# WHAT THE FUTURE: FARMING




**+ Experts from Cargill, Tyson, Ocean Spray and AGCO about how our changing climate is driving how and where we grow and produce food and what that means for farmers, brands and food shoppers**

GAME CHANGERS

Ipsos

# Can we tech our way out of a food shortage?

**Imagine it's 2033. Feeding our population is harder. And different. What we grow, where we grow it and who grows it have all shifted due to macro forces like climate change, globalization and tech advancements. So what does that look like? We still get to eat, right?**

You are likely not a farmer. But it doesn't take a futurist to know that you not only eat food today but will want to in five to 10 years. Odds are, much of that will still be farmed. Or ranched.

Farming has always been an industry dependent on both climate and weather, which has put agriculture at the forefront of dealing with climate change. Not only is the future of farming relevant to all of us as eaters, it's also relevant to a wide range of products, services and the sectors that produce them, from tech to restaurants and grocery and CPG to auto and air travel (think biofuels).

There are two basic schools of thought about climate change: We can modify how we do things now and try to stave off the worst of it or we can adapt to a climate that *is changing*. And of course, the correct answer is: yes, both.

Investor Kevin Van Trump is bullish on the future of farming and technology, topics he covers in his must-read newsletter. While many are worried about impending food shortages globally, he makes a case for why that won't happen.

"As humans we've done a crazily good job always of overcoming complications and problems when they arise," he says. He sees some adaptation playing out already. "You go back 10-12 years, and it didn't seem like we were seeing nearly as much corn growing in the Dakotas. Now it's a lot less wheat and a lot more corn," he says. "A lot of my friends and farmers who are older talk about how much it's changed in their lifetime with dramatic changes in shifts in the soil."

He thinks that the tech coming to market in everything from autonomous equipment to gene-editing tool CRISPR to seed technology will keep us fed for a long time to come. But it's more of an open question as to who exactly will do that feeding.

**345**

million people are affected by food insecurity across 82 countries, up from 135 million in 2019.

https://www.weforum.org/agenda/2023/04/mitigate-climate-change-food-security/

The U.S. has been a leader in agriculture because of our productive soil and abundant water. If that changes, the beneficiaries of these technologies might not be the *American* farmer, says Van Trump.

**"I hope that North America maintains its leadership. South America is coming on like gangbusters. We see China and Russia trying to realign with BRICS and trying to reposition themselves. It's going to come down to water and natural resources."**

In short, what we farm, where it's farmed, how it's farmed and who (or what) does the farming is all in flux. Texans are selling off their longhorns as cattle herds move north to better climates. Farmers are changing the crops they grow to provide more inputs for plant-based meats or biofuels. And investors who are buying up parcels for water rights are accelerating the separation between those who farm the land and those who own it.

Later in the issue we talk to a farmer who cites outside investors as one of the biggest challenges he faces to expanding his operation and passing it on to his three daughters, who want to take over the family farm when he retires. Farmers, he says, are "land rich and cash poor. They only have one opportunity to sell [their land.] They're going to try to get the top dollar. And unfortunately, it's not going to come from the neighbor down the road or the daughter or the beginning farmer. It's investors."

Foreign investment is seen as a national security issue by some, as a Fox Business headline warned that "China can 'blight' U.S. food production!" by sabotaging seeds and production.

In this issue we also talk to executives from Cargill, Tyson Ventures and Ocean Spray who are changing the way they do things today and finding new ways for tomorrow. They're responding both to climate change and consumer change as people want their food to taste good, but also be healthier, more affordable and sustainably grown. And we talk to AGCO, which is building the farm equipment of the future with more autonomy — not to replace farmers, but to help them adapt to changes in their business and keep farming later in life.

Whatever your business, the future of farming will impact it, and you, driven by changing climate and changing consumers. Solutions are abundant for both adapting and mitigating. We just need them to grow and scale.

*Matt Carmichael is editor of What the Future and head of the Ipsos Trends & Foresight Lab.*


**10.4**

billion is the projected peak world population in the 2080s.

(Source: The United Nations)

# Contents





# Territory: What will drive the future of farming?

Americans are used to fresh foods in all seasons, in abundance and at an affordable price. How will tomorrow's farmers and food producers meet the demand from a growing and shifting population for healthy and sustainable nutrition amid the uncertainties of global trade and the certainties of climate change? Brands and businesses will need investment, innovation and ingenuity to feed a changing world.

# Farming by the numbers

## What people want from food producers

### Americans largely eat everything ....

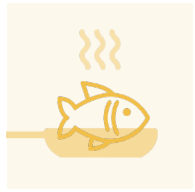
Q. Which of the following best describes your diet?

**81%** You regularly eat both animal and non-animal products (omnivorous)

**2%** You do not eat meat, but do eat other animal products (e.g., eggs, cheese, milk) (vegetarian)

**2%** You do not eat any animal products at all (vegan)

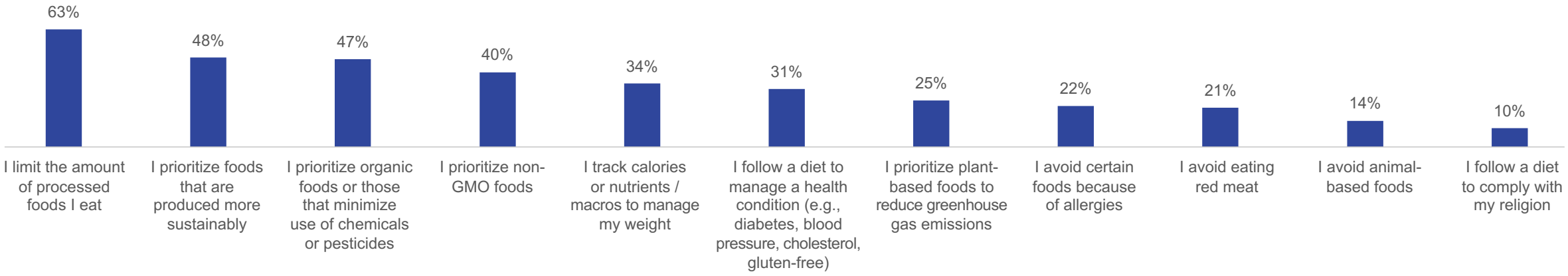
**14%** You only occasionally eat meat or fish (flexitarian)



**2%** You do not eat meat but do eat fish (pescatarian)

### … But they also want less processed, more sustainable foods

Q. When thinking about how you make food choices, do you do any of the following, or not? (% Yes)





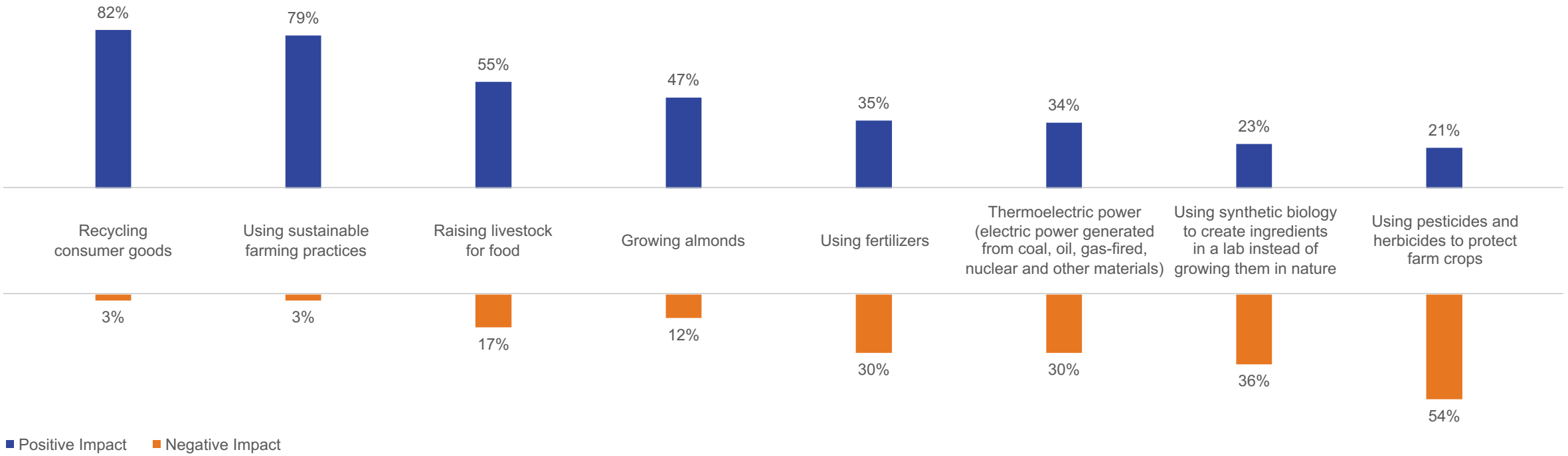

(Source: Ipsos survey conducted Mar. 13-14, 2023, among 1,120 U.S. adults.)

# Farming by the numbers

## How people feel about the environmental impact of agriculture and industry

### Most people feel positively about sustainable farming but negatively about using crop chemicals

Q. Based on what you may know or feel, how much of a positive or negative impact do the following have on the environment? (% Total)






(Source: Ipsos survey conducted Mar. 13-14, 2023, among 1,120 U.S. adults.)

# Emerging Global trends

# How global views on climate can shape world food systems

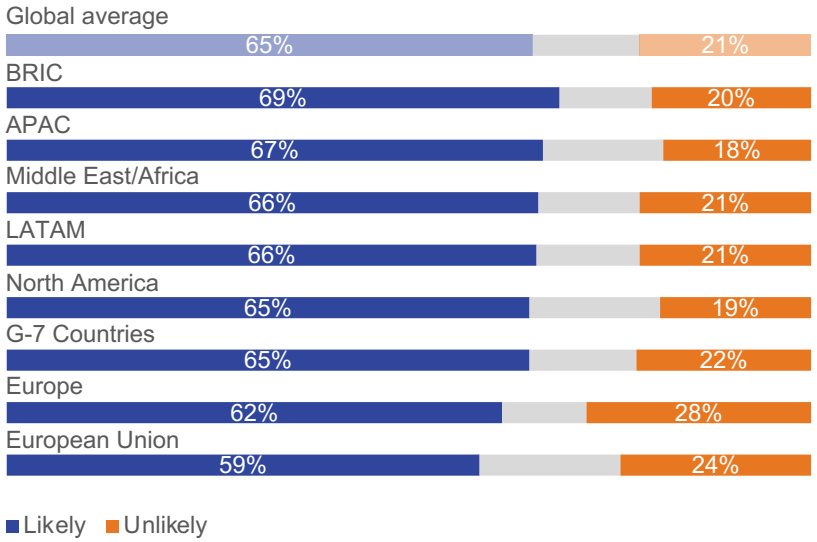
**The world's food systems face a growing dual threat: The first is one people can't control, the second is one they can.**

Most people around the world agree that there will be more extreme weather events in their country in 2023 than last year. If reality matches expectations, once-in-a-generation floods, droughts and other catastrophes could wipe out the crops that feed nations and the world. As these events happen more frequently and more intensely, Americans are more concerned about the environment and climate than many global peers.

An equally large threat is the distrust of world citizens of climate science. Eight in ten people globally think scientists don't know what they're talking about on environmental issues. Americans are among the more trusting global citizens, but with 69% sharing this sentiment, that's of little comfort. In the U.S., climate change is one of the most divisive issues. That could stymie new research funds in the 2023 Farm Bill renewal.

## Most people globally think more extreme weather is likely in 2023

Q. Please tell me how likely or unlikely you think the following are to happen [in 2023]. There will be more extreme weather events in [my country] in 2023 than there were in 2022.

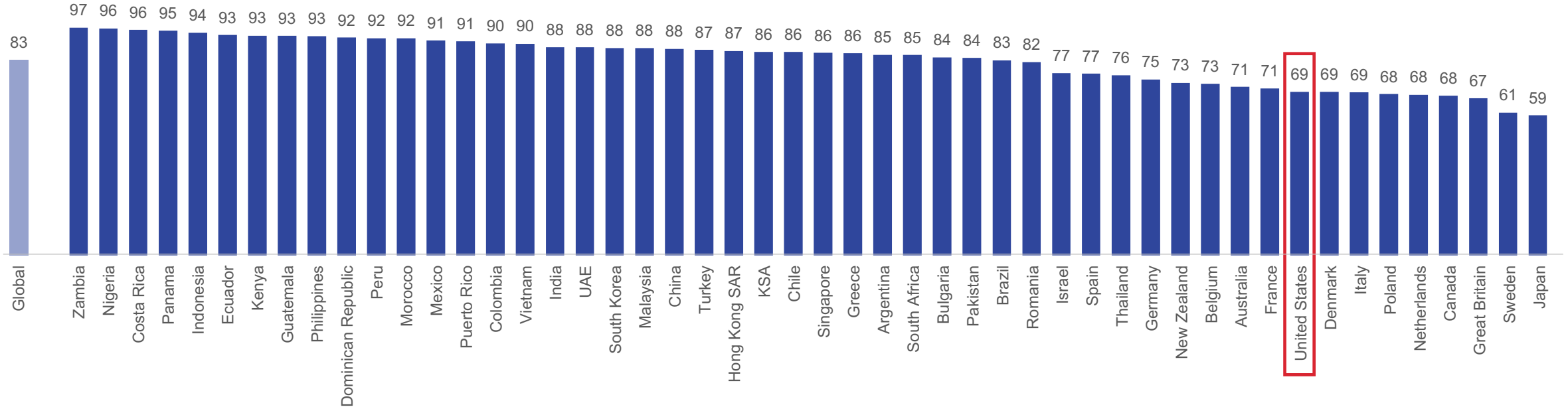



(Source: Ipsos Global Advisor survey conducted Oct. 21-Nov. 4, 2022, among 24,471 adults in 36 markets, including 1,001 U.S. adults.)

# People globally doubt scientists on the environment

## Most people globally think scientists don’t know what they're talking about on environmental issues

Q. To what extent do you agree or disagree with the following statement? Even the scientists don't really know what they are talking about on environmental issues. (% Total)




(Source: Ipsos Global Trends survey conducted Sept. 23-Nov. 14, 2022, among 48,541 adults surveyed across 50 markets. For full methodology see ipsosglobaltrends.com.)

Climate change

FARMING

# Why saving our water supply must be a priority for everyone

## Pilar Cruz

### Chief sustainability officer, Cargill

Feeding people requires immense amounts of water, whether to irrigate crops, nourish livestock or process all those source ingredients into the foods that people eat. Yet few people know that farming is one of the most water-demanding industries. But as the climate bakes the planet, farmers and food producers want agriculture to be part of the solution, doing more with less water and to restoring freshwater resources. That's a major focus for Pilar Cruz, the chief sustainability officer of Cargill, one of the world's largest food ingredient suppliers.

**41%** of Americans rank the public water supply as using the most water each year, while 17% rank crop irrigation as using the most water annually.

(Source: Ipsos survey conducted Mar. 13-14, 2023, among 1,120 U.S. adults)

Climate change
FARMING

Such an effort takes cooperation and innovation. Water (with land use), climate and people are among Cargill's top sustainability priorities. Since it has a significant role at the center of the food supply chain and a footprint that spans 70 countries, Cargill connects partners, stakeholders, customers and non-governmental organizations to develop and implement agriculture-driven solutions for conserving and restoring water, says Cruz.

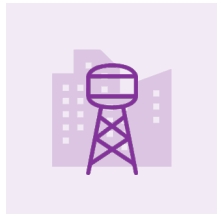
**"It takes a village to bring water solutions to scale. We know we cannot do this alone."**

Some regenerative agriculture practices use cover crops to protect the soil rather than for harvesting, and sustainable grazing to help retain water in the soil. Cargill is also investing in more efficient irrigation systems, which use sensors to track humidity, measure the sun's intensity, and identify the best time to irrigate. Early results suggest that the systems can help save 30% to 50% of the total amount of water farmers use for irrigation while improving yield.

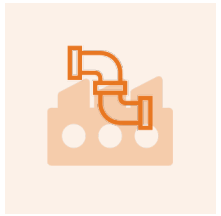
Read the full Q&A on page 35.

## Americans underestimate how much water farming uses

Q. Please rank the following in the order that you think uses the most water each year. Please use a scale of 1 to 5, with 1 as using the most water each year and 5 as using the least water each year. (Mean guess)

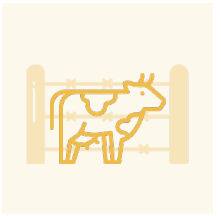


Public water supply



Industrial

Crop irrigation



Livestock

Thermoelectric power (electric power generated from coal, oil, gas-fired, nuclear and other materials)

| | | | | | |
|---|---|---|---|---|---|
| Rank based on mean guess | **1** | **2** | **3** | **4** | **5** |
| Actual rank | 3 | 4 | 2 | 5 | 1 |
| Gallons per day (millions) | 39,000 | 14,786 | 118,000 | 2,000 | 132,900 |

(Source: Ipsos survey conducted Mar. 13-14, 2023, among 1,120 U.S. adults; U.S. Geological Survey 2015.)

FARMING | Land use/ resources

# How nationalism feeds Americans' priorities for future land use

**Debates are raging over the topic of land — both its designated use (farming, energy, preservation, reparations) as well as its ownership (public vs. private, foreign vs. domestic). What's certain is that these choices will have potentially drastic implications at home and abroad.**

The COVID-19 pandemic and the war in Ukraine highlight the need for securing domestic resources of energy, food and supplies as a key element of national security strategy; however, we lack consensus on the right mix and prioritization. At the same time, aging farmers expect to transfer millions of acres in the coming decades, and younger farmers say they lack access to available land due to rising competition.

Looking ahead, we can anticipate energy independence and transitions away from fossil fuels to start impeding more on arable land. Adding to the debate are calls to return land to native tribes and give land to descendants of formerly enslaved people, a prospect that is often split among party lines.

While these issues will continue to play out, Ipsos data makes it clear that people across the spectrum are thinking America first, says Trevor Sudano, foresight lead at Ipsos Strategy3.

**"Brands with a stake in land ownership need to be ready to convey why their use is better for the country than alternatives."**


**78%**

of Americans agree that the U.S. should restrict foreign governments or companies from owning American farmland.

(Source: Ipsos survey conducted Mar. 13-14, 2023, among 1,120 U.S. adults.)

# How big food must evolve to feed the world sustainably

## Rahul Ray

### Senior director and investment lead, Tyson Ventures

How do you feed the world sustainably in an increasingly climate-stressed planet? Tyson Foods, one of the world's largest food companies and a recognized leader in protein through its brands like Tyson, Hillshire Farm and Jimmy Dean, sees innovation as the answer. Rahul Ray is senior director and investment lead at Tyson Ventures, the company's venture capital group. Ray's team is exploring innovation, AI and other technologies to produce more proteins for more people sustainably.

**64%** of Americans expect the cost of the food they eat to get worse in the next decade.

(Source: Ipsos survey conducted Mar. 13-14, 2023, among 1,120 U.S. adults.)

FARMING
Food at scale

Over the next 30 years, Ray expects the world to add 2 billion more people, which will require finding ways to produce more high-quality food sustainably and affordably for a changing population in evolving population centers. That means innovating not just conventional protein, but also alternative proteins.

Then, it's a matter of getting those products to people. The food industry has a unique supply chain issue because it can't flex up or down based on demand like other sectors, he says.

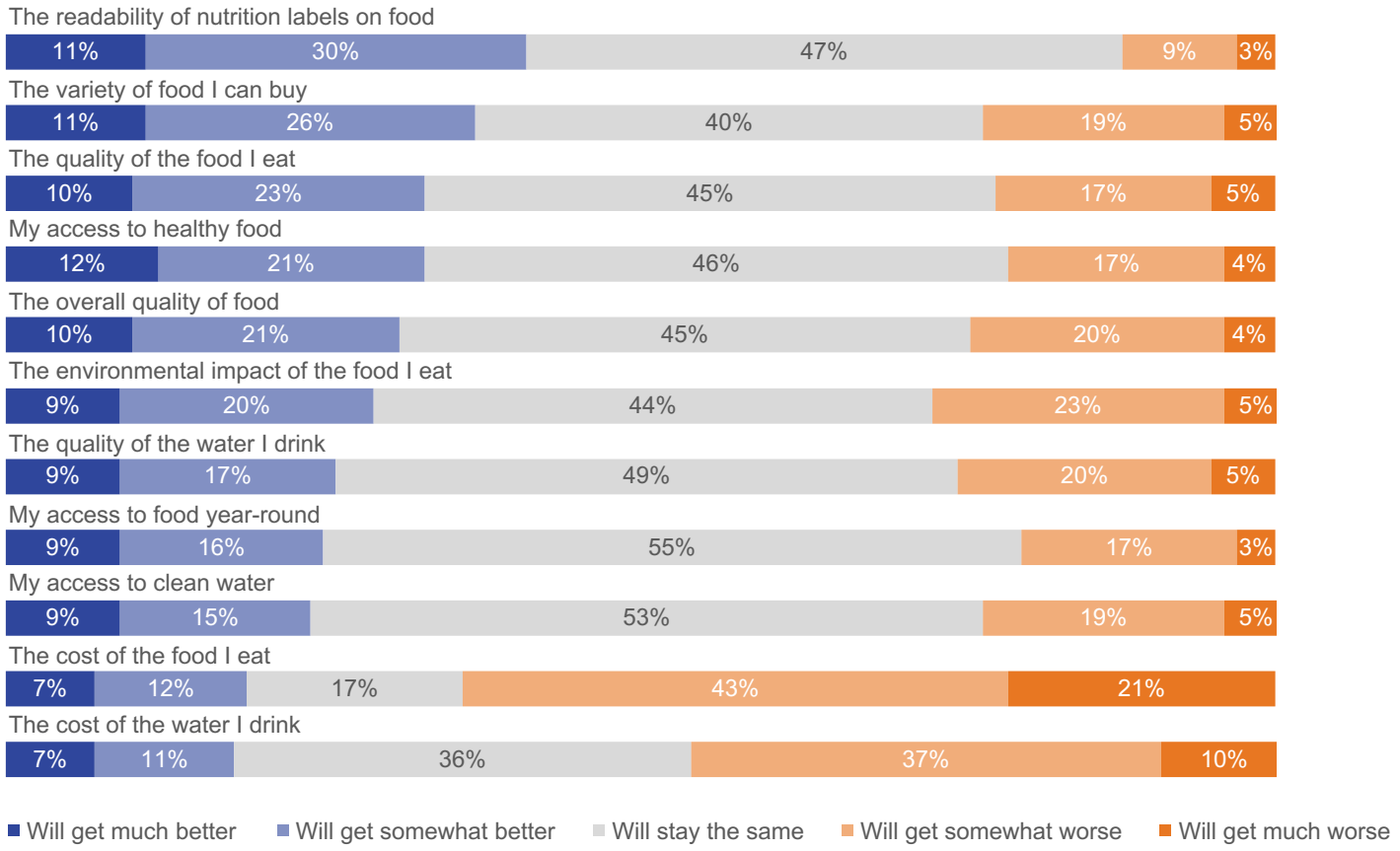
**"You have an organic product that's coming in the door no matter what. You have to manage your supply and demand in a way that you eliminate waste."**

So, the venture group is recruiting its next class of startups focused on upcycling waste.

Read the full Q&A on page 37.

## Americans have a bleak outlook on the future cost of food and water

Q. Looking into the next decade, do you think the following will get better or worse? (% Selected)




(Source: Ipsos survey conducted Mar. 13-14, 2023, among 1,120 U.S. adults.)


# Here's how Americans want to fix food deserts

It's estimated that 18.8 million Americans live in a "food desert," an area with limited access to affordable, nutritious food. This gap, driven by income inequality, systemic racism and other inequities, can have long-lasting impacts on health and general well-being.

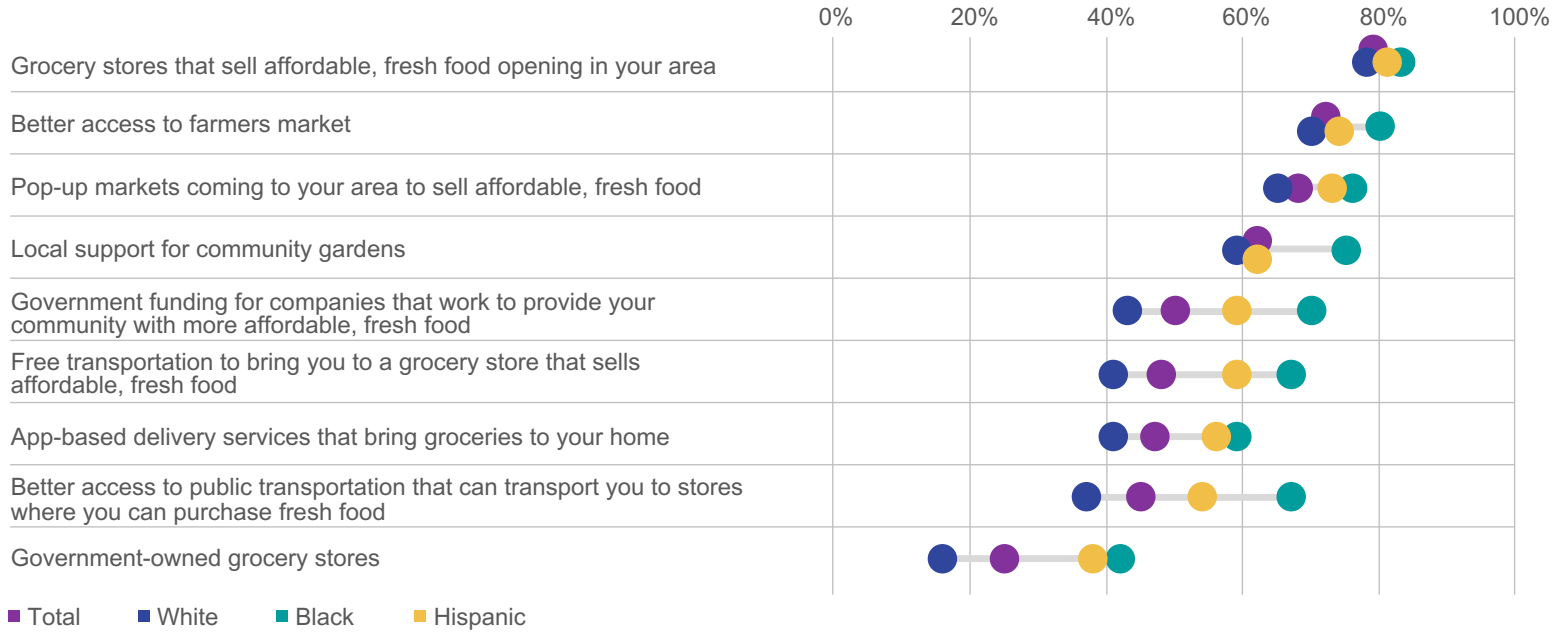
Ipsos research finds that Americans affected by food deserts are enthusiastic about some solutions. Community-based proposals, like opening new grocery stores, are popular. But people are split on other ideas, like delivery services or government subsidies.

Regardless of the strategy, companies need to increase awareness and support healthy lifestyles, says Manuel Garcia-Garcia, global lead of Neuroscience at Ipsos.

**"Whether they invest in fresh ingredients or equitable access, brands will have a responsibility to improve health outcomes."**

## Americans are most interested in local solutions that expand access to affordable and fresh food

Q. How interested are you, if at all, in each of the following so that you have more access to affordable, fresh food? (% Interested)




(Source: Ipsos polling conducted between October 10-27, 2022, among 1,085 U.S. adults who report living in a food desert.)

# How science can pull more value from existing crops

## Katy Galle

Senior vice president, research, development and sustainability, Ocean Spray

As the head of research, development and sustainability at Ocean Spray, Katy Galle is paying close attention to what people want from their food. Once, a snack was just a snack. Now, Americans expect health benefits, sustainability and more from each bite. But while synthetic biology can bring these benefits, many Americans distrust GMOs. Galle believes that traditional horticulture can deliver the healthier, more affordable and tastier options that people crave.

**83%** of Americans who are familiar with organic food view it favorably.

(Source: Ipsos survey conducted Mar. 13-14, 2023, among 1,039 U.S. adults.)

FARMING
Science

Farmers are under pressure to increase yields and minimize costs. But Galle believes the future of sustainable, affordable and flavorful food lies at the intersection of conventional agriculture and unconventional thinking.

People may demand cheap, shelf-stable, sweet snacks, but Galle is confident that out-of-the-box innovation can help farmers and food manufacturers meet those needs without genetic modification, whether by repurposing familiar ingredients or developing new recipes.

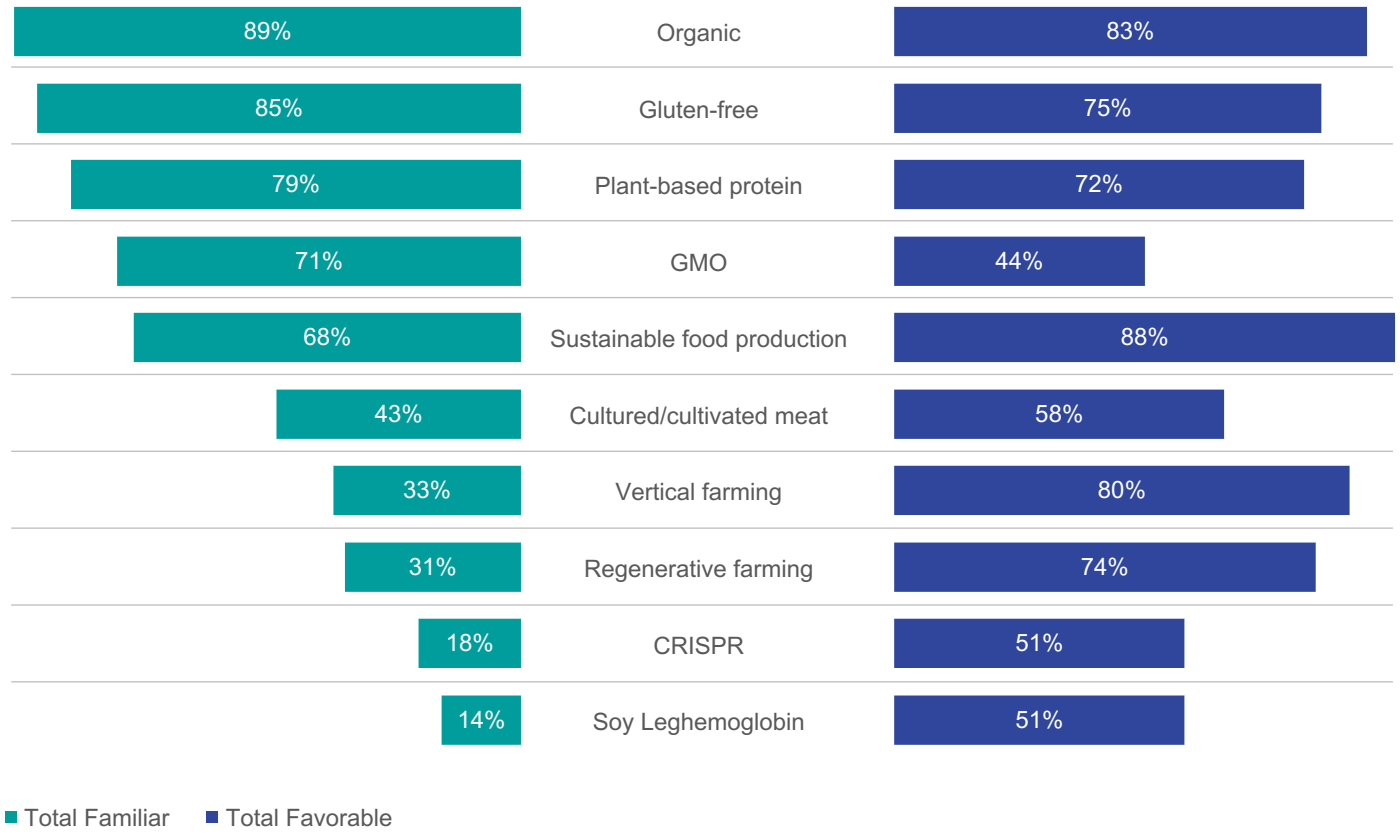
**"I'm really looking for those synergistic formula blends, whether it's a blend of nutrients or other ingredients that can have functionality while also delivering great taste."**

Galle thinks that in the future, the most important innovations won't change *what* we eat, but how we cultivate and harvest it in the first place.

Read the full Q&A on page 39.

## How Americans feel about food ingredients and processes

Q. How familiar are you, if at all, with each of the following terms? / How favorably or unfavorably do you feel about the following terms? (% Total)




(Source: Ipsos survey conducted Mar. 13-14, 2023, among 1,120 U.S. adults.)

Tech/ equipment **FARMING**

# How farm tech is changing how we'll feed America

## Seth Crawford

Senior vice president and general manager of precision ag and digital, AGCO

Think Teslas are high-tech? You should see the cabin of today's combines and tractors. Farming technology often leads the way for more consumer uses. Where is farm tech today, and how is it changing the way we feed America? Seth Crawford from ag equipment manufacturer AGCO gives us the lay of the land.

**52%** of Americans believe that the government should provide tax credits or subsidies to family farmers who invest in technology to help them compete with large industrial farms and be more sustainable.

(Source: Ipsos survey conducted Mar. 13-14, 2023, among 1,120 U.S. adults.)

Tech/ equipment **FARMING**

Farmers have been using GPS for decades to get the most yield out of every inch of their land. The combination of tech and ag is only increasing. Farming machines today are quieter, which creates less stress on nearby livestock. They are safer, with better filtration so farmers aren't breathing fertilizer and other chemicals. They're faster, and speed matters when you're making 80 passes a day on your field. And they're more sustainable, reducing chemical use while increasing yield. All industries can benefit from the lessons AGCO learns in ag design, says Crawford.

**"A lot of times people think the tech is just for the young ones in the industry. Absolutely not. I know plenty of 80-year-old farmers that are fully decked out with their technology."**

Making the complicated simple for an older audience means it works better for everyone.

Read the full Q&A on page 41.

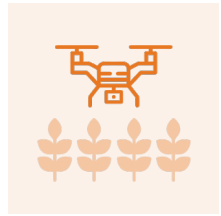
## Actions Americans agree the government should take to help farmers be more sustainable

Q. Which of the following actions, if any, should government take to support farmers to be more sustainable?

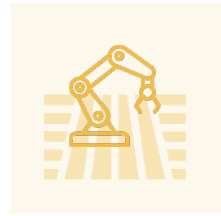
**52%** Provide tax credits or subsidies to family farmers who invest in technology to help them compete with large industrial farms

**41%** Fund technology that helps farmers reduce their water use

**32%** Expand broadband internet services to more rural areas to be able to use more technology for more precise farming



**13%** Fund robots, drones and autonomous farm equipment to protect the environment and improve soil fertility



**8%** Fund robots, drones and autonomous farm equipment to prevent farmers from needing to hire foreign labor

**1%** Other

**14%** None of the above

(Source: Ipsos survey conducted Mar. 13-14, 2023, among 1,120 U.S. adults.)

**47%**

of Americans say they consider wearable technology to be important to making their lives easier.

(Source: Ipsos survey conducted Mar. 10-13, 2023, among 1,006 U.S. adults.)

Tech/ equipment | FARMING

# How AI could guide decision-making from farm to table

**Breakthroughs in AI and machine learning are already boosting agricultural innovation, from autonomous tractors to sensors that gather data for sustainability practices. But in the years to come, this technological shift could also transform the consumer end of the supply chain.**

Imagine going to your local store wearing augmented reality smart glasses or visiting a virtual store via virtual reality. As you pick up a food item, your device displays information related to the sustainability of the food source, rates its fit with your wellness goals, or shows a quick rundown of recipes.

The potential applications are broad — and many shoppers are interested. New research conducted by Ipsos Innovation reveals that one in two Americans are interested in leveraging AI algorithms that analyze their preferences, habits, behavior, health and wellness goals to offer personalized product recommendations, says Christo VanDerWalt, a vice president in Ipsos' U.S. Innovation practice.

**"AI can guide consumer decision-making in a way that's better for the individual, their budget, and the planet."**

By understanding people and the information they need about sustainability, nutrition and affordability, brands can improve shopping experiences and earn customer loyalty.

Corporatization and regulation

FARMING

# How this farmer is planning for an uncertain future

## Dale Hanson

### Farmer

It would be remiss to talk about the future of farming and not talk to a farmer. Dale Hanson knows full well the challenges facing the industry that has supported his family for generations. Some challenges are local and specific to his region of Montana; some aren't. He feels the effects of globalization personally, but he's also fortunate not to be affected by some of the key challenges. Hanson is hopeful about his own farm, although he sees clouds around farming's future in general.

**46%** of Democrats most support the Farm Bill proposal to maintain government food assistance for low-income households while 25% of Republicans and 39% of independents do.

(Source: Ipsos survey conducted Mar. 13-14, 2023, among 1,120 U.S. adults.)

Because farming demands skills that are learned over time, finding workers is an ongoing challenge, says Hanson. His three adult daughters are taking over and expanding the farm. However, they, like his wife, have other jobs to make ends meet.

Not all farmers have another generation interested in staying on the farm. And not all farmers can afford to pass their land (where most of their wealth is) to their kids. Foreign investors, looking to secure irrigation rights, are driving up prices, says Hanson.

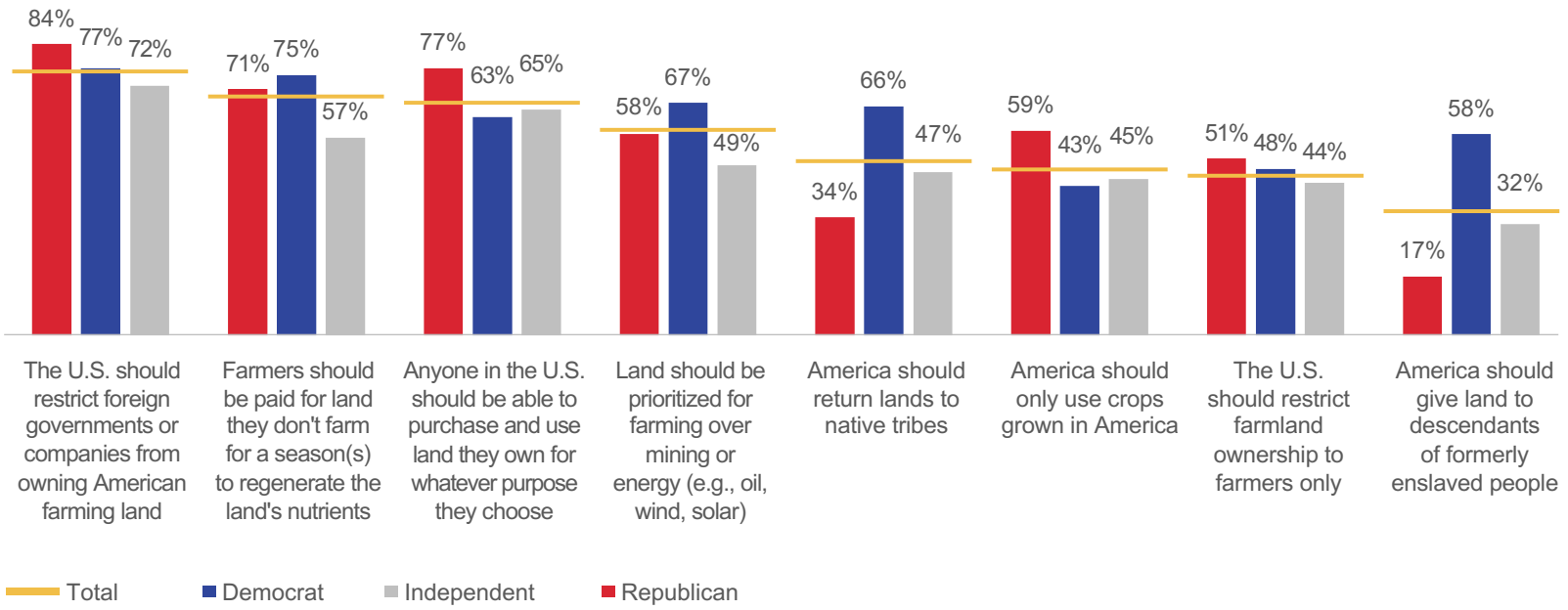
**"If somebody's getting ready to retire, they probably don't have a lot of money saved, but they have a lot of value in their land. They only have one opportunity to sell it."**

He worries about the impact if those sales aren't going to the next generation of farmers but to investors willing to outbid other buyers.

Read the full Q&A on page 43.

## How Americans feel about who should own or use U.S. land

Q. Please indicate how much you agree or disagree with each of the following statements. (% Agree)




(Source: Ipsos survey conducted Mar. 13-14, 2023, among 1,120 U.S. adults.)

## Five tensions that will drive change:

# 1. Crops or lawns?

Technology can only do so much for farming. We have yet to imagine crops that don't require any water. Water shortages are not an easy problem to solve, and we could certainly hit a future where we have widespread, massive restrictions on water for personal use. Luckily, we might be ready to accept these, at least in the abstract. This tension could easily move if the choice were "water for *my* lawn." One worrying aspect is that there can be no one-size-fits-all approach. "We have consistently adopted a local approach to this global crisis because water challenges are so different from place to place," says Pilar Cruz, chief sustainability officer of Cargill.

### A majority of people prioritize water for farmers over landscaping


Q. For each of the pairs of statements, please select the statement that comes closest to your view, even if neither statement is exactly right. (% Total)

(Source: Ipsos survey conducted Mar. 13-14, 2023, among 1,120 U.S. adults.)

## Five tensions that will drive change:

# 2. Convenience or sustainability?

Sustainability is on the upswing. When we asked about this tension a year ago, the split was 67% / 33%. That's a noticeable shift. But while this tension is becoming tighter, Rahul Ray, senior director and investment lead at Tyson Ventures, thinks industry will have to make it easier for people to avoid having to choose between convenience and sustainability. "It's really a question of *and*, not *or*. We are innovating on the protein production side, not just conventional protein, but alternative proteins," he says. "Then, how do you get the produced protein to the consumer? That is a whole supply chain problem. Finally, we look at how we do this in the context of sustainability."

### People choose convenience over sustainability


Q. For each of the pairs of statements, please select the statement that comes closest to your view, even if neither statement is exactly right. (% Total)

(Source: Ipsos survey conducted Mar. 13-14, 2023, among 1,120 U.S. adults.)

## Five tensions that will drive change:

# 3. Trust nature or science?

Trust is a tricky thing, especially when it comes to something as ill-defined as "natural." Is a synthetic ingredient with the same genetic profile as the "natural" version equal or different in a customer's mind? It's clear that "natural" alone isn't going to feed the world sustainably. Science needs to be more involved. That said, creating products and scaling them are two different problems. Ocean Spray's Katy Galle says we need to be cognizant of that. "It's an important role of R&D to vet these technologies, but to also stick with them as they scale and evolve," she says.

### People significantly trust natural over lab-created foods


Q. For each of the pairs of statements, please select the statement that comes closest to your view, even if neither statement is exactly right. (% Total)

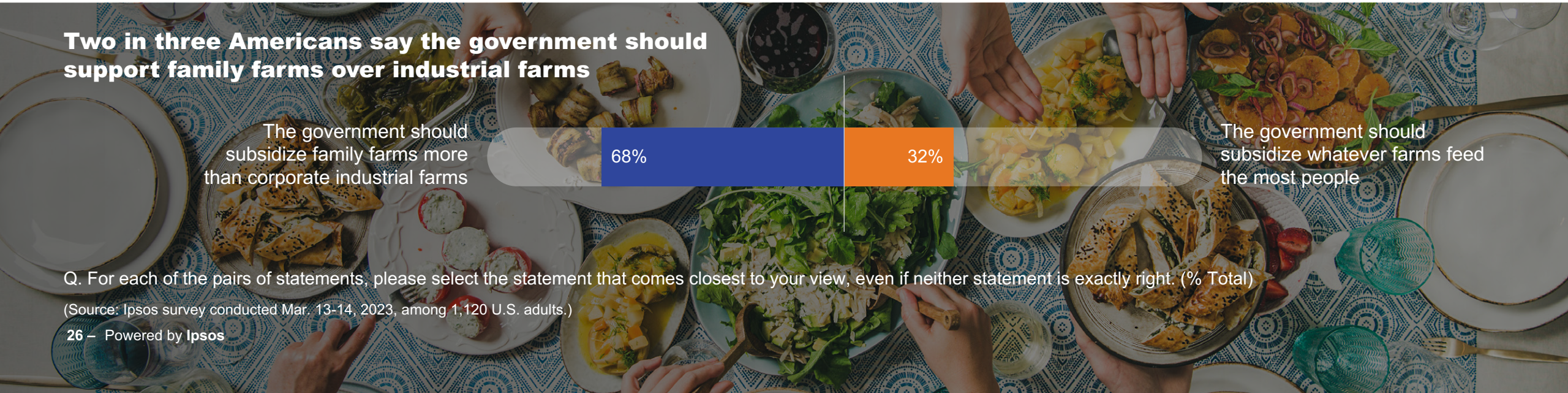
(Source: Ipsos survey conducted Mar. 13-14, 2023, among 1,120 U.S. adults.)

## Five tensions that will drive change:

# 4. Support family farms or industrial farms?

This is a bit of a false tension, but it reflects a dynamic many think is at play. Today there's often little difference between "family" farms and "corporate" farms. Farms, even those controlled by families, have been getting bigger and are often contracted out to big agriculture producers. Sometimes the farmers don't even own the land. The pandemic put our food sources and supply chains more in the spotlight. So as people learn more about this industry, will these lines blur and will public support shift, or maybe even dry up? Farmer Dale Hanson worries that the changing dynamics will hurt farming and family farmers. "You tend to take things more seriously and do a better job on it for the simple fact that it's your land. These bigger farms — it all turns into a big business," he says.

### Two in three Americans say the government should support family farms over industrial farms




Q. For each of the pairs of statements, please select the statement that comes closest to your view, even if neither statement is exactly right. (% Total)

(Source: Ipsos survey conducted Mar. 13-14, 2023, among 1,120 U.S. adults.)

## Five tensions that will drive change:

# 5. Funding from government or business?

Most people think that government should have a role in funding sustainable farming practices, more than businesses. But we've met government. Funding often comes with a string attached: regulation. AGCO's Seth Crawford thinks that sustainability efforts are working so well that farmers will be required to comply and prove them. "We're going to see a regulatory environment where farmers have to document operations, and that's going to require certain technology, because it's proving to be much more sustainable," he says. He sees AGCO's role as making that easier by having the equipment streamline the reporting of how it's used. So maybe this tension will become less tense as business and governmental efforts support rather than conflict each other.

### More Americans think government should fund sustainable farming technology R&D than business


Q. For each of the pairs of statements, please select the statement that comes closest to your view, even if neither statement is exactly right. (% Total)

(Source: Ipsos survey conducted Mar. 13-14, 2023, among 1,120 U.S. adults.)

# Plausible port one:

# People get religion on saving water and the planet

**It's 2033.**

**The Hoover Dam is in danger, as is the future of almond farming. But people catch on to the urgency of the water and climate crises. Turns out that having a well-watered lawn and lush golf courses aren't the only kind of landscape available.**

Water restrictions that in 2023 were mostly theoretical start to turn into actual policy proposals, which turn into regulation, which turns into case law. But eventually people decide to actually prioritize farmland for the increasingly precious resource of water, once thought to be infinite and abundant. It literally falls from the sky for free! Until it doesn't.

We adapt. Replacing grass in our yards decreases our dependance on water and helps return some biodiversity and pollinators. We learn from South Africa how to bring ourselves back from the brink with changes big and small like shortening our showers.

Science and technology help, too. We lean into vertical farms that help shorten the supply chain and bring more foods closer to the communities that eat them. We move past today's better pesticides into small robots with lasers that remove weeds but don't harm crops or ecosystems.

Immigration restrictions loosen as policymakers catch up to the fact that as the geography of farming follows the water as climate changes, the mobility of skilled farm labor needs to be prioritized.

It also turns out that the threat of widespread hunger can be a motivator for all sides to work together.

# Waypoints

**The poet Samuel Taylor Coleridge wrote an oddly prescient line. "Water, water everywhere, nor any drop to drink." Coasts may be overwhelmed with ocean but inland might go dry. Too much water, in the wrong places. None of it useful.**

Today people overwhelmingly say they prioritize water for farming over water for other uses like watering lawns and golf courses. It's reasonable to think that because such restrictions haven't really been a permanent part of our reality … yet. But we are hurtling toward a future where that's going to be one of many things that need to be done if we want to keep growing food. What happens when governments big (federal) and small (local and even homeowners associations) start coming for your grass and your lush 18th green? Then "growing food" will seem more abstract and harder to support. 2023's multistate drama about proportioning the water from the Colorado river may be just the start. Those state-level restrictions will certainly trickle down to the individual soon and continue.

# Plausible port two:

# Water becomes the new oil, and few owners control the supply

**It's 2033 and it's ... dry. Like Dust Bowl dry. But wider spread. While occasional periods of overwhelming deluges occur, as the West coast saw happen in 2022 and 2023, a boom-bust cycle of water doesn't resolve long-term drought reduction. The world doesn't move fast enough on desalination technology to convert sea water into fresh water, nor on finding ways to collect and store water when it does rain in big bursts.**

All of this sounds bad. But here's what's worse. Shadowy shell corporations, foreign nation states, private equity and wealthy individuals spent the 2020s quietly buying up any parcel of land adjacent to a supply of fresh water as they could. As a result, this gave the government fewer protective levers to pull, assuming there even was political will to use them. When regulations and restrictions are proposed, grass-roots organizations pop up to fight for their "right" to keep the Great American Lawn.

Water is the new oil. New cartels bloom.

This makes it harder for farmers to buy land. It makes it more costly to do just about anything because water rights have become a more expensive commodity. And the climate shifts the center of gravity for where food producers can farm, and ranchers can sustain livestock. This was already happening in 2023. Then it accelerated.

Farming's long move away from small, family enterprises to larger, industrialized conglomerates accelerates. Food costs inevitably rise, despite all that industry does to improve yields and sustainability efforts. Misinformation makes us distrustful of scientific advancements that could help mitigate all of these problems. This does not end well.

# Future Jobs to Be Done

The traditional “Jobs to Be Done” framework focuses on the tasks and outcomes that people are trying to accomplish and why they hire products and services to help them achieve that outcome. We don’t buy water; we hire it to quench our thirst and sustain us. We don’t buy a bunch of bananas; we hire it for a tasty experience and nutritious boost.

Ipsos takes this theory forward with future Jobs to Be Done (fJTBD). We envision powerful and plausible future scenarios through strategic foresight. These scenarios help us define the circumstances in which people may find themselves, like in the metaverse. What will their new needs be? Then we use fJTBD to tie these scenarios to actions organizations can take today and tomorrow to help people meet those needs.

While many needs are enduring and do not change over time (e.g., our need for food and water to survive), the context of that job (e.g., a world with greater food and water scarcity) will change that job space and the potential solutions and alternatives. Because of this, we often create fJTBD clusters that are higher-order and needs-driven. Within each, we can envision more granular fJTBD to illuminate opportunity spaces to meet human needs in new ways.

*Sophie Washington is a senior consultant with Ipsos Strategy3.*

# Potential Future Jobs to Be Done related to farming

1

## Help me survive, considering the collective

Humans are hard-wired to survive, and food and water are essential needs. In a future where these basics become scarce and difficult to access, we may turn inward to prioritize our individual needs versus the needs of the collective.

**Potential fJTBD:**

- Help me access water to survive *and* thrive
- Help me live in harmony with my community
- Help defend my rights to food and water

**Imagine a world where** … small coastal town residents either join mass migration toward inland freshwater lakes or fight inwardly after losing battles with corporations who bought up local water rights.

2

## Help me stay within my budget

Record-high inflation in the early 2020s coupled with continued uncertain macroeconomic conditions, supply chain issues, and climate change altering farming leave people hungry, unable to afford the food they love.

**Potential fJTBD:**

- Help me provide for myself, my loved ones, and/or my family without breaking the bank
- Help me afford high quality food and drink so I don't have to trade down

**Imagine a world where** … a vertical farm in Jersey City, New Jersey, supplies a large portion of New York City with fresh produce at a lower cost thanks to a decentralized supply chain.

3

## Help me nourish, protect and heal myself

Food systems have changed — and so has food. Soil degradation means fruits and vegetables aren't as nutritious anymore, and more and more food is processed. But at the same time, people turn to plants for healing as food both heals us and leads to sickness.

**Potential fJTBD:**

- Help protect me from chronic disease, inflammation and ill effects from the food I eat
- Supercharge my wellbeing in a tasty way
- Give me food that can heal for optimal health

**Imagine a world where** … Amazon and online pharmacies experience mass shortages of food supplement multivitamin/minerals because of chronic, overwhelming demand.

# Future optimism gaps

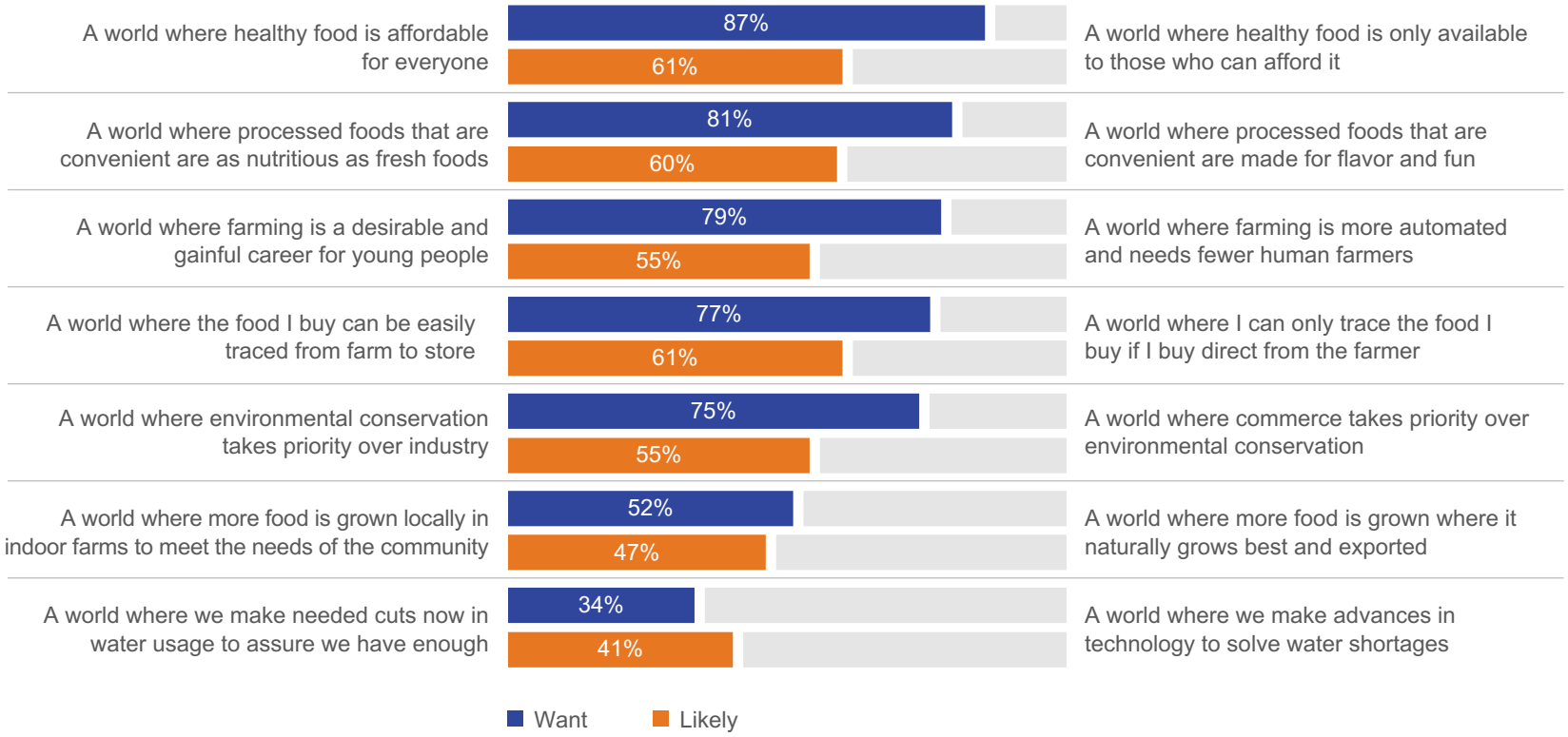
**Americans want a future where food is both convenient and nutritious, where food is affordable and where it's easy to learn the origins of their food.**

But there is a sizable gap between their hope and their optimism that that will happen. So how can brands and policymakers help people get to the future they want? Progress is being made on labeling of sources. Some restaurants, even chains like Subway and Chipotle, have leaned into this and built sources into the design and decoration of their locations.

Affordability will likely be an increasing challenge, but innovation in products, services, tracing, labeling and marketing can all help close some of these optimism gaps.

## Americans have a bleak outlook on the future cost of food and water

Q. For each of the following future scenarios, select the one that [you most want/seems most likely] to happen. (% Total)




(Source: Ipsos survey conducted Mar. 13-14, 2023, among 1,120 U.S. adults.)

# Appendix

**In this section, we show our work and our workers**

1. Full Q&As
2. Signals
3. Contributors

# Why saving our water supply must be a priority for everyone

Pilar Cruz

Chief sustainability officer, Cargill

**Feeding people requires immense amounts of water, whether to irrigate crops, nourish livestock or process all those source ingredients into the foods that people eat. Yet few people know that farming is one of the most water-demanding industries. But as the climate bakes the planet, farmers and food producers want agriculture to be part of the solution, doing more with less water and to restoring freshwater resources. That's a major focus for Pilar Cruz, the chief sustainability officer of Cargill, one of the world's largest food ingredient suppliers.**

**Kate MacArthur: How does agriculture's demand for water shape how companies should manage their water use and pollution risk?**

Pilar Cruz: We started by assessing our risks. A few years ago, we partnered with WRI [World Resources Institute], a well-respected research organization that prioritizes action where it is needed most, based on the specific challenges faced by local businesses, communities, and the surrounding region. Together, we developed a clear and well-defined water strategy for our company, which focuses on restoration, reduction of water pollutants and providing local communities with access to clean, safe water.

**MacArthur: How important is water as a corporate or a strategic goal?**

Cruz: Cargill has a comprehensive sustainability strategy that focuses on the three specific areas [where] we can have the greatest impact: climate change, land use and water, and people (or social sustainability). Our water strategy doesn't just sit with me as Cargill's CSO. It is a priority and business imperative for our board, our CEO, the executive team and our business leaders. And it isn't just a priority for Cargill. We play a critical role in supporting the water goals of our customers like Walmart, Target, McDonald's and PepsiCo.

**MacArthur: What is the strategy?**

Cruz: At Cargill, we have consistently adopted a local approach to this global crisis because water challenges are so different from place to place. In Thailand, for example, our solution links up nitrate-rich discharge water from a Cargill facility to nearby rice farms, providing a sustainable source of water and fertilizer. For each of our priority facilities around the world, and indeed for every water-stressed region, we believe there is an effective local solution found within agriculture.

**MacArthur: How much power and influence do you actually have to drive change throughout the rest of the supply chain?**

Cruz: It takes a village to bring water solutions to scale. We know we cannot do this alone. The more that we can use our position at the center of the world's agricultural supply chain to bring companies, governments and NGOs together, the more we can scale effective solutions. We have very proactive strategic investments with non-governmental organizations such as WRI, The Nature Conservancy, the Tropical Forest Alliance, and WWF [World Wildlife Foundation] because they have capabilities and access to local networks that sometimes we may not have immediately within Cargill.

**MacArthur: What is your most ambitious goal?**

Cruz: Cargill's commitment is to restore 600 billion liters of water around the world by 2030 and reduce water pollutants by 5 billion kilograms, which is huge. In addition, we have prioritized 72 facilities within our company where we are implementing water stewardship practices, and lastly, our commitment to reach 500,000 people in priority communities with safe drinking water by 2030. That would be the equivalent of almost twice the water that we use in our facilities in about a year or supplying water for a city of 10 million people for an entire year — think Seoul or London.

**MacArthur: How are you thinking about how to adapt for future climate change?**

Cruz: Regenerative agriculture is one of the programs that we are very optimistic about because we have seen clear, tangible benefits, both from a climate perspective but also in water restoration and water conservation. From a technology perspective, we are excited about more efficient irrigation systems. In Mexico, we have a program in place with corn farmers in Sonora and Sinaloa, which are two of the most drought-prone states in the country. By implementing these improved, more efficient irrigation systems, the farmers in Sinaloa and Sonora are seeing a reduction in water use by 30% to 50%, and that is huge. At the same time, they've seen an increase in yields by 10%, which is a nice improvement, too.

**MacArthur: Can you give a specific example of how you're using those systems?**

Cruz: The sensors check for things such as humidity, the intensity of the sun in the field, and the best time looking at historical yields of productivity for farmers to irrigate.

*Kate MacArthur is managing editor of What the Future.*

**"The more that we can use our position at the center of the world's agricultural supply chain to bring companies, governments and NGOs together, the more we can scale effective solutions."**

# How big food must evolve to feed the world sustainably

## Rahul Ray

Senior director and investment lead, Tyson Ventures

**How do you feed the world sustainably in an increasingly climate-stressed planet? Tyson Foods, one of the world's largest food companies and a recognized leader in protein through its brands like Tyson, Hillshire Farm and Jimmy Dean, sees innovation as the answer. Rahul Ray is senior director and investment lead at Tyson Ventures, the company's venture capital group. Ray's team is exploring innovation, AI and other technologies to produce more proteins for more people sustainably.**

**Kate MacArthur: How does sustainability fit into the larger priority of feeding the world?**

Rahul Ray: Everything has to be seen through the lens of sustainability.

**MacArthur: What's the biggest opportunity for innovation to solve for feeding the world at scale?**

Ray: We're going to add about 2 billion people in the next 30 years. We need to be able to find ways to produce more high-quality food sustainably and affordably. So, it's really a question of *and*, not *or*. We are innovating on the protein production side, not just conventional protein, but alternative proteins. Then how do you get the produced protein to the consumer. That is a whole supply chain problem. Finally, we look at how we do this in the context of sustainability.

**MacArthur: Is there one area that's a bigger priority than others?**

Ray: A big part of our challenge is managing the cadence of supply and demand, which is unique to food. We talk about the automotive industry; you can flex up and down your production based on your consumer demand. In the food space, you have an organic product that's coming in the door no matter what. You have to manage your supply and demand in a way that you eliminate waste.

**MacArthur: Speaking of cutting waste, you are recruiting your next class of startups in the venture group, and you're focusing on upcycling. Where does that fit in?**

Ray: It all goes back to we have finite natural resources, and how you optimize it more is by reducing waste. One way is taking only the inputs that you need to produce what you need. The other way is to recycle what you don't need and upcycle it in a way that you can produce some value. We can look at waste from our plants and say, "Hey, how can I take this into adjacent industries?"

**MacArthur: Can you give an example?**

Ray: We looked at one of our waste products from our cattle program and how can we convert that into fiber so it can be used for footwear. Another classic point is looking at insect proteins, so how you take waste and feed it to black soldier flies. Black soldier flies are these amazing creatures that have an amazing DNA composition. They never get sick. But more importantly, they have a high protein content that can be used as fish meal.

**MacArthur: How important are alternative proteins?**

Ray: Absolutely important. The math is you have population growth, and then on top of that you have more people eating more protein. So, when you look at it through that lens, it's not either, or; you need all of it and that's when alternate protein is important. We were early investors in Beyond Meat way back when. We invested in cell-cultured meat, we invested in mushroom-based, we look at all forms of protein. The question that we have to ask not just us, but the whole industry, is how do you separate the mission versus the business models?

**MacArthur: How are you understanding consumer interest in conventional versus alternative proteins?**

Ray: Consumers care about three things: price, taste and personal health. So you have to be able to address those. It's only so much you can get a consumer to pay up on the basis of mission if it's a consumer staple, and you have to pay a premium for it. We are right now in that second phase of how do we solve that viable business model?

**MacArthur: For many people, a benefit of small-scale, local food is feeling connected to what you're eating. How can large-scale protein providers facilitate that trust and connection?**

Ray: Traceability is key to all of that, to be able to see where your protein came from, who produced it, and how it made its way to your table.

**MacArthur: Is that a blockchain solution?**

Ray: Blockchain is one solution, but we don't know how it's going to play out. You don't even need a blockchain solution as long as you have a proper form of record-keeping that goes from source to table. There's a lot of paper involved, and the more we can digitize it, the more information can flow and the more you can trace it. That's key. We had an investment in a company called FoodLogiQ, which we recently sold, that was all about traceability to be able to track where it came from and connecting the dots.

*Kate MacArthur is managing editor of What the Future.*

**"Consumers care about three things: price, taste and personal health. So you have to be able to address those. It's only so much you can get a consumer to pay up on the basis of mission if it's a consumer staple, and you have to pay a premium for it."**

# How science can pull more value from existing crops

## Katy Galle

Senior vice president, research, development and sustainability, Ocean Spray

**As the head of research, development and sustainability at Ocean Spray, Katy Galle is paying close attention to what people want from their food. Once, a snack was just a snack. Now, Americans expect health benefits, sustainability and more from each bite. But while synthetic biology can bring these benefits, many Americans distrust GMOs. Galle believes that traditional horticulture and ingredient-driven innovation can deliver the healthier, more affordable and tastier options that people crave.**

**Christopher Good: Ocean Spray is a co-op. How does that impact your perspective on innovation?**

Katy Galle: When you have a specialty crop like cranberries, farmers develop a lot of their equipment. Some use a mechanical rake for dry harvesting. Others do wet harvesting: They flood a bog, then they use tractors to knock the berries off the vines so they float in the water, then they use a boom to circle the cranberries. Our farmers are the real innovators. They've borrowed technologies from other industries and adapted them to cranberry farming — or they've created their own tools where they didn't exist before.

**Good: You recently partnered with a sea kelp-based company. What are the most exciting opportunities you see with alternative proteins and ingredients?**

Galle: We partnered with Atlantic Sea Farms, a New England-based company. It started with us seeing if there were any best practices we could share on harvesting, and that spurred some work with their innovation team. We have an extensive ingredients division, where we sell ingredients for a variety of applications outside our products — like using cranberry seeds as sprinkles, or as a healthy way to bring color to food.

We also regularly put products out in test markets. The key unlock for alternative proteins and new ingredients is delivering value and great taste to consumers. The challenge, though, is how to commercialize that on a larger scale at an affordable price.

**Good: Innovation can bring various benefits — health, cost, sustainability — but which are most important for the people buying your products?**

Galle: All of those play a really important role. You may have heard about our partnership with Amai Proteins on new sweetener technology, for example. At the end of the day, it's all about delivering great taste, along with

the nutrients that consumers are looking for. That's a balancing act, right? Unfortunately, there is no magic answer. But I'm really looking for those synergistic formula blends, whether it's a blend of nutrients or other ingredients that can have functionality while also delivering great taste. It's an important role of R&D to vet these technologies, but to also stick with them as they scale and evolve.

**Good: Our polling has found that many Americans have mixed feelings about GMOs. What signals are you watching for on this front?**

Galle: What we are seeing from consumers is the ask for a deeper connection to, and understanding of, the foods they eat. They are choosy about the brands they purchase, and that includes the ingredients used.

**Good: With Craisins, you turned discarded proteins into a snack. What lessons do you see for the future about reuse and recycling?**

Galle: We actually just did an analysis which found that we utilize 95% of the fruit. Like Craisins — originally those hulls were thrown away, but now we repurpose that skin. We also leverage some of the press cake that comes from pressing out the juice, which has naturally occurring pectin. And the last 2.5% of insoluble fiber, we sell for pet feed. We're doing research to see if we can convert that into an even more valuable use in the future. We have a lot of fun exploring every opportunity possible.

**Good: Climate change could have unpredictable effects on the food industry at large. What role does innovation and technology play in planning for the future?**

Galle: We're actually doing work right now with Yale University to explore carbon sequestration at the farm level, to really understand the carbon footprint not just of the cranberry bog, but also the surrounding land. For every acre of bog, there's about 5.5 acres of supporting land. That supports biodiversity at each of our farms.

Our farmers have also partnered with universities on the cranberry itself, looking at quality, yield, or mitigating rot effects — all things affected by climate change. Cultivating more robust, varieties can help with that. From an R&D lens, it's about how can we help farmers understand that biodiversity and share those best practices across our regions.

*Christopher Good is a staff writer for What the Future.*

**"It's all about delivering great taste, along with the nutrients that consumers are looking for. That's a balancing act, right?"**

# How farm tech is changing how we'll feed America

## Seth Crawford

Senior vice president and general manager of precision ag and digital, AGCO

**Think Teslas are high-tech? You should see the cabin of today's combines and tractors. Farming technology often leads the way for more consumer uses. Where is farm tech today, and how is it changing the way we feed America? Seth Crawford from equipment manufacturer AGCO gives us the lay of the land.**

**Matt Carmichael: How do you see the tension with big farms and smaller farms playing out?**

Seth Crawford: I think big farming gets a bad name. The reality is, the extreme majority of farms today are family farms. They're just bigger family farms than they've been before. Yet, the overall quality and the consistency of our food supply is better than ever with less variability and greater stability. That's exciting because as we have the growing world and improving diets, that's going be ever more important.

**Carmichael: Farm equipment is expensive and can take years to pay off. Will smaller famers be able to keep up?**

Crawford: We have retrofit products that we put on equipment. We make it scalable so they can step up in technology year-by-year, even if they have smaller units. I think the farmers that want to be a small farmer and operate with the latest technology can do that.

**Carmichael: How is technology making farming more sustainable?**

Crawford: We've been able to show in our field trials that by precisely placing the seed and the fertilizer and managing the timing of the fertilizer, we can maintain the same yield and reduce the fertilizer by 50%. You're not only reducing the cost for the farmer; it also greatly helps from an environmental standpoint.

**Carmichael: Will climate change force more regulation?**

Crawford: We're going to see a regulatory environment where farmers have to document operations, and that's going to require certain technology, because it's proving to be much more sustainable. We view our role as enabling the farmer to do that in an economically feasible and reliable way so they can continue their livelihood without being burdened.

**Carmichael: How is technology changing the experience of farming?**

Crawford: We're seeing farmers go much later in life operating at a very, very high level and they love it. They would never let you take that technology away. It's somewhat counterintuitive. A lot of times people think the tech is just for the young ones in the industry. Absolutely not. I know plenty of 80-year-old farmers that are fully decked out with their technology.

**Carmichael: There's ongoing debate if cars will ever be fully autonomous. Will farm equipment get there?**

Crawford: With camera-based sensors and high-speed connectivity you're able to reference back to have humans look at an obstacle rather than stop at everything and send a note to the farmer to go out and check their machine. We can remotely do that. That builds up our database so we can program our models so that we can overcome those issues. I wouldn't say that we'll never get there. We've made the commitment that we're going to be there across the full crop cycle by 2030. We're well on our way.

**Carmichael: How much of an issue will connectivity be?**

Crawford: Very few farmers have perfect connections across every acre in their operations. We have to have the sensors and the edge processing capability to process the data and take action in the moment without ever connecting to the cloud or going offboard in any manner. We do that today, but I think as we get to more autonomous operations, we will need better connectivity because without that, we can't just call in a second set of eyes to look at an issue the equipment has run into. We're going to be stuck. And that's going to get frustrating for everyone.

**Carmichael: Will we see more smaller equipment?**

Crawford: I first heard this debate close to 20 years ago about continuing to invest in larger equipment or small swarms of machines. What's happened is really a bit of both. In some ways, the machines have continued to get larger with higher horsepower, wider operating widths and higher speeds. I don't know that machines can get a lot bigger. It's very difficult today to move some of our machines from field to field. At the other end of the spectrum, with electrification and advanced sensors coming, we've worked with companies that are sending out small bots to scout fields, looking for pests on the underside of the crop canopy. They can get into fields much later in the season with some of our large equipment.

*Matt Carmichael is editor of What the Future and head of the Ipsos Trends & Foresight Lab.*

**"A lot of times people think the tech is just for the young ones in the industry. Absolutely not. I know plenty of 80-year-old farmers that are fully decked out with their technology."**

# How this farmer is planning for an uncertain future

## Dale Hanson

Farmer

**It would be remiss to talk about the future of farming and not talk to a farmer. Dale Hanson knows full well the challenges facing the industry that has supported his family for generations. Some challenges are local and specific to his region of Montana; some aren't. He feels the effects of globalization personally, but he's also fortunate not to be affected by some of the key challenges. Hanson is hopeful about his own farm, although he sees clouds around farming's future in general.**

**Matt Carmichael: What has changed recently about farming?**

Dale Hanson: For our area, the biggest thing we've seen is that people are realizing just how important the land is. A lot of foreign investors are coming in that have deep pockets and are willing to buy land. That's been really driving up the land prices.

**Carmichael: What kind of impacts does that have?**

Hanson: With farming you're land-rich and cash-poor. If somebody's getting ready to retire, they probably don't have a lot of money saved, but they have a lot of value in their land. They only have one opportunity to sell it. They're going to try to get the top dollar. And unfortunately, it's not going to come from the neighbor down the road or the daughter or the beginning farmer. It's investors.

**Carmichael: How is technology shaping farming?**

Hanson: We can steer our tractors without [manually] steering our tractors. All our equipment, whether it's an aerator or a sprayer, has section controls so it's mapping while we're doing it, so nothing gets oversprayed. Unfortunately, all this stuff comes out of costs, but it will pay for itself in time.

**Carmichael: What are some of the day-to-day effects of automatic steering or optimizing spraying?**

Hanson: It's amazing how tiring it is to hold the steering wheel of a tractor after a 15-, 16-, 18-hour day. With a 350- to 400-acre field you have like 80 passes on it at 4.5 mph. We all get a little bit of carpal tunnel [syndrome]. [With automatic steering] now I push a button and go. I can watch my implement, pay attention more and look for rocks. If you run a rock through the combine, those parts are expensive and it [costs] thousands of dollars in downtime.

**Carmichael: Will tractors get fully autonomous?**

Hanson: Twenty years ago, I could never fathom that we'd have autosteer, but by the same token, I can't quite think how tractors are going to be running themselves on our terrain, with hills and washouts and wet spots. I imagine that [an autosteer tractor] would get in trouble.

**Carmichael: Is labor an issue?**

Hanson: Labor is hard to find. If it wasn't for my family, my wife and I'd be screwed because you just can't find labor. Everybody's getting so far removed from agriculture that nobody really understands it. You can't just come on the farm and go to work, just like I couldn't go to your job and go to work. You need to know the ins and outs.

**Carmichael: How does that tie in with the investors buying farmland? Who farms it?**

Hanson: There's a small group of farmers that's OK with farming land for investors. They're farming because they cannot get the finances to buy it, and they just want to farm the land. But these investors aren't in it to make money. They just want to be able to control the land.

**Carmichael: Why is that?**

Hanson: Investors are getting in on irrigated ground. These people are controlling this irrigated land and, in essence, they control the water. Water is such a precious commodity; when you control the water, you control the outlook of the area. My dad, well, all the old-timers say, "Whiskey's for drinking, water's for fighting." It has caused a lot of heartaches between neighbors because somebody used too much water or stole the water. That's happened. During the night, people open gates or shut gates or put dams in and it's really not good.

**Carmichael: What's giving you hope?**

Hanson: For my operation, it's the next generation. My [three adult daughters] want to be part of it. That's rewarding to me. Farmers are getting a little bit of recognition. And we're starting to see this circle going through these younger kids that are now a little older and having kids in school. They realize these small towns aren't so bad. You don't need to have constant entertainment in life. If we have a good, stable school and a good grocery store and find a home, that's what we need.

*Matt Carmichael is editor of What the Future and head of the Ipsos Trends & Foresight Lab.*

**"These people are controlling this irrigated land and, in essence, they control the water. Water is such a precious commodity; when you control the water, you control the outlook of the area."**

# Signals

## What we're reading today that has us thinking about tomorrow

**The vertical farming bubble is finally popping** via Fast Company. Controlled indoor farming has been vaunted as a climate change solution. But 20 years and more than a billion dollars of venture capital later, most companies are failing.

**FDA clears California company's lab-grown chicken as safe to eat** via the Wall Street Journal. Cultivated chicken by Good Meat Inc. has been approved by the FDA as safe to eat. It is just the second company to clear this regulatory hurdle.

**The race against time to breed a wheat to survive the climate crisis** via The Guardian. Across the globe, researchers are rushing to breed heat-resistant and drought-tolerant wheat. Will the public trust these genetically modified varieties?

**New Zealand plans to tax agricultural emissions, in world-first plan** via The Washington Post. With a new tax on methane emissions, New Zealand aims to mitigate the environmental impact of livestock.

**Seaweed is having its moment in the sun** via The New York Times. From haute cuisine to bioplastics, many hope seaweed will be the new wonder material.

**As seas rise, Bangladesh farmers revive floating farms** via Reuters. Amid rising seas and monsoons, Bangladeshi farmers are using traditional floating farms.

**Factory or farm? Oregon may alter land use for chipmakers** via AP. Lawmakers in Oregon are considering a bill to allow the governor to expand long-protected growth boundaries for farms in a quest to lure chip companies to build factories.

**Ipsos Global Trends** via Ipsos. Despite record climate-related disasters, there is rampant debate about who is responsible for climate change and how to address it.

**Extreme problems from extreme weather** via Ipsos. In five charts, Ipsos unpacks how the public sees extreme weather.

**Embedding ESG in experience** via Ipsos. How organizations can create value, drive stronger relationships and customer behavior by embedding ESG commitments into the customer experience.

**Making a plant-based future: An idea whose time has come** via Ipsos. This report looks at barriers that stop people from embracing a truly sustainable relationship with food.

**Americans don't have a clear idea of which of their actions have the strongest impact on climate change** via Ipsos. This New York Times/Ipsos poll finds that except for recycling, actions to reduce greenhouse gas emissions are polarizing for the public.

Scanning for signals is a type of research that is foundational to foresight work. These signals were collected by the staff of What the Future and the Ipsos Trends Network.

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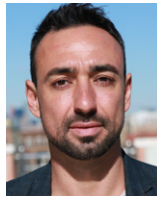

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