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United States House Small Business Subcommittee on Innovation and Workforce Development

**Farming in the 21<sup>st</sup> Century: The Impacts of Agriculture Technology in Rural America**

Testimony submitted by

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Chairman Crow, Ranking Member Balderson, and Members of the Subcommittee:

Thank you for the opportunity to submit testimony for the hearing on “Farming in the 21<sup>st</sup> Century: The Impacts of Agriculture Technology in Rural America.” This Committee’s leadership on this important topic is key because agriculture has the highest fraction of small business employment of any single sector in the US economy<sup>1</sup>, while at the same time, agriculture has the most opportunity at hand in closing longstanding technology gaps<sup>2</sup>. Getting the right technology investments into this sector now has the potential to be transformative in Rural America and beyond.

At **Indigo Agriculture**, Inc. (“Indigo”), our mission is to harness nature to help farmers sustainably feed the planet. We offer a systems approach to agriculture that includes regenerative agronomic services, satellite-powered digital tools, and beneficial plant microbes all aimed at helping farmers grow high quality, sustainable harvests while reducing input costs. **Indigo Marketplace**<sup>™</sup> is a supply chain solution for connecting those growers with buyers and food companies across America who are willing to pay premiums for healthier, more sustainable crops. Bringing crops to market efficiently is a challenge, especially for a small business. We use modern agronomy, finance, and logistics services, including **Indigo Transport**<sup>™</sup>, to give the grower the same market insights and sophisticated tools that have until now only been available to much larger enterprises. And most recently, with **Indigo Carbon**<sup>™</sup>, we’re redefining what a harvest means to include the massive carbon sequestration potential inherent in our soils. Agricultural soils are the most hopeful solution we know of in the climate change challenge, which is why we have created the **Terraton Initiative**<sup>™3</sup>, an ambitious program for sequestering a trillion tons of atmospheric carbon dioxide into the world’s agricultural lands.

Last year, *CNBC* ranked Indigo as the most innovative company in the world, making us the first agriculture company to be awarded the top spot on the *CNBC* Disruptor 50 list.<sup>4</sup> Founded in 2014, Indigo’s global headquarters are in Boston, with our North American commercial operations in Memphis and research facilities in Research Triangle Park, NC. We also operate in Argentina, Brazil, India, and Europe.

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<sup>1</sup> “2018 Small Business Profiles US,” US Small Business Administration, <https://www.sba.gov/sites/default/files/advocacy/2018-Small-Business-Profiles-US.pdf>.

<sup>2</sup> “Digital America: A tale of the haves and the have mores”, McKinsey Global Institute, Dec 2015. [www.mckinsey.com](http://www.mckinsey.com).

<sup>3</sup> Terraton Initiative <https://terraton.indigoag.com/>.

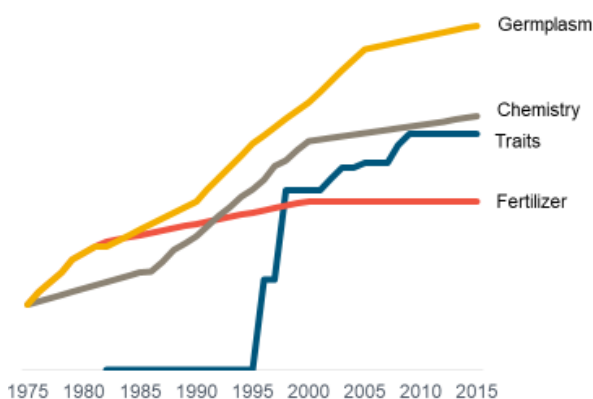
<sup>4</sup> “Meet the 2019 *CNBC* Disruptor 50 Companies.” *CNBC*, 15 May 2019. <https://www.cnbc.com/2019/05/15/meet-the-2019-cnbc-disruptor-50-companies.html>. See also <https://www.indigoag.com/pages/news/indigo-ag-ranked-top-cnbc-disruptor>.

## 1. Agriculture Technology Supports Crop Production

Indigo’s business was built to serve small and mid-sized businesses in the ag sector – from crop production to crop marketing. On the production side, we believe farmers have been underserved when it comes to obtaining independent advice on how to profitably grow crops. Often, advice comes from salespeople focused on optimizing maximum yield. For many farmers, the strategy has simply been to harvest and ship as much grain as their farm can produce. However, getting as much grain off the field may not always be the most profitable strategy for a farmer.

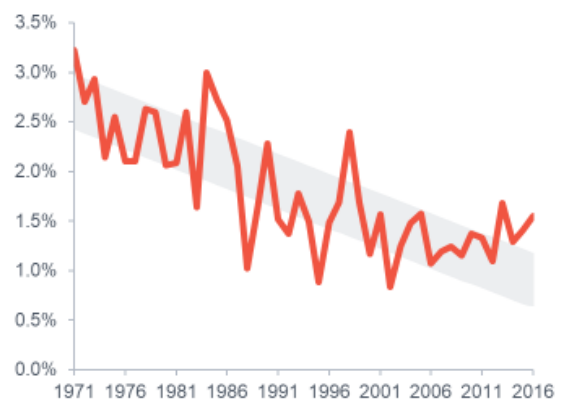
Over the last fifty years, U.S. agricultural productivity has been driven primarily by the increased use of four inputs: synthetic fertilizer, agricultural chemicals, plant breeding and hybridization, and, more recently, genetically modified traits (GMOs). Innovation in those four technologies has begun to plateau over the past fifteen years. Since around 2000, there has been no significant innovation in fertilizer technology and only one new class of agricultural chemicals. GMO traits first introduced in the 1990s have driven only incremental benefits, and traditional plant breeding has been more impactful, largely in corn.

**Innovation Rate of Key Farm Technologies**



Left Chart reflects cumulative impact of technology introductions by innovation since 1975 (based on a relative scale for shown innovations). Scale based on Company knowledge and industry research. Source: USDA, Indigo analysis.

**Growth Rate of Average Crop Yields**

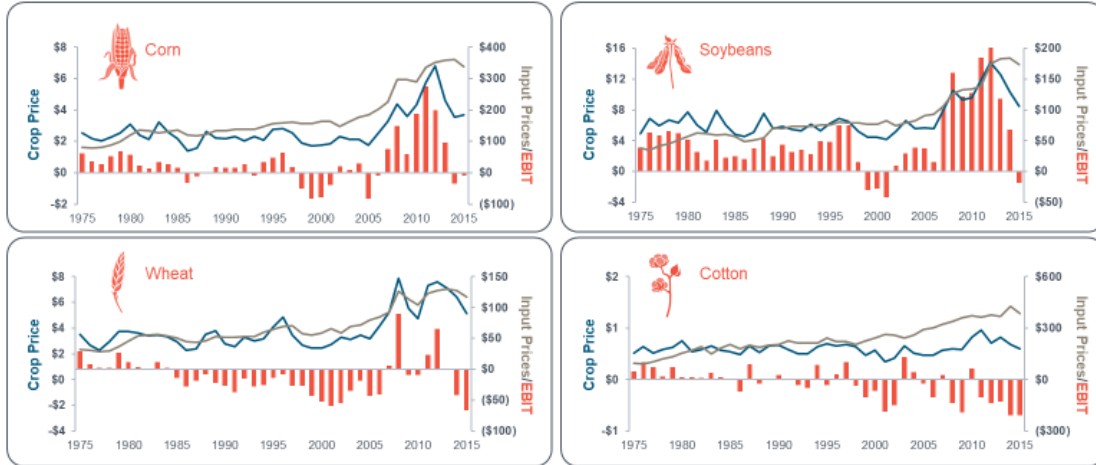


Despite this plateau in innovation, however, there has been a dramatic increase in the costs to the farmers of these inputs – about a four hundred percent increase over the same forty-year timeline. Most of this increase has happened over the past fifteen years and has been driven primarily by the costs of seeds and fertilizer. It is important to note that while costs have increased significantly, yields have increased only slightly. Not surprisingly, the result of this is that farmer margins are at unsustainably low levels. Farm profitability, specifically net farm income, is down by forty-nine percent since 2013.<sup>5</sup>

<sup>5</sup> “Highlights From the March 2019 Farm Income Forecast,” *USDA Economic Research Service*, 7 March 2019. <https://www.ers.usda.gov/topics/farm-economy/farm-sector-income-finances/highlights-from-the-farm-income-forecast/>.

## Farm Margins Are at Unsustainably Low Levels

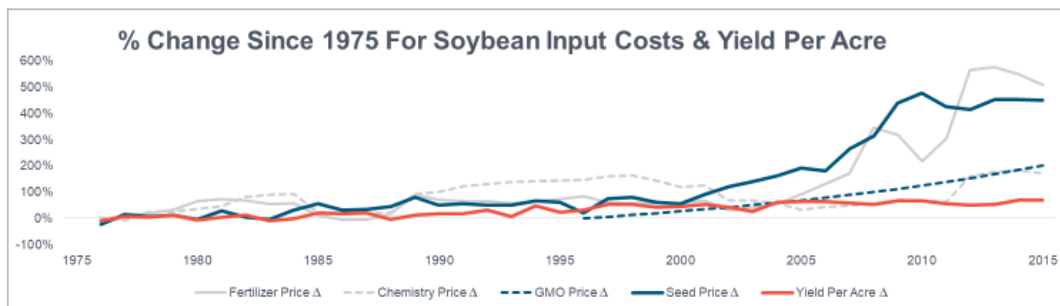
Columns = Farm Profit  
 Gray Line = Input Prices  
 Blue Line = Commodity Price



Source: American Farm Bureau, USDA, Economic Research Service estimates from Fugile et al (2011) and Capital IQ.  
 Note: EBIT figures include all Ag input costs (seed, chemistry, fertilizer & other) and land/machinery costs.

In the charts above we see the largest four crops in the United States. In each of those crops, we have graphed the input price (grey), the commodity price (blue), and farmer profitability (or lack thereof, in red). There are a few remarkable takeaways. Historically, profitability rose and fell with commodity price. Recently, we have seen spikes in commodity price, where both profitability and input prices soared. While commodity prices have since come down, input prices remain at historically high levels. This is why, despite the agricultural innovations of the last forty years, farmers today are not necessarily economically better off than they were in 1975.

## Input Companies Continue Capturing an Increasing Share of Farm Value Despite Plateauing Innovation in their Core Technologies



**Input prices have increased more than 400% over the past 40 years compared to an only 70% increase in yields during the same period**

Note: GMO price change assumes consistent YoY growth between launch price to current price. Seed price net of GMO.

With consolidation among suppliers, money is flowing from farmers to input providers. Indigo is focused on reversing that flow of money — putting it back into farmers’ pockets and reinvested in their local communities. If we are successful, we improve the economics of farming substantially, giving farmers increased



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market power, premiums at harvest, and data-based agronomic information. The agriculture industry needs to be economically attractive, supporting small actors throughout the supply chain in order to sustain and expand our small businesses across rural America.

## 2. Agriculture Technology and Satellites Support Crop Marketing

Indigo also helps farmers get paid more for what they are growing. When it comes to crop marketing, farmers consider how and where to sell grain by using a range of legacy tools, including personal networks, fax machines, or even driving to elevators to assess current prices. Indigo is focused on bringing transparency in this process. We believe the profit opportunities of the future for farmers will come from additional quality and traceability, while providing healthy food, becoming carbon positive, and conserving natural resources. By connecting buyers and sellers of grain through Indigo Marketplace™,<sup>6</sup> growers receive premium prices for producing high quality crops more sustainably, and buyers source grain with a range of characteristics to meet consumer preferences for quality and sustainability. Helping farmers create specialty products in a commodity system is how this platform connects buyers – from leading consumer facing brands to processors – with sellers, who largely run small businesses and may not find these markets on their own. Indigo Marketplace™ presents the opportunities for farmers to differentiate high-value products and earn more for them.

Indigo Transport™, incorporated within Indigo Marketplace™, is an agricultural transportation platform connecting carriers to a network of growers and dry bulk commodity shippers across the United States. The platform uses digital tools to help farmers access bids within an expanded region and assess net costs of moving grain. Not only can individual farmers increase profitability through efficiency gains in transporting grain, many independent carriers who may struggle with the scale and logistical challenges of finding new loads are exposed to new hauling opportunities. Indigo Transport™ enhances the ability of carriers to diversify their portfolio, so they have full occupancy roundtrip, providing them with the tools to operate with the efficiency and scale of a large carrier fleet. This agility and efficiency is enabled by Indigo’s proprietary technology, similar to that used in other industries, such as Uber™. On the buy-side, small elevators and co-ops rely on full occupancy to get paid; an error in bookings is expensive. Allowing smaller businesses to draw on a larger community of growers is beneficial to keeping small businesses thriving in Rural America.

Indigo also uses algorithms to help farmers identify the best times to sell their grain. This type of technology provides smaller growers with access to information on the cash grain economy, previously only accessible to large enterprises. In collaborating with small businesses, Indigo works with startups to help them reach scale through partnerships. In fact, my seed stage startup, TellusLabs, is an example. I cofounded Tellus in 2016 to bring more transparency into the food system via NASA satellite imagery, and in 2018 we joined Indigo. Now through the **Indigo Atlas**™ technology, we provide crop reports, satellite imagery and expert commentary to all of the growers, buyers, and shippers – most of them small businesses – who work with Indigo. Plants are their own best weather stations, and thanks to decades of US leadership in spaceborne satellite technology, we can listen to what they have to say about the condition of our crops. Atlas is a “Google Maps™” for the food system and for rural America. Our crop production forecasts level the playing field for US farmers, giving them early, accurate, and detailed grain marketing intelligence. All of this is made possible by continued free access to NASA, NOAA and USGS data assets. At Indigo we are democratizing access to actionable insights from that public data, translating raw pixels into the sort of advice and early warning that can make a difference for US farmers. Last winter’s bomb cyclone is a good example, where we translated thousands of raw NASA images into a flood map that identified the grain storage bins and farms most impacted by flooding.

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<sup>6</sup> Indigo Marketplace™ <https://www.indigoag.com/indigo-marketplace>.

### 3. Agricultural Technology Supports Sustainability and Carbon Sequestration

Agriculture offers the most hopeful opportunity for addressing climate change. It is Indigo's firm belief that the world's 12 billion acres of farmland and pastureland offer the most immediate, scalable, and affordable opportunity to remove carbon dioxide from our atmosphere.

This past summer, Indigo launched the Terraton Initiative, a global effort to remove one trillion tons of atmospheric carbon dioxide and store it within agricultural soils.<sup>7</sup> Agricultural technology now makes it possible to pay farmers for carbon sequestration. This matters since atmospheric carbon dioxide has risen fifty percent above pre-industrial levels, putting us on-track for severe climate change. Agriculture generates twenty-eight percent of global greenhouse gas emissions, and farm productivity is expected to worsen by nine to sixteen percent on average as the planet grows warmer.<sup>8</sup> Experts project that climate change will further lower farm productivity. As long as farmers are producing commodities, farmers will lack financial incentives to adopt technologies and practices that shift these dynamics and improve sustainability and quality. Paying farmers for carbon sequestration is a way to harness a scalable and affordable solution to address climate change—starting today.

Incentivizing drawdown through agricultural soils will require partnerships with government to maximize this potential. There is fortunately a bipartisan roadmap for how to achieve these key principles through policy tools. As originally enacted in the Energy Improvement and Extension Act of 2008 and substantially modified by the Bipartisan Budget Act of 2018, section 45Q provides a tax incentive for carbon sequestration by a qualified facility, used by such a taxpayer as a tertiary injectant in a qualified enhanced oil or natural gas recovery project. The new law raises the tax credit linearly from \$22.66 (the inflation-adjusted amount) to \$50 per ton over the period from 2017 until calendar year 2026 for CO<sub>2</sub> captured and permanently stored, and from \$12.83 to \$35 per ton over the same period for CO<sub>2</sub> captured and used as a tertiary injectant. Starting with calendar year 2027, the tax credit would be indexed to inflation.

Throughout its history, section 45Q has enjoyed broad bipartisan support. In the run-up to 45Q's eventual expansion in 2018, stand-alone bills expanding the provision had 50 cosponsors in the House and 24 cosponsors in the Senate. Unfortunately, section 45Q was designed for industrial and energy facilities and is generally unusable for farmers today. But, if there is broad bipartisan support for federal policy that incentivizes corporate industrial and energy producers to sequester carbon, why can't that same support be there when farmers try and do the same?

At Indigo, we question everything because we think it's time for our food system to change. If farmers were to be paid for meeting market demands uniquely, for ecosystem services, or for additional benefits such as more nutritious crops, then soil health and food production could be enhanced together. Doing so will create more opportunities for small and mid-sized businesses across Rural America and just might help revitalize the rural economy in the process. It's a solution whose time has come. Thank you for the opportunity to present these remarks.

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<sup>7</sup> Terraton Initiative <https://terraton.indigoag.com/>.

<sup>8</sup> Sources: WWF, FAO, Water Resources Research, Washington Post, American Geophysical Union, WRI