



Why **Now**

AN OPENING STATEMENT ON OUR IMPACT
2022 REPORT

Lisa, Former National FFA President, on her farm in Osage, IA.

We need a way to grow that **sustains our way of life**

BY LISA P., THIRD-GENERATION FARMER

Growers raise food for the world—and that’s a big calling. One of the most important lessons we teach our kids on the farm is that, in order to meet that calling, we have to care for other people and care for the environment.

Feeding the world comes with a responsibility to take better care of the soil, the land, and our crop every year. But “better” is easier said than done when growers are at the mercy of so many variables. Farmers have to manage changing costs, unpredictable weather, and a spectrum of delicate decisions—like how much fertilizer to apply. Too much costs us; too little means our crops don’t reach their full potential.

And the reality is that only 30-60% of the synthetic nitrogen fertilizer we pay for actually gets to our crop¹. When we lose fertilizer from the field, it hurts our crops, our bottom line, and our future. If we don’t take care of our land, it doesn’t take care of us; and to pass on healthy farms to the next generation, we have to adapt.

For me, that means incorporating a new kind of nitrogen from a microbe that doesn’t run off. One that consistently fixes nitrogen for my crop so I can run a sustainable operation, cultivate a healthy farm, and raise food for my family, our neighbors, and the world.



The first word on this topic belongs to growers.

No one understands the complex variables that go into a successful, sustainable agricultural operation like growers do. We’re at an inflection point, with an innovation that produces nitrogen on-demand for crops in a way that’s better for farmers, our natural resources, and the entire planet.

KARSTEN TEMME, CEO & CO-FOUNDER

The world's nitrogen demands are increasing. And we need a better way to meet them — for growers and the planet.

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WHAT THE FUTURE HOLDS

Nitrogen fertilizer is a global issue that demands attention.

Nearly half of meals eaten around the world are made possible by synthetic fertilizer². At the same time, the production and use of synthetic nitrogen fertilizer contributes 1.31 gigatons³ of greenhouse gas annually—one of the few industries significant enough to show up individually.

We require agricultural nitrogen inputs to sustain our ways of life—we can't just get rid of it. We must replace it, thoughtfully, with a solution that empowers growers to feed the world and protect the planet.

52.4 GIGATONS

ANNUAL GLOBAL GREENHOUSE EMISSIONS⁵

11.9%

ROAD TRANSPORTATION

7.2%

IRON + STEEL

2.5%

NITROGEN FERTILIZER⁴

1.9%

AVIATION

1.7%

MARITIME

CHART DATA SOURCE⁶



Nitrogen: the tiny element with massive influence

BY DR. DAVID KANTER, ASSOCIATE PROFESSOR OF ENVIRONMENTAL STUDIES, NEW YORK UNIVERSITY



I study nitrogen pollution, which results from oversupplying fertilizer to agricultural land. It's a complex challenge, because we can't simply stop using nitrogen. Plants will always need it, and without nitrogen, we'd have no life on this planet at all. It fuels photosynthesis; it's in the basic structure of DNA and proteins. But more than 99% of nitrogen exists in a form that's unusable to plants and animals—and when we developed the Haber-Bosch process to solve this problem, it opened the door to others.

Synthetic fertilizer production accounts for about 2% of the world's total energy use and 1% of its CO₂ emissions. We can't do without nitrogen, but the way it's produced and applied now poses an

environmental challenge. The question at the heart of the nitrogen opportunity is: How do we keep the world fed without sacrificing the health of our planet?

Nitrogen pollution is one of the most critical environmental challenges because it factors into so many areas: air pollution, water pollution, biodiversity loss, ozone layer depletion, human health. The glass-half-empty view is that nitrogen makes all of these problems worse.

The glass-half-full view is that if we better manage our relationship with nitrogen—if we get it to our crops in a less energy-and-emissions intensive way that produces less run-off—our potential for positive impact is far-reaching.

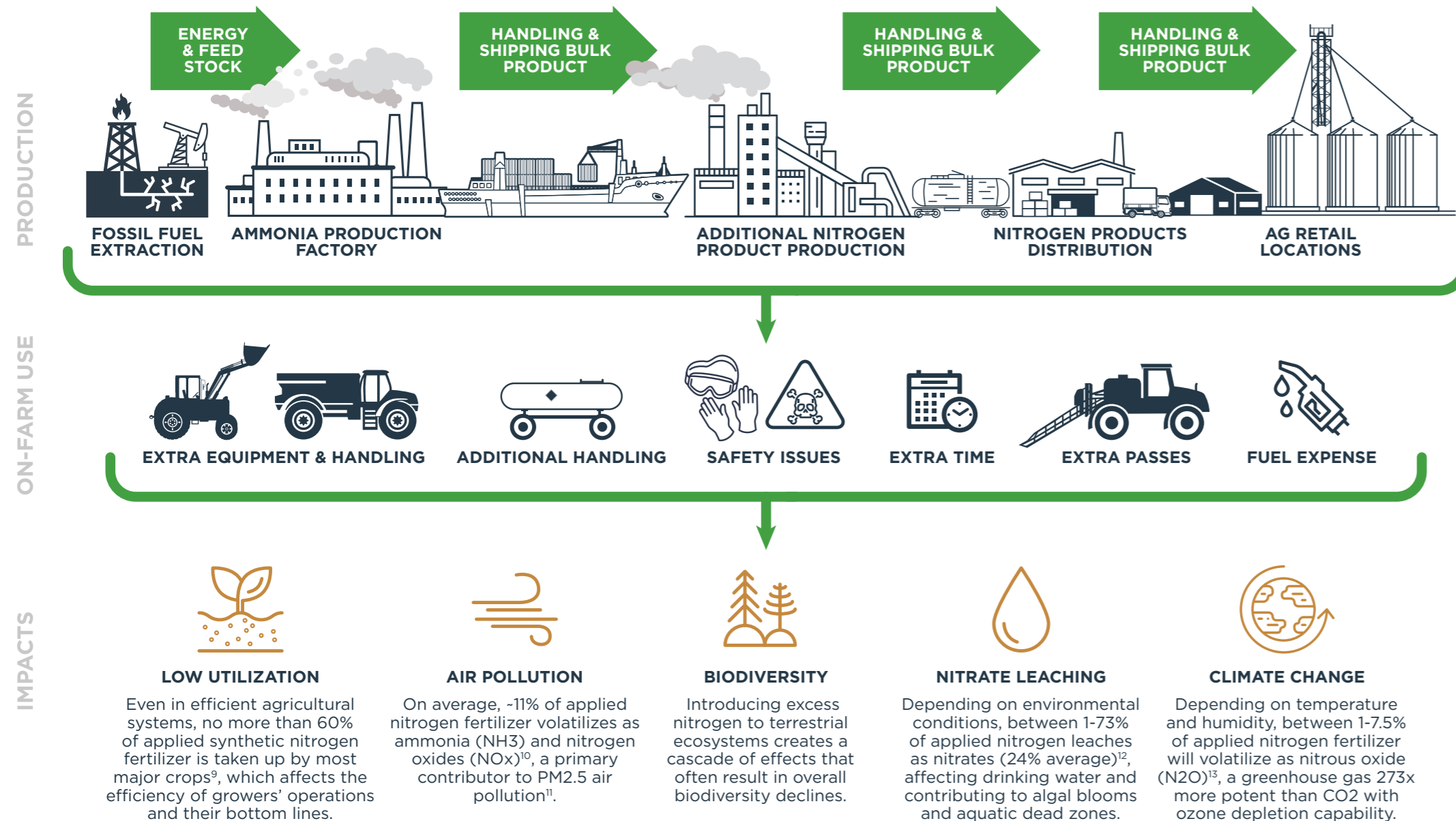


A word on water and nitrates

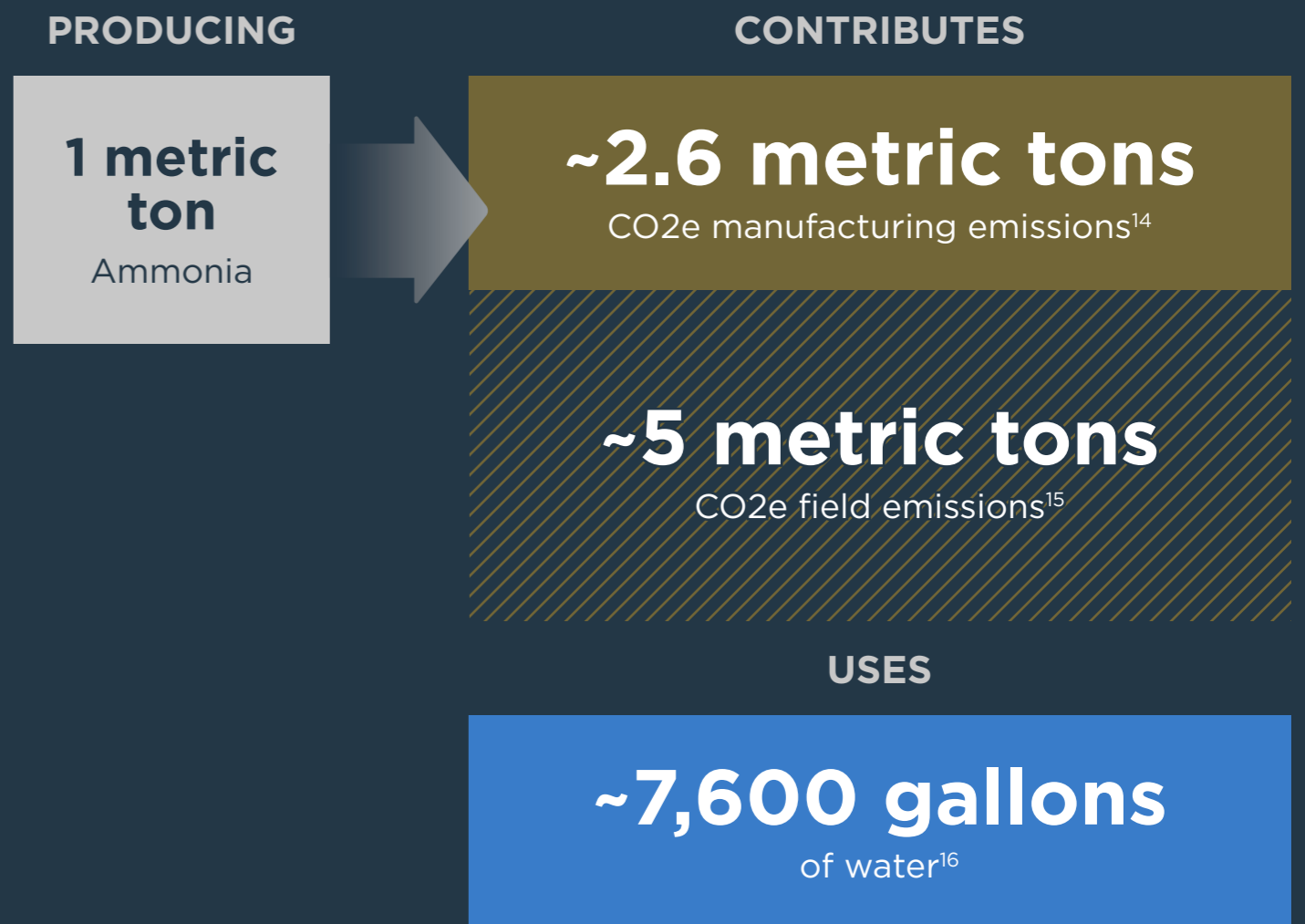
When water moves through soil, water-soluble compounds like nitrate (NO₃-N) can be carried away in the process called leaching. Nitrate leaching is both an economic and environmental concern, representing significant loss of applied fertilizer that contributes to eutrophication of freshwater, the formation of algal blooms and “dead zones” in coastal waters, and drinking water contamination in rural and agriculture adjacent watersheds. Exactly how much NO₃-N moves via leaching is highly variable, with contributing factors including rainfall, drainage, and soil moisture⁷ (the IPCC cites anywhere from 1-73% of applied synthetic nitrogen may be leached, with an average value of 24%)⁸.

How nitrogen fertilizer is made

Nitrogen is a critical component of our global food system and economy—but today’s agricultural demands exceed the levels of nitrogen that the earth can supply on its own. To keep up, we’ve long relied on an industrial chemical reaction that converts hydrogen and nitrogen into ammonia for use in synthetic fertilizers. This process—the only option we’ve had for a hundred years—increased agricultural yields and answered a global need.



Global ammonia production, largely for synthetic nitrogen fertilizer, is massively impactful:



150 million metric tons of ammonia produced annually¹⁷ (70% for synthetic nitrogen fertilizer)¹⁸

450 million metric tons CO₂e emissions annually¹⁹

~2.5% annual greenhouse gas emissions are caused by the production and use of synthetic fertilizer²⁰

~2% of total final energy consumed annually (8.6 EJ)²¹

Pivot Bio's transformational solution

Pivot Bio set out to reimagine how growers get nitrogen to their crops. We identify prime nitrogen-fixing microbes in the soil, enhance their strengths, and rigorously test their efficacy before delivering them for on-field use. Our microbial nitrogen results in improved operational efficiency for growers, and cleaner air and water for all of us.

PRODUCTION



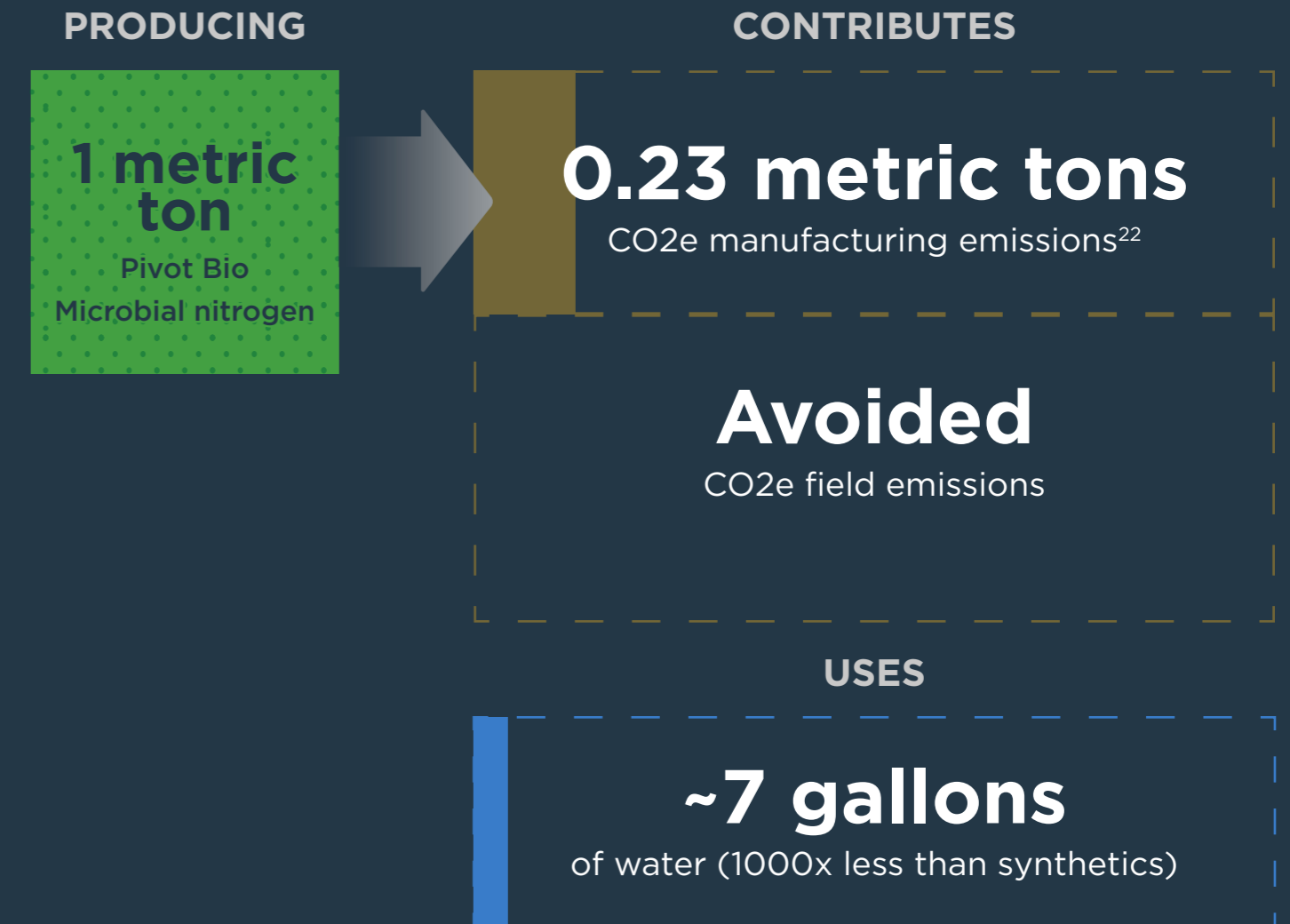
ON-FARM USE



IMPACTS



Pivot Bio changes everything:



Understanding Pivot Bio's effect on leaching

A typical farm in Iowa replacing 40lbs of synthetic nitrogen with Pivot Bio PROVEN® 40 could reduce nitrate leaching by 42.5 lbs N per acre (impact modeled using IPCC average leaching value of 24%). A 2022 Pivot Bio PROVEN 40 mesocosm study conducted by Iowa State University observed a mean nitrate leaching reduction of 28.7 lbs N per acre across 6 replicates when compared to the untreated check with an additional 40 lbs of applied synthetic N. We continue to work with research partners to better understand the variability in nitrate leaching, and the impact of our products.



Pivot Bio is designed to transform agriculture.

The world's nitrogen needs are increasing

Today, it's estimated that half the world's population is supported by synthetic nitrogen fertilizers. With that population on track to grow by 2 billion over the next 30 years, use of synthetic fertilizers is expected to increase 50% from the 2012 level by 2050²³. The implications are clear: as the population grows and nitrogen demands increase, we'll see more nitrate runoff, more N₂O emissions, and more demand on liquified natural gas, an essential feedstock to manufacture ammonia.

We need more efficient nitrogen to sustain our agricultural demands, farm economics, and the health of our planet. Pivot Bio is the solution. Pivot Bio's microbial nitrogen delivers the results growers need while improving water quality, air quality, and biodiversity. We're designed for impact, and we're already in-field, making it happen.

Pivot Bio is a revolutionary market and environmental solution—in the acres of farmland that require an efficient nitrogen, and in the volume of synthetic fertilizers we can replace with a more effective, more sustainable, safer product.



In the USA

- » 131.8 million acres wheat, corn & coarse grains²⁴
- » 7.2 million metric tons nitrogen fertilizer market²⁵



Globally

- » 1.4 billion acres wheat, corn & coarse grains²⁶
- » 112.3 million metric tons nitrogen fertilizer market²⁷



Meeting agricultural demand has long been one of our greatest challenges, and Pivot Bio stands poised to shape the future with a more productive, more sustainable nitrogen.

KARSTEN TEMME, CEO & CO-FOUNDER



Serving Growers

Sustainability starts with profitable grower operations



In-season plant analysis, Ames, IA

Growers manage a vast, interlocking network of variables to run their operations. While some of these components remain in their control—the equipment they purchase, the seeds they use, the crop protectants they apply—many do not. From rainfall, to temperature, to crop prices and beyond, growers deal with a massive amount of uncertainty and variables well outside of their control.

We owe it to growers to deliver high-performing, cost-effective technology that helps make their operations economically and environmentally sustainable. That's why our microbial nitrogen products maintain yield, productivity, and profitability. In the face of volatility from unpredictable commodity prices, supply and demand, and weather, Pivot Bio is a tool that helps growers take control over the nearly 30% of their operational costs represented by nitrogen fertilizer.

Being a grower has become increasingly challenging

More intense and erratic weather

Unpredictability of nitrogen reaching the crop

Volatile international market + commodity prices

Dangerous application process of synthetic fertilizer

Emissions that affect climate

“My dad was a farmer. I remember vividly how difficult it was. It sticks with me, and being able to help farmers — **improving their profitability, making it easier for them, creating technology that helps them and impacts their livelihood** — is something that really motivates me.”

RYAN S., SOFTWARE ENGINEERING, PIVOT BIO

Pivot Bio is built to serve growers

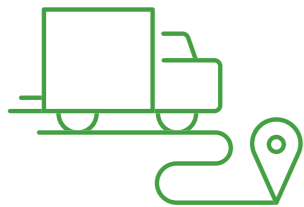
Localized grower resources



Customer Success Center
Ames, IA



Product Success Center
St. Louis, MO



Regional Distribution Centers
Omaha NE, Chicago IL,
St. Louis MO



900 independent sales
representatives nationwide



Geographically dispersed teams to be close to the customer

Designed with growers' needs in mind

We listen to growers and design our products to easily fit into their existing operations so that using a better, more efficient nitrogen doesn't require a shift in practice. We're always innovating: each generation of our products delivers more nitrogen.

Prioritizing grower safety: unlike synthetic nitrogen fertilizer, which can cause severe injury and even death, our nitrogen comes from soil microbes and can be safely handled with minimal precaution.

UNIVERSITY RESEARCH

In 2022, we partnered with 9 universities across 9 states to evaluate product performance. In 2023, we're expanding our research partnerships to include 23 universities across 23 states.

Products that deliver in the field



A better nitrogen for corn

Available on-seed or in-furrow, Pivot Bio PROVEN[®]40 microbes form a mutualistic relationship with corn plants, taking nitrogen from the air and creating ammonia that the plants need to grow and thrive. Pivot Bio PROVEN[®]40 supplies ammonia throughout the most critical growth stages by adhering directly to the corn plant's roots—preventing run-off and providing predictable, reliable, consistent results for growers.



A better nitrogen for small grain crops

Available for spring wheat, sorghum, barley, millet, oats, and sunflower, Pivot Bio RETURN[®]'s on-seed or in-furrow microbes adhere to plants' roots to continually feed nitrogen during the entire growth cycle. This weather resistant solution significantly reduces loss to leaching, denitrification, or volatilization—which can lead to bigger plants and increased plant dry weight.



Our Impact

NOVATOR™

VERIFYING REPLACEMENT. REWARDING GROWERS.

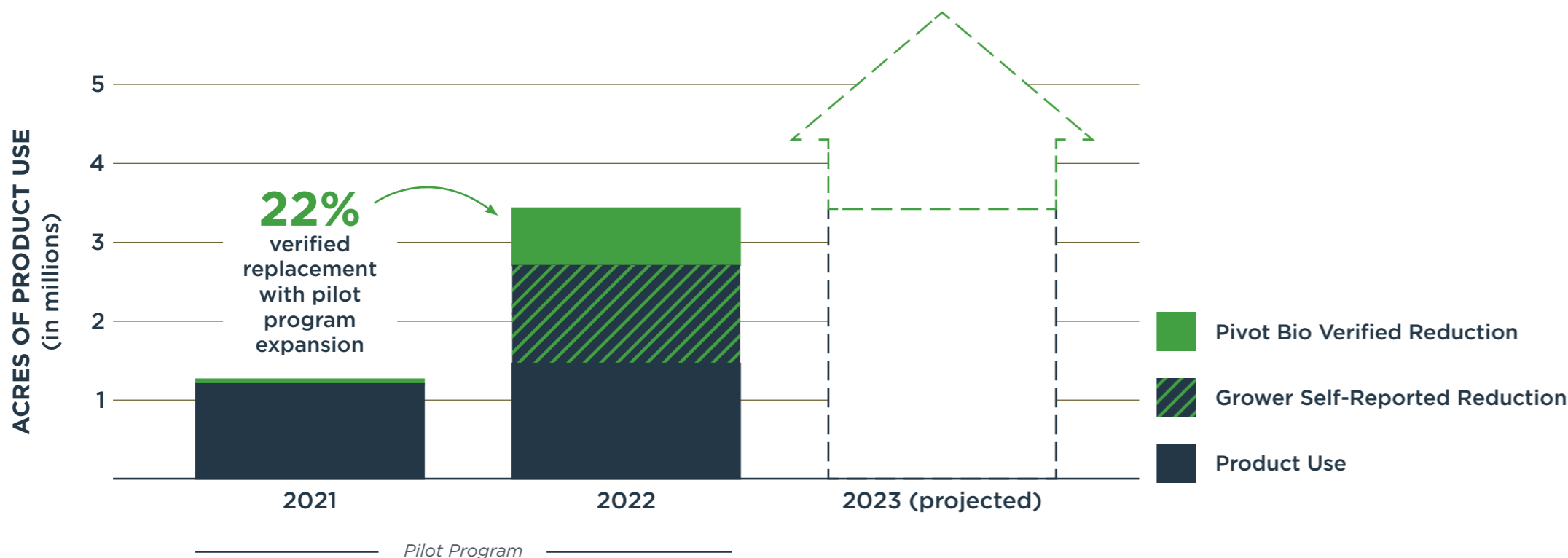
When growers replace synthetic nitrogen fertilizer with Pivot Bio microbes they create immediate, durable, and permanent change to their operations' economic and environmental profile. Change that's measurable and quantifiable.

Pivot Bio N-OVATOR™ is our revolutionary program to amplify this impact by validating on-farm synthetic fertilizer replacement and sharing its value.

The program pays growers for every acre with validated replacement and delivers the majority of the value of nitrogen credits produced from their operation. And, N-OVATOR validated nitrogen credits and sustainably produced grains enable forward-looking businesses to create immediate, permanent change to their emissions profile.

INCREASING VERIFIED REPLACEMENT

N-OVATOR is a powerful tool incentivizing growers to choose, use, and replace synthetic fertilizer with Pivot Bio products—and when they do, it unlocks the myriad benefits for their operations and for improving environmental outcomes.



N-OVATOR, 2022 PILOT PROGRAM

78.8 thousand metric tons

of CO2e avoided

26 million lbs

of nitrogen replaced

723.7 thousand

verified acres

600+

participating operations

“N-OVATOR gives farmers the ability to collect a little extra cash and gives them that little extra encouragement to reduce synthetic nitrogen. I tell other farmers: ‘Reduce your nitrogen, keep your yield the same, and cut some costs. And, here’s some money for doing so.’”

SHAWN F., 3RD GENERATION FARMER, LUVERNE, MN

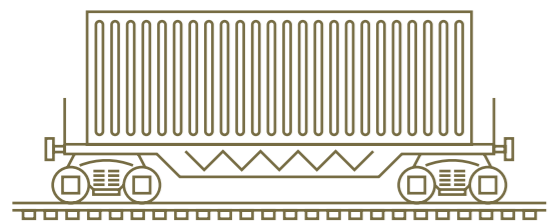
Our 2022 Impact

In addition to growers who validated their replacement through our N-OVATOR program, 49% of non-enrolled customers reported reducing their standard synthetic nitrogen application due to adoption of PROVEN 40. Modeling²⁸ to the total 2022 acreage using Pivot Bio products, we project our overall impact:



226.4k

METRIC TONS OF CO₂e IS EQUIVALENT TO...



1,200
RAILCARS' WORTH
OF COAL BURNED

That's a train >11.8 mile long...
about the width of Lincoln, NE



44k
HOMES' ANNUAL
ELECTRICITY USE

That's about the housing
stock of Davenport, IA



270k
ACRES OF U.S. FOREST ANNUAL
CARBON SEQUESTRATION

That's about the size of Rocky
Mountain National Park

A NOTE ON SYNTHETICS

Different synthetic nitrogen fertilizers have significantly different CO₂e emissions profiles. This means the product used as a benchmark for replacement has a considerable influence on the modeled data.

To be conservative, we model using ammonia as the reference for replacement.

But our likely impact is greater, given the range of synthetic fertilizer products our microbes are used to replace.

COMMON SYNTHETIC NITROGEN FERTILIZER CO₂e EQUIVALENCIES

Ammonia <small>2.59 KG CO₂e/ KG</small>	UAN <small>6.15 KG CO₂e/ KG</small>	Urea <small>9.81 KG CO₂e/ KG</small>
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1x

2.4x

3.8x

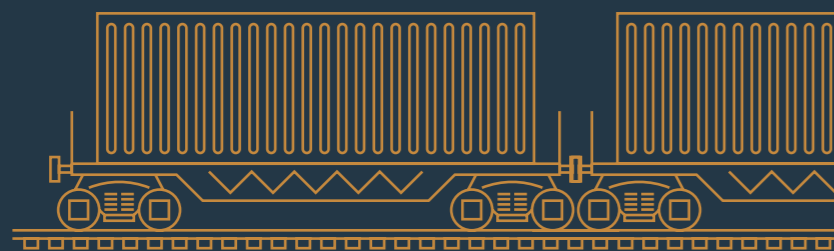
When we replace, we make a big difference

On a typical 1500-acre Iowa corn farm...

Replacing 40lbs/acre of synthetic nitrogen fertilizer with Pivot Bio would

- » Replace ~27.21 metric tons of synthetic nitrogen with nitrogen supplied by Pivot Bio microbes
- » Avoid ~260 metric tons of CO₂e emissions

That's equivalent to...



1.4

RAILCARS' WORTH OF COAL BURNED



53.6

HOMES' ELECTRICITY USE FOR ONE YEAR



310

ACRES OF U.S. FOREST CARBON SEQUESTRATION

Across all 88.5 million U.S. corn acres in 2022...

Replacing 40lbs/acre of synthetic nitrogen fertilizer with Pivot Bio would

- » Replace ~1.6 million metric tons of synthetic nitrogen with nitrogen supplied by Pivot Bio microbes
- » Avoid ~12.3 million metric tons of CO₂e emissions

That's equivalent to...

~68k

RAILCARS' WORTH OF COAL BURNED

2.4M

HOMES' ELECTRICITY USE FOR ONE YEAR

14.7M

ACRES OF U.S. FOREST CARBON SEQUESTRATION



That's the length of a train stretching from Springfield, IL to Washington, D.C.



That's about the total housing units in South Carolina



That's a forest nearly the size of West Virginia

Assay Development Scientist
measures acetylene reduction
activity in a plant sample
Pivot Bio lab, Berkeley, CA

Inside Pivot Bio

Pivot Bio is built for innovation and execution

“What attracted me to Pivot Bio was the mission of providing sustainable solutions to farmers, and improving the health of the planet. Pivot Bio’s product and the mission is really something that **I’m passionate about and that I’m proud to be a part of.**”

ALLEN K., LEGAL

“I love working at Pivot Bio because **it is such a unique intersection of so many different disciplines.** I get to work with software engineers, microbiologists, agronomists, salespeople, due to the shared vision.”

JONATHAN F., FINANCE

“I enjoy the feeling of collective problem solving. **We’re constructive. It’s the idea that matters,** not who it came from or where they are in the hierarchy.”

L. STUPIN, PROJECT DEVELOPMENT

We actively nurture a highly engaged team strengthened by shared values, and we keep a pulse on our performance. Our top rated attributes reinforce the importance of this commitment and the connections between culture, innovation, and effectiveness.

87%

OVERALL

Employee Engagement score—3% higher than category leader benchmark

95%

AGREE

I practice our values regularly

95%

AGREE

I’m proud to work at Pivot Bio

91%

AGREE

At Pivot Bio we act on promising new or innovative ideas

88%

AGREE

We are encouraged to be innovative even though some of our initiatives may not succeed

We use CultureAmp measures with Gallup Q12 Engagement questions incorporated or directly represented in our Pulse Survey.



What it means to be an innovative organization

NITROGEN TURNING POINT EXCHANGE PROGRAM

Innovation comes from the open exchange of knowledge and ideas among experts. We thrive when we collaborate across disciplines, which is why we implemented an exchange program

between our lab and field teams.

As part of the program, we bring scientists to the field to meet with reps and growers and see our product in action. Participating team members train with local sales reps and meet growers on their own land to learn the challenges they face first-hand.

In turn, we invite field employees to our labs to see our research, discovery and development process at work. By cross-pollinating ideas across teams and sharing real-world insights about flask and field, we're able to identify knowledge gaps, communicate more effectively, and bring better results to growers and the planet.



OUR VALUES



Solve Creatively

We are here to solve big problems and make meaningful and lasting impact. We pursue questions that challenge everything we know, and we believe we can find the answers and create new solutions. Data drives our curiosity and our decisions, and underpins our innovations.



Act Fearlessly

We aren't afraid to dream big. We encourage one another to be bold and challenge convention. We choose to act fearlessly, because we believe risk-taking and failure are the pathways to learning and success.



Model Openness

We welcome dialogue, debate, and discussion with our colleagues and with individuals outside of our organization, especially those with opinions that differ from our own. We hold ourselves and the integrity of our work to the highest ethical standards and scientific rigor. Our candor with one another reflects our openness and mutual respect, fostering a culture of professionalism and collaboration.



Inspire Each Other

We observe immense need in our world, among our fellow humans and throughout the environment. We continually strive to solve the challenges of the people who inspire our work. We care for each other and our broader community as we cultivate an environment of trust, safety, and enjoyment.



Our organization thrives when **our people thrive**

HEALTH & WELLBEING:

We support employees with **comprehensive healthcare** and dependent care, flexible time off, sick pay, and a generous holiday schedule including a quiet period in the last week of the year. We also offer free enrollment in Modern Health—a platform that offers **emotional wellbeing services** from daily content to wellness coaching and therapy sessions—for employees and their dependents.

WEALTH:

We offer competitive pay, 401(k) matching, and employees can also opt into long- and short-term disability, life insurance, and matching HSA funds.

We provide a living wage to our 400+ employees, as per the MIT Living Wage Calculator, adjusted for location.

We extend to all employees the option to **own a part of Pivot Bio's success through stock options.**

GROWTH:

We believe in a culture of feedback and continuous improvement. We offer regular training that covers topics from adaptability and resilience to practicing inclusive behaviors, and employees can access professional coaching through Modern Health. Our team members can also access **funds for self-directed professional and personal development every year.**

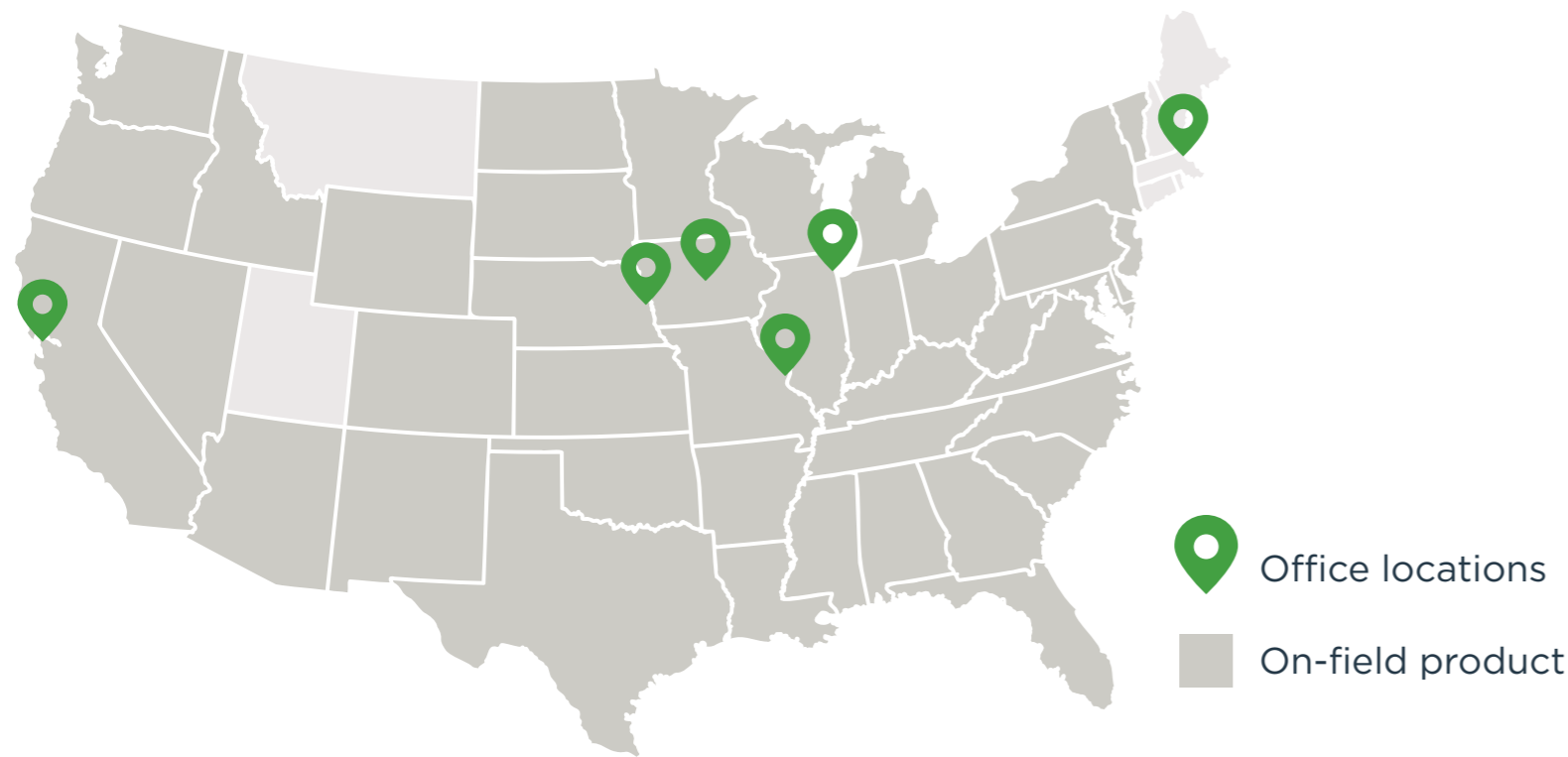
“Pivot Bio’s culture embraces flexibility. There’s trust that you’re going to do your job right, and support when you need family or personal time. **We’re innovators in that space.”**

CHANCE M., AGRONOMY

Annual Pivot Bio employee gathering, Berkeley, CA

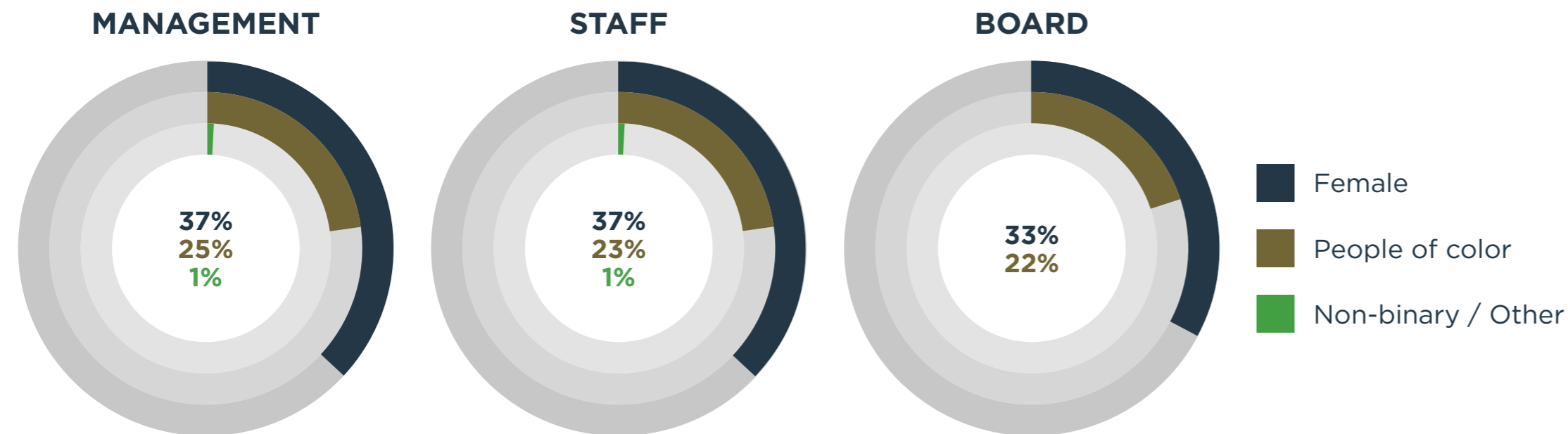
Visualizing Pivot Bio

Our locations



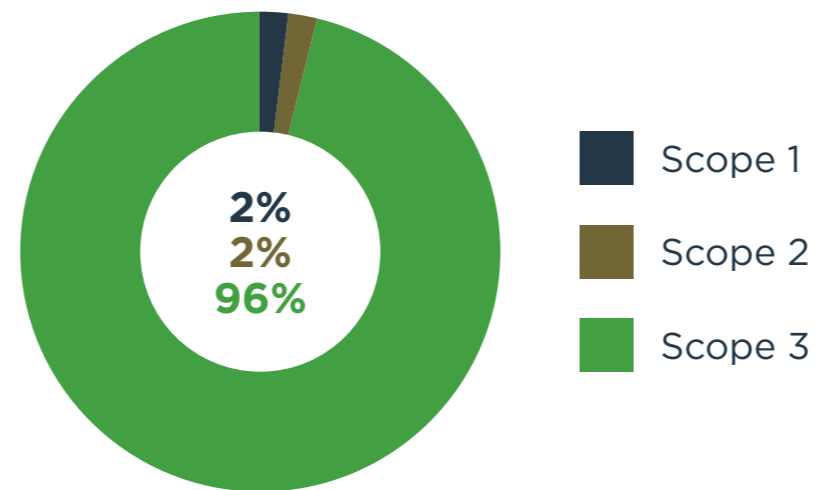
Our team

We're committed to a transparent, inclusive culture, centered on belonging. We are sharing our starting point on this journey and look forward to moving ahead in our commitment.



Our absolute emissions

106% YoY increase in GHG emissions
400% increase in revenue



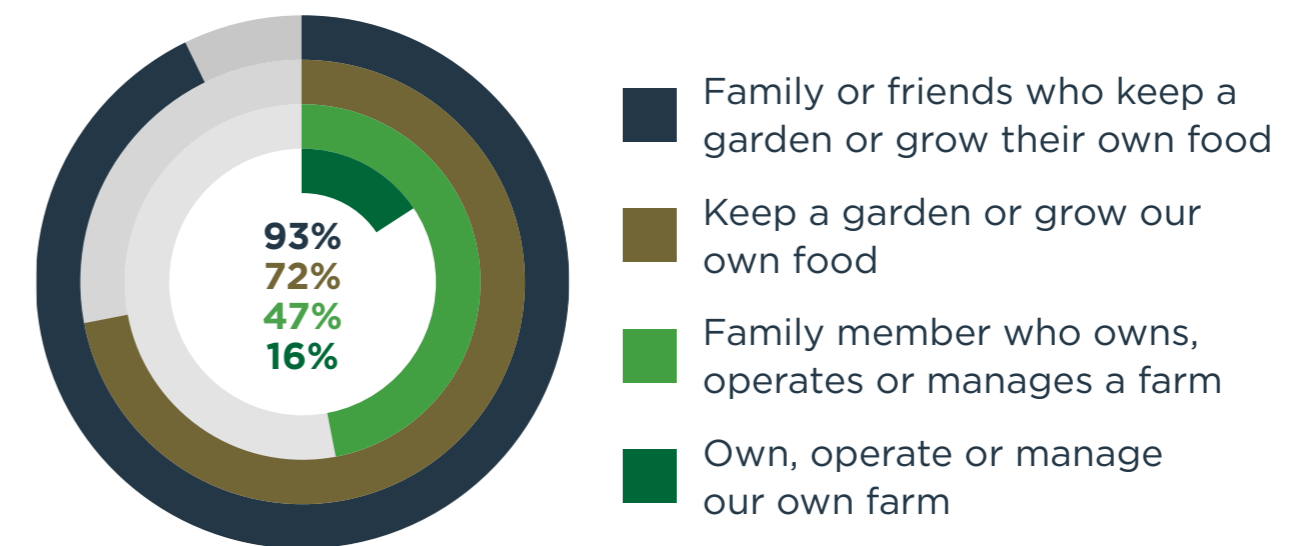
Energy use	2 GWh
Water Use (cubic meters)	6,799
Waste Generated (metric tonnes)	33

Though our products exist to create impact in and of themselves, we also make every effort to run our operations sustainably.

In 2022, we partnered with Polycarbin to launch **closed loop recycling** for clear plastic pipette trays in our Berkeley HQ labs. We quickly expanded the program to collect clear plastic pipette tips for recycling, and in the span of 4 months diverted 1330 lbs of plastic waste. In 2023, we will expand this program to other locations and launch an initiative to **improve the energy efficiency** of our lab freezers.

Also in 2022, we partnered with Emitwise to calculate our Scope 1, 2 and 3 carbon footprint and **offset 100% of our Scope 1 and 2 emissions** with purchased offsets from the N-OVATOR™ program. We're proud to support growers leading the way in climate-smart agriculture while achieving carbon neutrality for our operating emissions.

OUR FARMING CONNECTION



What the Future Holds



Smallholder corn farmer, Nakuru, Kenya



Our global ambitions

Synthetic nitrogen fertilizer remains inaccessible to most of the world. Supply chain infrastructure and high costs remain two of the largest challenges globally, and in particular for African farmers—both large and small. Historically, most of Africa has seen very low nitrogen use, one of the main factors in low crop yields. Africa also faces massive nutrient deficits.

Microbial nitrogen can be part of the solution. In 2022, Pivot Bio joined the Agriculture Innovation Mission for Climate (AIM for Climate) as an Innovation Sprint Partner, committing at least \$291 million in product development funding over four years to accelerate the adoption of climate-resilient microbial fertilizers. We're now conducting field trials for our microbial products in Kenya to learn more about how they perform and to adapt them to manual farming practices.

We're committed to creating a more equitable nitrogen landscape for growers globally. Unlike synthetic fertilizer, microbial nitrogen can be manufactured domestically within any country. Microbial nitrogen also has a 1,000 times weight reduction compared to the fertilizer it replaces, a game changer for the supply chain. With more affordable, more accessible nitrogen—nitrogen whose price isn't dictated by fossil fuel volatility or global shocks to supply chains—we can change the way our world grows food and provide an important tool to support African farmers who are building food security in their communities.

“I use nitrogen fertilizer on my crops to boost my production, but it hasn't been easy getting it as the price keeps appreciating. It's challenging to get fertilizer and seedlings, and the weather is unpredictable.”

MARGARET M, SMALLHOLDER CORN GROWER, KENYA

We're all trying to create a better future

This unites everyone across our Pivot Bio team, the growers we serve, and the partners who make this possible with us.

How do we solve for that future, knowing there's no way around our need for nitrogen? The real Achilles' heel is that our only vehicle for delivering nitrogen for so long has been as synthetic fertilizer. It can be economically detrimental for growers, and we know that it's detrimental to soil health, water quality, and air quality.

We have to come together to champion a new kind of nitrogen—one that powers our agricultural economy without the inefficiencies and environmental impacts. Our growers will be the heroes of this story, like they always have been. It's growers who will help us solve this dilemma.

We built Pivot Bio in service of growers, and as we forge ahead into a new kind of nitrogen landscape, we want to walk side-by-side with growers each year in the field. As they adopt our product into the operations that fuel their livelihoods—and feed the world—we'll be here to make sure their farms are healthy and sustainable for the next generation.

We take a long view, thinking about our impact in terms of the connection between this generation and all the generations to follow. Our cause at Pivot Bio is to be here for the long term—to help every farm be profitable, to protect our natural resources, and to do something that benefits the entire planet and the people who call it home.

What we're building today will be here for the next century, shaping what it means to be responsible stewards of the land. Let's get to that better future together.



KARSTEN TEMME
CEO & CO-FOUNDER

FOOTNOTES & SOURCES

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What does a better future look like?

“I want my kids to grow up with posters of growers on their walls—for that to be their idea of a hero.

Agriculture will be the bedrock of a more resilient economy. Right now, we’ve got a world population that’s becoming more dependent on agriculture and an agriculture system that’s becoming less stable. Agricultural innovation will get us to a healthier, more sustainable future where the soil can provide food for us, where growers can feed us, and where our planet can sustain us. At Pivot Bio, we won’t set our sights on anything shorter than supplying all of the nitrogen that crops require.”

KARSTEN TEMME, CEO & CO-FOUNDER



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