Byte-Sized Revolution

How cutting-edge tech is transforming the way we eat.

A 2024 ADM Global Consumer Trend Series

Episode 4

The Next Big Tech Boom? It's on the Farm.

Understanding the impact that technology is having on consumer trends is essential for modern businesses to thrive.

From increased connectivity and information access through the farm-to-fork supply chain to advancements in artificial intelligence, robotics and seed genetics, new technologies are accelerating change on the farm.

A deep understanding of the link between these technological and scientific innovations and how they can benefit consumers can enable brands to meet the rising demand for better, more sustainable and more accessible human and pet nutrition solutions.

As an industry leader in consumer trends, and by leveraging our close and collaborative relationships with farmers around the world, ADM can help you apply this knowledge to innovation and create products and services that resonate with consumers' ever-changing considerations and aspirations.

Consumer expectations are high –
ADM can help you not only meet, but also exceed them.

Technological acceleration is a macro force changing how global consumer trends are expressed in the marketplace

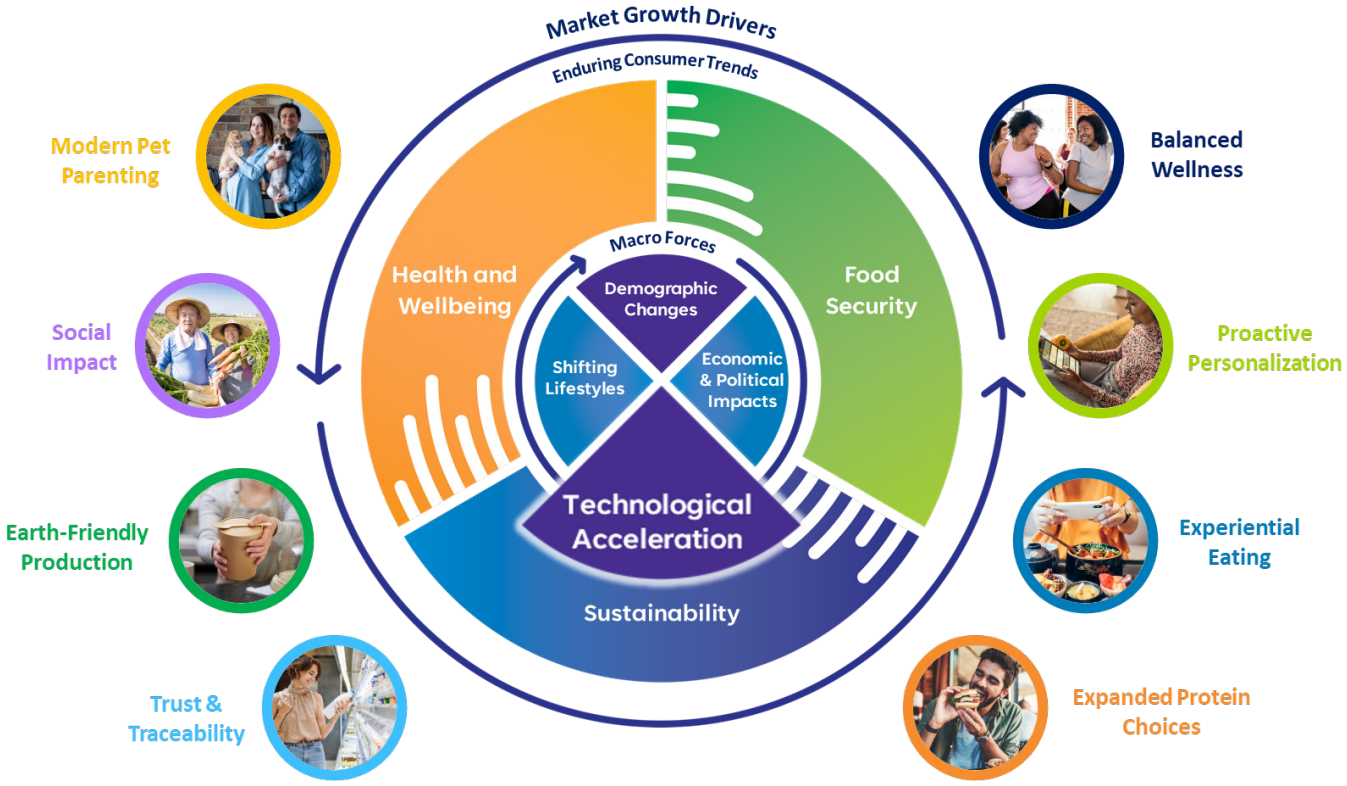
Based on in-depth proprietary research and a network of TrendXplorers around the world, each layer of the framework is key to understanding consumer behavior:

Macro forces: broad cultural shifts that impact across societies, markets and industries.

Enduring Consumer Trends: unifying principles that shape consumer demand for products and services.

Market Growth Drivers: A dissection of larger trends that highlight consumer attitudes, expectations, and behaviors which serve as starting points for brands to prioritize opportunities for innovation.

Global Consumer Trends Framework



[Learn more about global trends @ ADM.com/trends]

Harnessing the power of the framework, ADM's Global Consumer Trend Series delves into 4 key areas that are rapidly transforming due to technology

These areas represent emergent shifts in consumer and industry behavior where technology is playing a transformative role.

This is Episode 4:

The Next Big Tech Boom? It's on the Farm.

Unapologetic Flavor & Color Experiences.

Multisensorial eating like never before

Replacement Isn't the Future. Variety Is.

Expanding food choices to meet lifestyle goals

What's For Dinner? Data.

Optimizing everyday personal performance through data

The Next Big Tech Boom? It's on the Farm.

Transforming agriculture with next gen technology

Episode 4

The Next Big Tech Boom? It's on the Farm.

Tech on the farm is:

Enabling Sustainable Practices

Enhancing Crop Quality

Broadening Food Access

Promoting Farm-to-Fork Traceability

Supporting Animal Nutrition

Today's new generation of farmers is adopting innovative, technology-driven solutions that help restore and rebuild the environment, improve employee and animal welfare, increase efficiency and profitability, enhance transparency and traceability in the supply chain, and elevate the overall quality of food across the globe.

Ground-breaking farming technologies such as seed AI genetics, laser scarecrows, drones and satellite imagery, farm automation and robotics, and techniques supporting regenerative agriculture are revolutionizing the agricultural and animal farming industries. These advancements are directly benefiting consumers and accelerating global trends in sustainability, health and wellbeing, and food security.

"Data is the new tractor."

—Jeff Rowe, CEO of Syngenta Group

55%

of U.S. consumers believe that modern industrial systems for farming and raising animals are the best ways to feed a growing population, +10pp from 2019[1]

1: Hartman Group, Food & Technology 2023.

#1: Enabling Sustainable Practices

Faced with some of the persistently hottest temperatures ever recorded in human history and a vast array of natural disasters across the globe, consumers express heightened concerns for the environment and look to farmers to utilize innovative, tech-forward and sustainable solutions. Farming practices that focus on regenerative agriculture, lowering carbon emissions and conserving resources are becoming increasingly important.

Consumers also connect social well-being to sustainability, as many environmental issues disproportionately impact farmers and their livelihood. Consumers are more often considering how their food purchases impact their communities and look to support local farmers whose ethics align with their own. At the same time, farmers are turning to technologies that can support both environmental and social sustainability efforts, which helps consumers "feel good" about their purchases.

Example technologies:

- **N-Drip** wants to solve the global water shortage by reducing water use in agriculture. Their Gravity Micro-irrigation system provides farmers with a "precise and cost-efficient" alternative to flood irrigation and helps maximize yield.
- **AeroFarms** uses the latest breakthroughs in indoor vertical farming, AI and plant biology to improve the way fresh produce is grown by using less water, less land and zero pesticides. The company, which is B Corp Certified, claims their products are not only more sustainable than conventional farming, but also better tasting and more nutritious.
- **Teralytic's** wireless soil sensors provide real-time data on soil nutrients and pH levels. This information helps farmers apply fertilizers more effectively, promoting better soil health and reducing nutrient runoff.
- **Naïo's** Oz Weeder is an automated weeding robot that uses vision systems to differentiate between crops and weeds, removing unwanted plants mechanically without the need for chemical herbicides. This reduces reliance on harmful chemicals and promotes soil health.

So what?

Consumers are increasingly purchasing according to their ethical values, and many are demanding innovative solutions to both environmental and social sustainability problems. Unsustainable practices on the farm may not only deter consumers from purchasing products but may also persuade consumers (and the media) to use their voice to protest.

64%

of global consumers say they look for products from companies that support farmers and local communities[1]

[57% NA - 60% EMEA - 67% AIPAC - 68% LATAM]

38%

of global consumers believe that regenerative agriculture can have a positive impact on the planet in the long term[1]

[34% NA - 37% EMEA - 38% AIPAC - 48% LATAM]

38.5%

US Dollar Sales Growth vs year ago of food & beverage products with a regenerative agriculture claim on pack (Full year 2023)[2]

> *If you take something out of the earth, you need to put something back. So, you can't just take a plant or take a fruit or something. You need to plant something in its place. It's a very balanced way of engaging with the environment, very sustainable. [Africans have] been saying this for thousands of years and now the world is catching on.*
>
> – Global Industry Expert, Africa

1: ADM OUTSIDE VOICE℠, Global Lifestyles Study, 2023
2: ADM OUTSIDE VOICE℠, Analysis of FY2023 Nielsen IQ data

#2: Enhancing Crop Quality

As consumers learn more about the impacts of industrial agriculture and become more connected to farmers and local markets in their own communities, they increasingly draw connections between the effects of food production on their own health, as well as the well-being of the planet and its inhabitants. Soil health, in particular, is a rising area of interest that connects better ecology to both better taste (healthier soil = more flavorful food) and better nutrition (healthier soil = more nutrient dense food).

Technologies that assist farmers with regenerative agriculture practices such as cover cropping, crop rotation and livestock grazing not only lead to better biodiversity and carbon sequestration, but also improved crop nutrient density and even better flavor. At the same time, plant breeding and gene editing technologies are creating new flavors and benefits that open opportunities for new consumer experiences.

Example technologies:

- **Luna UCR Avocado** is the result of a decades-long tree breeding program at the University of California, Riverside. The new variety has a more "floral" flavor than the Hass, and the skin turns black once it's ripe, taking the guesswork out of slicing in. These avocados are also easier to harvest, require less land than the Hass variety and stay fresh long enough to transport.
- **Pairwise** uses CRISPR genome editing technology to engineer fruit and vegetables with specific attributes (e.g., removing bitterness from mustard greens, creating pitless cherries and seedless berries) to remove potential barriers to consuming healthy food.
- **EarthSense Agricultural Intelligence's** TerraSentia system utilizes advanced robotics and AI analysis to enable more precise agriculture, improve crop diversity and enhance soil health, all of which support regenerative farming practices across the globe.
- **BioLumic's** next-generation seed technology uses UV hotomorphogenesis to trigger biological events in seeds, increasing crop strength, which leads to increased yields.

So what?

Consumers are no longer content with companies that "do no harm" and instead expect those in the food and beverage industry to restore damage done to the soil and agricultural lands, potentially increasing nutritional content and overall quality of the product.

58%

of global consumers say they are more attentive to the ingredient listings on food and beverage products; 28% of them do it to avoid ingredients that are harmful for the environment[1]

56%

of global consumers believe that there are benefits to food processing[2]

[48% NA - 50% EMEA - 64% AIPAC - 52% LATAM]

> *We would not be where we are today agriculturally and have the power we do without the evolution of seed genetics. Without these advances, we wouldn't be able to raise crops, and we do that continuously to outpace the rest of the world and production over time.*
>
> - Family-Owned Farmer, Alabama US

1: FMCG Gurus, The Needs for Regenerative Farming, 2023
2: ADM OUTSIDE VOICE℠ Global Lifestyles Study, 2023

#3: Broadening Food Access

Disparities in food access and its impact on communities across the world prompt greater demand from consumers for companies to increase access to more nutritious food. From providing nutrient dense solutions to malnourished and vulnerable populations, to increasing crop yields in developed markets to help mitigate the impact of inflation, addressing a broad range of food accessibility issues is critical to achieving a more democratized food system for all.

For farmers, technology-based solutions that allow for better productivity, efficiency and increased crop yields will ultimately lead to more equitable (and healthier, more sustainable) food systems.

Example technologies:

- **Netagrow's** platform leverages the power of artificial intelligence to offer personalized recommendations on crop management, soil health, and pest control, transforming traditional farming practices that the company claims will allow farmers to reduce waste and enhance productivity.
- **Netafim's** precise irrigation technology measures a variety of parameters such as climate data, soil texture, crop development stages and more to provide real time insights via a mobile app about the optimal amount and timing of water application, which ultimately increases crop productivity.
- **AGCO's** new end-to-end distribution model, FarmerCore, is designed to boost farmers' profitability, productivity, and sustainability globally. Built on three pillars—on-farm focus, smart network coverage, and digital customer engagement—FarmerCore brings the entire business directly to the farm, offering 24/7 support.
- **Bird Control Group's** laser bird deterrents (a.k.a. laser scarecrows) are helping farmers keep birds away from their lands utilizing non-lethal, animal friendly technologies that they claim provide long-term effectiveness vs traditional bird control methods.

So what?

As the world population continues to grow, providing affordable nutrition for all consumers will increasingly become both a social and environmental sustainability issue that the food and beverage industry must address.

25%

of global consumers cite food shortages due to drought or crop failure as a top environmental concern, up from 23% in 2022[1]

59%

of global consumers believe that products having too short shelf lives is a main contributor to their food waste[2]

"With the tech that is available we can treat a field more effectively with less inputs. That helps the bottom line and insure we are not overapplying inputs... herbicide, seed and fertilizer. We are producing a safer product for a lower cost because of technology."

- Crop Farmer, Kansas US

1: Mintel, Global Outlook on Sustainability, 2023
2: FMCG Gurus, Addressing Food Waste & Shortages, 2023

#4: Promoting Farm-to-Fork Traceability

A growing focus on wellness and sustainability, alongside perennial concerns around food safety, motivates consumers to learn more about how their food is grown. For companies to garner trust among consumers, traceability efforts that not only communicate what is in a product but also where it was sourced, how it was produced and who made it have become much more essential.

While certifications can certainly provide assurances of sustainable sourcing, there are limitations. Technology advancements that trace ingredients throughout the supply chain can address these limitations and offer verifiable assurances that the product is made with real ingredients, from real people and real communities, and in a sustainable manner.

Example technologies:

- **Chipotle** is one of the first large foodservice chains to use RFID technology to optimize operations and trace ingredients at select restaurants, enabling real-time, item-level traceability from source to table. This system is designed to allow the company to quickly and efficiently act on food safety and quality concerns.
- **Friso's** infant formula features QR codes that let consumers experience the full "grass-to-glass" journey while participating in loyalty programs and promotions. Increasingly, brands are leveraging QR technology to offer detailed insights into where products are grown, who produces them, and how they're made.
- **The Center for the Fourth Industrial Revolution (C4IR) Brazil** is coordinating with government agencies and agricultural industry associations to promote the adoption of traceability technology, which can better position farmers to meet potentially stricter EU regulations for imports.
- **TraceX Technologies** is leveraging blockchain tech to enhance traceability and transparency within the food supply chain. By providing an immutable and transparent record of every transaction and movement, the company's platform supports businesses in adhering to sustainability standards and ethical sourcing practices.

So what?

Gaining consumer trust is essential to building brand loyalty. Moving forward, traceability efforts should go beyond issues of food safety and focus on communicating how products are made simply and produced in a manner that is healing for the planet and respectful of others throughout the supply chain.

72%

of global consumers say that they often/sometimes look for locally grown or produced products when buying food & beverages[1]

[63% NA - 72% EMEA - 73% AIPAC - 76% LATAM]

51%

of global consumers often/sometimes scan bar codes at the store to learn more about the product they want to buy[1]

[35% NA - 44% EMEA - 58% AIPAC - 61% LATAM]

> *"Consumers are more demanding when it comes to having full access to information when it comes to their food products. So, where is it coming from? How is it being produced? How is it being shipped? Who was involved? What's in it? What's done to it? To limit the risk they take with eating something, but also to see how can it be a little bit more sustainable and to have as little ingredients in a product as possible."*
>
> - Global Industry Expert, Europe

1: ADM OUTSIDE VOICE℠, Global Lifestyles Study, 2023

#5: Supporting Animal Nutrition

Closely aligned with their desire for transparency, consumers today have a greater awareness around animal welfare and look to companies to address a variety of sustainability issues, including animal feed and animal lifestyle. Ethical farming practices not only address animal welfare, but also overall food quality, human nutrition, environmental health and social welfare.

Consumers intuitively understand that "you are what [the animals] eat" and want assurances that animal feed are free from things like antibiotics or GMOs and in alignment with the species' nutritional needs. The absence of hormones and antibiotics has become a baseline expectation for consumers when purchasing animal products due to their potential impacts on the long-term health of humans who consume animals given these drugs. In addition to precise and high-quality feed, consumers want reassurances that animals lived a stress-free life (e.g., pastured, crate-free) and were stewarded by caring ranchers and farmers.

Example technologies:

Wearables, such as smart collars, can track animals' activity, sleep and current location, while AI and machine learning can help enable pet parents to determine a pet's mood – whether it's happy, sad or in pain – and track indicators of potential health issues. Examples include:

- **Nedap Livestock Management** is a leader in farming automation using individual animal identification for dairy cows. Their technologies not only optimize production and improve efficiency, but also improve animal health through monitoring and precision feeding.
- **Zelp** is developing a low-cost, cattle wearable technology to mitigate methane emissions, whilst helping farmers improve productivity, efficiency and animal welfare. The company also develops animal health monitoring systems, which quickly flag potential illnesses and reduce the need for antibiotics.
- **Smartbow GmbH** is a smart monitoring systems that provides real-time data on animal health and behavior, such as activity levels, temperature and feeding patterns, giving farmers more insights into their health and welfare. Remote technology like drones can also be used to count animals, track their location and study their behavior.
- **eVerse.AI** has introduced CowGPT, a generative AI application designed for the dairy, veterinary, and animal husbandry sectors that aims to provide farmers with personalized insights into animal health and welfare. By democratizing access to expert knowledge, CowGPT has the potential to revolutionize the industry by potentially doubling milk yield and income for dairy producers.

35%

of dairy producers in the US expect to invest in genetics & genomic testing to improve herd characteristics in the next 3-5 years, 35% in tech to monitor & detect animal health event[1]

40%

of global consumers say that "grass-fed" claims are influential when choosing what food and drink to buy[2]

> *"The feeding of the animal for me is a lot more important because I'm going to taste that when I eat it."*
>
> - Jessica, Millennial, U.S. consumer

1: Dairy Herd Management, State of the Dairy Industry Report, 2024
2: FMCG Gurus, Clean Label & Naturalness Study, 2023

So what?

Consumers will increasingly look for proof points of responsible farm management and will be more likely to connect animal welfare and nutrition to a healthier, better tasting and more sustainable end product.

Consumer are increasingly seeking better, more diverse, and more sustainable nutrition solutions. Tech advancements are empowering farmers to meet these evolving demands.

Leveraging our close and collaborative relationships with farmers around the world and our deep understanding of consumer trends, ADM has the tools to help your brand create products and services that resonate with consumers' evolving considerations and aspirations around sustainability, quality, accessibility, traceability and animal nutrition/welfare.

- Leadership in regenerative agriculture powered by close relationships with farmers and local experts around the world
- Innovative farm initiatives to increase farm yields and reduce the amount of crops that are lost before reaching consumers
- A robust supply chain that lays the foundation for unparalleled ingredient portfolios in human and animal nutrition
- A direct line to consumer trends around the globe monitored via our team of TrendXplorers
- Culinary ingenuity for a holistic, inspired approach to product development in an array of categories
- Technical expertise that unlocks breakthrough innovations and end-to-end capabilities
- Continued investment in the technologies of tomorrow through ADM Ventures

1 **Unapologetic Flavor & Color Experiences.**

2 **Replacement Isn't the Future. Variety Is.**

3 **What's For Dinner? Data.**

4 **The Next Big Tech Boom? It's on the Farm.**

Missed an episode? Check out our previously released reports…
this is a Byte-Sized revolution you won't want to miss!
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