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The United States' Competitive Positions in Beef, Corn, Pork, Soy, and Wheat Exports: 1980–2023

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WITH A new administration considering tariffs, it is important to examine the current state of the United States' export position. CARD recently published a policy brief titled "Waging a Global Trade War Alone: The Cost of Blanket Tariffs on Friend and Foe" (Balistreri and McDaniel 2024). In 2021, CARD developed an online tool and published an accompanying article (Chen, Crespi, and Ji 2021) that examined the United States' relative trade strength.

In this update to the Chen et al. (2021) APR article we alert readers to the updated online tool as well. The new tool extends the data set that calculates the normalized revealed comparative advantage (NRCA) index developed by Yu et al. (2009), to examine the United States' trade position over the years 1980 to 2023 in beef, pork, corn, soybeans, and wheat. The NRCA is a measure of the competitiveness of export markets.

As discussed in our earlier APR article, competition is sometimes difficult to see when only looking at trade flows over time. The NRCA allows us to see whether the increasing total US export values in these commodities masks any underlying slippage in a measure of competitiveness called "comparative advantage." To say that a country has a comparative advantage in the production of a good is not to say that they are the best at producing that good. Rather, comparative advantage means that a country is better at producing that good in terms of its opportunity cost of producing something else (see Balistreri 2019 for a more detailed discussion). Economists use comparative advantage in trade as a way of measuring how competitive a country is because it takes into account other things that a nation, and its rivals, could produce.

In the figures presented in this article, there are two sets of graphs for each commodity for the six main exporters of that commodity (based on current export shares on the world market). The graph on the left side of each figure shows the export values for the commodities in a traditional fashion. The graph on the right side of each figure presents the NRCA measure of comparative advantage or, competitiveness. An NRCA value of zero means that a nation has neither a comparative advantage nor a comparative disadvantage. If all nations are more or less around zero, it means the market is very competitive with no nation having a distinct advantage. On the other hand, negative values do indicate a competitive disadvantage and positive values indicate a nation's competitive advantage relative to its trading rivals. NRCA comparisons allow us to say a country with a higher NRCA has a stronger competitive position for that commodity. Trade data can be difficult to measure especially in the case of meats because the aggregations used can differ among the various reports. For consistency, we chose to use data based upon total market value measured in US dollars from the United Nations' Comtrade database (DESA/UNSD 2021).[1] Choosing to use value instead of quantities makes the ranking of national exports a function of exchange rates. Further, for beef and pork, our data do not include exports of live animals. The nations we rank as the top six, thus, may

In this issue:

1. The commodity classification codes used are: Beef (SITC Rev.1 0111); Corn (SITC Rev.1 0440); Pork (SITC Rev.1 0113); Soybeans (SITC Rev.1 2214); Wheat (SITC Rev.1 0410).

differ from those reported in other trade databases that look at quantity of exports or include other data in their commodity export aggregation such as the USDA/FAS database.

Figures 1 and 2 present export values and NRCA indices from the top exporters of beef and pork, which show steady growth in export values since the 1980s. By 2018, the United States had become the leader in export value in both beef and pork; however, by 2020 this was no longer the case. By comparison, the graphs on the right side of figures 1 and 2 show the NRCA indices declining for the United States (the steep drop in NRCA in BEEF around 2003–2004 was due to a mad cow disease event). The United States is not as competitive in either pork or beef as it used to be, with Spain becoming more competitive in pork, and Australia and Brazil becoming more competitive in the beef trade.

Likewise, figures 3, 4, and 5 show corn, soybean, and wheat export values and their related NRCA indices. For decades, the United States was the dominant supplier in these crops but lost the top spot in soybeans to Brazil around 2017 and in corn the United States dropped to the same level as Brazil in 2023. For wheat, Australia, Canada, and Russia export about the same today as the United States. In terms of comparative advantages only in soybeans do the Untied States and Brazil have significant comparative advantages relative to other exporters and between the United States and Brazil, Brazil has expanded its comparative advantage.

What is clear is that the United States, although a major player in the commodities examined here, has significantly lost the competitive advantage it once had in wheat, corn, and soybeans. In soybeans, the United States still has some advantage, but

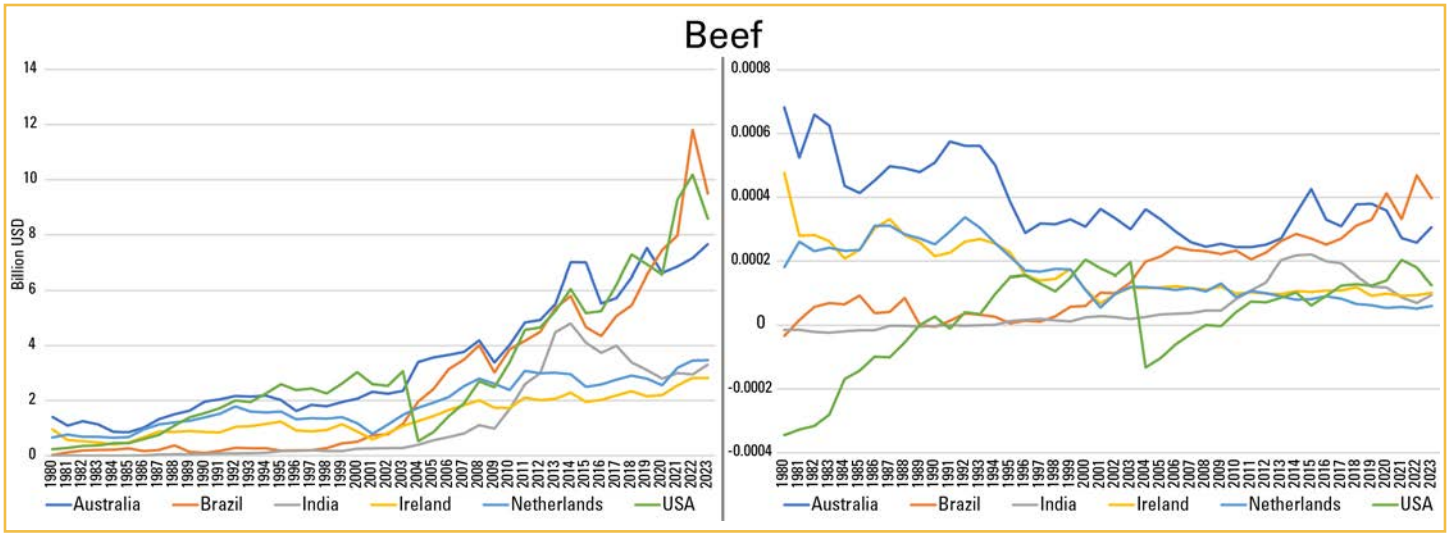

Figure 1. Beef export value (left) and NRCA (right), 1980–2023.

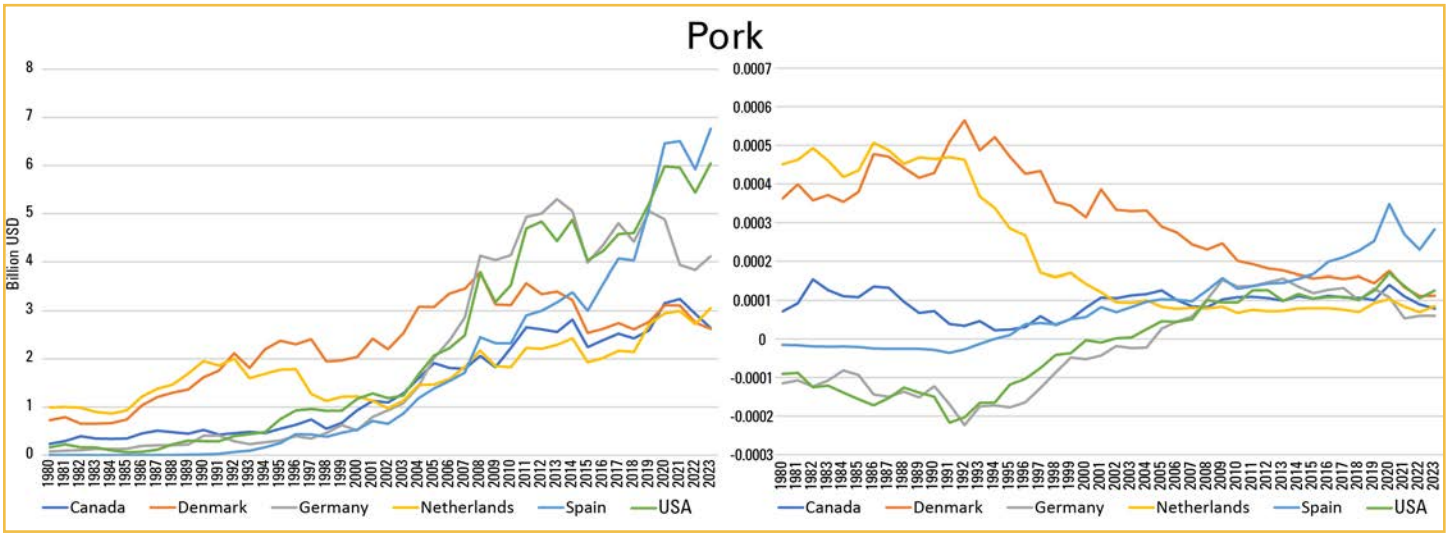

Figure 2. Pork export value (left) and NRCA (right), 1980–2023.

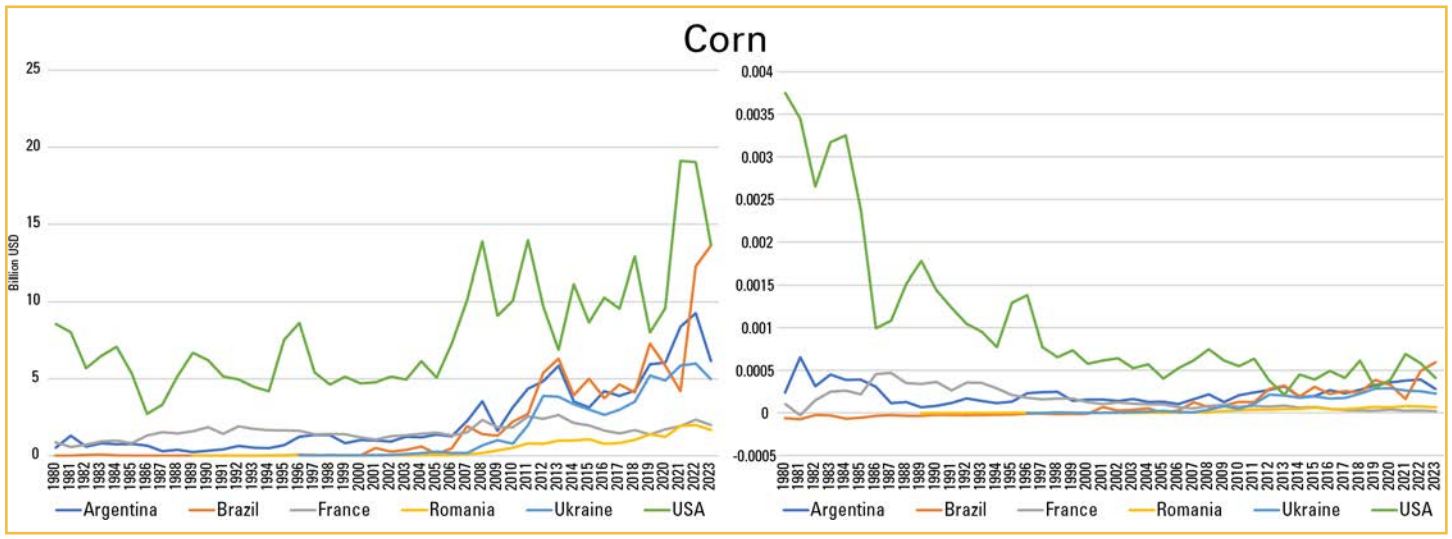

Figure 3. Corn export value (left) and NRCA (right), 1980–2023.

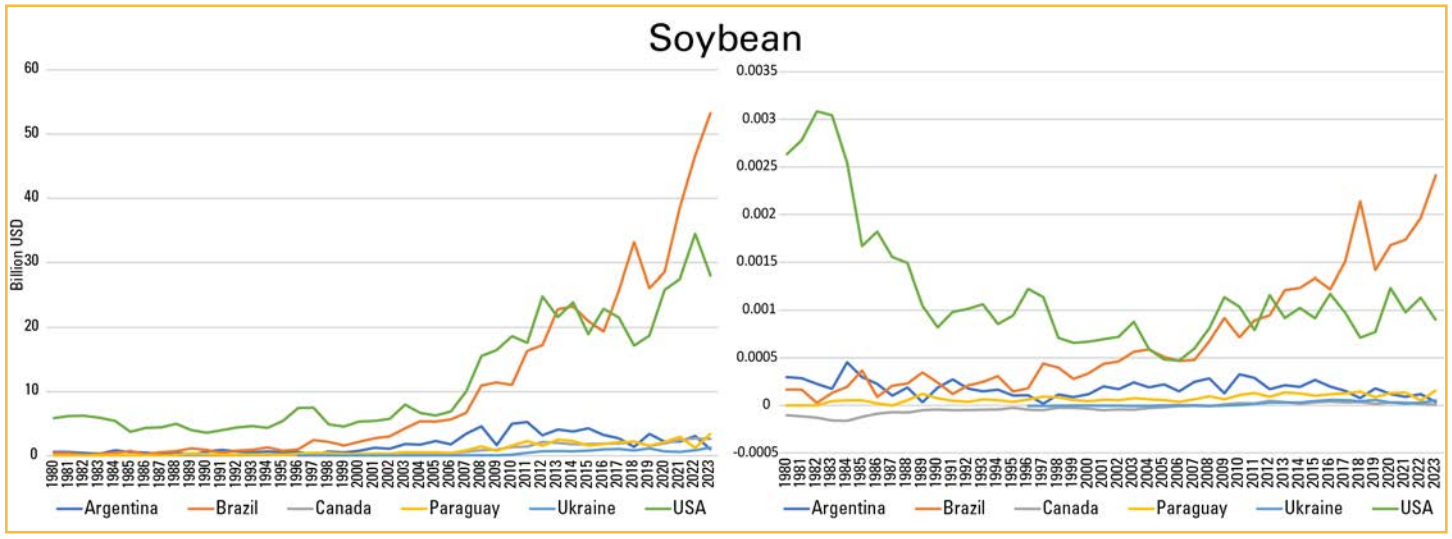

Figure 4. Soybean export value (left) and NRCA (right), 1980–2023.

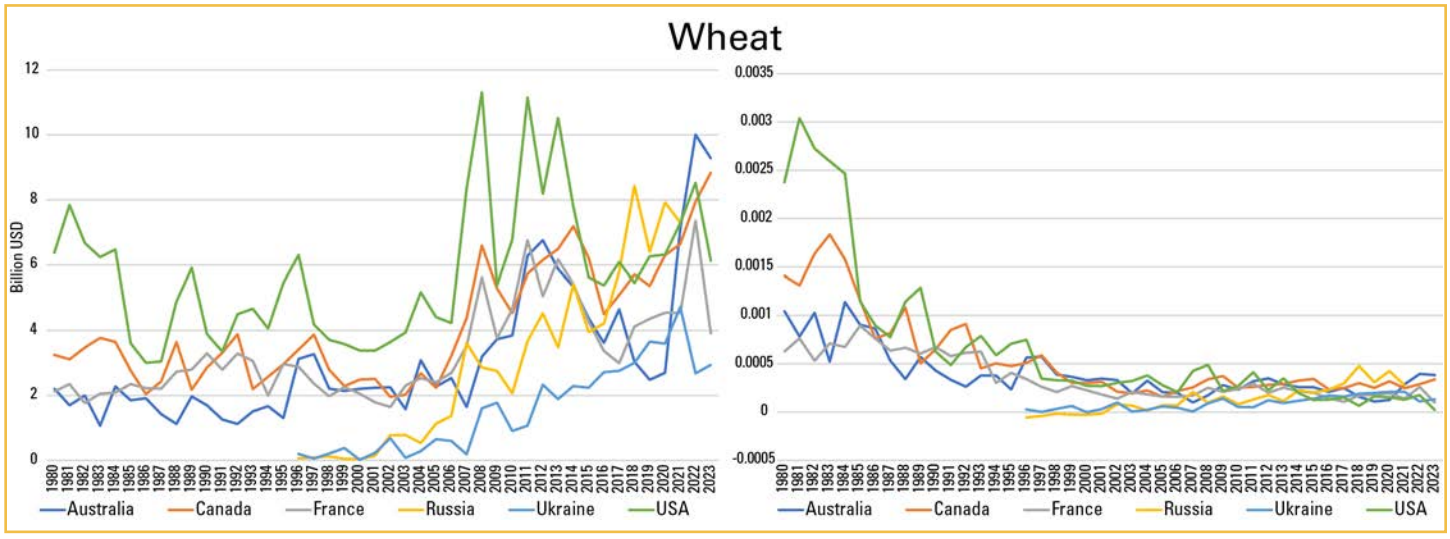

Figure 5. Wheat export value (left) and NRCA (right), 1980–2023.

Brazil appears to be the nation with the clearest competitive advantage in that market. Where the United States used to lag behind in terms of competitiveness in pork and beef, it has become more competitive with other trading nations, which is good. Nonetheless, that competition is now fierce and Spain has emerged with a slight comparative advantage in pork exports.

What we find over time is that there is a weaving together of the NRCA indices from a situation where some countries had competitive advantages in the 1980s and 1990s to the condition by 2023 where so many of these markets indicate that no nation is really in a position to demonstrate dominance. The markets have gotten more and more competitive. For buyers of these commodities, this is good. More competition benefits consumers. On the other hand, tariffs and retaliatory tariffs in these markets would be of little benefit to any country or consumers because an exporter can more easily find another buyer today than it could in 1980. To quote Hart from this issue of *Agricultural Policy Review*, "While domestic usage for all of the commodities is still quite strong, the gains in usage over the past year have mainly come from exports. The potential for tariffs reducing or eliminating that growth is large (Hart 2025)."

You can also find these comparative advantages demonstrated in the updated animation tool on the CARD web page (see figure 6). With this tool, you can choose any of the five commodities and look at the comparative advantage as measured by the commodity export share relative to a nation's export share. This method of presenting the NRCA allows viewers to focus on changes in both relative competitive position and size of exports. Figure 6 is a screen shot from the tool that shows the relative competitive positions of the world's six major beef exporters in 2023. In the visualization, the larger a nation's circle the larger its export value, the higher the circle the larger its share of total beef exports, the closer the circle to the diagonal line the lower its comparative advantage.

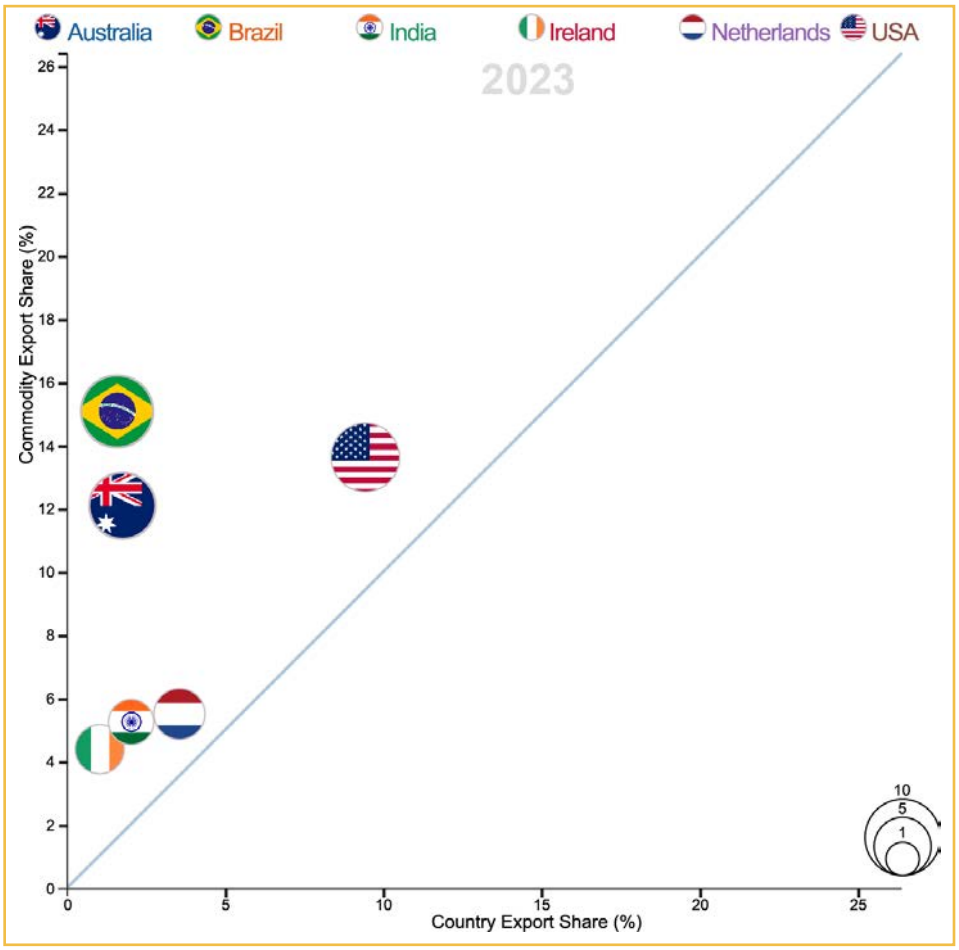

Figure 6. Evolution of Revealed Comparative Advantage of Key Agricultural Commodities Tool.

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The Landscape of Green Agricultural Patents: A Focus on China and US Patent Offices

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GREEN AGRICULTURAL patents are essential for driving agricultural productivity while enhancing sustainability, resource efficiency, and climate resilience, and for addressing critical challenges such as soil degradation, water scarcity, and greenhouse gas emissions. In 2013, the World Intellectual Property Organization (WIPO) launched the WIPO GREEN initiative to facilitate green technology innovation and transfer.

Based on the International Patent Classification (IPC), a standardized framework for categorizing technological fields, green patents are grouped into several categories, including farming and forestry. We focus specifically on green agricultural patents, excluding forestry-related innovations from the farming and forestry category. We examine the number of granted green agricultural patents, the leading countries driving innovation, and the key inventors shaping the field from 1990 to the present, with a particular focus on the patent landscapes of China and the United States, as they are both dominant players in global agricultural trade and major contributors to agricultural innovation.

The patent analysis is conducted using the Lens platform (www.lens.org), a comprehensive open-access database that integrates global patent and scholarly data. Lens enables advanced patent landscape analysis, including tracking innovation trends, identifying key inventors, analyzing patent families, and linking patents to research publications, making it a powerful tool for evaluating the development and impact of green agricultural technologies.[1] We used the International Patent Classifications (IPCs) under the green agricultural patents category to query granted patents from 1990 to 2024, forming the basis of our analysis.

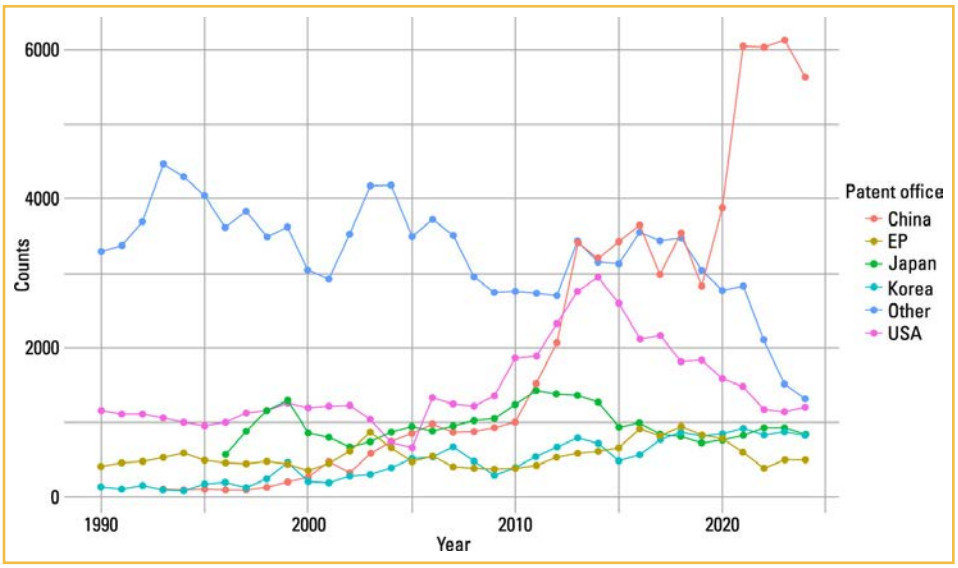

Figure 1. Granted green agricultural patents across studied countries, 1990–2024.

US leads in high-value green agricultural patents, while China dominates in total grants

Trend of granted green agricultural patents

Figure 1 illustrates the number of granted green agricultural patents across different jurisdictions from 1990 to 2024, with highlights on IP5 (USA, China, European Patent Office, Japan, and Korea).[2] The trends reveal key shifts in global green agricultural innovation over the past three decades. The United States led in granted green agricultural patents throughout the 1990s and early 2000s, with a relatively stable number of patents per year (1,000–3,000). However, after 2012, US patent grants started to decline from the 2015 peak. In contrast, China's green agricultural patenting activity remained relatively low until the mid-2000s; however, it started increasing sharply around 2010. By 2014, China had surpassed the United States in the number of granted patents, marking a shift in global agricultural innovation leadership. The most striking trend is the dramatic rise in China's patent grants after 2020, peaking at over 6,000 patents per year—far exceeding other jurisdictions.

1. If interested, please email yongjiej@iastate.edu for the specific query.

2. According to fiveipoffices.org, the IP5 offices together handle around 90% of global patent applications (IP5 2025).

Trend of high-value granted green agricultural patents

Figure 2 shows the trend of granted high-value green agricultural patents across different jurisdictions over the same period. A high-value patent is defined as one that has also been applied for in other jurisdictions, based on the information recorded under "Extended Family Member Jurisdictions" in the Lens patent database. The underlying assumption is that a patent must possess significant commercial value for applicants to seek intellectual property protection in multiple jurisdictions. Since international patent filings involve substantial costs and legal complexities, only innovations with strong market potential, broad applicability, or strategic importance are typically pursued in multiple regions. Therefore, tracking these patents provides insights into the most commercially promising and globally relevant green agricultural technologies.

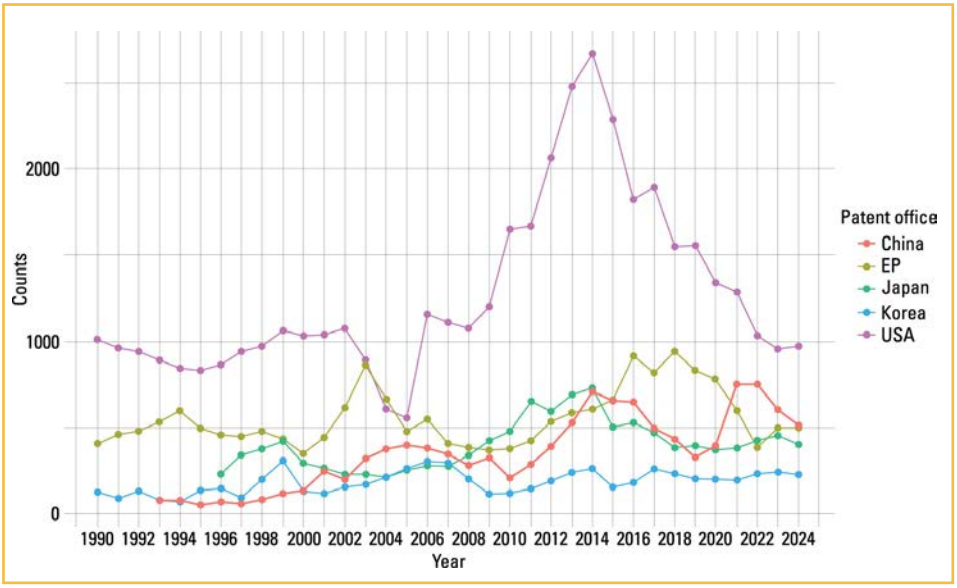

Figure 2. Granted high-value green agricultural patents across studied countries, 1990–2024.

Patents from the US Patent Office have consistently dominated the landscape of high-value green agricultural patents, reaching a peak in 2014. However, since then, the gap between the United States and the other four IP5 offices has gradually narrowed. The competition for second place has shifted over time, with the European Patent Office (EP) maintaining the position until the early 2000s, with Japan briefly overtaking second place during the mid-2000s. In the 2010s, EP regained its standing; however, in recent years, China has taken second place, reflecting its growing influence in green agricultural innovation. Table 1 shows the top 10 patent applicants in US and China Patent offices.

Table 1. Top 10 Leading Applicants in the United States and China

	US		China	
Rank	**Entity**	**No. of patents**	**Entity**	**No. of patents**
1	**Bayer**	2,320	**Bayer**	714
2	**BASF**	1,510	South China Agricultural University*	671
3	**Syngenta**	891	**BASF**	621
4	**Sumitomo Chemical Co.**	784	China Agricultural University*	582
5	Dow	746	Zhejiang University*	469
6	DuPont	417	**Syngenta**	425
7	Rohm & Haas	416	Nanjing Agricultural University*	389
8	American Cyanamid Co	412	**Sumitomo Chemical Co.**	339
9	USDA*	386	Nankai University*	309
10	Ciba Geigy Corp	375	Institute of Plant Protection, CAAS*	294
Subtotal		8257		4813
Total of green ag patents		51,226		63,108
Share of top-10 applicants		16%		8%

Note: * indicates a pubic institution.

Corporations lead in the United States, while public entities lead in China

International conglomerates as key players in both the United States and China

One of the most striking patterns in green agricultural patenting is the significant presence of international conglomerates in both the United States and China. Companies such as Bayer, BASF, Syngenta, and Sumitomo Chemical Co. appear among the top patent applicants in both countries, reflecting their global influence in agricultural

innovation. These multinational corporations have well-established R&D networks and file patents across multiple jurisdictions to protect their technologies in key markets. Their dominance in both the United States and China suggests that green agricultural innovation is highly globalized, with major firms patenting in multiple markets to maximize commercialization potential.

Public sector dominance among leading green agricultural patent applicants in China

In the top 10 patent applicants list, US Department of Agriculture is the only public US entity (ninth place), while in China, six public entities—five universities and one government-funded research institute—were among the top applicants. This over-representation of universities in the patenting landscape is not limited to agriculture-related patents. Compared with their counterparts in other countries, Chinese universities are more active in patenting. For example, university-held patents in China surpassed those in Korea, Japan, and the Untied States in the early 2000s (Luan, Zhou, and Liu 2010). The surprisingly elevated patenting activities from Chinese universities raised the "patent bubble" (i.e., trading patent quantity with low quality) concerns among researchers. A recent study on general patents held by Chinese universities suggests that university-affiliated patents in recent decades may exhibit lower qualities in terms of forward citation and patent licensing fee (Lin, Ding, and Chen 2024). Whether Chinese pubic institutions will continue their leading roles in patenting activities in the near future remains uncertain. An improvement in the quality of university-held patents or a greater role for corporate entities in green agricultural patenting could enhance both agricultural productivity and environmental sustainability, ensuring that innovations translate into real-world impact.

The landscape of green agricultural patents highlights distinct innovation models in China and the United States. While the United States has historically led in high-value patents, China has surged ahead in total grants, driven by public-sector institutions, particularly universities. International conglomerates remain key players in both countries, reflecting the globalized nature of agricultural innovation. In the future, whether China can transition to an innovation model more like the United States', with greater corporate involvement and a stronger focus on high-value patents, deserves close attention. Such a shift could enhance the commercialization and global impact of its green agricultural innovations, shaping the future of sustainable farming and environmental technology.

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Similarities in USDA's International Baseline Projections and their Relationship with Projection Accuracy

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THE US Department of Agriculture (USDA) releases annual international baseline projections that play a key role in shaping farm policy, guiding market outlooks, and informing stakeholders about how supply, demand, and trade might evolve over the next decade. Just as farmland value surveys or commodity price outlooks assist local producers in Iowa and the broader Corn Belt, these USDA baselines are critical for understanding broader trends in US agriculture. However, compared to short-term forecasts—like monthly crop production estimates—these long-term projections have typically received less attention.

In our recent article in *Journal of the Agricultural and Applied Economics Association* (Chandio and Katchova 2024), we investigate an under-explored aspect of these international baselines: the extent to which forecasts for different countries might converge—often toward major producers like the United States—and whether these similarities are related to the accuracy of the forecast. Below, we share our approach and key insights that may be of interest to producers, agribusinesses, and policymakers who rely on these baselines for strategic guidance.

Why focus on similarities?

USDA's international baseline projections are created through a collaborative process where model-based outputs are adjusted based on expert judgment. This collaboration, while necessary, can lead to some countries' forecasts resembling those of more data-rich or influential regions—most often the United States. In situations where robust local data are limited, experts may lean heavily on the United States' path to fill in the gaps.

Such a strategy can work well if the United States truly serves as a good reference point. At the same time, it might fall short if local conditions—from climate and labor availability to policy and market demand—differ significantly. In our work, we center on three major commodities—corn, soybeans, and wheat—which together form a large portion of global grain and oilseed trade. Within each crop, we examine yield, harvested area, imports, exports, total consumption, and ending stocks—the core set of supply and demand indicators that shape how markets function worldwide.

Does similarity help or hinder accuracy?

To assess whether these similarities matter for accuracy, we measured each country's projection error by comparing the baseline forecasts to the actual data once it became available. We then examined if a closer resemblance to the United States reduces or increases projection errors. We replicated this process using China and Brazil as alternate "base countries," acknowledging both nations' growing role in global grain and oilseed markets.

Note that our analysis focuses on correlations: a strong similarity might reflect "herding," where forecasters align with a dominant viewpoint. Whether that helps or hurts varies by commodity and variable.

Key findings

1. **Yield forecasts are most similar across countries:** We discovered that yields, especially for corn, tend to have the smallest projection distances—meaning countries' projections often look very much alike. Yields typically shift more slowly over time, so a single assumed annual productivity growth could plausibly get extended across multiple regions. However, when we checked actual yield differences, they were sometimes larger than the projected differences. This suggests there may be more alignment on paper than local agronomic realities would justify.
2. **Harvested area and ending stocks diverge more:** In contrast, we found that harvested area and ending stocks showed much higher projection distances across countries. These variables can be heavily influenced by domestic policies, local land constraints, or strategic storage decisions that differ from US norms. When we see large distances in the forecasts, it may reflect truly distinct assumptions or deeper uncertainty about local conditions.
3. **When similarity helps—and when it hurts:** We looked at how similarity correlated with accuracy. In some cases, a country that closely mirrored the United States ended up reducing its forecast errors. Examples include, corn yield, corn harvested area, corn exports, and wheat imports. For these, aligning a smaller or data-deficient country's

projections with the more robust US outlook seemed beneficial. However, for other variables—particularly soybean imports, wheat harvested area, and total consumption—being too close to the US forecast was associated with larger errors. It appears that demand-related variables are more localized and require region-specific information.

4. **China or Brazil as an alternative benchmark:** Recognizing that China and Brazil are also big players, we replicated the analysis using them as the base country. In some instances, aligning with Brazil's corn outlook resulted in stronger accuracy gains than aligning with the United States. Similarly, China could be a better anchor for soybean imports, given its enormous share of global soybean demand. Our takeaway is that "one-size-fits-all" anchoring to the United States is not necessarily the best strategy for every commodity and variable—nor is ignoring the United States entirely.
5. **Projection horizon matters:** Forecast accuracy typically worsens at longer horizons (e.g., 7–10 years; see figures 1 and 2). Our study confirms this, but we also found that the effect of "herding" or "diverging" can magnify over time. If a region's path is overly synchronized with a major producer's assumptions, any local differences that surface down the line can lead to large forecast misses.

From Farm Bill debates to international trade negotiations, USDA baselines inform a wide range of policy decisions. Recognizing that certain country forecasts may sometimes systematically track US assumptions gives policymakers a more nuanced understanding of these projections and helps ensure more informed, effective usage. Our analysis shows that USDA international baselines can show significant similarity

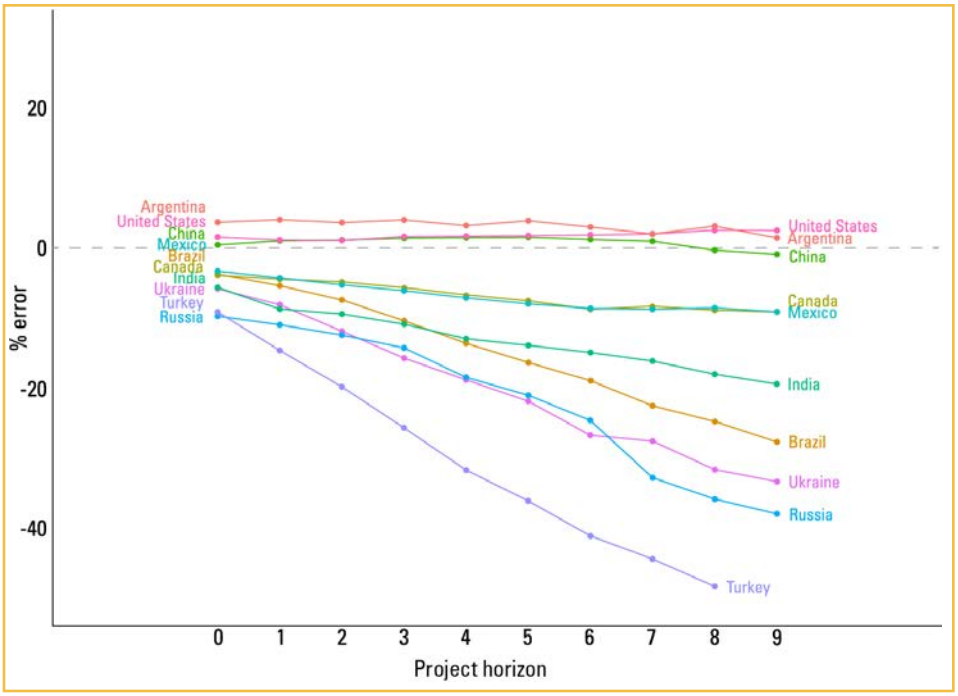

Figure 1. Projection error for corn yield by projection horizon.

Note: USDA's baseline projections extend up to 10 years into the future. This figure illustrates how, for the countries shown, the projection error in corn yield shifts as the forecast horizon increases.

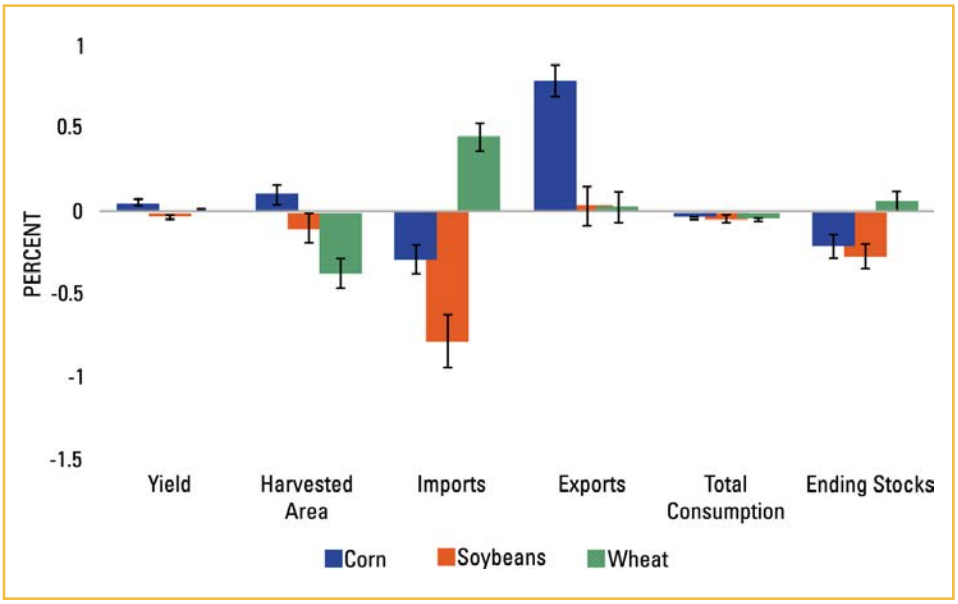

Figure 2. Relationship between projection error and projection distance from United States.

Note: This figure shows how much the projection error (in percentage terms) changes when the distance between other countries' USDA forecast and the US forecast increases by 1%. The bars above and below each estimate are the standard errors, which indicate the precision of those estimates.

across countries' forecasts—especially for yield—while other variables reveal bigger divergences. Importantly, whether this similarity helps or harms accuracy varies by commodity and measure. For instance, aligning yield and harvested area forecasts with a big global producer's outlook might be beneficial, but clustering around US assumptions for imports or consumption sometimes

increases errors.

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USDA's Outlook for 2025

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OVER THE past month, the US Department of Agriculture (USDA) has provided its outlook for agriculture in both the short and long term. The last couple of years have been challenging in the agricultural economy. Prices for crops have fallen, costs have risen, and net farm incomes have retreated. Drought, tariffs, and inflation remain as substantial concerns for the industry. The projections for 2025 highlight some of those challenges for agriculture in the year ahead and indicate that the ag economic downturn will likely continue, as production is likely to exceed consumption for many commodities once again.

Let's start with the one market where production is declining, cattle/beef. Table 1 outlines some of the basic numbers for cattle/beef. For the cattle sector, producers have been reducing their herds for several years. The long-run drought throughout various portions of the United States over the past five years has forced a significant reshaping of the cattle industry. The lack of high-quality pasture forced cattle producers to send more heifers into feedlots and sped up the movement of cattle to slaughter plants. Over the years, that has significantly reduced the overall size of the national cattle herd. The smaller herd translates into fewer cattle and lower beef production. We started this year with 1.2 million less cattle than we had last year—that will translate into a 1.1-billion-pound drop in beef production, lowering production to 26 billion pounds. With the combination of lower production and stubbornly strong domestic consumption, beef exports are projected to fall to 2.6 billion pounds, while beef imports have risen to 4.4 billion pounds and retail beef prices have hit record highs. As the herd continues to shrink, steer prices have risen significantly over the past few years. The outlook for 2025 shows average steer prices reaching $186 per hundredweight, with the potential for prices to rise to $200 per hundredweight.

Unlike the national cattle herd, the national swine herd has been growing over the past couple of years as productivity gains have more than offset smaller farrowing intentions. Over the past two years, the swine herd has grown by 1.1 million head (table 2). With the increase in animal numbers, pork production has climbed above 28 billion pounds. The increase in production has coincided with a resurgence in pork exports, with USDA originally projecting 7.4 billion pounds for pork exports in 2025. However,

Table 1. Cattle/Beef Statistics

	2023	2024	2025
Cattle and Calves, Jan. 1 (mil. head)	88.8	87.2	86.0
Beef Production (bil. lbs.)	27.0	27.1	26.0
Beef Exports (bil. lbs.)	3.0	3.0	2.6
Beef Imports (bil. lbs.)	3.7	4.4	4.4
5-Area Steer Price ($/cwt.)	175.54	186.18	186.50

Source: USDA (2025).

Table 2. Hog/Pork Statistics

	2023	2024	2025
Hogs and Pigs, Dec. 1 (previous year) (mil. head)	75.0	75.5	76.1
Pork Production (bil. lbs.)	27.3	28.0	28.5
Pork Exports (bil. lbs.)	6.8	7.2	7.4
Pork Imports (bil. lbs.)	1.1	1.2	1.2
National Base 51-52% Lean Live Hog Price ($/cwt.)	58.59	59.80	58.00

Source: USDA (2025).

Table 3. Corn Statistics

Marketing Year (2024 = 9/1/24 to 8/31/25)	2023	2024	2025
Area Planted (mil. acres)	94.6	90.6	94.0
Yield (bu./acre)	177.3	179.3	181.0
Production (mil. bu.)	15,341	14,867	15,585
Beg. Stocks (mil. bu.)	1,360	1,763	1,540
Imports (mil. bu.)	28	25	25
Total Supply (mil. bu.)	16,729	16,655	17,150
Feed & Residual (mil. bu.)	5,805	5,775	5,900
Ethanol (mil. bu.)	5,478	5,500	5,500
Food, Seed, & Other (mil. bu.)	1,390	1,390	1,385
Exports (mil. bu.)	2,292	2,450	2,400
Total Use (mil. bu.)	14,966	15,115	15,185
Ending Stocks (mil. bu.)	1,763	1,540	1,965
Season-Average Price ($/bu.)	4.55	4.35	4.20

Source: USDA (2025).

the early weekly export data has not lived up to those expectations; and, while hog prices did slightly improve in 2024, USDA's outlook shows a small decline in hog prices for 2025, with the national base price at $58 per hundredweight.

In total, USDA's projections are mixed for the livestock industry. The cattle sector continues to contract, leading to lower beef production and higher prices. The swine sector is growing, leading to higher pork production and lower prices.

Shifting to the crop sector, the general outlook is similar to that for pork, higher production and lower prices. Corn is following up on two record years—2023 was the largest crop in terms of production and 2024 was the best yield, which provided a lot of bushels for the corn market with which to work. During the 2024 marketing year (which we are in the middle of now), corn exports have been the major growth area for corn usage. Usually as exports grow, we would expect corn prices to rise.

However, given the expectations of tariffs throughout 2025 and the relative standing of corn prices versus other crop prices, the outlook for 2025 is for an increase in corn plantings and further erosion of corn prices. The early projections for the 2025 corn crop show a record 15.585 billion bushels of potential production (table 3). Thus, corn usage would need to expand quickly to match production. That usage expansion is unlikely given a shrinking cattle herd and a mature, but stable, ethanol industry. Corn exports are the only demand segment that could increase quickly, but the likelihood of that diminishes with each tariff announcement. Thus, ending stocks are projected to rise and the projected price for corn in 2025 is set to decline to $4.20 per bushel, over two dollars lower than the average price for the 2022 corn crop.

While the soybean market shares many of the storylines as the corn market, there are a few key differences. In 2024, soybean was the crop attracting acreage. With the increased area, soybean production increased by roughly 200 million bushels to 4.366 billion bushels; and, while soybean usage did quickly expand to utilize more soybeans, soybean supplies increased faster. Thus, the 2024 marketing year has been rough for soybean producers as the season-average price for soybean has fallen nearly $2.50 per bushel over the past year. The projections for 2025 show fewer soybean plantings, but with soybean yields based on the historical trend, soybean production is expected to hold relatively steady at 4.37 billion bushels (table 4). While domestic usage of soybeans is expected to increase due to growth in biofuel production, that growth is slowing down. Export sales are projected to increase as well, but by a smaller amount and the tariffs will likely force USDA to revise this estimate downward. In the end, USDA expects soybean prices to remain low throughout the 2025 marketing year.

Table 4. Soybean Statistics

Marketing Year (2024 = 9/1/24 to 8/31/25)	2023	2024	2025
Area Planted (mil. acres)	83.6	87.1	84.0
Yield (bu./acre)	50.6	50.7	52.5
Production	4,162	4,366	4,370
Beg. Stocks (mil. bu.)	264	342	380
Imports (mil. bu.)	21	20	20
Total Supply (mil. bu.)	4,447	4,729	4,770
Crush (mil. bu.)	2,285	2,410	2,475
Seed & Residual (mil. bu.)	125	114	110
Exports (mil. bu.)	1,695	1,825	1,865
Total Use (mil. bu.)	4,105	4,349	4,450
Ending Stocks (mil. bu.)	342	380	320
Season-Average Price ($/bu.)	12.40	9.95	10.00

Source: USDA (2025).

The full set of projections show higher production and lower prices for crops and pork, with the opposite for beef with lower production and higher prices. While domestic usage for all of the commodities is still quite strong, the gains in usage over the past year have mainly come from exports. The potential for tariffs reducing or eliminating that growth is large. Without that growth, pork and crop prices will remain lower. Thus, the outlook for 2025 looks to be a continuation of the pattern from 2023 and 2024 with lower market revenues and farm incomes, barring any additional support from the federal government.

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What Factors Influence Crop Insurance Coverage Level Choices? Learning from the Experiences and Perceptions of Farmers

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INITIALLY MET with little interest, the federal crop insurance program (FCIP) has evolved into a near-automatic annual choice for farmers across most regions and major crops. Key changes since 1980—including improved rate-setting, higher subsidies, and the introduction of revenue insurance, enterprise-level coverage, and trend-adjusted yields—have made crop insurance products less costly and better aligned with farmers' risk management needs. As shown in figure 1, both the share of major crop acreage insured and the average coverage level have increased substantially since 1980. Yet despite the high participation rate and average coverage level, farmers select a wide range of coverage levels, and some studies have raised the issue of whether farmers have been making crop insurance choices that maximize their economic benefits (Du et al. 2017). Using a recent survey conducted in Iowa and Kansas, this article presents patterns in farmers' coverage level choices and examines potential factors driving these choices.

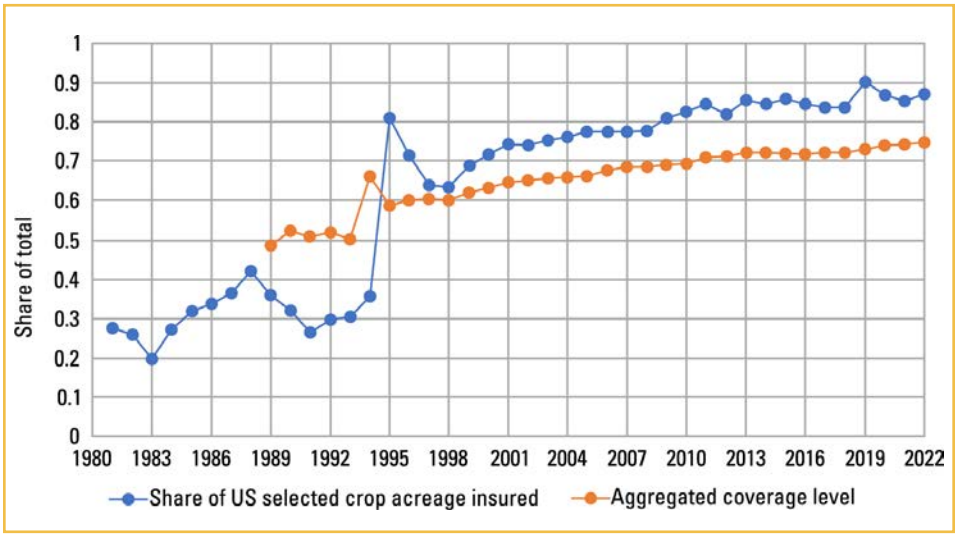

Figure 1. United States level data on crop insurance participation, 1980–2022.

Notes: 1. This graph is reproduced using data from USDA ERS (2024).

2. Selected crop acreage is the sum of planted acres for barley, corn, cotton, dry beans, flax, oats, peanuts, potatoes, rice, rye, sorghum, soybeans, sugar beets, sunflowers, sweet potatoes, and wheat, harvested acres for coffee, sugarcane, and tobacco, and bearing acreage for grapefruit, lime, lemon, mandarins, tangerines, and orange.

3. The aggregate crop coverage level is equal to the ratio of total insured liability to the total potential liability that participants could insure in the program.

Survey procedures

The survey was funded by the USDA's National Institute of Food and Agriculture and conducted in 2023. We targeted commercial non-irrigated cropland farmers from Iowa and Kansas who grew at least 100 corn acres in either 2021 or 2022. This selection criterion allowed us to examine choices made by producers operating under different production conditions. We distributed the survey through the Qualtrics online platform in two waves. The initial wave (January–April 2023) recruited participants through farmer meetings, university extension websites, mailed postcards with survey links and QR codes sent to farmers from an agricultural vendor list, and existing researcher networks. The second wave (August–October 2023) was conducted in partnership with Kynetec, a specialized farmer survey company. Participants could complete the survey on laptops, tablets, or mobile phones.

We collected responses from 653 farmers in total, with 330 participating in the first wave and 323 in the second. The sample included 476 farmers from Iowa and 177 from Kansas, covering most counties in Iowa and primarily the eastern and northern regions of Kansas. In our survey, the average per-acre corn yield is 209 bushels for Iowa farmers and 94 bushels for Kansas farmers, highlighting a significant difference in growing conditions between the two states. Additionally, while Kansas respondents tend to farm larger areas (with an average farm size of 2,220 acres compared to 1,180 acres for Iowa farmers), Iowa farmers have higher total farm sales (about 69% of Iowa farmers report total farm sales exceeding $500,000, compared to 52% of Kansas farmers.) Our state-level average acres are broadly consistent with data in agricultural censuses, in the sense that farms in Kansas are much larger than

those in Iowa. However, the comparisons are not so straightforward as our survey targeted farmers with a minimum of 100 acres.

Farmers' coverage level choices during the 2020–2022 period

Only 15 participants reported never purchasing crop insurance policies during the 2020–2022 period. Figure 2 shows that Iowa farmers predominantly insured at 80% or 85% coverage levels, while Kansas farmers most frequently chose 70% or 75% coverage level during the 2020–2022 period. These patterns align with the state-level coverage level choices observed in the Risk Management Agency's Summary of Business data (Schnitkey et al. 2021). During this three-year period, 35% of Kansas farmers and 24% of Iowa farmers received indemnity in (only) one year, 16% and 9% received indemnity in two years, and 8% and 3% received indemnity in all three years. Overall, Kansas farmers were more likely to receive indemnity payments than Iowa farmers, reflecting their higher risk levels.

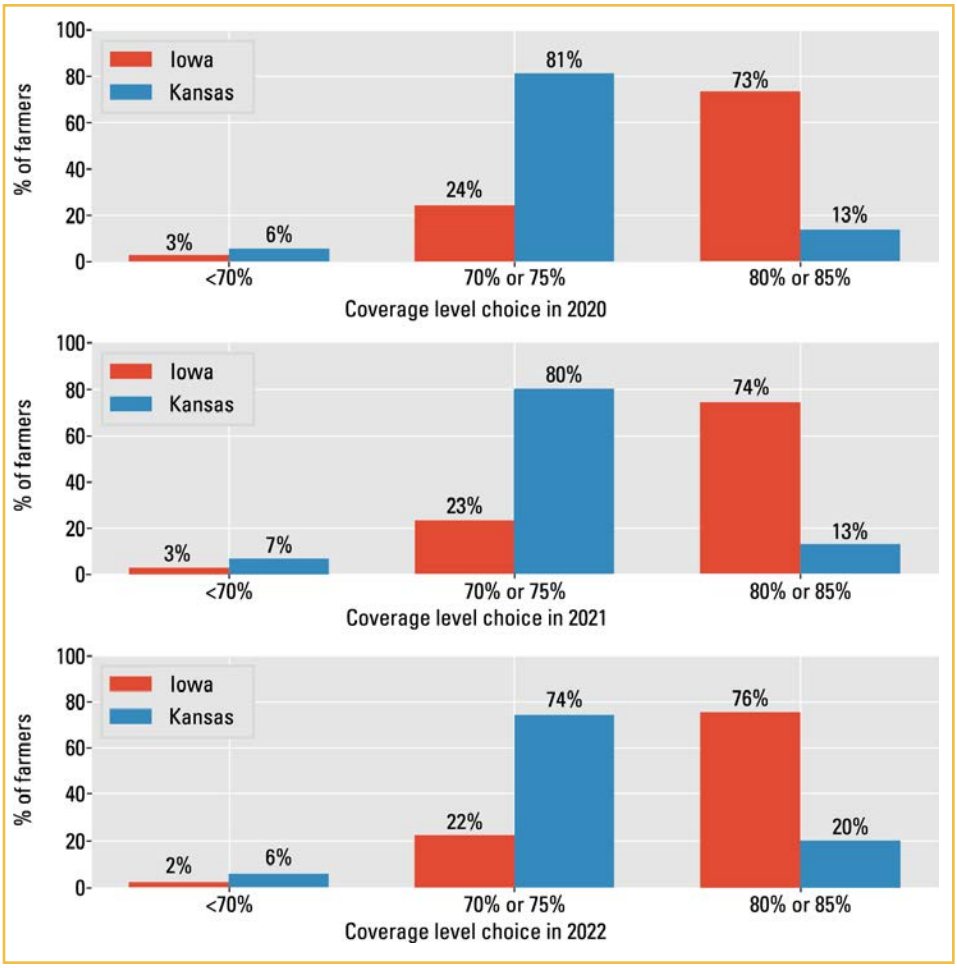

Figure 2. Farmers' coverage level choices by state, 2020–2022.

Table 1 highlights year-to-year changes in coverage levels from 2020 to 2022. Around 90% of farmers in both states maintained the same coverage levels over three years. This suggests a preference for keeping the same coverage levels over time. In Iowa, 91% of farmers retained their coverage levels from 2020 to 2021, and 90% did the same from 2021 to 2022. Similarly in Kansas 90% of farmers did not change their coverage from 2020 to 2021, and 80% maintained their level from 2021 to 2022. This pattern suggests that farmers tend to stick with their initial choices, even when circumstances change. This "inertia phenomenon" may be due to the high time and other costs of regularly switching coverage levels, insufficient information on the costs and benefits of switching, or producers focusing their attention on other management decisions (Du 2025). Farmers may also choose the same coverage levels year after year simply because they believe a certain coverage level is right for their farm regardless of market or weather

Table 1. Changes in Coverage Level, 2020–2022

Changes from 2020 to 2021	Changes from 2021 to 2022							
	Iowa farmers				Kansas farmers			
	Decrease	No change	Increase	Total	Decrease	No change	Increase	Total
Decrease	5 (24%)	**9 (43%)**	7 (33%)	21 (100%)	0 (0%)	**2 (50%)**	**2 (50%)**	4 (100%)
No change	15 (4%)	**363 (91%)**	22 (6%)	400 (100%)	1 (1%)	**133 (90%)**	14 (9%)	148 (100%)
Increase	6 (11%)	22 (40%)	**27 (49%)**	55 (100%)	0 (0%)	6 (24%)	**19 (76%)**	25 (100%)
Total	26 (5%)	394 (83%)	56 (12%)	476 (100%)	1 (0%)	141 (80%)	35 (20%)	177 (100%)

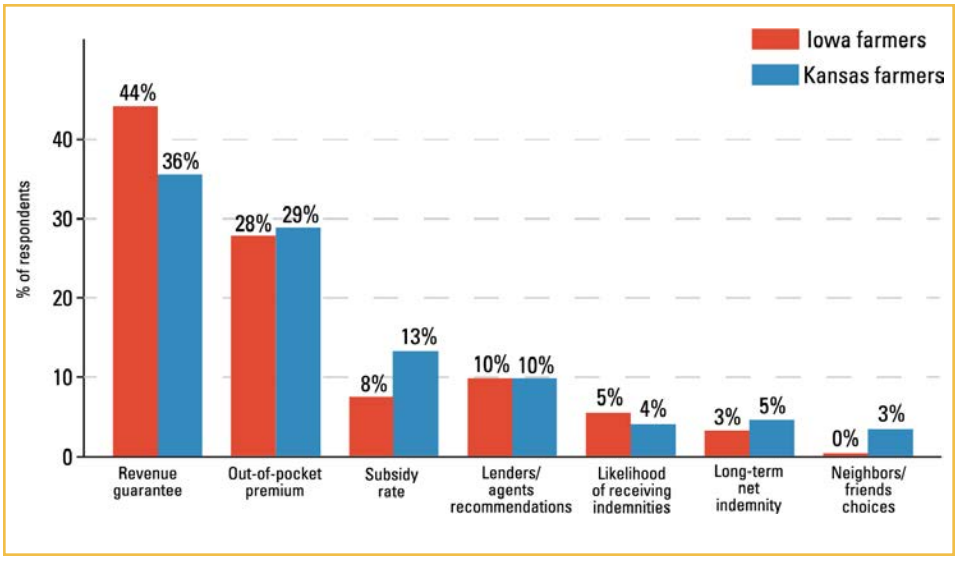

Figure 3. Factor that had the greatest impact on farmers' coverage level choices, 2018–2022.

conditions.

Unlike inertia, the recency effect hypothesis suggests that farmers are more likely to increase their coverage levels after receiving insurance indemnities due to negative yield or revenue shocks (Che et al. 2020). However, we do not observe this phenomenon in our data. Analyses of our survey data, not shown in this article, provide no evidence that farmers who received any indemnity in the past year are more likely to increase their coverage level in the following year. Instead we find that the increase in coverage levels tends to occur incrementally, that is, among those who increased their coverage in 2021, 49% in Iowa and 76% in Kansas continued to increase their coverage in 2022. This finding suggests that once farmers adjust they are more likely to reinforce the change rather than revert to lower levels. Furthermore, increased coverage levels are mainly made by young and early-stage farmers. This result suggests that crop insurance choices may evolve as producers gain experience and adapt to changing production conditions.

Farmers' views on impact factors

Figure 3 depicts the percentage of farmers who identified a specific factor as having the most significant impact in response to the question "For the years 2018–2022, how much impact did the following factors typically have on your corn crop insurance choices regarding whether to buy insurance and at what coverage level?" The revenue guarantee function emerges as the leading factor, indicating that the risk protection level primarily drives farmers' coverage level choices. Iowa farmers are significantly more likely to report revenue guarantees as the most important factor than are Kansas farmers. This may reflect the higher corn yield potential in Iowa, which creates a greater need to secure the associated higher revenue through insurance guarantees. Further analysis of the survey data reveals that small operations (annual sales ≤$250,000) place less emphasis on risk protection. This may be because these farmers often have off-farm income and don't depend as heavily on crop revenue for financial security.

The second-most common response is a distaste for paying out-of-pocket premiums. Nearly 30% of farmers in both states indicated that high premiums were a major concern. Since higher premiums correspond to higher revenue guarantees for the same farmer, this widespread distaste for paying premiums suggests farmers carefully weigh cost against benefit when considering additional risk protection. This distaste is most pronounced among small operations (annual sales ≤$250,000), likely reflecting limited payment ability or greater flexibility for self-insurance. Additionally, because crop insurance is relatively more expensive in Kansas, this premium aversion helps explain why Kansas farmers typically insure at lower coverage levels than their Iowa counterparts.

The subsidy rate and recommendations from agents or lenders are the third- and fourth-most influential factors, although their ranking varies by state. Premiums for crop insurance are subsidized by the Federal Crop Insurance Corporation. The subsidy rate directly determines the subsidy benefit a farmer receives from FCIP. While many farmers might have already factored such benefits into the reduced out-of-pocket premium, the decreasing subsidy rate at higher coverage levels may still be a salient feature that deters some farmers from purchasing high coverage levels. This effect appears stronger when unsubsidized premiums are high, explaining why a larger percentage of Kansas farmers cite the subsidy rate as the most important factor compared to Iowa farmers.

Meanwhile, many farmers rely on advice from crop insurance agents or lenders when determining their coverage levels. These recommendations typically aim to meet specific financial goals, such as covering break-even costs or securing favorable loan terms. Our survey reveals that farmers with higher debt-to-asset ratios are likelier to follow such advice. With limited financial cushion, these farmers may be more attuned to production and market risk as well as subject to the risk management standards required by financial institutions.

Finally, very few farmers reported receiving indemnities or friends' and neighbors' choices as important factors. It is interesting that receiving indemnities is not ranked as an important factor by many farmers, implying that farmers value the benefit of "peace of mind" that comes with crop insurance more than the benefit of "getting back" what they pay for crop insurance.

Discussion and conclusions

Farmers' coverage level choices often reflect the interplay of multiple factors. Using data from a recent online survey, we find that Kansas farmers tend to insure at the 70% and 75% coverage levels while Iowa farmers tend to insure at the 80% and 85% coverage levels. Approximately 90% of farmers maintain identical coverage levels across multiple years. Revenue guarantees and premium expenses are the two most influential determinants of coverage level decisions. Subsidy rates and recommendations from insurance agents or lenders each emerge as the most important factor for about 10% of surveyed farmers. Yet these two factors are also closely related to the cost and risk protection function of crop insurance. We find less support for the claim that farmers prioritize receiving indemnities or following the suggestions of their peers.

For producers, there are tradeoffs based on what aspects of the crop insurance decision they emphasize. Focusing on a revenue guarantee maximizes risk protection and can support both production and investment decisions. However, additional risk protection at the highest levels can be costly. Some producers have shared that they do not select the highest coverage because they believe that the additional premium dollars could be better spent elsewhere. Likewise, focusing on cost can provide savings but higher exposure to yield or market swings that could have long-term impacts. Keeping the same coverage level over time may allow producers to focus on other management and production decisions but may not always provide the desired risk protection. For example, higher coverage levels may be necessary during low-price periods to protect breakeven revenue.

Agents and lenders can provide information and analysis that helps producers make this complex decision. While sometimes this is in the form of advanced decision tools that incorporate producer and market information, simple measures such as "cost per additional guarantee" can also be useful. This measure shows the premium cost per additional guarantee/liability when increasing coverage and incorporates the revenue guarantee, premium cost, and subsidy rate. Agents can also review possible revenue outcomes based on different price and yield changes. This exercise can help producers understand how they are protected under different revenue outcomes, providing a realistic understanding of the current risk environment and preventing post-harvest disappointment.

Overall, our survey results suggest farmers strategically balance risk protection with associated costs when selecting coverage levels. However, what risk protection level farmers are willing to pay for remains an open question. Using data from the same survey, Gong et al. (2025) show that covering the expected break-even revenue is an important goal for many farmers when making their coverage-level decisions. Further studies are needed to understand better how farmers determine their optimal protection levels across different market and production environments and financial situations.

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