

WHY GLOBAL NORTH-SOUTH
FOOD SUPPLY FLOWS ARE VITAL

INNOVATIVE GLOBAL TECH
DEVELOPMENTS UNCOVERED

HIGHLIGHTING PROBLEMS AND
OFFERING SOLUTIONS

TECHNOLOGY AND FOOD SECURITY

IMPACT

2024

AN FII INSTITUTE PUBLICATION



HOW TECHNOLOGY AND AI CAN HELP REDRESS GLOBAL IMBALANCES IN FOOD SECURITY

EDITORIAL

COMBINING TECH INNOVATION AND HUMAN DIGNITY

→ IN A WORLD MARKED BY RAPID technological progress and significant global challenges, the integration of food security and technology is vital. Facing climate change and a growing population, we urgently need innovative solutions for sustainable food systems.

At the FII Institute, we are committed to utilizing technology to address these issues and ensure food security for all.

This report highlights the transformative impact of technologies like precision farming, AI analytics, and blockchain

on agriculture. These innovations are revolutionizing food production, distribution, and consumption. However, technology alone isn't enough. Effective implementation requires collaboration across governments, private enterprises, and research institutions.

The FII Institute leads in integrating technology with sustainable practices, supporting initiatives and research to build resilient food systems. Our goal is a prosperous, food-secure future for all, ensuring that technological advancements meet the challenges of today and tomorrow.



Richard Attias
CEO, FII Institute

CONTACT US:
www.fii-institute.org

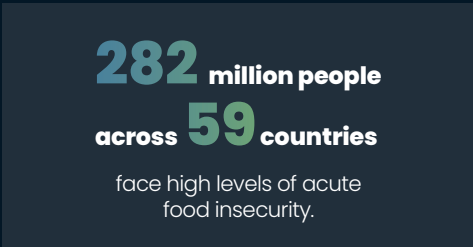
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FOOD SECURITY

Food security affects billions of people worldwide. Having access to sufficient safe and nutritious food to meet dietary needs and food preferences for an active and healthy life should be a prerequisite of a civilized society. But too few people know where their next meal is coming from – or are able to get reliable sources of good, nutritious food. Food insecurity can stem from a variety of factors, including poverty, conflict, climate change and economic instability. Regardless of where it comes from, the consequences of food insecurity are far-reaching and severe. It not only leads to hunger and malnutrition, which have devastating impacts on human health and development, but also hinders economic and social progress. Children who experience food insecurity often suffer lifelong effects, including stunting, wasting, developmental delays and lower educational attainment. Assuring food security is one of the greatest challenges facing the global community. It requires a multifaceted approach that addresses issues such as agricultural productivity, supply chain resilience, economic and physical access to food, and sustainable resource management. Working together will be key – as we'll learn.

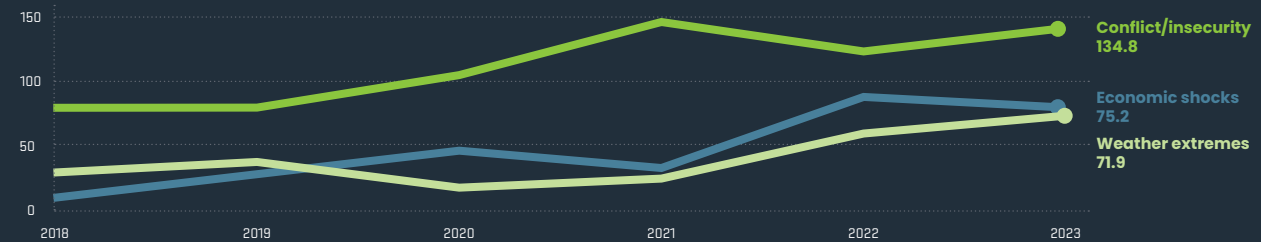


SOURCE: OUR WORLD IN DATA, FOOD SUPPLY



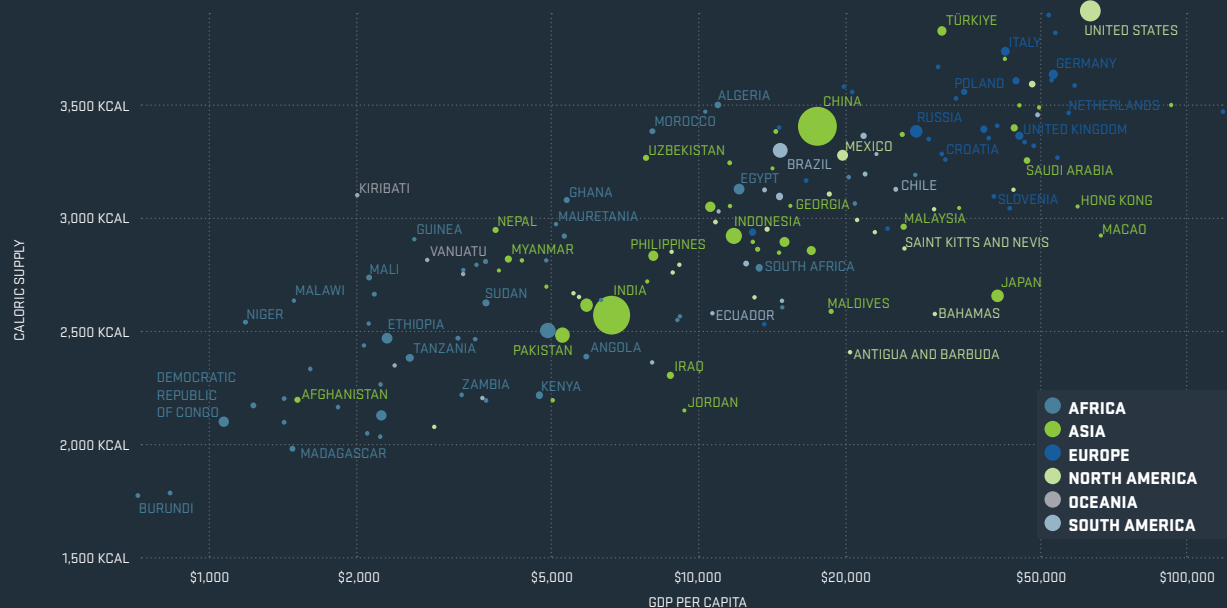
SOURCE: GLOBAL REPORT ON FOOD CRISES, 2024

NUMBER OF PEOPLE (MILLIONS) IN FOOD CRISIS BY PRIMARY DRIVER, 2018–2023



SOURCE: GLOBAL REPORT ON FOOD CRISES, 2024

CALORIES CORRELATE TO CASH, 2021



SOURCE: UN FOOD AND AGRICULTURE ORGANIZATION, 2023



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CONTACT US:

info@fii-institute.org

 @fiiiksa

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People rush to grab food parcels in Bangladesh.

NOT SO SAFE, NOT SO SECURE

Food insecurity is a growing major problem, with worrying trends toward heightened problems.

14m

children suffer from **severe acute malnutrition**.

45%

of **deaths among children** under 5 are linked to **undernutrition**

1 in 10

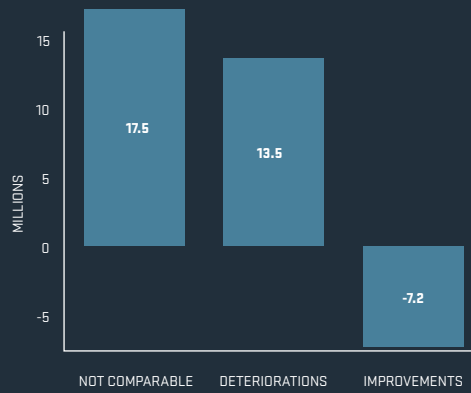
people go to bed **hungry every night**.

3bn

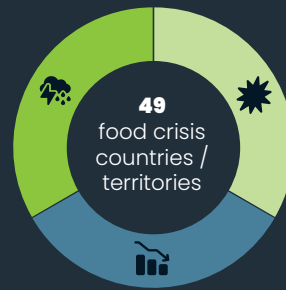
people can't **afford a healthy, nutritious diet**.

SOURCE: ACTION AGAINST HUNGER

CHANGE IN NUMBER (MILLIONS) OF PEOPLE FACING HIGH LEVELS OF ACUTE FOOD INSECURITY SINCE 2022



SOURCE: 2024 GLOBAL REPORT ON FOOD CRISES [HTTPS://WWW.FSLNPLATFORM.ORG/REPORT/GLOBAL-REPORT-FOOD-CRISIS-2024/](https://www.fslnplatform.org/report/global-report-food-crisis-2024/)



Weather extremes

18 countries where **71.9m** people faced high acute food insecurity

Conflict/insecurity

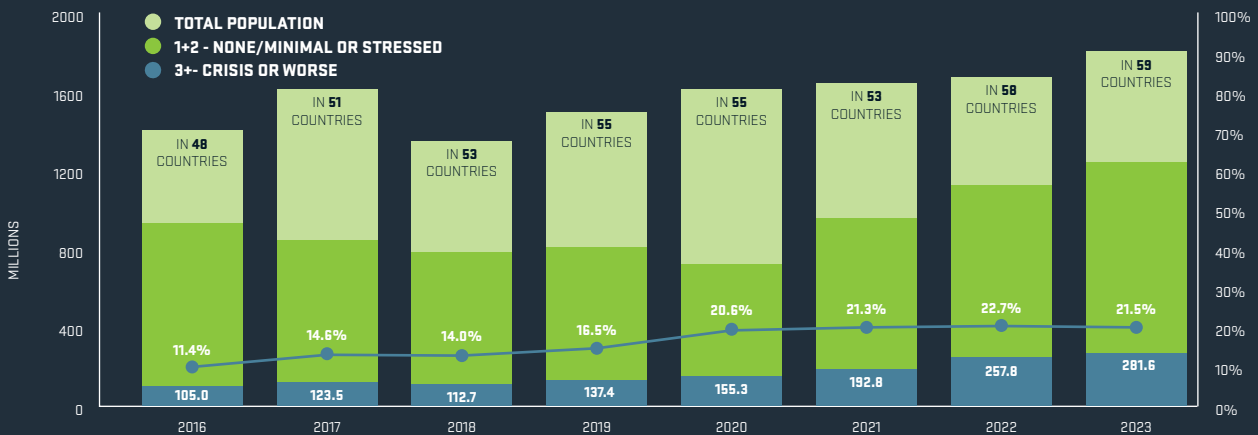
20 countries where **134.5m** people faced high acute food insecurity

Economic shocks

21 countries where **75.2m** people faced high acute food insecurity

SOURCE: 2024 GLOBAL REPORT ON FOOD CRISES [HTTPS://WWW.FSLNPLATFORM.ORG/REPORT/GLOBAL-REPORT-FOOD-CRISIS-2024/](https://www.fslnplatform.org/report/global-report-food-crisis-2024/)

NUMBER OF PEOPLE AND SHARE OF POPULATION FACING HIGH LEVELS OF ACUTE FOOD INSECURITY



SOURCE: 2024 GLOBAL REPORT ON FOOD CRISES [HTTPS://WWW.FSLNPLATFORM.ORG/REPORT/GLOBAL-REPORT-FOOD-CRISIS-2024/](https://www.fslnplatform.org/report/global-report-food-crisis-2024/)



WHY FOOD SECURITY MATTERS

What happens when you don't act and people go hungry.

Children make the dash for daily provisions in Bangladesh.

→ KNOWING WHERE YOUR NEXT MEAL IS COMING from isn't likely an issue for any of us reading this report. But it is something we ought to worry about – not on our behalf, but on the behalf of hundreds of millions of others.

Food security is a crucial issue that impacts the health of individuals and the stability and prosperity of societies. Ensuring that all people have consistent access to sufficient safe and nutritious food is foundational to sustaining life and fostering economic and social development. Food security has profound implications on health, education, economic stability and overall quality of life.

AN IMPERATIVE FOR HUMAN HEALTH

Food security is all about ensuring that people have access to the nutrition necessary to maintain a healthy life. The World Food Programme (WFP) believes nearly 282 million people experienced high levels of acute food insecurity in 2023 – a worrying rise from previous years.

The increase in food insecurity is driven by a number of factors, including conflict, climate change and economic disruptions. But whatever the cause, the effects can be deleterious.

Malnutrition, especially among children, has severe consequences, including stunted growth, weakened immune systems, and increased vulnerability to disease. Undernourished children are particularly susceptible to common childhood diseases like diarrhoea and measles, which can be fatal in severe cases. By not acting, we are dooming future generations to severe risk of illness and, in some instances, death.

BOOSTING ECONOMIES

It's not just at a human level that the imperative to act is clear. Food security is intrinsically linked to economic stability and development. When people are well-nourished, they are more productive, can work more effectively, and contribute positively to the economy. When they're not, they can't – and good security →

Staff pick food for parcels at a Canadian food bank.



HOW COULD TECH HELP?

AI, coupled with the block-chain, could help ensure produce is delivered to food banks while still in prime condition, reducing spoilage and improving the quality of food parcels.

→ leads to lost productivity, higher healthcare costs and economic instability.

While food insecurity is more likely to hit the Global South and economically developing areas, it's also negatively touching people in the Global North and developed areas. In 2022, the United States Department of Agriculture (USDA) reported that 44 million people lived in food-insecure households in the US, with 17% of households having children affected by food insecurity.

CONFLICT AND CLIMATE CHANGE COMBINE

Conflict remains the biggest driver of hunger, with 70% of the world's hungry population living in areas affected by war and violence, according to the WFP. And as the world fractures and tensions rise, such conflict becomes more commonplace.

Conflict has a harmful effect on food supplies. It disrupts agricultural production, displaces populations and destroys infrastructure, leading to severe food shortages. The war in Ukraine, for example, has had a ripple effect on global food prices and availability, demonstrating how regional conflicts can have global repercussions.

Climate change further exacerbates food insecurity by causing extreme weather events, reducing agricultural yields and destroying crops – meaning this is an issue we need to think about beyond the here and now. The increasing frequency and severity of climate-related disasters undermine the ability of communities to feed

themselves, pushing millions into hunger. Over 35% of arable land has been degraded due to human-induced activities, making it even more challenging to produce sufficient food to meet global demand.

WASTE NOT, WANT NOT

Food waste is a further critical issue impacting global food security. Around one-third of global food supplies – equivalent to nearly 1.2 billion tonnes – is wasted annually. That's food that could help those who need it most. Reducing food waste, particularly in high-income countries, could significantly alleviate hunger elsewhere. According to one study, halving post-harvest waste could reduce the number of undernourished people in poor countries by up to 63 million, making efficient management of food resources an essential weapon in addressing food security.

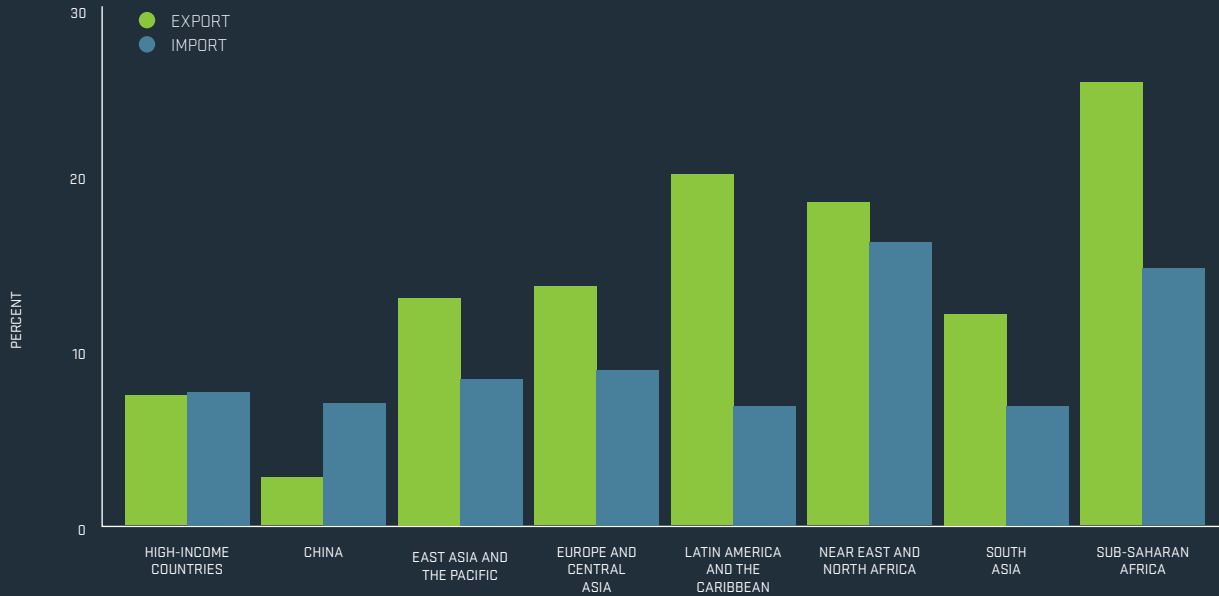
A GLOBAL ISSUE

While the problem touches all corners of the planet, it affects some more than others, making some leaders more reticent to act. But they should. Addressing food security requires coordinated global efforts and strong political commitment. International groups, governments and local communities must work together to develop and implement policies that ensure equitable food distribution, improve agricultural practices, and build resilience against climate and economic shocks. ■

GLOBAL GIVE AND TAKE

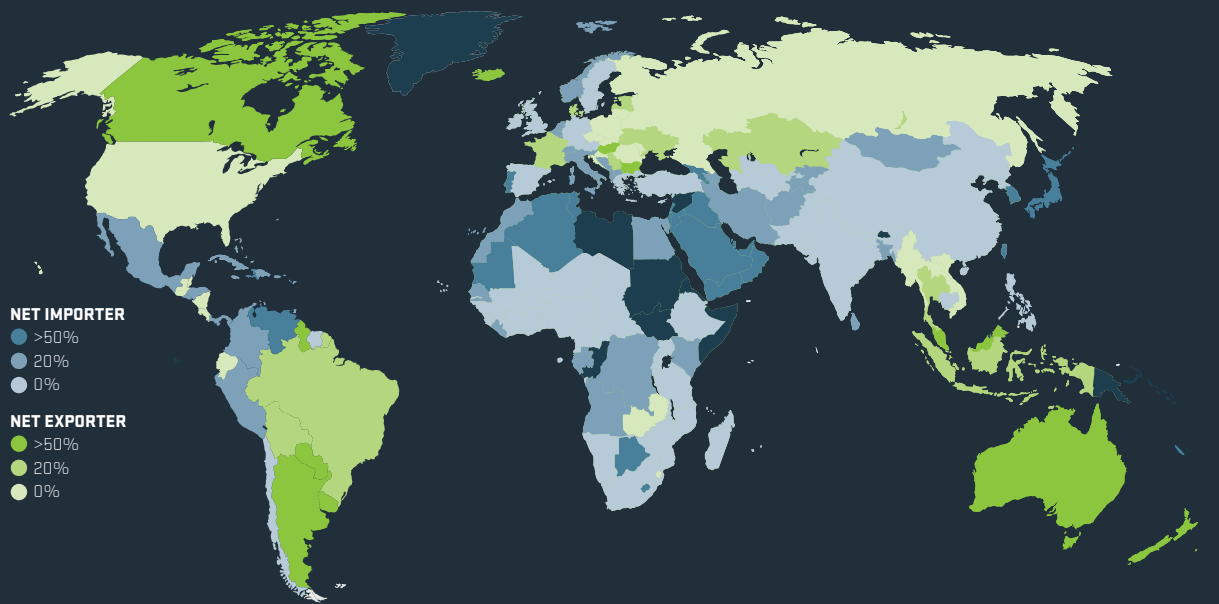
Who produces the world's food, and who eats it? The reality is a stark divide between the Global North and South.

AGRI-FOOD PRODUCTS AS A SHARE OF IMPORTS AND EXPORTS BY VALUE (2021)



FOOD DEPENDENCE

Trade as a share of domestic food supply



SOURCE: UN'S FOOD & AGRICULTURE ORGANIZATION GLOBAL PERSPECTIVE STUDIES

SECTION 1

THE PROBLEM(S) OF FOOD SECURITY

Where do we face issues when it comes to feeding the world's population, and why?

A man wanders among animal carcasses in Ethiopia - a country badly hit by food insecurity.

PHOTO: GETTY IMAGES/AFP/ EDUARDO SOTERAS



Vessels wait at the mouth of the Suez Canal after the Ever Given ran aground and blocked its route

STANDING ON A PRECIPICE

The interconnected supply chains that power our planet are great for food security – until they fail.

→ THE GLOBAL FOOD SUPPLY CHAIN IS A COMPLEX WEB of producers, processors, distributors and retailers, spanning continents and built up over centuries of free trade, augmented by recent advances in technology. It's a marvel of modern logistics, allowing consumers in New York to enjoy fresh avocados from Mexico or wine from France year-round. However, this system's complexity is also its weakness.

Global food supply chains are intricate systems involving multiple stages, including production, processing, distribution and retail. These stages often span multiple countries, each specializing in different components of the supply chain. Your coffee might be grown in Brazil, processed in Germany, and consumed in the US. This interdependence means that a disruption in one part of the chain can ripple across the entire system.

BREAKING UP IS EASY TO DO

One of the most recent, visible and impactful supply shocks was the Covid-19 pandemic. Lockdowns and restrictions led to labor shortages, especially in critical sectors such as agriculture and food processing. In the US, meatpacking plants became hotspots for COVID-19, forcing many into temporary shutdown. This resulted in significant supply chain disruptions and shortages in the market.

Global shipping, the backbone of international trade, was also severely impacted during the pandemic, with issues taking longer to be remedied when they arose thanks to the peculiar impacts of global lockdowns. The blocking of the Suez Canal by the Ever Given in March 2021 highlighted how a single incident could materially disrupt global trade. About 12% of all global trade →

A shell lands, unexploded, in a wheat field – highlighting the consequences of conflict



→ passes through this canal, and the blockage delayed hundreds of ships carrying vital goods, including food, from reaching their destinations.

WAR AND WORDS

Geopolitical tensions and conflicts, when they arise, can also severely impact food supply chains to the detriment of the global population. The ongoing war in Ukraine, one of the world's largest grain exporters, has led to significant disruptions in global grain supply that have resulted in shortages on shelves. Russia and Ukraine together account for nearly one-third of the world's wheat exports – and with one country incapacitated and depleted in supply, and the other subject to sanctions that cut it off from global markets, supplies have been hard to come by. The conflict has not only reduced the amount of

grain available on the global market, but also driven up prices, exacerbating food insecurity in vulnerable regions.

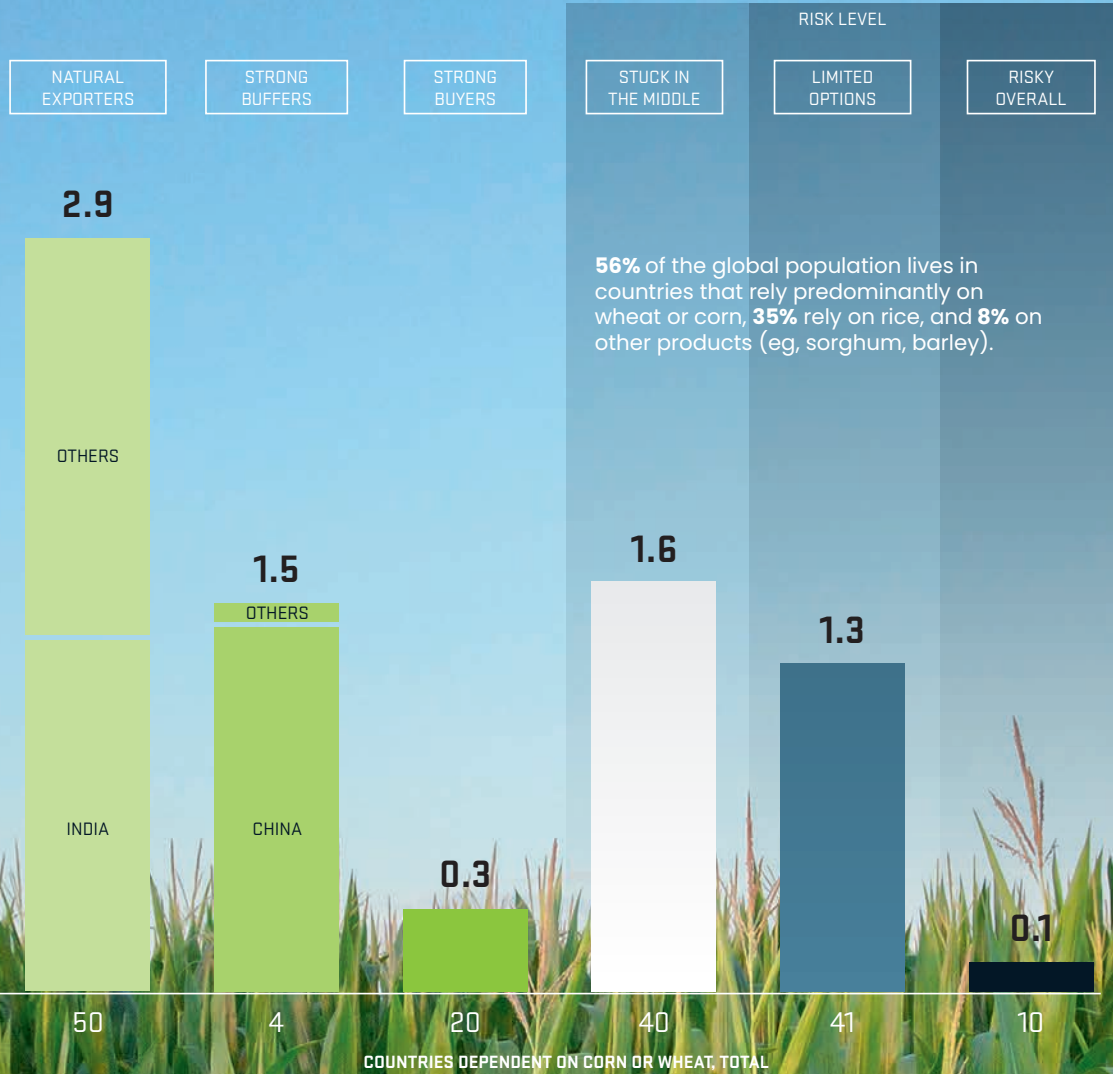
But it's climate change that poses one of the most persistent and pernicious threats. Extreme weather events such as droughts, floods and hurricanes are becoming more frequent and severely disrupting agricultural production. For instance, prolonged droughts in California, a major producer of fruits and vegetables for the United States, have led to decreased yields and higher prices for end consumers.

Beyond that, climate change affects fisheries and aquaculture, crucial sources of protein for billions of people. Rising ocean temperatures and acidification are altering fish migration patterns and reducing fish populations, impacting both local fishing communities and global seafood markets. →

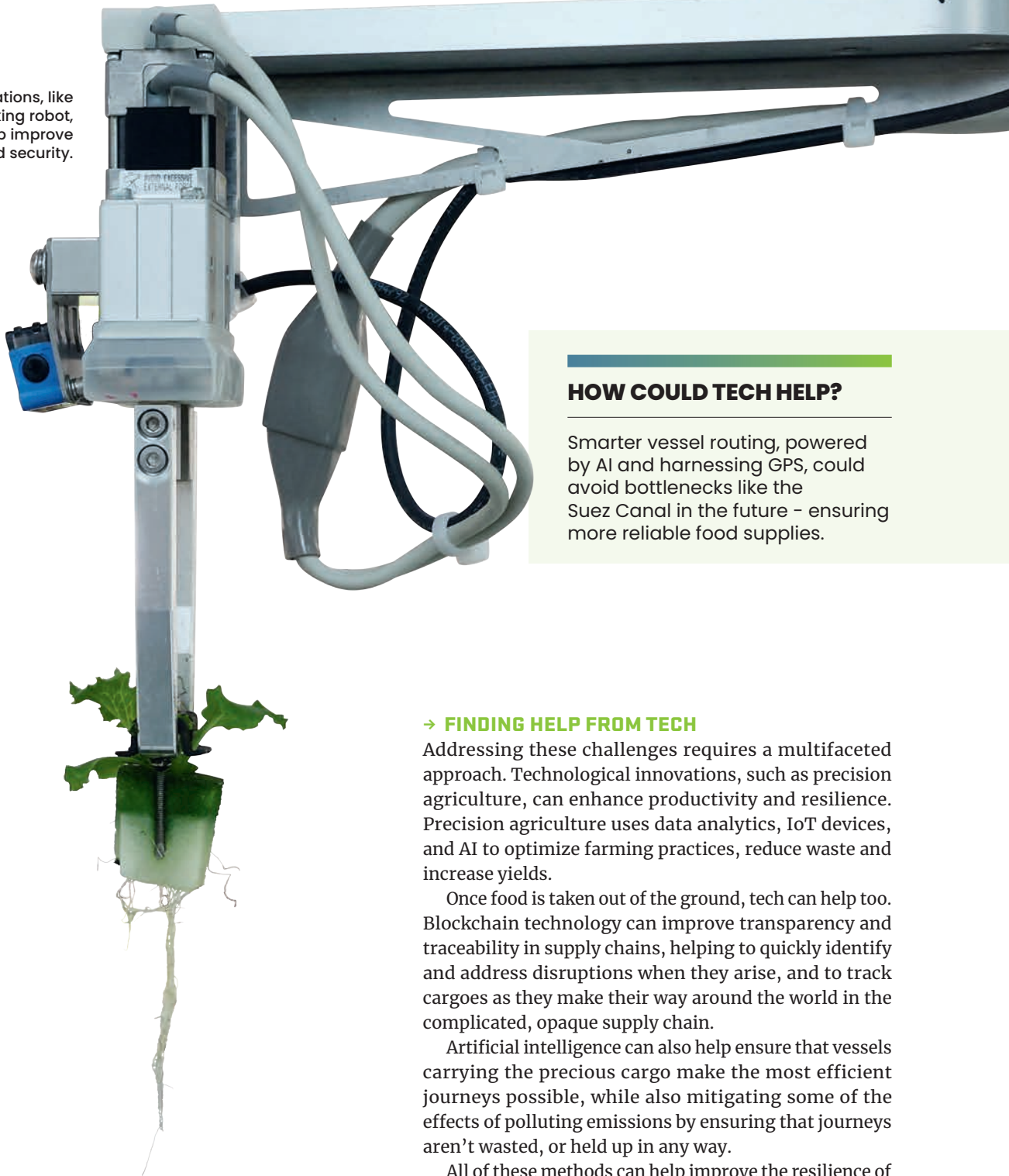
SOME COUNTRIES – AND 1.4 BILLION PEOPLE LIVING IN THEM – ARE HIGHLY VULNERABLE TO SUPPLY SHOCKS; THIS NUMBER COULD INCREASE TO 1.9 BILLION AS RESERVES DEplete

Population by archetype, billion people

165 countries were included in analysis, excluding small island states and territories



Tech innovations, like this crop-picking robot, could help improve food security.



HOW COULD TECH HELP?

Smarter vessel routing, powered by AI and harnessing GPS, could avoid bottlenecks like the Suez Canal in the future - ensuring more reliable food supplies.

→ FINDING HELP FROM TECH

Addressing these challenges requires a multifaceted approach. Technological innovations, such as precision agriculture, can enhance productivity and resilience. Precision agriculture uses data analytics, IoT devices, and AI to optimize farming practices, reduce waste and increase yields.

Once food is taken out of the ground, tech can help too. Blockchain technology can improve transparency and traceability in supply chains, helping to quickly identify and address disruptions when they arise, and to track cargoes as they make their way around the world in the complicated, opaque supply chain.

Artificial intelligence can also help ensure that vessels carrying the precious cargo make the most efficient journeys possible, while also mitigating some of the effects of polluting emissions by ensuring that journeys aren't wasted, or held up in any way.

All of these methods can help improve the resilience of supply chains to withstand supply shocks such as those we've encountered in the last few years - and to help further improve the efficiencies already realized within the sector. ■

AN ONGOING CONVERSATION

FII Institute is far more than its reports, as these insights into food security from our events this year highlight.



“As countries look at the future of food and companies look at surety of supply, they need to address the question of how to produce food without land in the future.”

Shara Ticku
Cofounder and CEO, C16 Biosciences, speaking at FII PRIORITY Miami



“Here’s what we learned from food investing: no one knew that food or healthy food investing was a category, but we went around the world telling people they could make good money from that.”

Gabrielle Rubenstein
Cofounder & Managing Partner, Manna Tree, speaking at FII PRIORITY Miami

“

At sbe, we injected context, energy, food, and design into our hotels, growing into the world’s largest company in this space, offering experiences that enable real-time understanding of oneself, amplified by AI for a program aimed at saving lives.”

Sam Nazarian

Chairman & CEO, sbe, speaking at FII PRIORITY Miami



“

The oceans are connected to food security, they’re connected to coastal infrastructure, they’re connected to climate change, they’re connected to tourism, they are connected to every aspect of our societies.”

Alexandra Cousteau

Explorer, Oceans Advocate & NEOM Advisory Board Member, speaking at FII PRIORITY Hong Kong



“

“We’re focusing on the fourth industrial revolution, we’ve made so many gains as humanity, but we’re still dealing with fundamental issues of human rights, of access to food, clean water, things that are going to need money and funding.”

Eleni Giokos
Anchor and Correspondent, CNN,
speaking at FII PRIORITY Hong Kong



“

We have to address common challenges, such as climate change, economic resilience, food security and new equilibriums of inflation. This affects all aspects of life under our social framework.”

Jixun Foo
Managing Partner, GGV Capital,
speaking at FII PRIORITY Hong Kong



“

Health and food security are of fundamental importance in Third World countries. Effort must be put forward to close these gaps.”

Zahin Razeen
Founder & CEO, Hydroquo+, speaking
at FII PRIORITY Hong Kong



“

AI has the potential to uplift every man, woman and child on this planet. It is the ultimate demonetizing and democratizing force for food, water, energy, healthcare, education – everything.”

Peter H. Diamandis
M.D., Founder & Executive Chairman,
XPRIZE Foundation, speaking at FII7



“

There's a new 'S' in ESG, that's Security – food security, energy security. It's a theme decision-makers are talking about globally. For Citi, resilience means coping in a world where globalization is fragmenting.”

Jane Fraser
CEO, Citigroup, speaking at FII7





Sweet potatoes are thrown after harvesting in Cuba - highlighting the manual labour involved in much agriculture in the Global South.

THE HAVES AND HAVE NOTS

Global inequalities in the food supply chain are a major issue that needs to be tackled – and technology could help.

→ **HISTORY IS LITTERED WITH EXAMPLES OF** dominant countries extracting resources – including food – from other, smaller nations. And despite hope that things have changed in our modern society, inequalities still exist in the food supply chain.

Despite huge strides in agricultural productivity and our global distribution networks, the divide between those who have ample access to nutritious food and those who do not continues to widen. This inequality in the food chain not only undermines global food security but also perpetuates cycles of poverty and malnutrition, exacerbating social and economic disparities worldwide.

Large parts of the developing world are the planet’s farms, food production facilities and agricultural hubs. They’re often powered by family farmers and small-scale producers whose products enter the global supply →

→ chain – at which point they’re marked up and sold on supermarket shelves in more economically developed countries.

MAKING THE NUMBERS ADD UP

We produce more than enough food globally to feed the planet – 6,000 calories per person, per day’s worth of food are grown around the world, three times the amount needed – but those calories are distributed unequally.

The world is built on small-scale farmers. Those holding less than 10 hectares each produce around 55% of

the world’s food supply, on just 30%–40% of the world’s arable land. A staggering 70% of the global population is fed or dependent on peasant farming, on just 30% of agricultural land. But the food is whisked away quickly on the global supply chain network from the Global South, often to the Global North – with little attempt made to keep food within the country that has produced it.

Those supply chains have been analyzed and improved to try to help their efficiency, but food waste remains a major issue. What’s more, being the site of a major hub of food production can be as much curse as blessing. →

Workers pick plants in Colombia, where the average calorie intake of 3,091 calories is marginally higher than the global average.

6,000
calories of food
grown globally
per person per day

2,250
calories of food
needed globally
per person per day

PHOTO: GETTY IMAGES/AFP/ DANIEL MUNOZ

SOURCE: WAR ON WANT



→ That's the finding of a 2022 study on how the global wheat supply chain can impact on hunger. "One might expect that having lots of farm land would help buffer against hunger," says Catherine Brinkley at the University of California, Davis, and one of the authors of the study when it was published. "Yet agriculturally rich areas of the world are often literal battlegrounds for control over resources."

INNOVATING IMPORT-EXPORT

One of the other issues is that often countries that are the breadbaskets of the world have to rely on imports to meet other elements of their need for food. In that instance, they're doubly exposed to the inequalities of the global food network. Not only are they given incredibly low prices for the food they produce, but they're then expected to pay higher prices for the food they have →

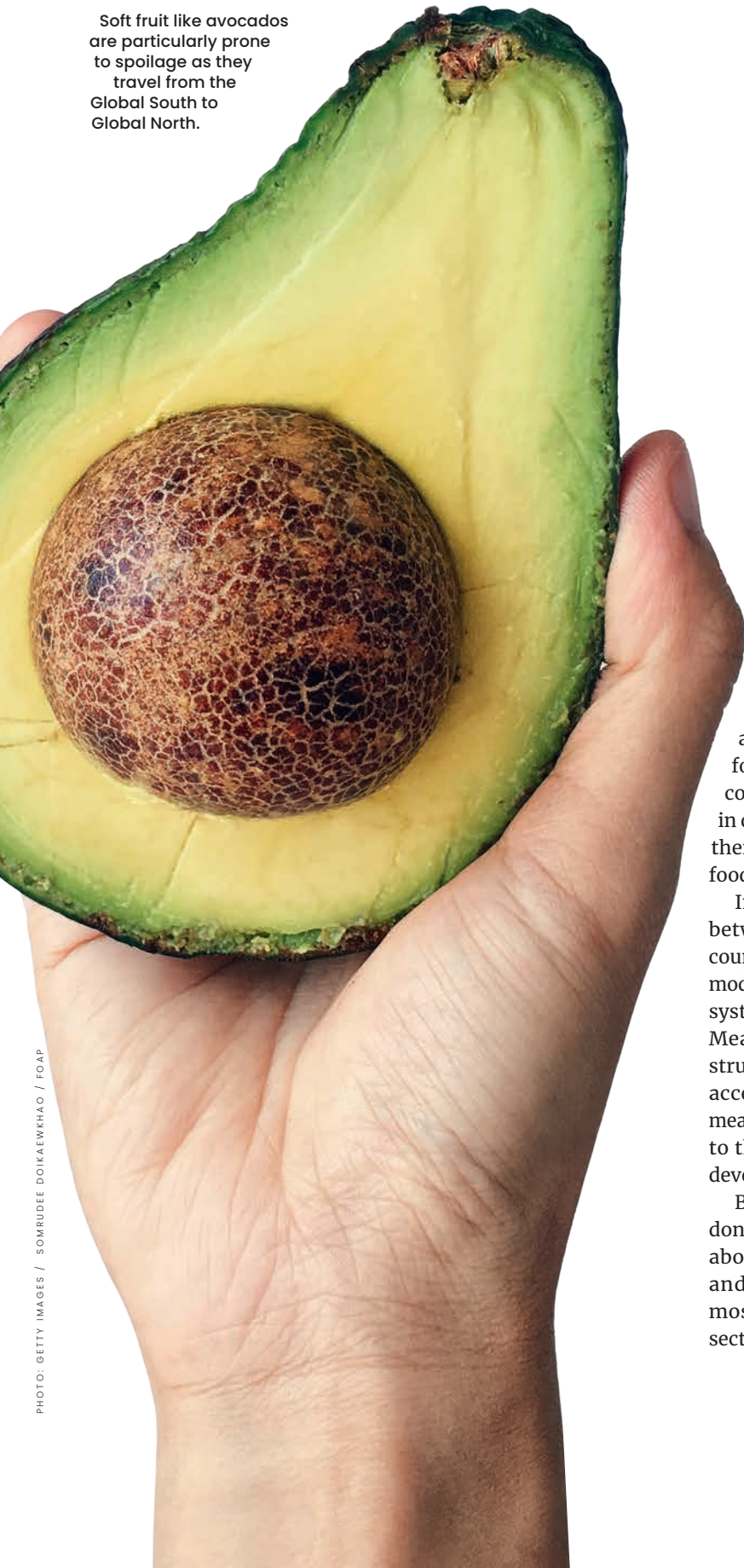
HOW COULD TECH HELP?

Human fruit picking could be supplanted by computer vision-powered precision robots, freeing up farmers to pursue better job opportunities - and improve their life chances.

Workers from a cacao plantation shell fruits in Ambanja, Madagascar.



Soft fruit like avocados are particularly prone to spoilage as they travel from the Global South to Global North.



11%–28%

of the global population can fulfil their demand for specific crops within a 100 kilometer radius.

SOURCE: AALTO UNIVERSITY

→ to import from elsewhere. This double whammy effect can stymie economic growth for countries that need as many chances as possible.

At times the global economic system can seem weighted against the Global South. Subsidies and trade policies in the developed world often protect local farmers while disadvantaging those in poorer countries. Economic benefits in the United States and European Union lower the cost of agricultural products, enabling these nations to export food at prices with which developing countries cannot compete. This imbalance undermines local agriculture in developing regions, where farmers are unable to sell their produce at fair prices, perpetuating poverty and food insecurity.

In technology, the divide in agriculture is also stark between the haves and the have nots. High-income countries benefit from innovations, such as genetically modified crops, precision farming and efficient irrigation systems, which enhance crop yields and reduce losses. Meanwhile, smallholder farmers in poorer nations struggle with traditional farming methods and limited access to fertilizers, quality seeds and pest control measures. This technological gap contributes significantly to the productivity disparity between developed and developing regions.

But a growing recognition that something needs to be done means that change is coming. And conversations about how to correct the global imbalance in trade and food security can help alleviate some of the most egregious issues. As we'll see in our Solutions section later in this report, help is at hand. ■

SECTION 2

THE SOLUTION(S) TO FOOD SECURITY

In all corners of the globe, leading thinkers, politicians and businesses are finding solutions to solve the food security problem.

Plants growing under Red Sea Global's unique greenhouse could augur the future of agriculture.

THE PIONEERING SOLUTION TO FOOD SECURITY

Red Sea Global's tech-enabled attempts to improve food security in the Kingdom of Saudi Arabia could present a model for the rest of the world to follow.

IF YOU COULD THINK OF THE MOST CHALLENGING place on the planet from which to grow a reliable, sustainable source of food, the desert regions of Saudi Arabia would be high on the list. In parts of the country, temperatures can reach up to 48 degrees Celsius in summer. And as climate change continues to wrack the world, Saudi Arabia is an augur of what is to come across the rest of the globe.

The Red Sea destination sits in a challenging environment for agriculture. Characterized by sandy and rocky composition, the soil is challenged by low organic matter, poor structure and erosion.

But those conditions soon won't be solely the preserve of Saudi Arabia. Temperatures around the globe are rising dramatically with climate change, of which there has been a historical nexus in this part of the world by nature of its topography and climate. But now, we're seeing more unusual countries facing these challenges. In short, Saudi Arabia's challenges in the present are the world's challenges in the future – whether in Spain's Iberian Peninsula, Greece, which was hit with wildfires last year, or elsewhere.

“People are starting to wake up to the idea that although they may be somewhat protected by climate change at the moment, in the next few years they will be as affected as Saudi Arabia,” said Professor Derya Baran, Associate Professor, KAUST.

“These are the three major issues affecting farmers in increasingly desert environments, especially in Saudi Arabia: How do we sustainably grow crops in high-heat environments? How do we grow crops where we need to mitigate water use? And how do we do so when water quality increasingly becomes saline?” he added.

A CHANGING CLIMATE

With global temperatures rising due to climate change, more and more regions are facing the same agricultural challenges as Saudi Arabia's desert expanses. The Kingdom is looking to position itself as a pioneer in solving these problems and it's managing to do so →



A staff member monitors plant growth to ensure the maximum possible crop production.



A Saudi farmer picks rice from Al-Ahsa, Saudi Arabia by hand.

→through the work carried out by a Strategic Alliance of national Saudi public and private sector companies.

Along Saudi Arabia's Red Sea coast, an innovative agricultural project offers a glimpse of how to achieve food security. Launched as the National Food Production Initiative, the Strategic Alliance members include Red Sea Global, Iyris, SABIC, NAPCO, Terraaxy, the local farming cooperative TAMALA, Tabuk University and Tamimi Markets. The National Food Production Initiative aims to create a sustainable model for growing food locally.

It's not just for the 300,000 guests expected annually at The Red Sea, or the million a year expected when the tourist destination becomes fully operational at the end of the decade. It's for the wider world.

"Saudi Arabia has an opportunity to make some ground, in terms of its own food security and as a soft power play to ensure that it's passing on its innovations and technologies to other countries that are challenged. It's everywhere from the Caribbean to countries in Asia, China, Europe and Africa. It really is a global problem," →

→ said Richard Kohn, Global Marketing Director and Head of External Relations, iyris.

A GREAT GREENHOUSE

The heart of this food security initiative is a 0.75-hectare greenhouse facility utilizing SecondSky technology that optimizes greenhouse covers, developed by iyris, a KAUST Tech start-up alumni. SecondSky uses nanoparticle additives that block harmful near-infrared heat radiation. These optimized covers are also the most sustainably produced agricultural plastic in the world, having been manufactured by NAPCO, using 100% recycled TRUCIRCLE materials from SABIC.

Along with technologies that have been provided by other Alliance Members – such as Terraxy, another KAUST Tech start-up alumni with their biochar and water evaporation technology – the greenhouse is a fantastic example of homegrown Saudi technologies that are easy to adapt for local farmers. The covers are 100% recyclable. Despite the intense desert conditions, the results from the pilot facility have been impressive.

The farmers utilizing these technologies achieved all the yields that were planned to be produced. They are in the thousands of kilos for tomatoes, and thousands of kilos for cucumbers.

Those numbers are impressive. But that wasn't the point. Given the limited local water resources, the goal was never for Red Sea Global's tourism destinations to achieve self-sufficiency in food production. The issue is not just about how you mitigate against the climate, but how you can enable and empower those farmers to do so in a way that enables them to be profitable. This has been the driving principle for all the companies engaged in this initiative.

Community impact is the goal – to enable local farmers to supply local businesses, stimulating the local economy and drastically cutting down on food miles. That community impact is central to the philosophy behind the initiative, which aims to create economic opportunities that enhance livelihoods locally while minimizing environmental harm.

“What you offer rural farming communities is the future,” said Kohn. “Instead of them thinking that they →

The Second Sky greenhouse plastic developed by Iyris Technology manages to let through the optimal level of sunlight while blocking harmful heat radiation.



“ Two-thirds of our planet is experiencing desertification, causing catastrophic effects on ecosystems, food security, water resources and communities. Without intervention, by 2050, 1.5 million km² of agricultural land will be lost. This initiative demonstrates how we are building resilience in our agricultural sector, combating climate change, and restoring ecosystems in ways that benefit both people and the planet. ”

Raed Albasseet

Group Chief Environment and Sustainability Officer at Red Sea Global



Staff continually check the prime performance of the automated systems involved in the state-of-the-art greenhouse.



The farms developed by Red Sea Global help give back to local farmers, helping them grow.

PHOTO: RED SEA GLOBAL

→ need to think about urban employment opportunities, you offer a future for that rural community to be able to continue.”

Rasha Shawaosh, Senior Director for Social Development, Red Sea Global added: “Our goal is to pioneer regenerative tourism, and that is as much about regeneration for people as it is for the planet. Through this initiative, we have embraced and implemented innovative technologies developed within our nation, to directly benefit local farmers by addressing their cultivation challenges and enhancing their market reach. We are proud to announce the operation of a greenhouse, managed and owned by a local farmer, which now supplies our resorts with high-quality produce. This achievement represents a significant milestone in our commitment to community engagement and food security.”

START LOCAL, GO GLOBAL

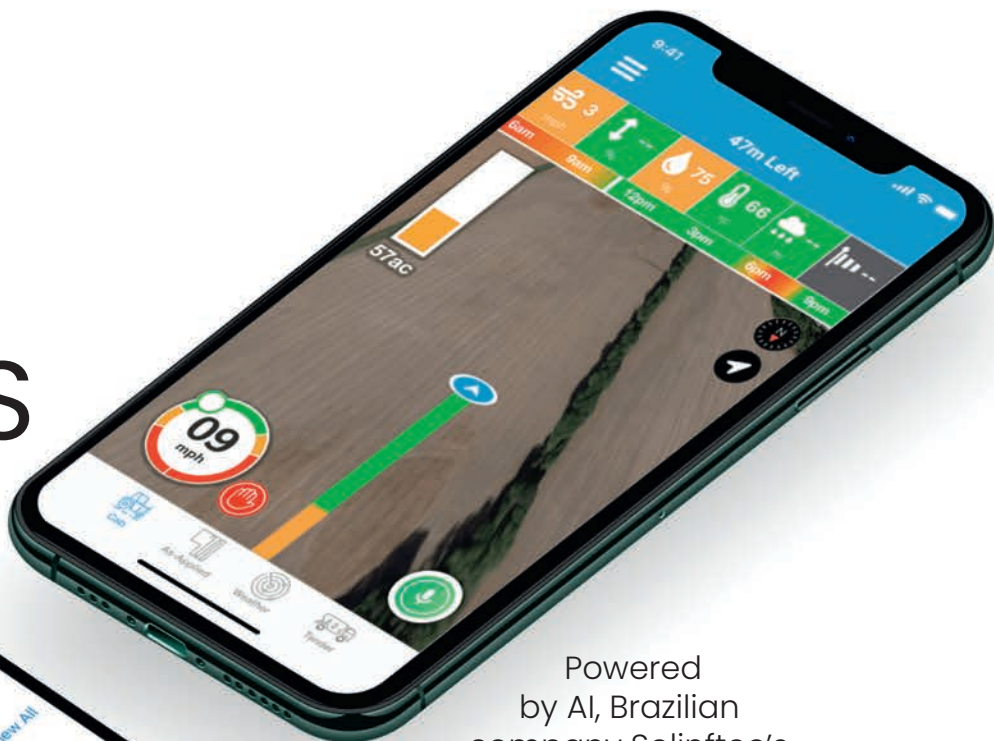
While the percentage of the overall national produce requirements this project supplies may seem small, the implications are enormous if this model is replicated across Saudi Arabia’s agricultural regions and the arid territories of other nations facing similar climate challenges.

For each farmer or farming collaborative can help an area move towards 5% or 6% of the produce being produced locally, and that is multiplied across multiple countries that are in the same situation, the global potential is significant. This is a pilot with great potential and impact. Taken into areas of the country, or regions of different countries, that are more apt for agriculture, the benefit becomes exponential. Saudi Arabia could be primed to share its knowledge with other nations.

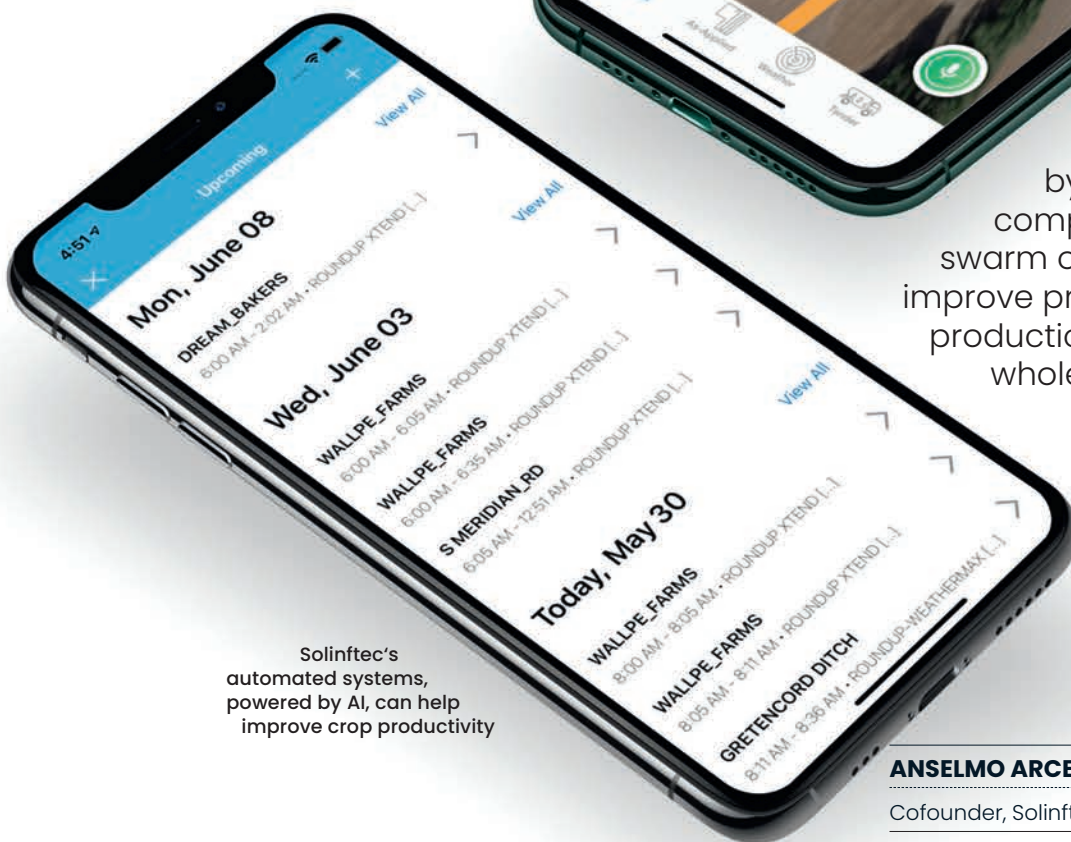
What started as a small pilot near the Red Sea offers a roadmap for the Kingdom to enhance its own food security, while positioning Saudi innovation as part of the global solution to agricultural challenges exacerbated by climate change. And at a time when we’re all struggling to find reliable, regenerative sources of food security, it’s vital.

“It’s an important story, not just from a national consequence perspective, but from a global one,” said Kohn. ■

SEND IN THE ROBOTS



Powered by AI, Brazilian company Solinftec's swarm of robots help improve productivity of food production – benefiting the whole supply chain.



Solinftec's automated systems, powered by AI, can help improve crop productivity

ANSELMO ARCE

Cofounder, Solinftec



→ **TACKLING GLOBAL FOOD INSECURITY AND** environmental challenges is at the heart of Brazilian agtech company Solinftec's approach to farming. Founded in 2007 by Cuban entrepreneurs, the company uses artificial intelligence, machine learning and robotics to create a more sustainable and productive agricultural model.

The company initially focused on the sugarcane industry in Brazil, according to Anselmo Arce, Cofounder, Solinftec, where they now hold a 94% market share. But since then, Solinftec has expanded its focus to major global food crops like soybeans and maize.

"We're fundamentally working with the crops that feed the world," Arce explains. The company's approach to changing how farming works began with data acquisition, installing onboard computers and weather stations in fields to collect real-time information. This data helped form the foundation for Solinftec's AI-driven solutions, which tackle the issues inherent in logistics, traceability and agronomic control.

NATURAL COMPUTING

Solinftec aims to standardize the process of farming, which is traditionally subject to constantly changing →

→ variables like weather, pests and diseases. The vast variability of nature makes traditional automation processes deployed in factories and other areas difficult and necessitates the use of advanced technologies like machine learning and AI to adapt quickly to changing conditions.

Attempts to introduce technology into farming often face a critical problem, said Arce. Most solutions focus on measurement and insight, but fail to make real impact in the field. This is largely due to the economics of operating large, expensive machinery, which limits the ability to intervene at the optimal moment.

To address this issue, Solinftec has developed a robotic platform that can autonomously execute tasks in the field. These robots, designed to “live” in a specific area, serve as field sentinels, continuously monitoring and acting on crop needs.

PROTECT, DEFEND AND PROMOTE

“Our robotics platform is making three functions in the field,” Arce explains. First, it counts and assesses plants individually, monitoring health, pest infestations, and other vital signs. Second, it performs targeted weed control during the day, achieving up to 95% reduction →

Solinftec’s soybean Solix robots harvest crops in a field at a scale previously unimagined.



→ in herbicide use. Finally, at night, it acts as an insect hunter, using light waves to attract and eliminate harmful pests without affecting beneficial insects like bees.

This approach not only reduces chemical use, but also increases crop productivity by up to 15% through limiting plant stress. The continuous presence of these robots in the field allows for 24/7 monitoring and rapid response to changing conditions, which is increasingly crucial as climate change accelerates.

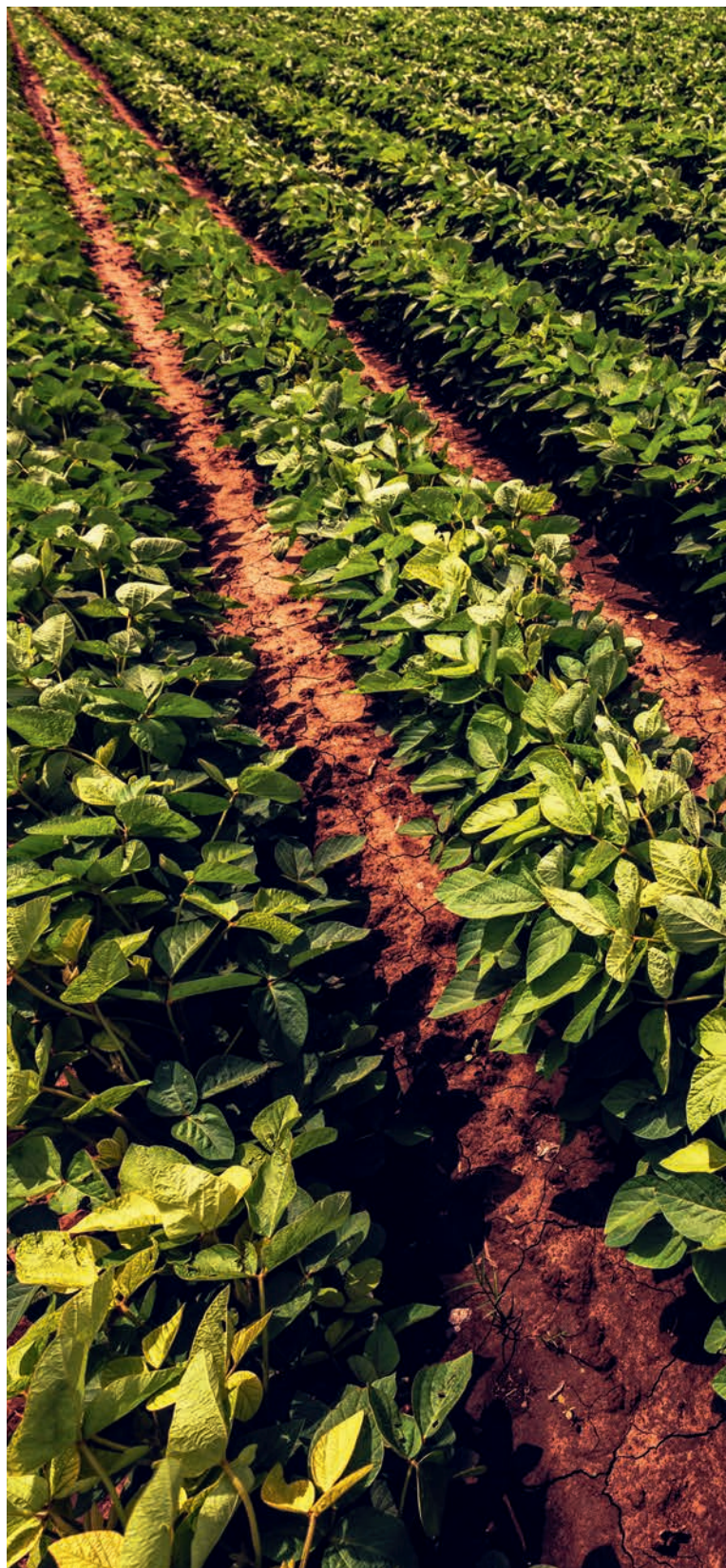
But this technological shift is about more than just simple efficiency. Current large-scale farming practices, reliant on heavy machinery and chemical inputs, have led to soil compaction, ecosystem damage and the marginalization of small-scale farmers. Solinftec's vision is to reverse this trend.

A NEW NORM

“We need to turn the tables on this evil cycle,” Arce said, outlining how, as machines have become larger and more expensive, they've become inaccessible to the small producers who make up the majority of the world's farmers. What's more, the overuse of chemicals has damaged soil health and biodiversity.

Arce envisions a “fourth agricultural revolution” driven by these disruptive technologies. He predicts a shift toward smaller, intelligent, autonomous machines working in coordination. This change could democratize access to advanced farming techniques, making them available to smaller producers and promoting the use of biological products over chemicals.

The implications for global food security are significant. With only 50% of arable land currently in use and the need to increase food production by 30% to 40% to meet future demand, technology will play a crucial role. Solinftec offers a way to increase productivity while reducing environmental impact – a balance that is essential for sustainable food security. “Food security is a problem that has to be solved, and it's a huge challenge,” says Arce. →



Solinftec's systems enable better analysis of how crops grow, including on this organic agricultural plantation.

→ However, he stressed that for these technologies to be widely adopted, the sums have to add up for farmers. “Any solution that you take to agribusiness has to be economically viable for the producer,” he said, adding that environmental benefits should be seen as a valuable “second layer” that could potentially be monetized to further improve adoption.

As climate change and population growth continue to put pressure on global food systems, innovations like those developed by Solinftec offer hope for a more sustainable and productive agricultural future. “What farmers have in their hands does have an impact,” he said. “And this in the end will convert into more productivity for agriculture itself.” ■

“ Food security is a problem that has to be solved, and it’s a huge challenge. ”

Anselmo Arce
Cofounder, Solinftec

Technology like this could become common in the fields of the future.





SECURING FOOD THROUGH TECHNOLOGY

Longstanding issues could be helped through the judicious deployment of technology, experts believe.

Rice transplanters such as these combine AI and 5G technology to improve efficiency.



LOOK AT THE DATA AND THE WORLD IS IN FOR A challenging few decades ahead. Climate change, population growth, and resource scarcity all increasingly threaten global food security. The UN Food and Agriculture Organization says farmers will have to increase food production by 70% in order to feed the global population of 2050.

“We are doing a good job of maintaining food security worldwide,” said Avery Cohn, Senior Partner at Ode. However, doing a good job of maintaining food security now doesn’t mean reassurance will remain for the future. “The problem is it’s not as good as we want it. And we’ve been more or less treading water on food security for a couple of decades,” said Cohn.

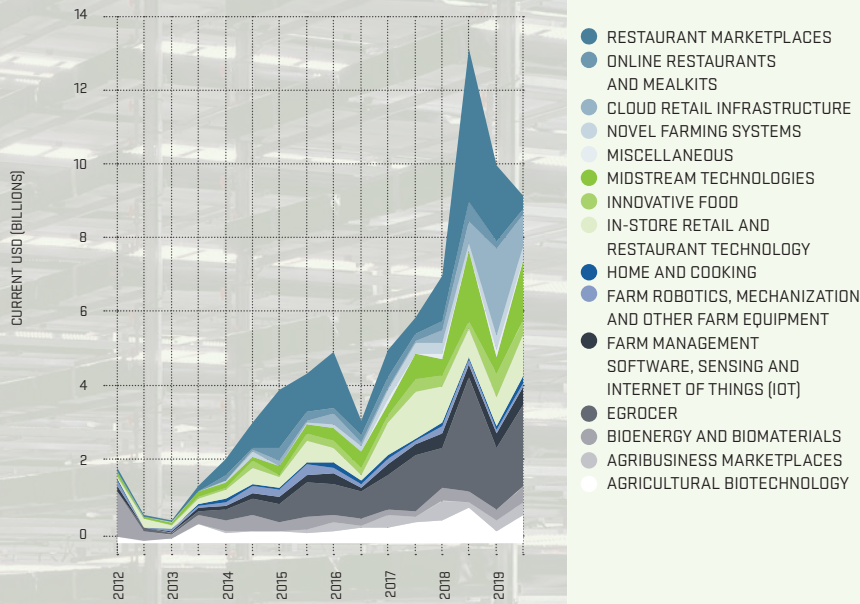
Because of the mismatch in how the causes of food insecurity are increasing, exponentially, but changes to ensure food security remains strong have not, there’s a need to make a significant change. Help is at hand, though. Technology and artificial intelligence (AI) offer promising solutions to enhance agricultural productivity, sustainability and resilience.

IMPROVING PLANNING

AI and related technologies are in the early stages of deployment, with the potential to revolutionize crop planning and management. Leveraging AI to analyze vast datasets, including climate forecasts, soil health and historical crop performance, can help farmers optimize →



GLOBAL VENTURE CAPITAL INVESTMENT IN AGRICULTURE AND FOOD TECHNOLOGY BY CATEGORY



→ planting schedules and crop selection. That maximizes yields and reduces resource usage – vital in a world where climate change is affecting water supplies.

AI-driven soil testing can now deliver real-time results, allowing immediate action to improve soil health and crop outcomes. But it's not just in the planting planning process that action can be taken with the help of tech. Smart farming can help analyze vast volumes of data about water levels, soil nutrients, humidity and heat to better promote good growth of crops, ensuring a more stable and regular source of food for the world.

One company, Agerpoint, uses thousands of laser beams simultaneously pointed at a plant to create a digital twin of

it, so farmers extract knowledge from the sensors rather than the live plant, according to the World Economic Forum.

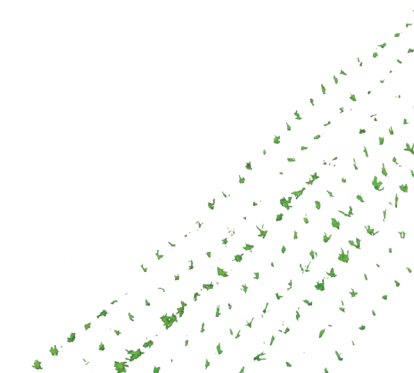
OUT OF THE HANDS OF HUMANS

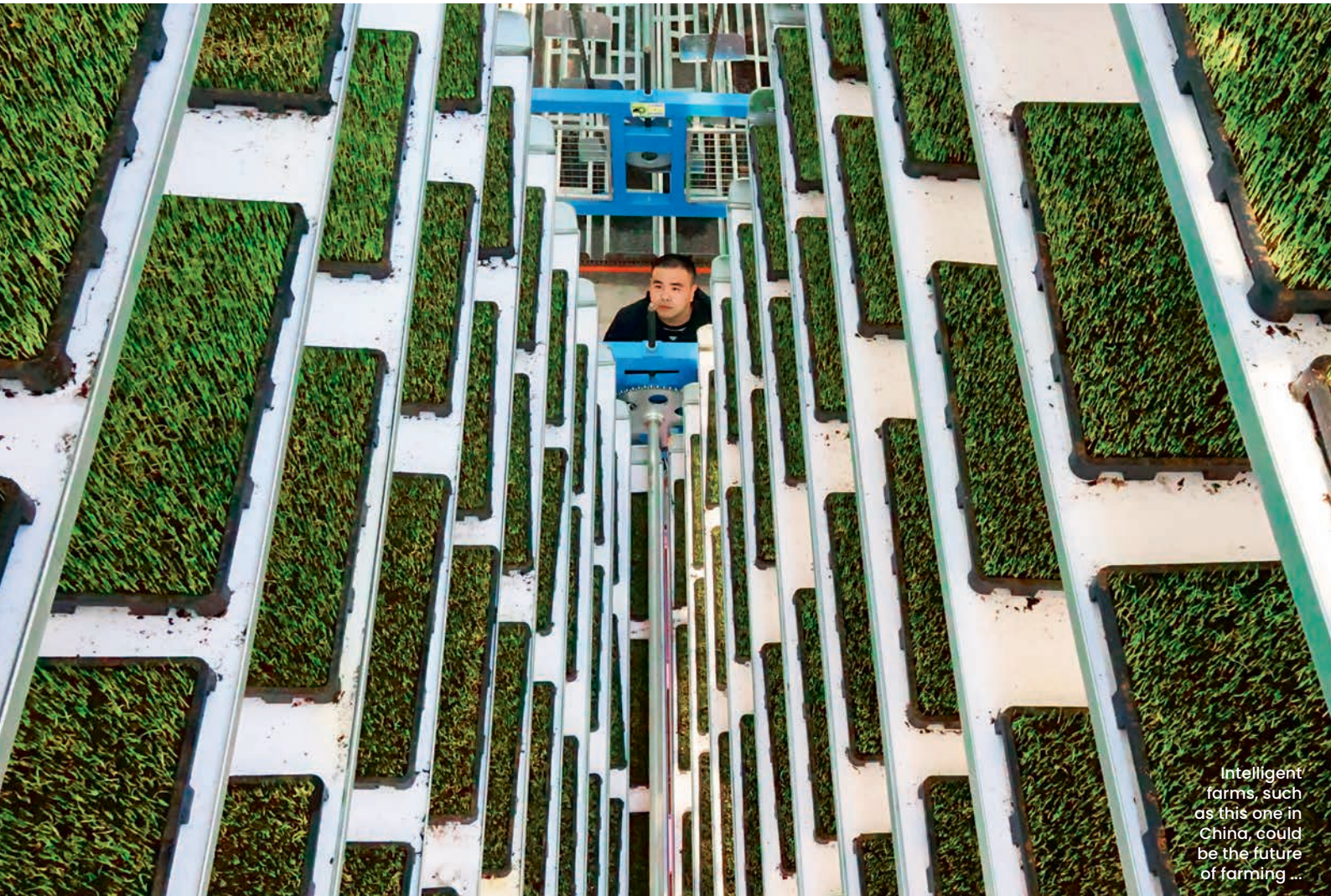
As with many processes, regularizing how a system works is often key to improving its efficiency and output. Robotics also plays an increasingly crucial role in ensuring food security, automating tasks such as planting and weeding, which reduces labor costs and increases operational efficiency.

But beyond harvesting plants, tech can also help give plants a better chance of success in the first place. Gene editing technologies like CRISPR, enhanced by AI, are used to develop crop varieties that are more resilient to pests, diseases and extreme weather conditions. By analyzing complex genetic data, AI helps scientists to →

Robots, like these ones in Denmark, can help automate and improve the speed at which crops are harvested.

PHOTO: GETTY IMAGES/JEFF THIBAUT SAVERY





Intelligent farms, such as this one in China, could be the future of farming ...

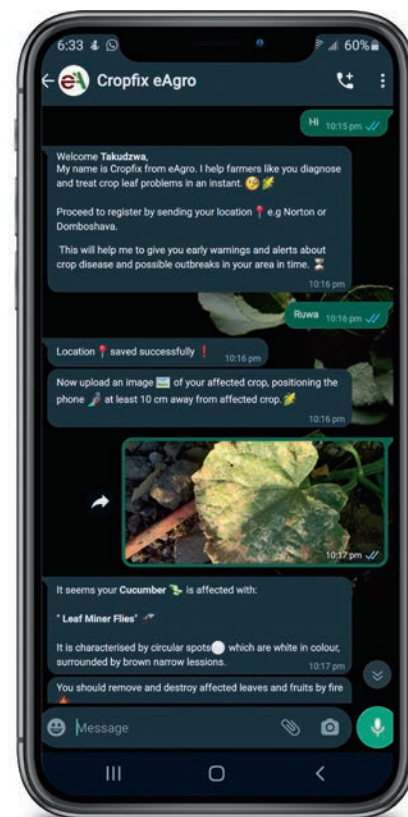
→ accelerate the development of these high-yield, climate-resilient crops.

Companies such as Inari and Cibus – both based in the United States – are at the forefront of using AI to enhance crop yields while minimizing resource inputs. Inari claims its technology can increase crop yield by as much as 20% versus historical increases of just 1% year-on-year, driven by efficiency gains seen by farmers firsthand.

This is particularly crucial as climate change exacerbates challenges like drought and pest infestations. AI models can predict which genetic modifications will produce the best results, significantly speeding up the breeding process and ensuring that new crop varieties are more quickly available to farmers.

SPREADING SUCCESS

One of the biggest hurdles to achieving global food security is adequately supporting smallholder farmers, →



... controlled using apps and WhatsApp integration like this one from eAgro Cropfix.

→ who produce a substantial portion of the world’s food but often lack access to advanced technologies. AI can bridge this gap through affordable, accessible tools. For instance, AI-powered chatbots developed by Nigerian company Agpreneur can provide real-time advice on farming practices, pest control and market trends. These tools are invaluable for farmers in remote areas, offering them the information needed to make informed decisions and improve their yields.

Of course, all farmers know they can’t do their jobs if they don’t have financing, and it’s important that attempts to improve food security look at the entire supply chain, up to and including the point at which farmers set up and run their businesses. Innovative solutions put forward by companies like Viamo, who have developed an AI-powered voice assistant, will help.

The voice assistant can also assist farmers in their local languages, providing guidance on sustainable practices and helping them to apply for government subsidies or loans. This support is crucial in enabling smallholder farmers to adopt more efficient and resilient agricultural practices.

HOW TO MAKE A DIFFERENCE

The successful integration of AI and tech more generally into agriculture requires intense collaboration across sectors. Public-private partnerships and initiatives like the World Economic Forum’s AI for Agriculture Innovation (AI4AI) play a vital role in scaling up these technologies and bringing them to reality.

Collaborations help bring together stakeholders from technology, agriculture, finance and governance to develop and implement solutions that address the complex challenges of food security. But it’s also incumbent on all of us to take action – and to think of the future, not just the present.

“I think we need to be asking ourselves, ‘Where do we want to be on food in 2050? Where do we want to be in 2030?’ when we’re kind of asking, ‘Where is the food system today?’” says Cohn. “We can then ask: ‘What is the gap?’ And then we can begin to ask: ‘What are some of the innovations that could help us to close that gap?’” In the pages that follow, we’ll look at some of those innovative projects in more detail. ■

AI could help analyze the performance of crops like these from INARI to pick better-growing options that result in higher yields.

70%

more food needed to feed the predicted 2050 global population of **9.1 billion**.



BUILDING COMMUNITIES AND FEEDING THE MASSES

An urban growth revolution is helping improve the food chain, thanks to Hong Kong's urban farming start-up Rooftop Republic.

PHOTO BY ROOFTOP REPUBLIC / I.4 IMAGE / XAUME OLLEROS



Rooftop Republic volunteers plant soft leaves in the center of Hong Kong.



PHOTO: ROOFTOP REPUBLIC; MARK TEO



ANDREW TSUI
Rooftop Republic



URBAN FARMING IS MORE THAN JUST A TREND. IT'S

a movement that can reconnect city dwellers with their food and nature – and help bolster food security when done at scale. Andrew Tsui, along with his partners Michelle Hong and Pol Fabrega, are three city natives united by a love for good, sustainably grown food – are the visionary founders of Rooftop Republic, which since 2015 has transformed underutilized urban spaces into flourishing edible oases.

Rooftop Republic was born from a shared frustration with the growing disconnect between urban residents and their food. Tsui became convinced that growing your own food helps to build a deeper relationship with what you consume. This conviction drove Tsui and his cofounders to transform Hong Kong’s unused rooftop spaces into urban farms. Research revealed that Hong Kong boasts 6 million square meters of rooftop space, yet less than 1% was being utilized for farming.

Armed with this knowledge and their savings, the trio launched Rooftop Republic. They believed that if urban farming could succeed in Hong Kong’s dense, fast-paced environment, it could work anywhere. Their mission was clear: to reconnect city dwellers with their food, promote sustainable living and transform the urban landscape.

CHANGING SPACES AND MINDS

Since its founding, Rooftop Republic has achieved remarkable milestones. The organization has built more than 80 urban farms in Hong Kong and beyond, utilizing spaces such as skyscraper rooftops, shopping mall free space and public terraces. In all, approximately 8,200 square meters of underutilized urban areas have been transformed into productive green spaces. →

Reclaiming dead urban space and putting it to use to produce food is Rooftop Republic’s aim.



Reducing food miles helps raise awareness of supply chains and brings people closer to the food they eat.

→ That's in collaboration with more than 20 organic farmers, with a future pipeline of farmers firmed up thanks to the Rooftop Republic Academy, which will nurture the next generation of urban farmers.

These achievements underscore the enormous demand for greater connection with food and nature. "We're creating this place where city dwellers can learn about food and reengage and reestablish that relationship with food," Tsui said. For him, urban farming is not just about producing food; it's about fostering community, education and environmental stewardship.

MAKE IT HERE, MAKE IT ANYWHERE

It's also about making sure that food supply works in a world that is changing rapidly. Urbanization is a key trend on our planet, with 55% of the world's populace forecast to live in cities by 2050, according to the United Nations. That means that we need to be able to grow food closer to the population. "Populations are going to live in cities," said Tsui. And places like Hong Kong import up to 90% of their food, racking up air miles, extracting from other countries, and running the risk of major disruption if supply chains are hit.

Urban farming in a city like Hong Kong comes with its challenges, Tsui admits. "The biggest pain point is the

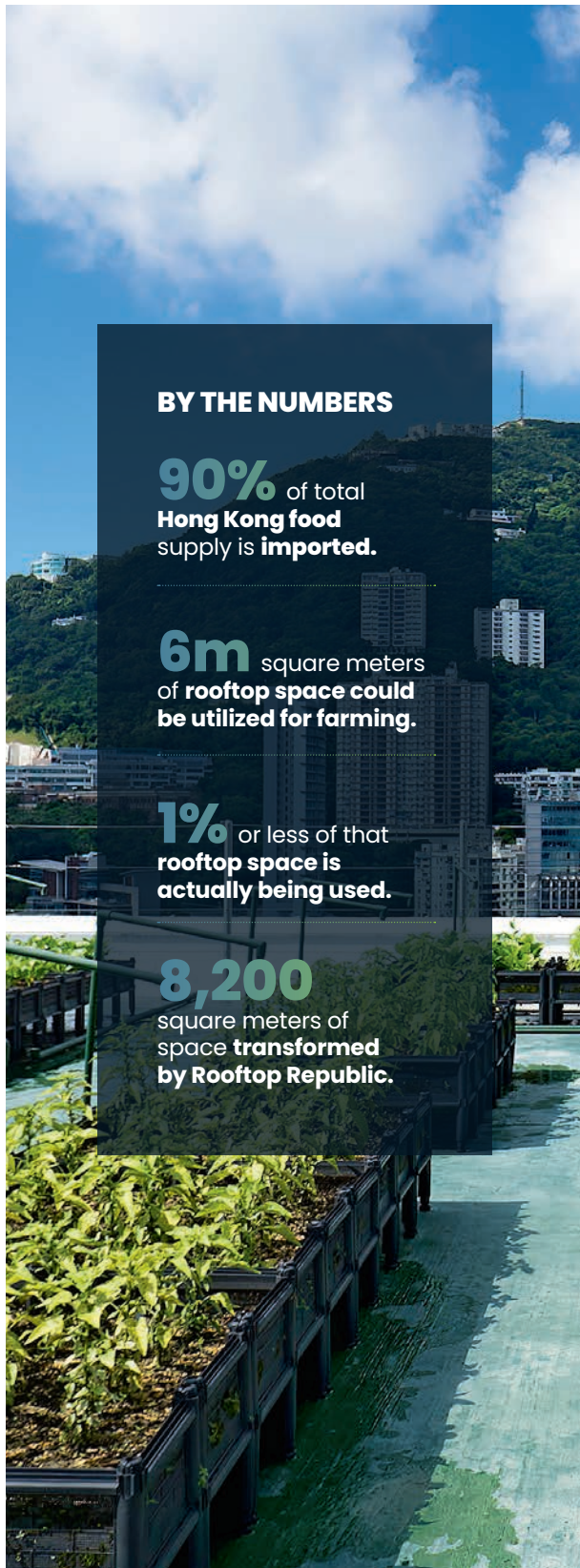
knowledge gap and industry gap," he says. The concept of "cosmetic green" often dominates, where greenery is added for appearance rather than meaningfully integrated into the urban ecosystem – and not used to produce food.

Rooftop Republic aims to change this by making urban farming a professional service rather than a hobby. They grow over 60 varieties of vegetables on skyscrapers, proving that it's possible to farm even at 300 meters up in the air. "We need to raise the game by designing a professional service around growing," Tsui said.

SIZING UP THE PROBLEM

Rooftop Republic's projects vary in size, with the largest being 1,100 square meters in Guangzhou, China. In Hong Kong, typical projects are around 100 square meters, but they are expanding with plans for a 460 square meter flagship project that will open in Q4 2024. These farms serve as proof of concept, demonstrating that urban farming can be scalable and impactful.

Urban farming also addresses critical issues of food security and resilience. Tsui highlights the broken relationship between consumers and food as a fundamental problem. "Some 30% to 40% of food being produced today at a global level is being wasted," he says. Tackling that is a major requirement if we're to fix the →



BY THE NUMBERS

90% of total
Hong Kong food
supply is **imported**.

6m square meters
of **rooftop space**
could
be utilized for farming.

1% or less of that
rooftop space
is
actually being used.

8,200
square meters of
space **transformed**
by Rooftop Republic.

PHOTO: SARAH THROWER/ROOFTOP REPUBLIC

→ food security issue. So the hope is that by reconnecting people with the food production process, urban farming helps reduce waste and improve food distribution.

One of the core aspects of Rooftop Republic's mission is education. They organize numerous events to engage the community and teach sustainable living practices. These activities not only promote awareness but also inspire a new generation of urban farmers. "We're not just transforming spaces; we're transforming mindsets," Tsui says.

LEARNING NEW SKILLS

The Rooftop Republic Academy plays a crucial role in this effort. By training individuals how to tend crops, they create opportunities and foster a deeper connection to nature. This approach helps build a resilient urban food system that involves the community at every level.

Technology is integral to Rooftop Republic's projects. From data collection on climate conditions to organic soil health, technology helps optimize farming practices and measure environmental impact. "We are experimenting with data, installing climate data collection points on rooftops," Tsui explains. This data-driven approach enhances the effectiveness of urban farms and supports ongoing research and innovation.

Rooftop Republic's vision extends beyond individual buildings to city-wide transformation. Tsui formed the non-profit Farm the City to support global urban farming initiatives. Farm the City is an organization committed to advancing sustainability education and social transformation in Hong Kong and beyond. "This is not just a Hong Kong issue, right? This is not a Singapore issue. This is a global city, or metropolitan city, issue." The goal is to "invite more friends, collaborators, partners from all over the world to work together," Tsui explains, to create a resilient urban food system through global collaboration and innovation.

Rooftop Republic remains committed to its mission of reconnecting people with their food and with nature. They have pioneered the urban farming movement in Hong Kong, but their journey is far from over. "We're trying to build a circular system model," he says. "Then you have a resilient urban food system." ■

Reducing food waste, 30%–40% occurs in the journey from farm to fork, is Tsui's goal.

SHOWING ACTIONS SPEAK LOUDER THAN WORDS

Two experts helped FII Institute's global community come up with resolutions to help solve the issue of food insecurity at FII PRIORITY Rio de Janeiro.

As the world grapples with the dual challenges of feeding a growing population and combating climate change, a radical reimagining of our approach to food security is needed. And at FII PRIORITY Rio de Janeiro, held June 11-13, a special conclave was held to discuss solutions to the issue.

The conclave was led by Marcos Jank, Senior Professor, INSPER Agro Global University, and Avery Cohn, Senior Partner, Ode, who believe that a combination of technological innovation, increased investment, and global cooperation could hold the key to solving this complex issue.

"We've been more or less treading water on food security for a couple of decades," Cohn explained in an interview ahead of FII PRIORITY Rio de Janeiro. This stagnation, coupled with the looming threats of climate change and rising protectionism, painted a concerning picture for the future of global food security.

The scale of the challenge is immense. According to Cohn, current estimates from non-profit research group the Climate Policy Initiative suggest that we are investing only about one-thirtieth of what's necessary to align the food and agricultural system with climate goals. This massive shortfall in funding is compounded by the fact that nearly one billion people are currently food insecure, primarily in the Global South.

HELP IS AT HAND

But Cohn sees reason for hope in the potential of emerging technologies, particularly artificial intelligence (AI). "I think the basket of AI technologies is super helpful," he said, "whether it's helping people do what they're already doing better, or helping people do far more of stuff that is already good." For that reason, AI – alongside infotech – was seen at FII PRIORITY Rio de Janeiro's food security conclave as one of the key factors that can positively impact food security around the world.

This technology has the potential to revolutionize agriculture, from crop monitoring and early warning systems for pests and diseases to optimizing supply chain finance and identifying the best areas for production. For smallholder farmers in emerging markets, who often lack access to advanced agricultural technologies, such innovations could be particularly transformative.

However, Cohn is quick to point out that technology alone is not a panacea. "We need to figure out how to build scalable solutions that can eventually attract the kind of capital necessary to make a difference in the space," he said. This involves addressing key challenges around data accessibility, financing and aligning incentives among various stakeholders in the food system.

One approach advocated by Cohn is focusing on "win-win-win" innovations that simultaneously benefit food security, livelihoods, climate and nature. "I

would basically ask the question in almost every case, is it win-win-win? Witness nature, solves climate, resilience? If yes, focus on it. If not, it might not be the highest priority right now.”

Cohn also emphasizes the need for creative financing solutions to mobilize investment in the sector. “If there’s some way to begin to get some of the needs that smallholders have met by investments in software built for them, but that have software-style returns, I think that that can be really important and exciting,” he said. This approach could help bridge the gap between the high-risk, low-return profile of many agricultural investments and the more attractive returns typically associated with software investments.

Public-private coalitions could play a crucial role in driving innovation and adoption of beneficial practices. “It’s this idea of having a concerted push designed from the beginning to try to solve for the combination of business value and social good. It’s really what I think we need,” Cohn explained. Such collaborations could help align the interests of various stakeholders and create the necessary momentum for large-scale change.

While much of the focus in food security discussions is on caloric intake, Cohn points out that nutrition security is an even bigger challenge. “When we look at nutrition security, not just are we getting enough calories, but are we getting the nutrients we need to be healthy. That’s an even more dire picture,” he explained. This highlights the need for a more holistic approach to food security that considers not just quantity, but quality of food as well.

One area Cohn believes is underexplored is the potential to learn from and scale up the practices of the world’s most successful farmers. “I’ve been wondering whether we’re doing enough to understand, connect, showcase and scale up the wisdom of the world’s leading farmers,” he mused. Identifying and disseminating best practices could help accelerate the global adoption of more sustainable and productive farming methods.

GAZING INTO THE CRYSTAL BALL

Looking to the future, Cohn sees a need for the food and agriculture sector to adopt a more goal-oriented approach, similar to what has been seen in the climate community. “In the food space, we’re not quite there yet ... we need to do some reimagining. I think it is hard to imagine kind of bold, collective action without people even talking about what it is we’re trying to do.”

This call for clear goal-setting and alignment underscores the need for a coordinated global effort to address food security. Just as the world has rallied around specific targets for reducing greenhouse gas emissions, Cohn suggests that similar concrete goals for food security could help focus efforts and drive progress. The resolutions from FII PRIORITY Rio de Janeiro helped provide those goals to pursue.

But time is of the essence. As Cohn’s comments make clear, the current level of investment and action is far from sufficient to meet the challenges ahead. It will take a concerted effort from governments, businesses, farmers and consumers worldwide to transform our food systems and ensure sustainable food security for all. The path forward is not easy, but as Cohn explained, there are reasons for optimism. With the right combination of innovation, investment and cooperation, we have the potential to create a future where no one goes hungry, where agriculture works in harmony with nature, and where our food systems are resilient in the face of a changing climate. The challenge now is to turn this potential into reality.



Tech tweaks can turn this handful of beans from Benson Hill into enough to feed a community.

TECH'S BLUE SKY THINKING

How to revolutionize food security using AI and emerging technologies.



IN THE QUEST TO SOLVE THE GLOBAL FOOD

security challenges we're facing, cutting-edge technologies that promise to transform agriculture and food systems will likely play a role. From AI-powered satellite imaging to gene editing and vertical farming, these solutions could bring us to a future where food scarcity could become a thing of the past.

One of the most promising technologies in this space is Clay, an AI and data visualization platform that boasts the largest open-source Earth observation model out there. Clay leverages AI and foundation models trained →

→ on satellite and geographic data to provide crucial insights for agriculture. “Clay basically is trying to pick up where Google Maps leaves off,” says Avery Cohn, Senior Partner at Ode, which has backed Clay. Clay then creates a foundation model of all of the parts of the map that aren’t well detailed.

The technology has far-reaching implications. It’s possible to imagine a world where farmers in remote areas can access real-time data about their crops, soil conditions and potential threats like pests or diseases. Clay’s AI models could analyze vast amounts of satellite imagery and environmental data to provide early warnings of those crop failures, optimize irrigation schedules, and even predict yields with accuracy that would allow supply chains to be better forecast.

BEING BETTER BY DOING

But Clay is just the tip of the iceberg. Other companies and research institutions are developing more technologies that could help revolutionize food production. These blue-sky thinking innovations include CRISPR technology, pioneered by companies like Corteva Agriscience and Benson Hill, that can develop crops more resistant to pests, diseases and climate change. These genetically optimized plants could thrive in harsh conditions, potentially expanding arable land and increasing yields.

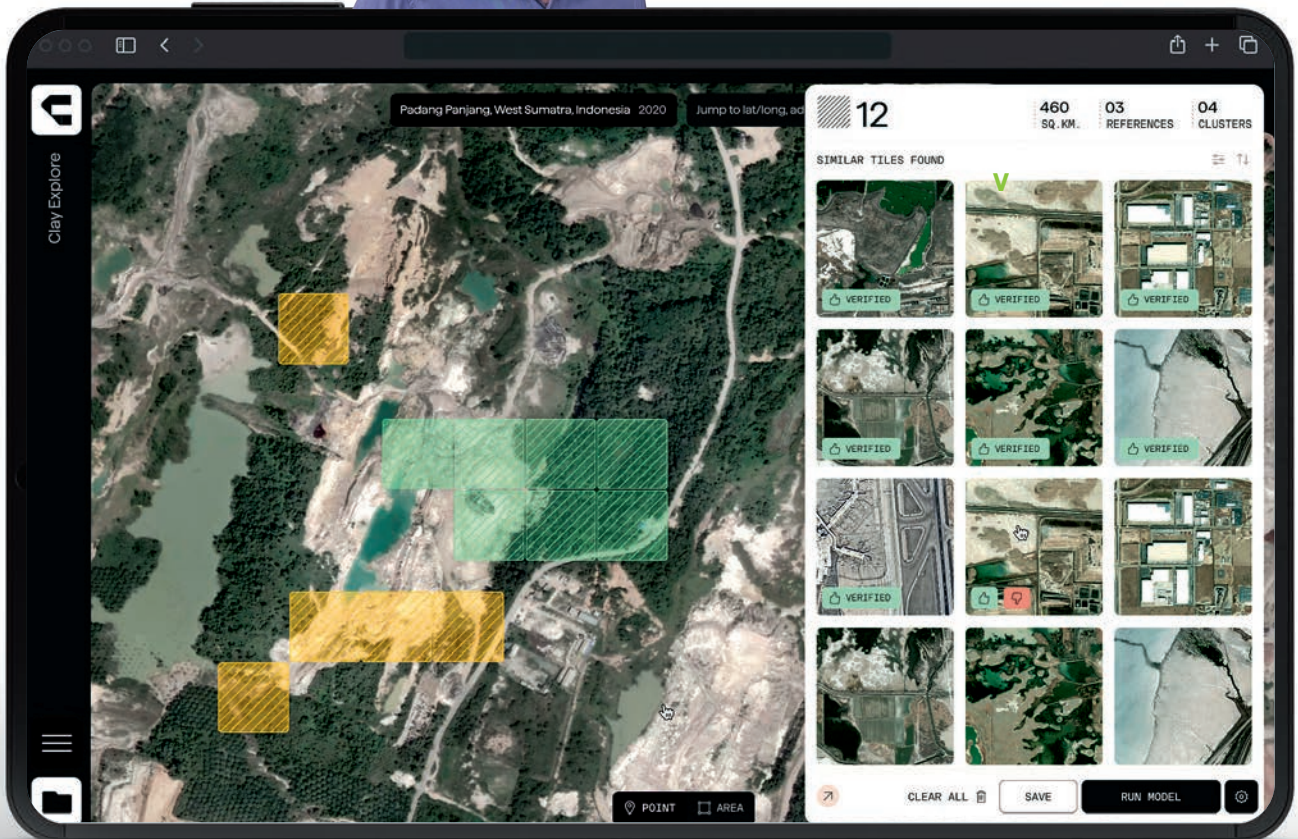
Vertical farming also holds potential, with firms such as AeroFarms and Plenty perfecting indoor farming techniques using LED lighting and hydroponic systems to grow crops in vertically stacked layers. This approach could bring fresh produce closer to urban centers, →

AVERY COHN

Senior Partner, Ode



Clay’s AI overview can empower farmers to make the most of their land using a simple tablet app.



→ reducing transportation costs and emissions – similar to the way Rooftop Republic in Asia (see page 41) is helping reduce food miles.

On the ground, changes are also being made. John Deere and other agricultural equipment manufacturers are developing AI-powered tractors and drones that can plant, water and harvest crops more accurately, reducing waste and maximizing yields.

But beyond that, there are innovations happening in labs, too. Memphis Meats and Mosa Meat are working on lab-grown meat alternatives that could provide protein-rich food without the environmental impact of traditional livestock farming.

AN UNEQUAL CHANGE?

While these technologies hold huge promise, key questions about access and equity remain. Many developments are being proposed by private companies in advanced countries, raising concerns about who will ultimately benefit from them. What’s more, the majority of innovations in the tech sector come from places like Silicon Valley, home to the super-rich. The products they develop are often ignorant of the challenges faced by those who encounter the issues on the ground in less developed parts of the world.

Cohn acknowledged this challenge: “We need to figure out how to build scalable solutions that can eventually attract the kind of capital necessary to make a difference in the space,” he said. This means not only developing the technologies, but also creating business models and distribution channels that make them accessible to smallholder farmers in developing countries.

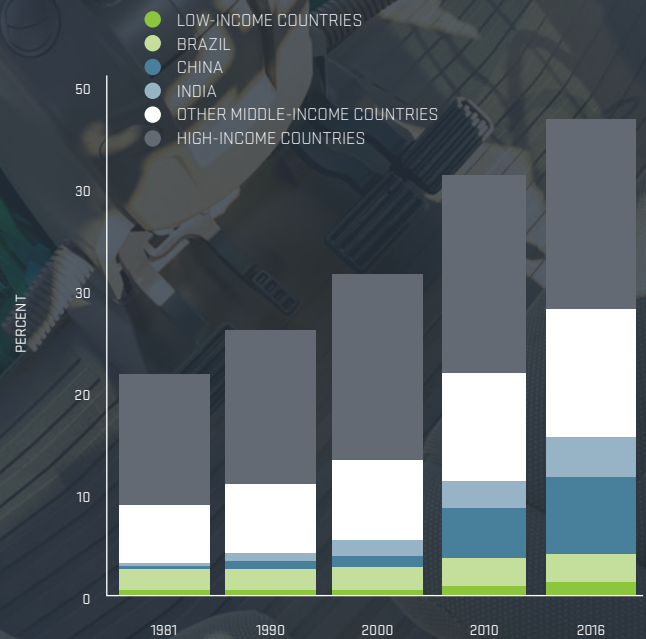
One potential solution? “There’s a key role for the private sector to play,” Cohn said. “There are strong synergies between the public and private sectors on delivering on our food security goals.” Some organizations, like the Bill & Melinda Gates Foundation, are already working to bridge this gap, funding projects that adapt advanced agricultural technologies for use in developing countries. Similarly, initiatives like the CGIAR (Consultative Group on International Agricultural Research) are working to ensure that cutting-edge agricultural research benefits smallholder farmers worldwide. The United Nations Food and Agriculture Organization (FAO) is also playing a role in promoting the equitable distribution of these technologies.

But more can always be done. “We’re not quite there yet,” said Cohn. “It’s starting to happen. There’s some promising initiatives. But I think it is hard to imagine bold, collective action without people even talking about what it’s trying to do.”



Computer vision technology, such as in this John Deere tractor, can help automate production.

AGRICULTURAL RESEARCH SPENDING BY INCOME GROUP AND SELECTED COUNTRIES



HOW FII INSTITUTE IS FUNDING A MORE FOOD-SECURE FUTURE

Big changes require big action – and putting your money where your mouth is – both of which FII institute are willing to do.

SIMPLY SPEAKING ABOUT THE NEED FOR CHANGE isn't enough. Doing it is important. That's the only way to affect change when it comes to so significant a problem as food insecurity. That's why one of FII Institute's three pillars is called ACT, its investment

arm. And it chooses to act to support innovative projects to move beyond their research stage into action. FII Institute supports a number of tech-enabled innovations designed to improve food security worldwide and alleviate the challenges facing our planet. ■

DOGTOOTH TECHNOLOGIES

Dogtooth Technologies is a Cambridge-based technology start-up that sells smart robots for harvesting soft fruits such as strawberries and raspberries.

SEAFOOD SOUQ

Creating a digital ecosystem for global seafood trade to bring transparency, traceability and sustainability to the industry, SeaFood Souq has seen trading volumes jump 636% year-on-year.

PLANT SQUAD

Plant Squad is the leading light in the alternative proteins sector for emerging Latin American markets. The company offers a wide range of plant-based proteins with authentic flavors and healthier formulations. Plant Squad provides affordable, healthier meal alternatives formulated for Latinx tastes.

INTERSTELLAR LAB

Interstellar Lab develops environment-controlled pods for crop cultivation on Earth and life support in space. It is a recent winner of a prestigious NASA competition, the Deep Tech Food Challenge, and is completing a seed round that would see its valuation increase. Its first product, the Biopod, has been purchased by L'Oreal and Robertet, a leading natural ingredients corporation.

REDSEA FARMS

Revolutionary saltwater greenhouse innovators RedSea Farms is aggressively bringing to market its core technologies, and booked revenues of \$6 million+ in 2023, more than a 500% increase over 2022. The company has closed its Series A round with a post-money valuation of \$92 million, led by EIF, a well-regarded Silicon Valley-based venture capital firm.

IYRIS

Iyris is a world-leading, sustainable agri-climate tech company advancing commercial farming for low- to mid-tech farmers in hot climates. Its goal is a noble one: to help feed the world sustainably. Its patented, proprietary technologies reduce water and energy consumption by up to 90%.

TAKEAWAYS

Key questions to answer when thinking about tackling the challenge of food security – and how AI and tech can help.



FOOD INSECURITY HAS BEEN A MAJOR CHALLENGE

for large swathes of the world for decades, if not centuries. And the unique challenges we face in the years to come could exacerbate it even further. But as we've explained throughout this report, there are opportunities to make a meaningful difference to the global issue. It just requires asking the right questions – and considering the correct answers. ■

Drones like this one hovering over a Kenyan tea farm can help with tasks like spreading fertilizer.



WHAT CAN YOU DO?

- 1** Be the change you believe in. Action needs to be taken by us all to redress the imbalances in food security around the world.
- 2** Bridge the digital divide, taking advantage of the opportunities tech provides to find solutions, but ensure benefits are felt in the Global South as well as Global North.
- 3** Consider the environmental impact of any options you adopt to shore up food security around the world.
- 4** Improve access to financing for those who want to take advantage of the available tech innovations, but can't afford them.
- 5** Connect local producers with consumers, and cut down on middle men that limit access to affordable, nutritious food.



WHAT DO YOU NEED TO BE AWARE OF?

- 1** Be aware that this is a global issue, but is felt unequally across the world – and so ought to be considered holistically.
- 2** Recognize that what may benefit one part of the world could disadvantage other parts.
- 3** Supply chains can be brittle, as evidenced by disruptions in recent history. Ensuring more reliable supplies of food is vital for our future.
- 4** This is not a food problem alone. Malnutrition has knock-on effects on everything from educational attainment to population-level productivity.
- 5** Not doing anything is not an option. Collaboration is key to ensuring we reach a more just world – with the help of AI and technology.



HOW TECH CAN HELP SOLVE FOOD INSECURITY



AI HAS HAD A TRANSFORMATIVE

effect on many parts of our lives to date. And it looks likely to help in the fight against global hunger, brought about by a worldwide lack of food security. AI and cutting-edge technologies are revolutionizing agriculture, food distribution and resource management, offering hope of a future where no one goes hungry.

It will take time, but already we are seeing green shoots of growth where tech can help improve the reliability and growth of crops at scale, unlock efficiencies that help farmers enter the industry who otherwise would be locked out, and improve the routing of vessels carrying the precious cargo around the world to reduce wastage.

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is guided in all it does by a strong purpose, vision and mission.



PURPOSE

“Enabling a brighter future for humanity”



VISION

“Bringing together the brightest minds and most promising solutions to serve humanity”



MISSION

“Creating a purposeful present, promising future”

AI is linking up with other technologies, including drones, robotics and blockchain tech to help supercharge its impact on our food systems – as we have highlighted in this report using specific examples. As these technologies continue to evolve, they hold the promise of creating a more resilient and equitable global food system. However, ensuring widespread adoption and addressing the digital divide remain crucial challenges in harnessing the full potential of tech and AI to combat food insecurity worldwide.

The FII Institute community is a global one, representing the whole of our planet. And as such, it’s important that any change is felt equally – and benefits us all.

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**FII-I has three pillars to deliver its mission:
THINK, ACT and XCHANGE**



1 FII-I THINK

Identify societal challenges and current inhibitors. Curate the brightest ideas to address societal issues



2 FII-I ACT

Catalyze innovation and initiatives by mobilizing partners and resources



3 FII-I XCHANGE

Create platforms for live discussions on the future of humanity. Share knowledge, stories and publications with different stakeholders

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3884 Alakheel
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CONTACT

For clarifications and inquiries, kindly email: info@fii-institute.org

EDITOR

Chris Stokel-Walker

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