 was based in South America
- Company size:
 - Average: 526 full-time employees
 - Median: 5 full-time employees
- Company age:
 - Average age: 100 years
 - 16 companies founded in 2015 or later

Exploring challenges in upcycled food supply chains: a survey of upcycled food companies

Involvement in upcycling:



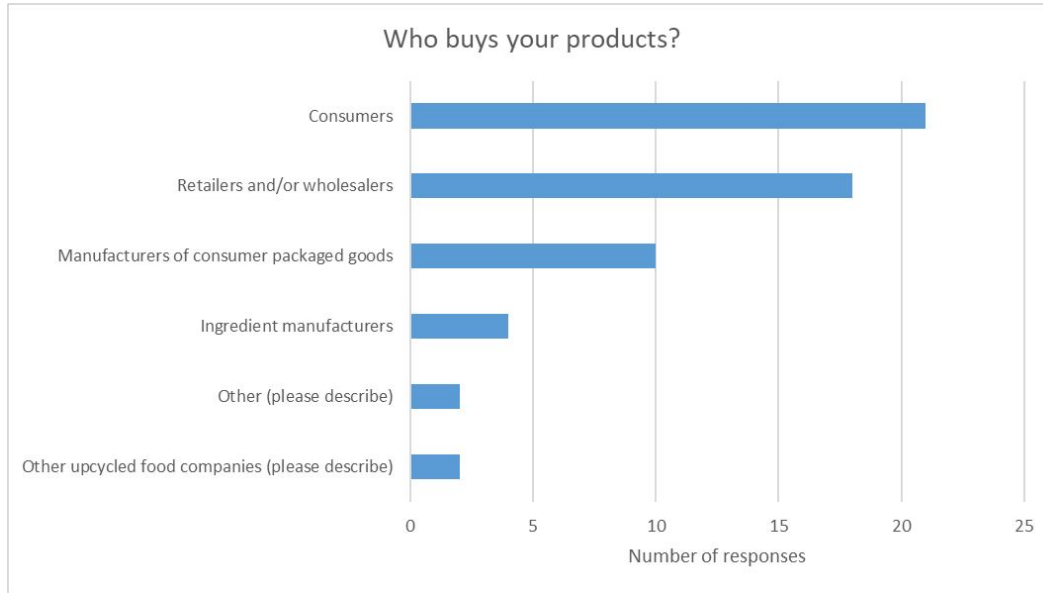
Out of 25 companies:

- 16 produce CPGs
- 12 produce upcycled ingredients
- 7 provide technology to facilitate upcycling
- 4 produce byproducts that are later upcycled

14 companies reported being involved in more than one category

Exploring challenges in upcycled food supply chains: a survey of upcycled food companies

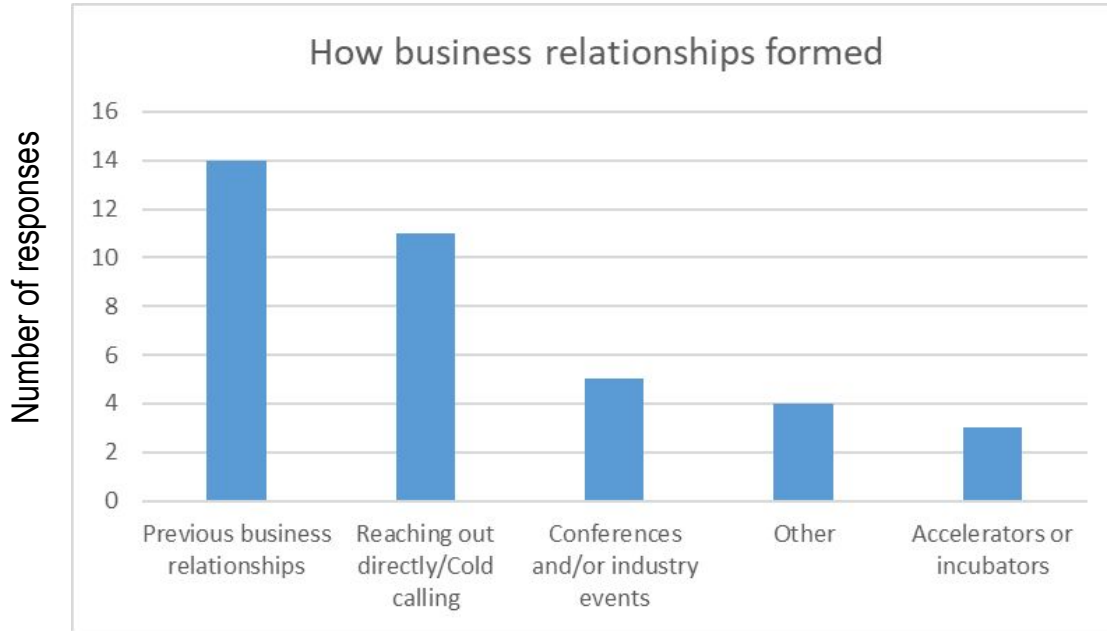
Who is using your product?



Most companies were primarily focused on consumers/retail endeavors.

Exploring challenges in upcycled food supply chains: a survey of upcycled food companies

How do partnerships form?



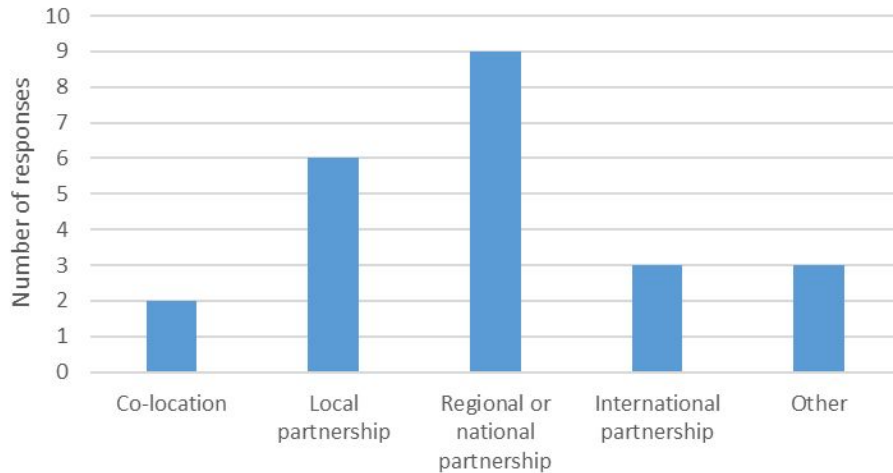
Many partnerships are the result of previous business relationships.

68.2% of respondents are looking for new suppliers

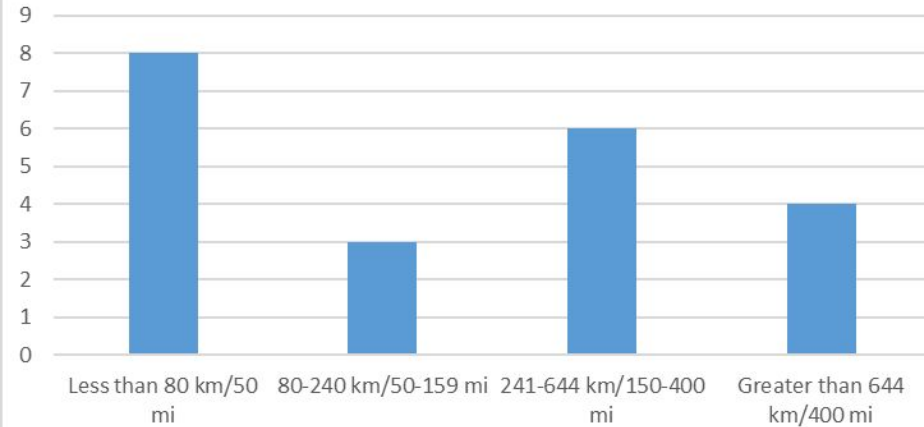
Exploring challenges in upcycled food supply chains: a survey of upcycled food companies

Supply relationships:

Supplier Relationship

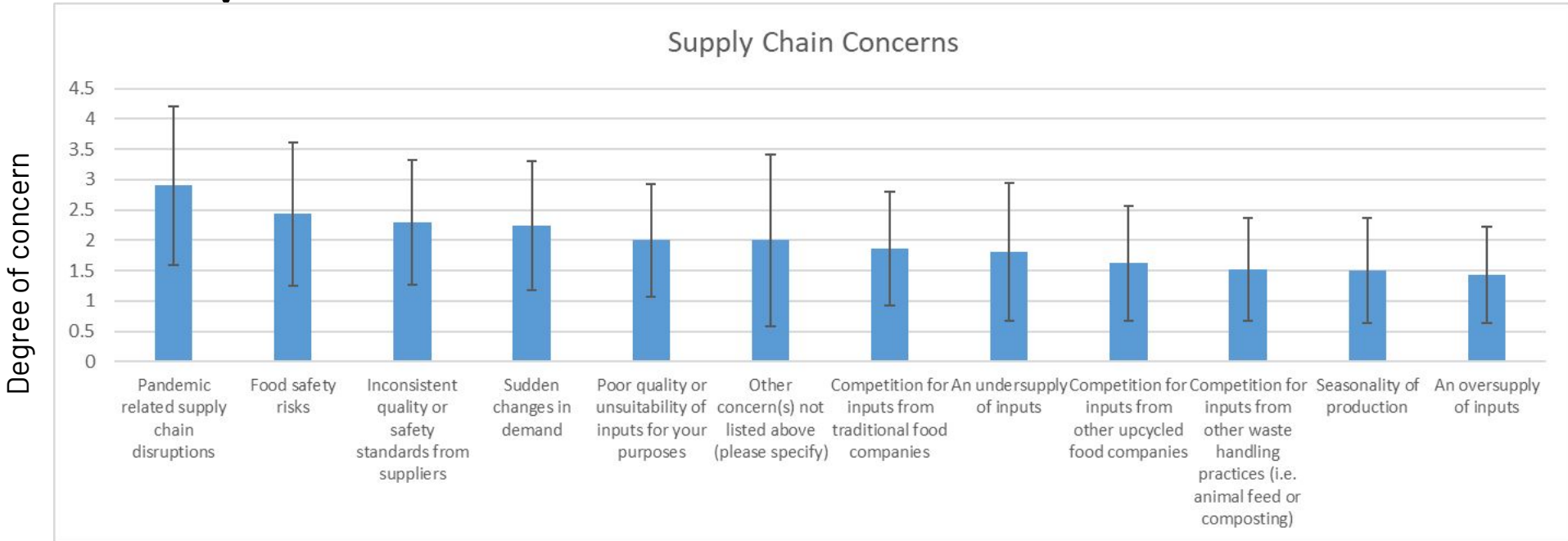


Where do you source most of the ingredients/products that you upcycle?



52.2% of respondents said that distance from suppliers was a concern

Exploring challenges in upcycled food supply chains: a survey of upcycled food



Company type (ingredient supplier/CPG manufacturer/etc.) and relationship to supplier did not have a statistically significant effect on the responses to these potential concerns

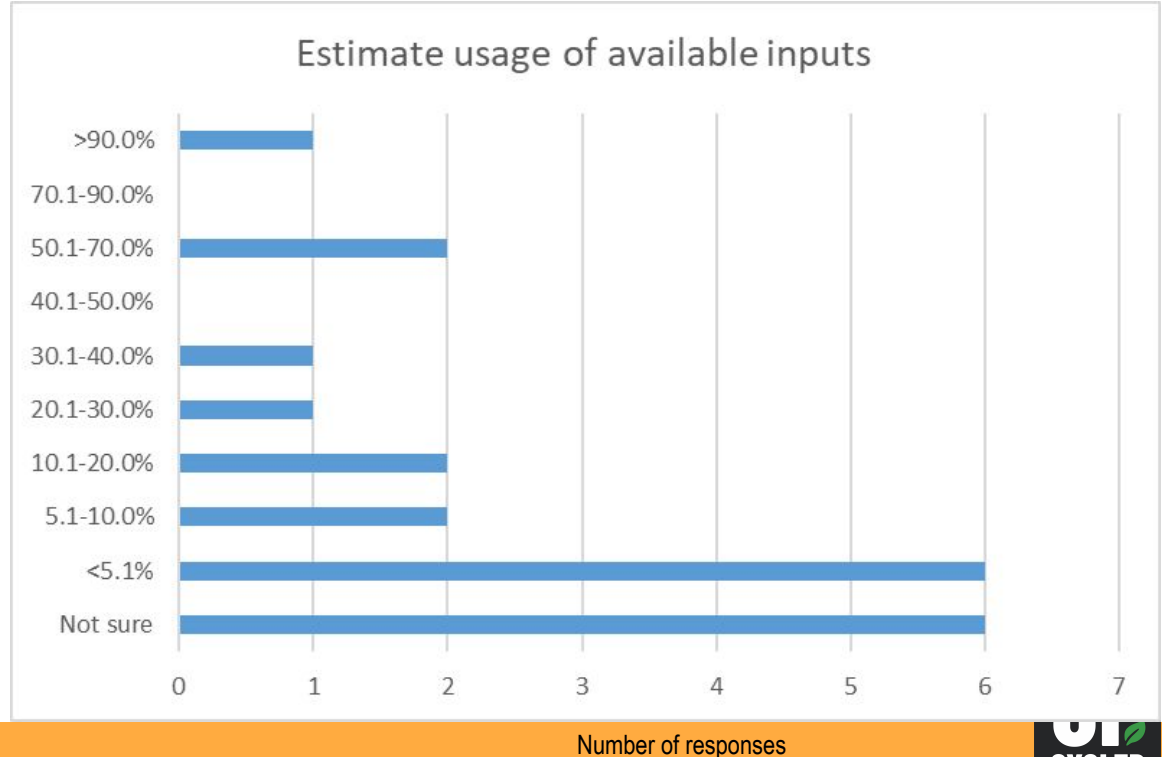
Exploring challenges in upcycled food supply chains: a survey of upcycled food companies

What are the biggest issues you currently face in your supply chain?

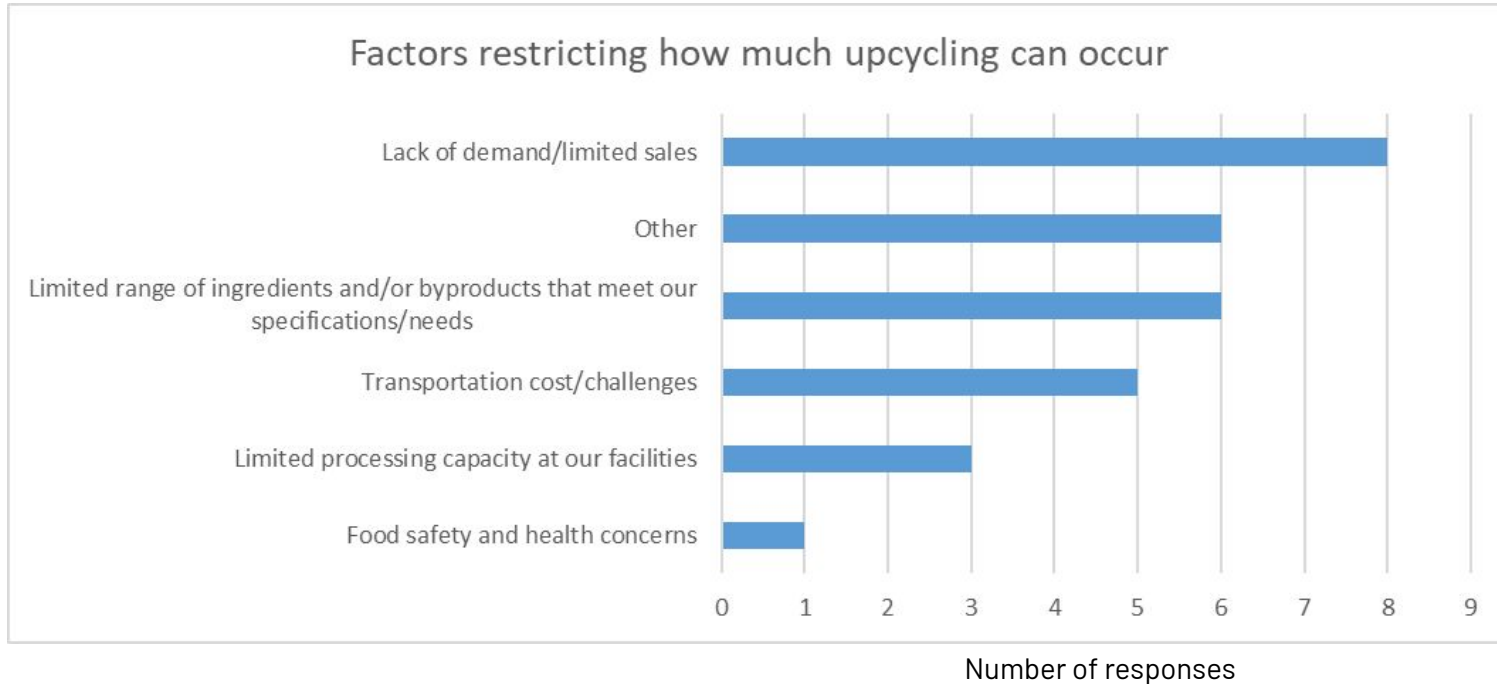
- Seasonality of production affected 30.4% of respondents but can be easily addressed through strategic planning
- Other issues:
 - Transportation/freight costs
 - Transportation and supply chain delays
 - Limited production of inputs
 - Building trust with new suppliers
 - Labor costs
 - Storage space
 - Maintaining quality
 - Enforcing food safety standards at origin

Exploring challenges in upcycled food supply chains: a survey of upcycled food companies

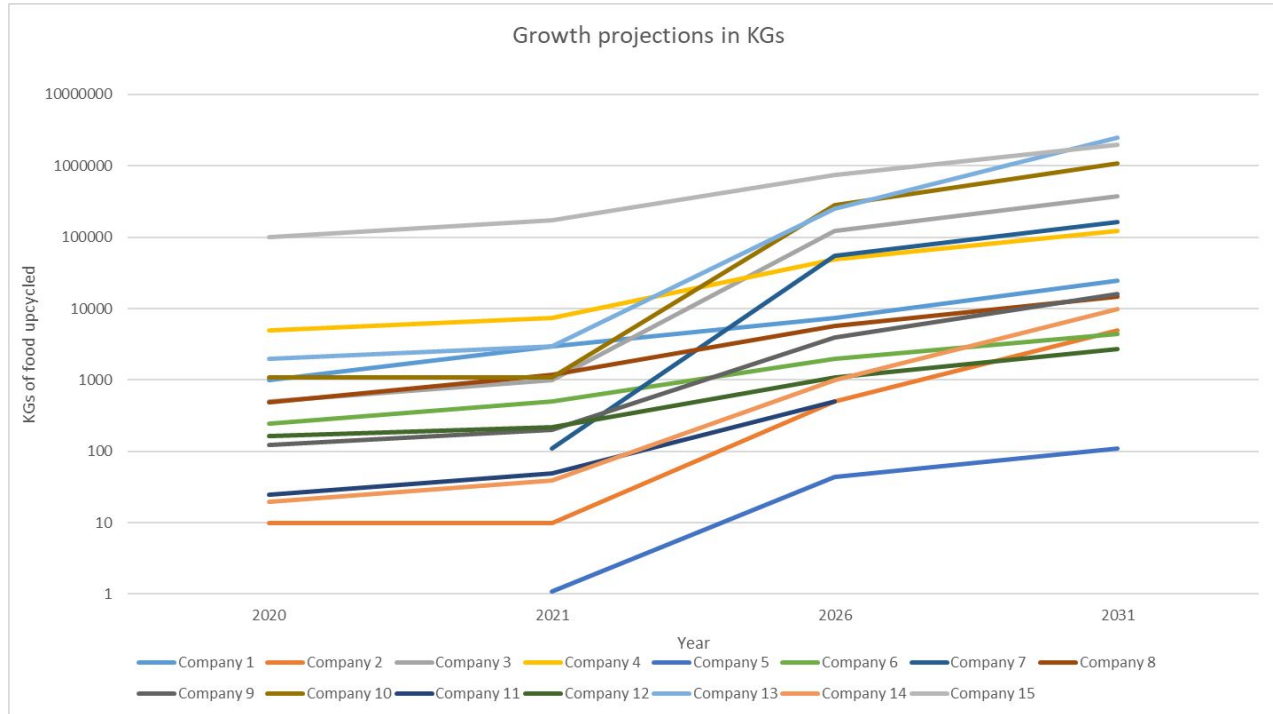
Most companies are currently upcycling a small percentage of available inputs from their partners



Exploring challenges in upcycled food supply chains: a survey of upcycled food companies



Exploring challenges in upcycled food supply chains: a survey of upcycled food companies

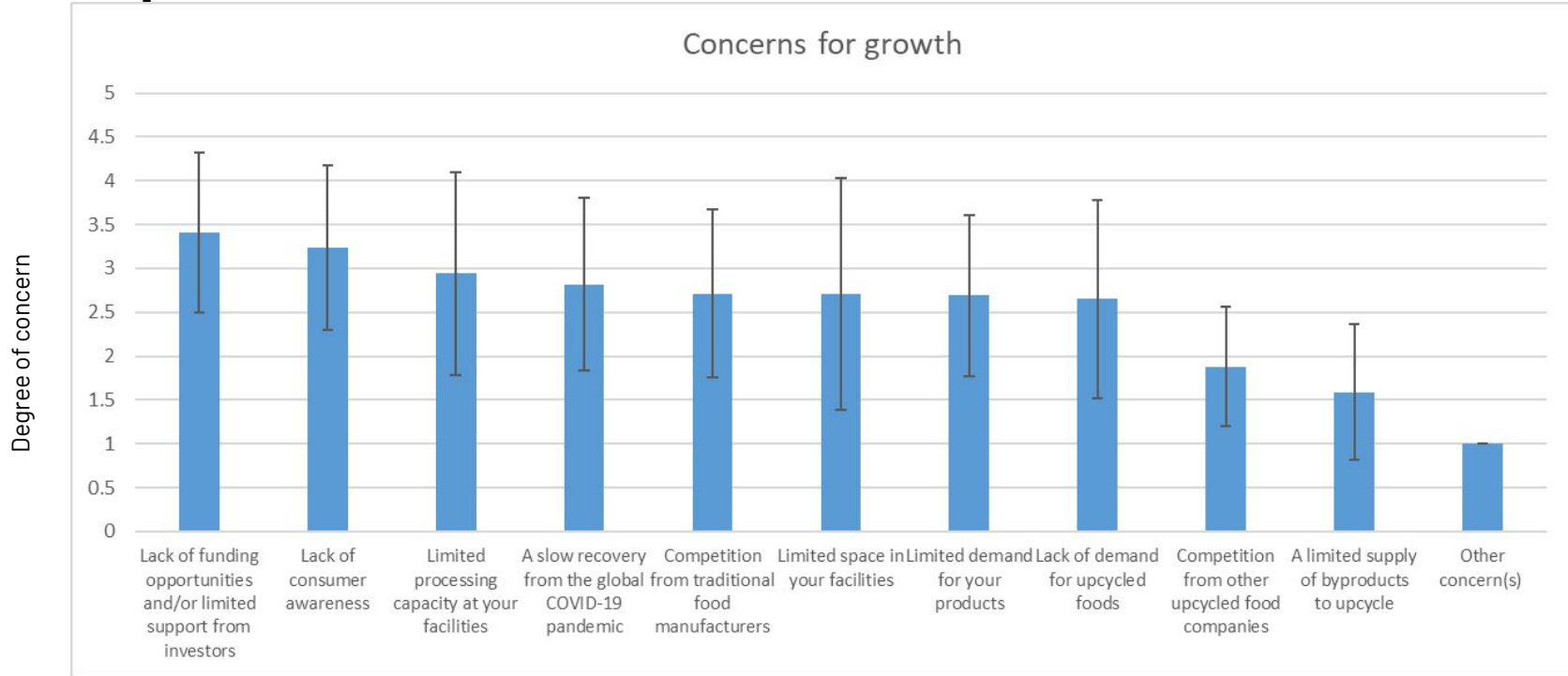


Exploring challenges in upcycled food supply chains: a survey of upcycled food companies

Table 1: Potential reduction in greenhouse gas emissions and water footprint based based on projected volume of upcycled food

GHG emissions if sent to landfill	MT CO2-eq				
	Sector	2020	2021	2026	2031
	Farm	53.1	92.55	738.06	3043.24
	Manufacturing	355.83	620.23	4945.94	20393.51
GHG emissions if sent to animal feed	MT CO2-eq				
		2020	2021	2026	2031
	Farm	40.08	69.86	557.05	2296.88
	Manufacturing	324.81	566.17	4514.87	18616.09
GHG emissions if sent to compost	MT CO2-eq				
		2020	2021	2026	2031
	Farm	12.56	21.9	174.61	719.98
	Manufacturing	306.16	533.66	4255.62	17547.11
Water footprint	Water Footprint (in million gallons)				
		2020	2021	2026	2031
	Farm	7.11	12.39	98.83	407.51
	Manufacturing	23.99	41.82	333.51	1375.16

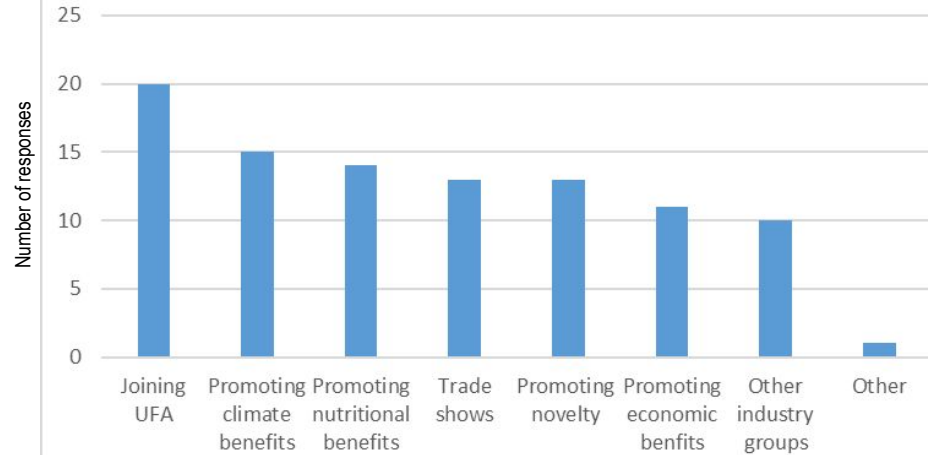
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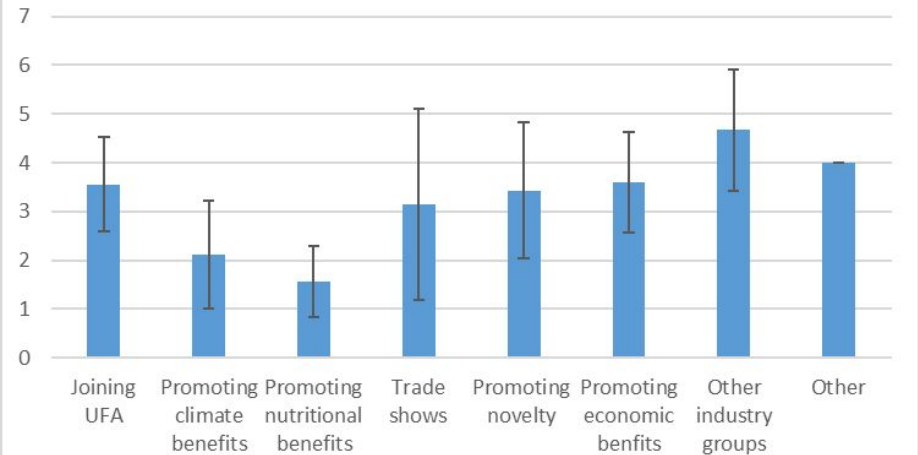
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How to drive demand:

Choices for driving demand

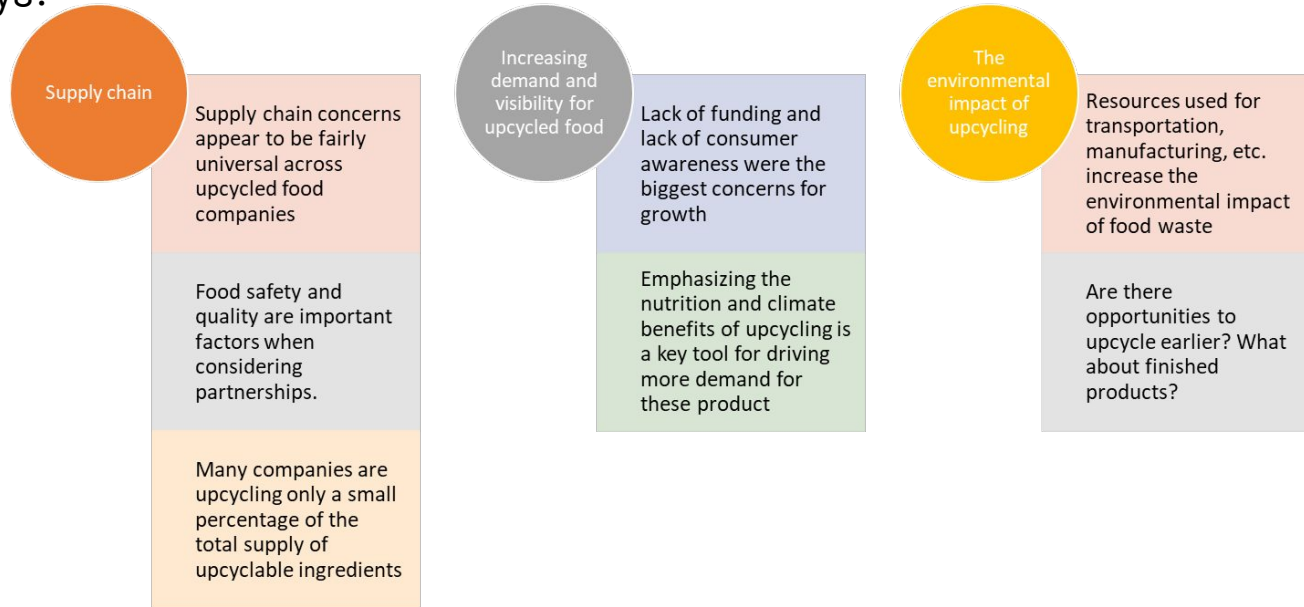


Average Rank



Exploring challenges in upcycled food supply chains: a survey of upcycled food companies

Key Takeaways:



Exploring challenges in upcycled food supply chains: a survey of upcycled food companies

Limitations:

- Many questions have a limited number of responses
- World events affecting supply chains concerns have been changing QUICKLY
 - Ukrainian crisis happened after the survey was conducted
 - Inflation concerns have grown since the survey was conducted
- Need for improved models and sustainable processing methods
 - Many models of the environmental benefit of upcycling exclude the energy and resources of the upcycling process itself
 - There may be opportunities to improve the energy efficiency of various stages of upcycling (transportation, drying, etc.)

Q+A



Consumer co-creation of upcycled foods in US and China

Dr Simona Grasso
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Highlights

- First study to compare a Western (USA) and Eastern (China) country
- Co-creation survey - preferred by-products and new upcycled food combinations
- Low upcycled food knowledge and familiarity but high WTT and WTB
- Top combinations: spent grains in snacks, vegetables in soups, fruit in snacks (US), fruit in snacks, in breakfast foods and in drinks (China)
- Top US/China themes: reducing food waste and being good for the environment

Survey structure



- 357 people in US and 357 people in China
- Screening: gender, age, responsibility for food shopping
- Upcycled food knowledge, definition and familiarity
- Attitudes and feelings: like/dislike, willingness to try (WTT) and buy (WTB)
- Attractiveness and likelihood of purchase vs conventional
- Upcycled food co-creation: by-products and new upcycled foods
- Scales and final questions: food neophobia scale, nutrition information scale, 3 final questions (income, education and employment)

Results - Knowledge

Have you ever heard of upcycled foods?	US 	China 
Yes	20%	30%
No	80%	70%



Results - Strong or weak knowledge?

11% and 16% of total!



What do you know about upcycled food?	US 	China 
Strong	55%	56%
Weak	45%	43%

The definitions provided by participants were compared to the official Upcycled Food definition from the UFA and categorised as strong or weak.



Results - Familiarity

Before participating in this survey, how familiar were you with upcycled foods?	US 	China 
Not familiar at all	63%	49%
Slightly familiar	21%	35%
Moderately familiar	8%	11%
Very familiar	7%	3%
Extremely familiar	2%	2%



Results - Like and dislike

Which of the following best describes your feelings about the concept of upcycled food?	US 	China 
Dislike very much	5%	3%
Dislike somewhat	11%	4%
Feel neutral about it	29%	53%
Like somewhat	32%	31%
Like very much	23%	8%



Results - Willingness to try

How willing would you be to try upcycled foods?	US 	China 
Definitely would not	6%	3%
Would not	7%	5%
Neither would or would not	17%	33%
Would	44%	50%
Definitely would	27%	9%



Results - Willingness to buy

How willing would you be to buy upcycled foods?	US 	China 
Definitely would not	6%	2%
Would not	6%	6%
Neither would or would not	19%	30%
Would	46%	53%
Definitely would	22%	8%

Results - Attractiveness vs conventional

If a food product contains upcycled ingredients, does that make the upcycled product:	US 	China 
Less attractive	18%	34%
No more or less attractive	60%	56%
More attractive	23%	10%


Results - Likelihood to purchase vs conventional

If a product similar to one you normally purchase was also available with upcycled food ingredients and everything else about the food product was the same (price, taste, size, etc.) would you be:	US 	China 
More likely to purchase the conventional food	26%	32%
Equal likelihood for both	52%	52%
More likely to purchase the upcycled food	22%	16%

Results - Top reasons to try upcycled food

I am willing to try food with upcycled ingredients if:

US 

China 

It is better for the environment (21%)

It has superior nutritional properties (25%)



It has a lower price (21%)

It has a better taste (22%)



It has a better taste (19%)

It is better for the environment (19%)

Results: top by-products to use

US 	China 
(1 st) Spent grains (20%)	(1 st) Cereals (18%)
(=2 nd) Cereals (17%)	(=2 nd) Fruit (14%)
(=2 nd) Vegetables (17%)	(=2 nd) Dairy (14%)



Results: top new upcycled foods to create

US 	China 
(1 st) Breakfast foods (14%)	(1 st) Breakfast foods (14%)
(2 nd) Snacks (14%)	(2 nd) Snacks (13%)
(3 rd) Pastas (13%)	(3 rd) Dairy foods (11%)

Results: top combinations by-products & new upcycled foods

US 	China 
(= 1 st) Spent grains in snacks	(1 st) Fruit in snacks
(= 1 st) Vegetables in soups	(2 nd) Fruit in breakfast foods
(3 rd) Fruit in snacks	(3 rd) Fruit in drinks

Results: what do you know about upcycled food?

Theme	Description of theme	Frequency	
		 US count (%)	 China count (%)
Reducing food waste	The process of turning food that would be otherwise wasted into new food products	38 (52%)	9 (56%)
Environment	Foods that are sustainable and better for the environment	10 (14%)	23 (22%)
Quality	Foods of higher overall quality that are safe to consume	3 (4%)	16 (15%)
Health	Foods that are more nutritious and have a positive impact on health	2 (3%)	10 (10%)

Summary

- More participants in China had heard of upcycled foods than in the USA but familiarity and “real knowledge” was low in both countries.
- Feelings towards upcycled foods were more positive in the USA than in China.
- In the US the top combinations were spent grains in snack foods and vegetables in soups, followed by fruit in snacks.
- In China the top combinations were fruit in snacks, in breakfast foods and in drinks.
- The Chinese participants characterised the upcycled foods in terms of quality and health, while reducing food waste and being ‘good for the environment’ were equally associated with upcycled foods in both countries.

People involved

- Simona Grasso
- Francesca Goodman-Smith
- Fu Rao
- Fiona Lalor
- Emily Crofton

Q+A



**THANK
YOU**

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