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DIS Insights

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***D**ecision **I**nnovation **S**olution*

FEATURED ARTICLE

IOWA'S ETHANOL GROSS PRODUCTION MARGIN DURING THE SECOND HALF OF THE COVID-19 PANDEMIC AND AFTER

By Jing Tang
Statistician

FEATURED DIS SERVICE

OUR WORK USING OUR DYNAMIC FLOW ANALYSIS™ METHODOLOGY

By Spencer Parkinson
Executive Director

Decision Innovation Solutions™
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RECENT ARTICLES

CONSERVATION RESERVE PROGRAM OF U.S. CROPLAND: A GLOBAL COMPETITIVENESS ISSUE

By Joy Das
Senior Research Analyst

RECENT TRENDS IN THE U.S. & IOWA'S AG MACHINERY INDUSTRY: 2021 LEADS WITH STRONG SALES

By Brittni Echols
Research Analyst

ANNOUNCEMENTS

NEW DIS TEAM MEMBER

We welcome Kade Grafel, our newest research analyst to the DIS team

WELCOME KADE!

By Rebekkah Amende
Marketing & Communications Intern

Kia Ora – or in other words, hello – DIS community! We are excited to have Kade join the team here at Decision Innovation Solutions (DIS).

As a research analyst at Decision Innovation Solutions, Kade is responsible for conducting economic impact and contribution analysis, writing reports, and data management and analysis. These are all utilized to assist clients in making informed and strategic business decisions.

Kade was raised on a family farm in the small town of Oberlin, Kansas. His family grew wheat, corn, and raised cattle. During his growing-up years he worked on the family farm and participated in 4-H. From these and other experiences he has developed a great passion for the ag industry.

Kade received a B.S. degree in economics with a minor in mathematics from Kansas State University in Manhattan, Kansas.

In the pursuit of his undergraduate degree, Kade took many opportunities to further his professional development.

As an undergraduate research assistant, Kade participated in an empirical research project studying education and labor market outcomes. He also improved process efficiency with the automation of a weekly task through script writing – a skill he continued to develop within coursework using STATA and R.

Kade completed a study abroad at the Universidad Carlos III de Madrid in Madrid, Spain. This provided an enriching environment for him to further develop his Spanish language skills.

Kade also completed an economics internship at the Kansas Department of Agriculture (KDA). He was predominantly responsible for gathering and cleaning data, along with creating an agricultural economic contribution report for each county in the state of Kansas.

He was also involved in various projects including: Updating a compilation of agricultural statistics available on the KDA's website, research into rural broadband availability, and assisting with the Kansas hay report.

CONTACT US

Decision Innovation Solutions is committed to bridging your information research needs. We hope you enjoy our newsletter and find it insightful. If you would like to learn more, ask us a question or schedule a visit? Please contact us today!

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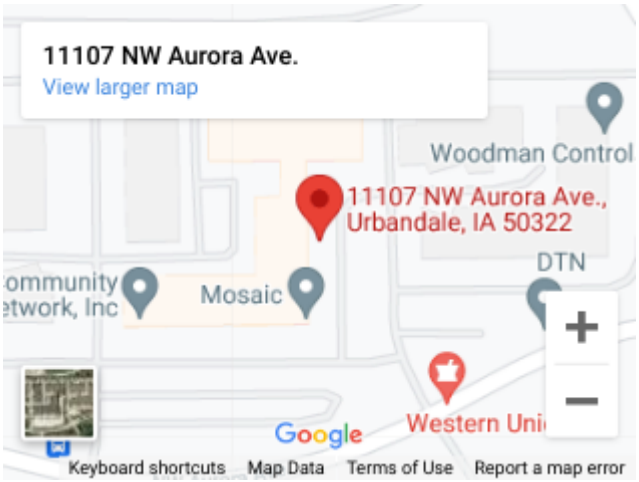

To contact any of the authors, click on their photo and you will be redirected to their biography with more information along with their contact details.

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FEATURED ARTICLE

IOWA'S ETHANOL GROSS PRODUCTION MARGIN DURING THE SECOND HALF OF THE COVID-19 PANDEMIC AND AFTER

By Jing Tang
Statistician

As a Statistician for Decision Innovation Solutions, Jing Tang is responsible for analyzing agricultural data to help clients to make better strategic business decisions, and to assist co-workers improve model prediction and model estimation preference.

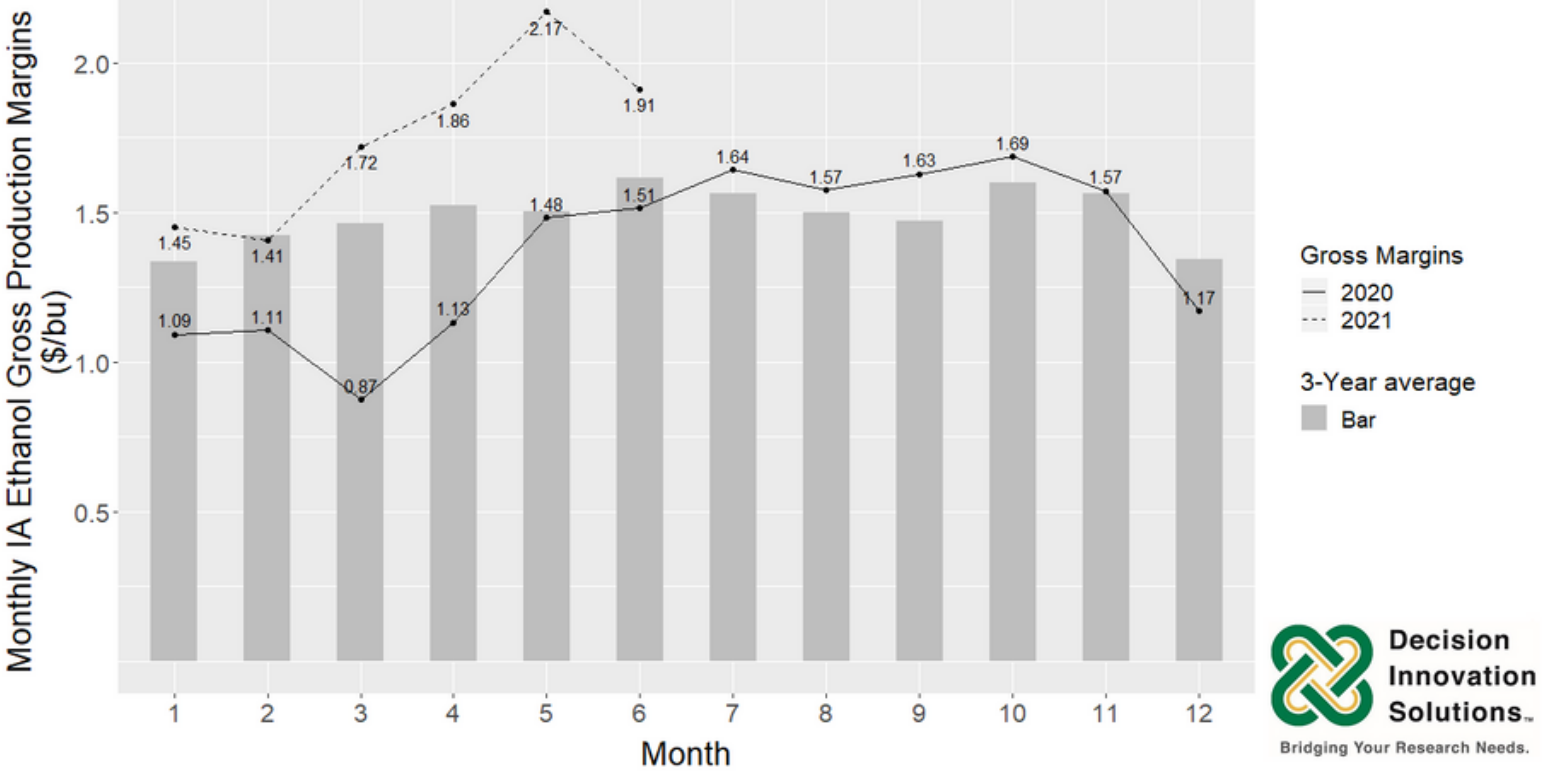
This series report has been prepared over two years, starting in 2019 with the abnormal weather event that caused serious flooding in the main corn planting states. In this first report, we discussed how the delays in corn planting progress influenced the ethanol gross production margin (GPM) values. Following the flooding in 2019, 2020 came with its own unprecedented and unique difficulties as the COVID-19 pandemic unfolded.

In the second report, we looked at the first three months of the pandemic – March to May – and discussed how the GPM behaved in this new situation. Although the pandemic has not officially ended, the U.S. appears to be in the recovery stages. In this article, we will focus on the behavior of the GPM during the second half of 2020 and 2021 thus far.

The gross production margin in the ethanol industry commonly represents the difference between the price of corn and the combined sales value of ethanol, and its co-products: distiller's dried grains (DDGs) and distillers corn oil (DCO). The GPM shows the calculated relationship between the value of ethanol and ethanol co-products and the cost of corn in ethanol production.

Figure 1 shows the monthly average of Iowa's ethanol GPM for the years 2020 and 2021, represented respectively by a solid line and dashed line. This figure also includes Iowa's ethanol GPM three-year average – 2018 to 2020 – for each month.

Figure1. Monthly IA Ethanol Gross Production Margins with 3-Year Average



All monthly GPMs in the first half-year of 2020 were below the three-year average (for more details, please check out the previous blog), and while most of the GPMs in the second half-year of 2020 were slightly over the three-year average, overall, the majority of 2020's monthly averages fell below the three-year average. Conversely, 2021 values are proving more optimistic with almost all monthly average GPMs having been above the three-year average.

Looking at the second half of 2020: The average corn price from July 2020 to October 2020 was $3.34/bu, $0.56/bu lower than the corresponding price in 2019 – $3.90/bu –, while the average sales value of both DDGs and DCO were slightly above those in 2019.

Therefore, based on the GPM calculation, the average GPM over these months ended up being slightly over the three-year average. However, during the last two months of 2020 corn prices increased to $4.08/bu in November and $4.20/bu in December for an average across both months of $4.14/bu. This was an increase of about 24% when compared to the average corn price from July 2020 to October 2020. On top of this DDGs values decreased by about 44% during the same period, resulting in the GPMs drop from $1.63/bu (average GPM from July 2020 to October 2020) to $1.57/bu November and $1.17/bu in December.

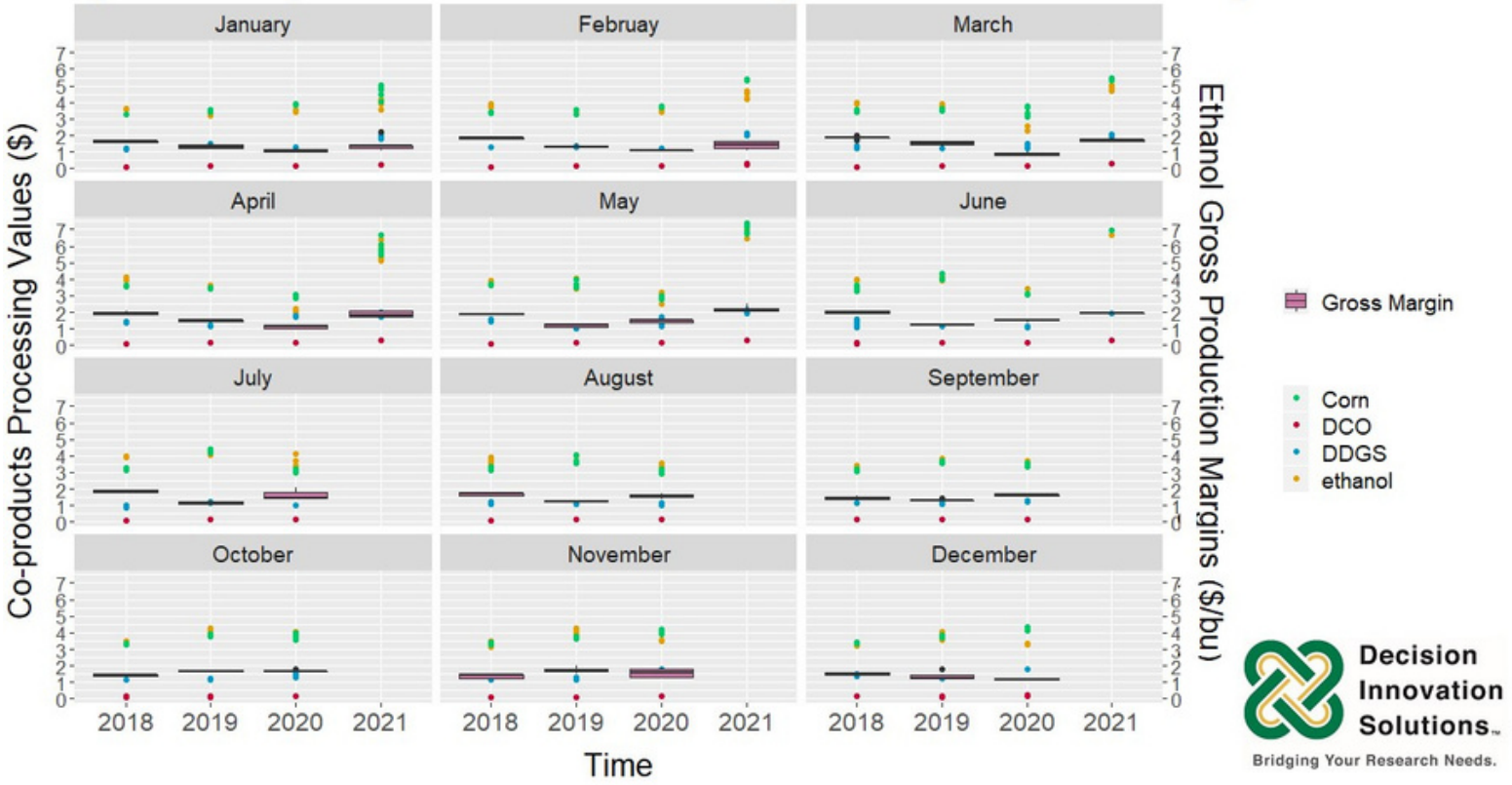
Looking at the first half of 2021: The average GMP for every month apart from February has been higher than the three-year average, with each month following a similar pattern to that seen in January 2021.

In comparison to January 2020, the GPM increased by 33%, from $1.09/bu to $1.45/bu – largely due to higher sale values of ethanol and its co-products. The sale values of ethanol, DDGs, and DCO in January 2021 were higher than those experienced in both 2020 and 2019.

The sale values of ethanol, DDGs, and DCO in January 2021 were $3.95, $1.94, and $0.24 respectively. In 2020 these sale values were $3.48, $1.29, and $0.15; and $3.28, $1.42, and $0.14 in 2019.

In Figure 2, the scatter points represent the weekly sales values – raw data from the AMS weekly report – for corn, ethanol, DDGS, and DCO using green, yellow, blue, and red respectively. The boxplots in pink, represent the range of weekly IA ethanol GPMs

Figure2. Monthly IA Ethanol Gross Production Margins and Co-Products Processing Values



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We applied the ANOVA and Tukey-HSD tests to the study period, i.e., January 2018 to June 2021, and found that:

- For the first half-year, in general (averaging the 6-month GPM values), the GPM values in 2019 and 2020 were significantly lower than 2018 and 2021; there is no significant difference between the GPM values in 2019 and 2020, and there is no significant difference between the GPM values in 2018 and 2021.

However, in April and May, the GPM values in 2021 are significantly higher than all other years.

- For the second half-year, in general (averaging the 6-month GPM values), there is no significant difference among the GPM values from 2018 to 2020. However, in July, August, and September, the GPMs in 2019 have significantly lower values than in 2018 and 2020. Also, in October and November, the GPMs in 2018 are significantly lower than in 2019 and 2020 whereas there is no significant difference in December GPM values.

Applying the Pearson correlation test, we found that within the study period, corn prices have had a strong significant negative effect in July and August, this effect becomes weaker but still significant as time moves forward. However, corn prices had no significant effect in November.

The sale value of DDGs had no effect on the GPMs for January through to April. However, with August as the exception, from May through to October the sale value of DDGs had a significant positive effect; and after November, the sale value of DDGs yet again had no effect on GPM values.

The sale value of DCO has had a significant positive effect on the GPMs in May, September, and October, while it has had a significant negative effect in July and December; No other significant effect was found in any other months.

The sale value of ethanol has had a significant positive effect on GPM, in the months' March, April, May, October, and November, but no significant effect in other months.

In summary, with regard to the 2021 GPM values: The ethanol price (ethanol sale value) is the dominant variable in March to May, the DDGs price (DDGs sale value) is the dominant variable in June, and both have significant positive effects on the GPM values. We found a similar conclusion in previous analyses, in that the ethanol price became the dominant variable. From the EIA Fuel ethanol overview table, ethanol fuel production is slowly returning to normal, but is still relatively low when compared to 2018 and 2019 levels. Ethanol fuel production may still have a continuous influence on the ethanol price and value which in turn is expected to influence the GPM values.

This was a general analysis of the GPM as we understand that various industries – such as ethanol production, corn production, and the feed industry, etc. – use the GPM and/or the co-product sale values from different perspectives to aid in the making of a variety of important business decisions. Let us know how you use the GPM, and which dominant variable has the most effect on your business.

All data came from the Iowa Ethanol Corn and Co-Products Processing Values Report and the National Daily Ethanol Report from the USDA AMS website – The latest data was updated on June 4th, 2021.

FEATURED BUSINESS SOLUTION

DYNAMIC FLOW ANALYSIS™ IN ACTION

By Spencer Parkinson
Executive Director

As Executive Director of Decision Innovation Solutions, Spencer Parkinson is responsible for business generation, ensuring client satisfaction and managing the overall operations of the business. He also seeks to understand clients' data challenges, propose potential solutions and works with clients to enhance their decision-making processes.

With 2020 in the rearview mirror, summer upon us, and varying covid restrictions easing, 2021 is shaping up to be more "normal". For this, the DIS team is grateful.

The DIS team continues to branch out to new areas but our march persists in familiar territory as well. As readers may recall, we completed some exciting work in the State of Missouri in 2019, which I summarized in earlier articles: "The "Quilt Map" Returns", and "Missouri Commodity Flow and Infrastructure Social Media Campaign". Not long after using our Dynamic Flow Analysis™ methodology to complete work in Missouri for farm commodities (corn, soybeans, grain sorghum, and wheat), we were asked to conduct a commodity flow study for biodiesel in Missouri. And, more recently, a forthcoming report for the Illinois Farm Bureau used our Dynamic Flow Analysis™ methodology to look at how the flow of cattle and hogs to market could influence the expansion of local meat processing in Illinois.

We wanted to share how we used this methodology in the commodity flow study we conducted for biodiesel in Missouri, and how it is being used in Illinois in regard to the potential expansion of local meat processing.

Increased Biodiesel Use in Missouri

This project evaluated the impacts of a new fuel standard policy in Missouri in comparison with the current situation. The project evaluated these impacts from different interrelated perspectives:

- Diesel and biodiesel consumption in the state
- Missouri out-of-state biodiesel shipments
- Biodiesel production
- Soybeans and soybean oil usage
- Number of processors
- Number of Missouri biodiesel producers
- Impact on current biodiesel and soybean oil production capacity

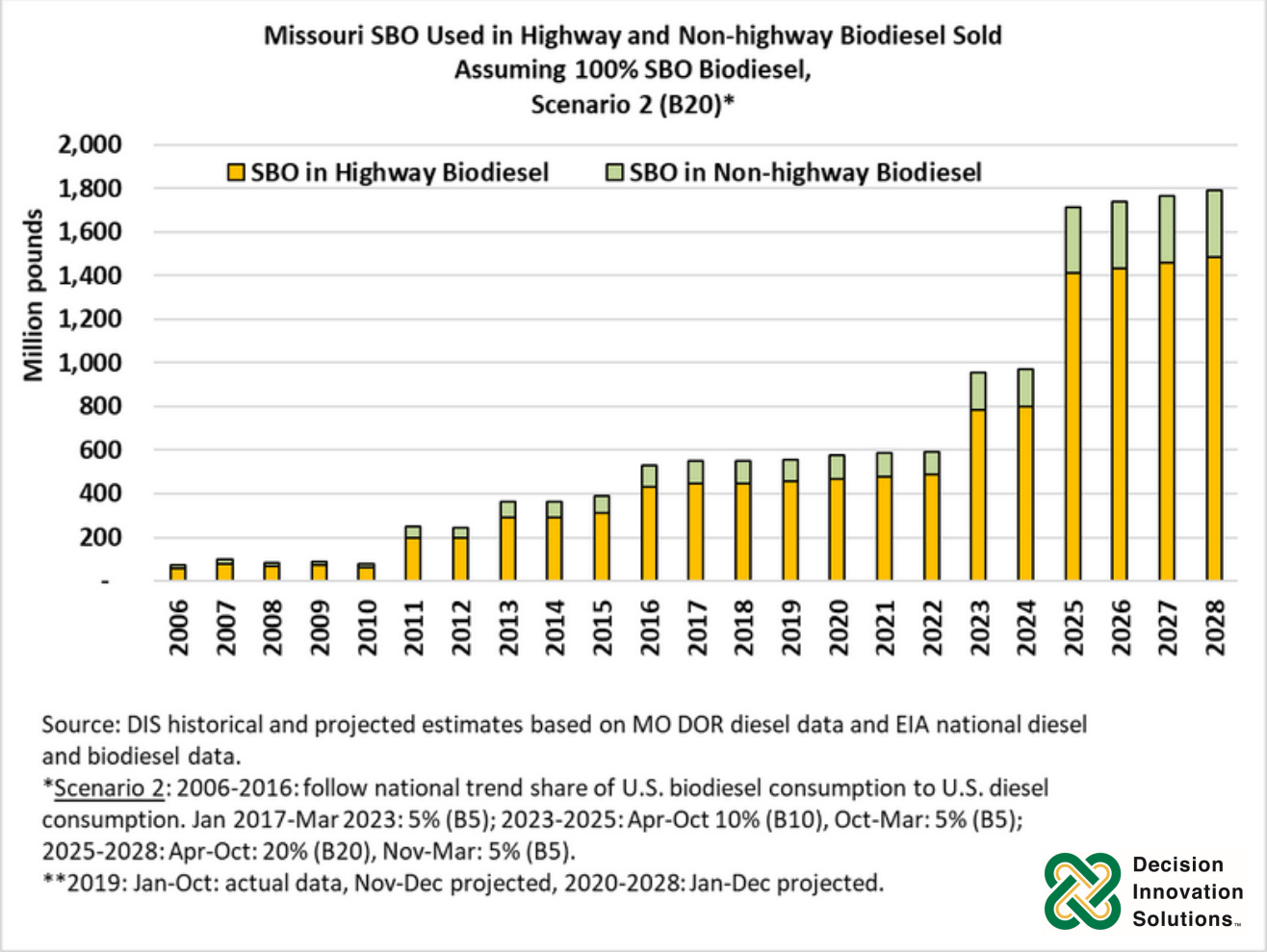

Figure 1. Missouri SBO Used in Highway and Non-Highway Biodiesel Sold, Assuming 100% SBO Biodiesel, Scenario 2 (B20)

Under the new biodiesel fuel policy, the industry is expected to grow, hence the corresponding additional economic activity from increased soybean production, soybean processing, and the construction of a new plant was estimated.

In addition to evaluating these core components, this project included a Dynamic Flow Analysis™ to model the flow of biodiesel from soy-based biodiesel production facilities in Missouri and selected contiguous states. View the full report here.

An example of the output of the Dynamic Flow Analysis is shown below:

2028 Scenario 2B Regional Flow analysis with 50 million gallons in Scott Co., MO

The 2028 flow analysis adds the unused capacity from biodiesel plants in the abutting CRDs, 38 million gallons of supply from outside of the region – used to partially satisfy western out-of-state demand –, and 50 million gallons of supply in Scott County, Missouri. With the addition of 50 million gallons of biodiesel production in Scott County, Missouri, and substantially increased use in the Kansas City and St. Louis metropolitan areas, the flow patterns change.

Much more of the Buchanan and Jackson County biodiesel production is used within the Kansas City and St. Joseph metropolitan areas. Scott county biodiesel would satisfy biodiesel needs in a greater portion of the Ozarks, and will also become a significant supply point for the St. Louis metropolitan area (35%) and eastern out-of-state shipments (44%). Southern out-of-state shipments would likely be satisfied by the Shelby County, TN biodiesel facility (92%). On the other hand, western out-of-state shipments would be satisfied by shipments from Kansas biodiesel facilities (46%), Buchanan Co., MO (16%), Gage Co., NE (14%), Independence Co., AR (4%), and Vernon Co., MO (20%).

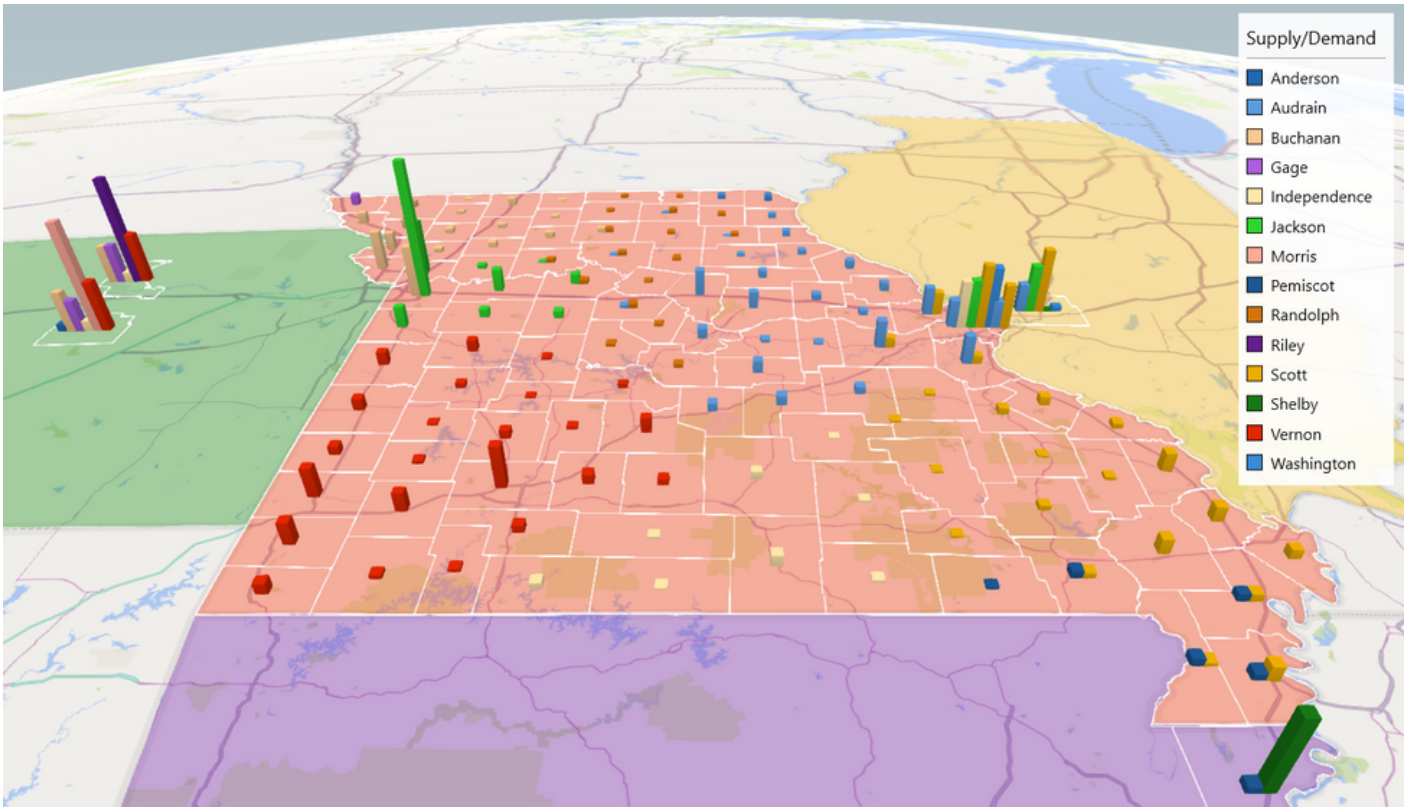

Figure 2. Regional Biodiesel Flow Analysis 2028, with Scott Co., MO Biodiesel Plant

Local Meat Processor Expansion in Illinois

Another recent application of the Dynamic Flow Analysis™ methodology examined two important aspects of Illinois agriculture: 1) the economic impact of a new or refurbished local meat processor; and 2) the current draw areas for hogs and cattle for current livestock slaughter and processing in Illinois and surrounding states. The intent of completing these two components of research was to identify potential opportunities in Illinois that would benefit from an expansion in local meat processing.

As we continue to refine and expand our Dynamic Flow Analysis™ methodology, other exciting opportunities are opening up for the team. And, generally speaking, without a great, diverse team intent on learning and applying new skills, DIS would have struggled throughout the last 18 months. Adaptability, industriousness, persistence, and innovativeness have allowed the team to thrive in these unique circumstances; we are excited to work with past, existing, and new clients for the rest of 2021 and beyond.

Our DIS team developed this Dynamic Flow Analysis™ methodology and it has been utilized in studies conducted for Missouri and Illinois. If you would like to learn more about it and how it can apply to your business, organization, or company, please contact us.

RECENT ARTICLE

CONSERVATION RESERVE PROGRAM OF U.S. CROPLAND: A GLOBAL COMPETITIVENESS ISSUE

By Joy Das, Ph.D
Senior Research Analyst

Joy Das, Senior Research Analyst at Decision Innovation Solutions, conducts research and analyzes data to estimate economic impacts and develop forecasts. He prepares reports and formulates plans to address economic problems related to the impacts of international trade on the production and distribution of goods and services.

Established under the 1985 Food Security Act, the Conservation Reserve Program (CRP) is primarily focused on: protecting otherwise arable land from erosion, improving water quality, and protecting wildlife habitats. The CRP works to achieve these through the voluntary retirement of environmentally sensitive cropland and highly erodible land from production through 10- or 15-year contracts. Cover crops of either trees or grasses and forbs are planted on the enrolled land, and participants in the program receive compensation for their land taken out of production.

In 1986 farmland began being enrolled in the CRP, and since then millions of acres have been enrolled through either the continuous or general enrollment process (see Figure 1). However, land idling due to the CRP has resulted in a reduction in agricultural production (Hellerstein, 2017). This article intends to discuss the trade-off between land conservation and reduction in the supply of agricultural commodities.

Since the establishment of the CRP in the U.S. and comparable acreage-idling programs in a few other developed countries, croplands in developed countries have decreased. Conversely, low-income and middle-income economies, have been experiencing an increase in croplands since 1986. These global cropland trend lines for low-income, middle-income, and other high-income economies compared to the U.S. are shown in Figure 2.

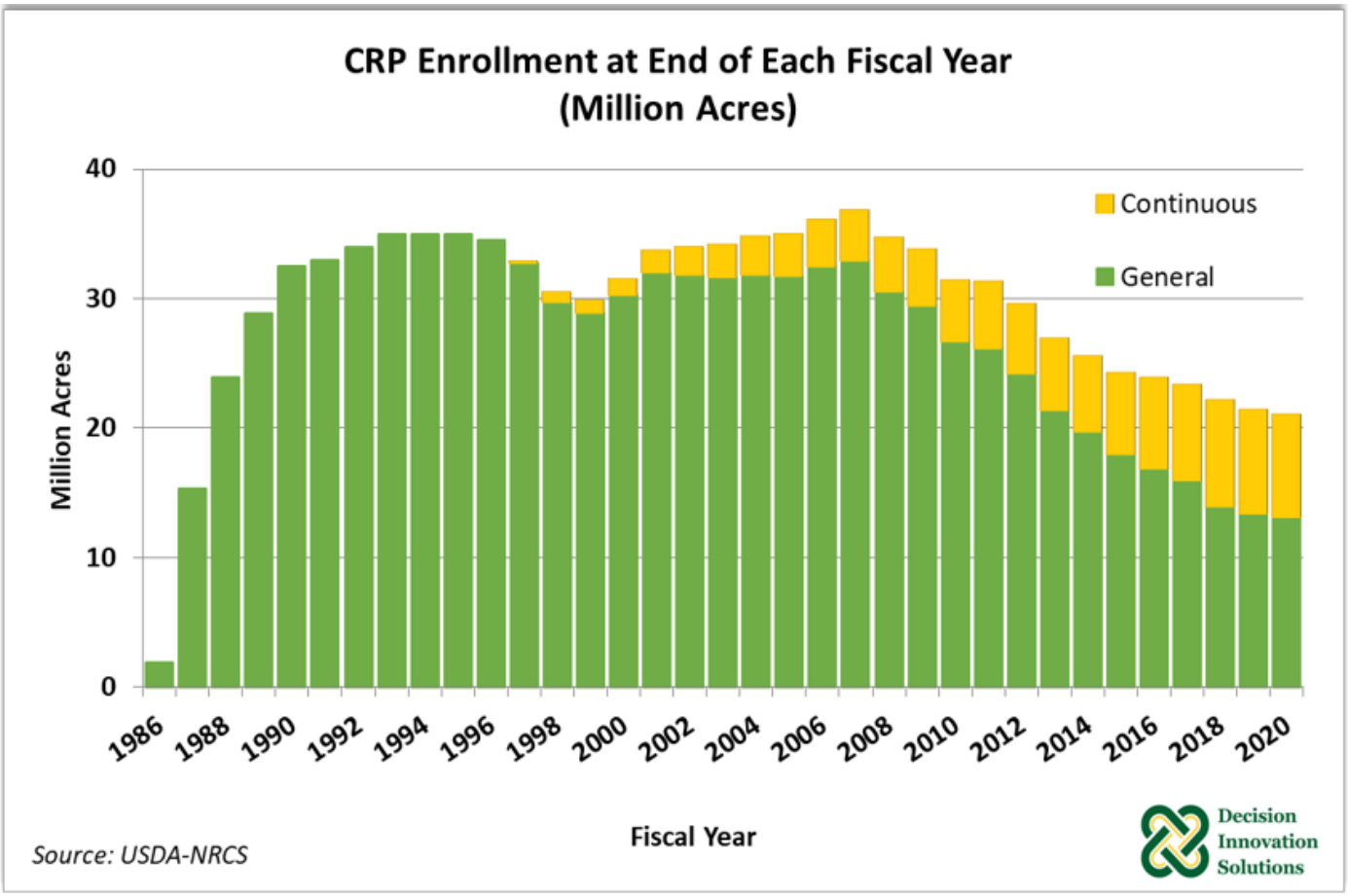

Figure 1. General and Continuous Enrollment of CRP Land

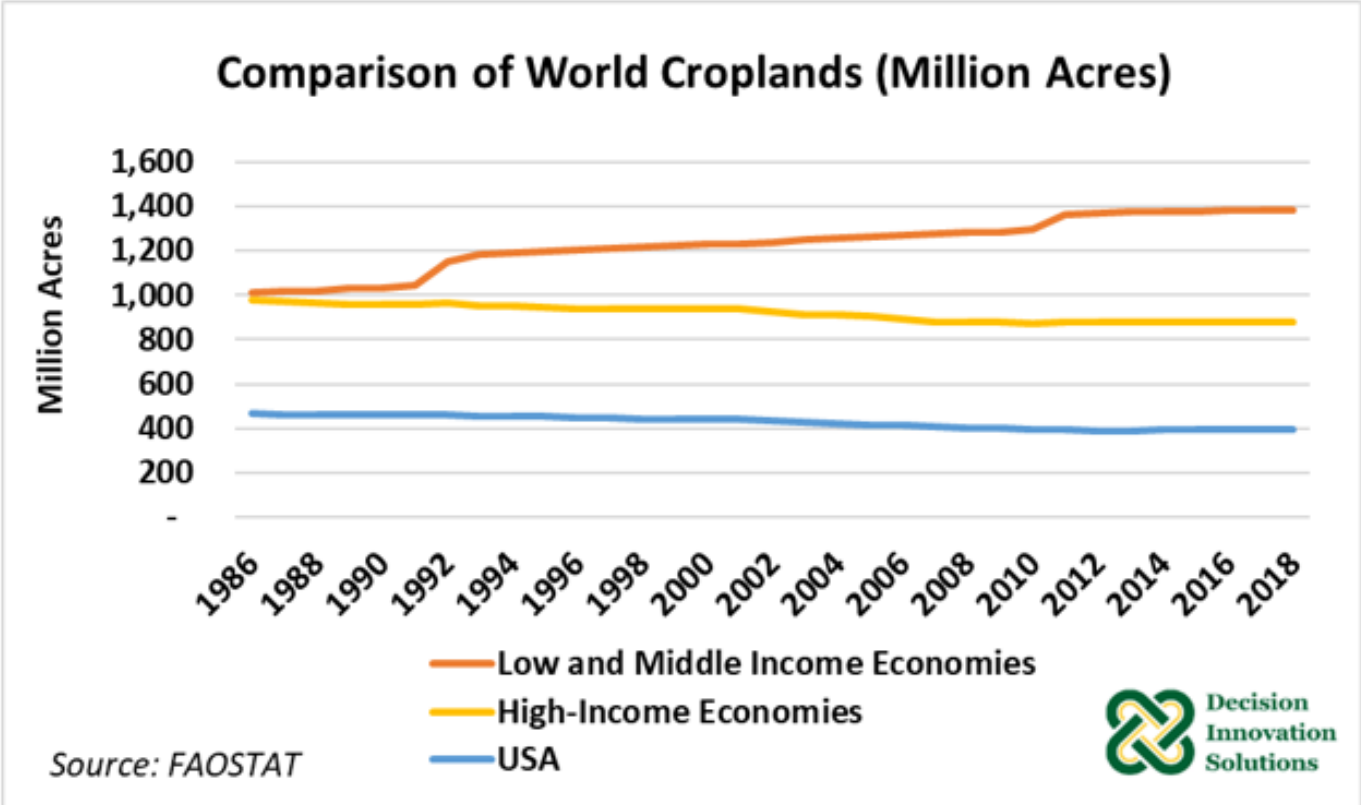

Figure 2. World Cropland by Income Strata

Crop-wise and country-wise, empirical investigation of these trends reveals that the international market has responded to the U.S. idled acres by planting and harvesting more acres of the crops for which the U.S. has foregone production.

The amount of foregone production in the U.S. has limited the growth of U.S. exports at a time when world demand has been increasing. With the intensity at which U.S. croplands have been idled under the CRP and the resultant increase in competing countries' harvested acres, the volume of total corn, soybean, and wheat exports from the U.S. has not increased significantly since 1986. Meanwhile, Brazil and Argentina (the two largest competitors of the U.S.) have increased their exports of corn, soybeans, and wheat by nearly 900 percent (see Figure 3).

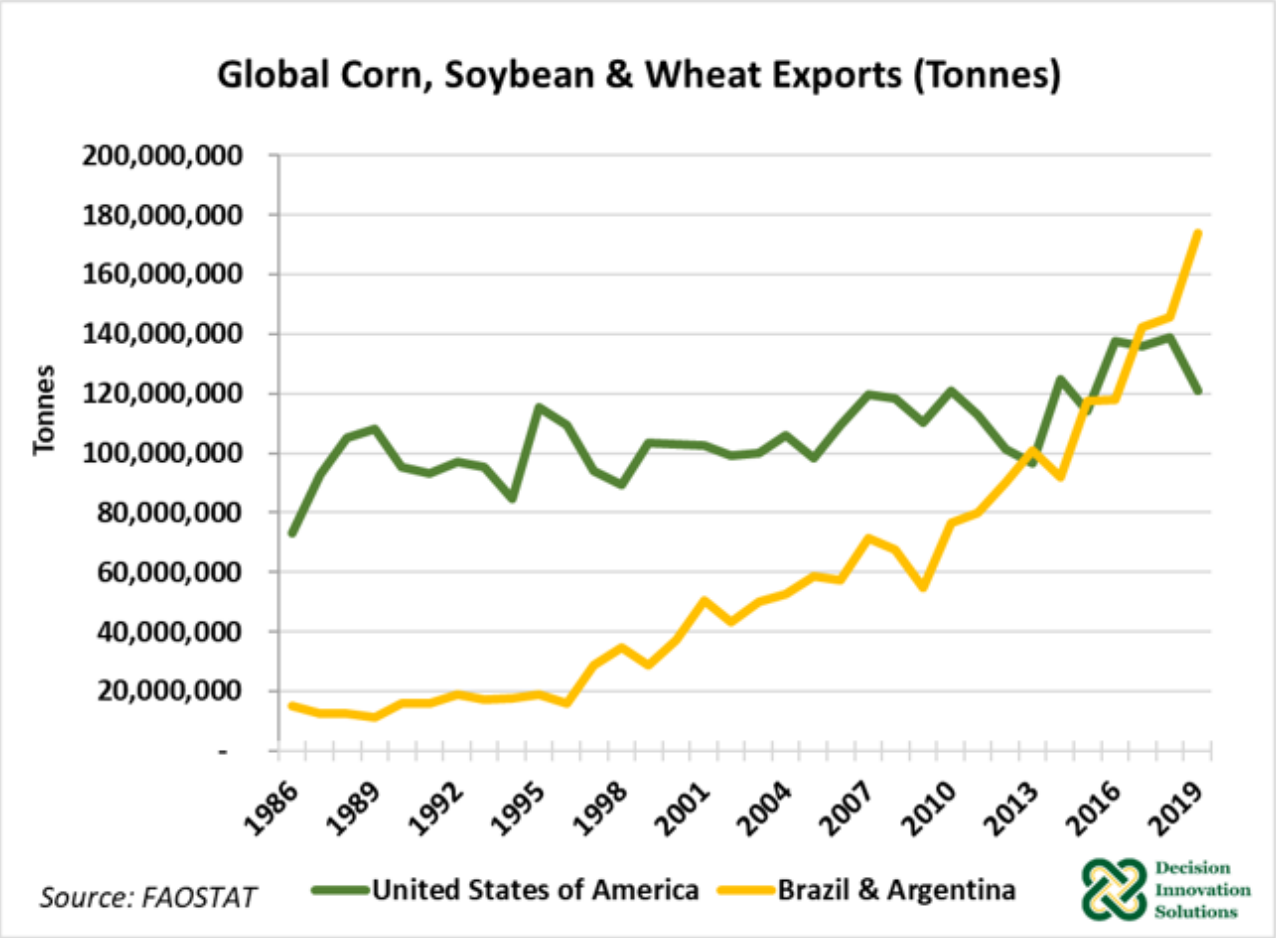

Figure 3. Export Share of Corn, Soybeans, and Wheat

As shown in Figure 4, the global population is projected to increase from 7.8 billion in 2020 to about 8.5 billion in 2050. With this projected increase in population, there is also an expected increase in the demand for crops to sustain the global population.

In addition to this, per capita food consumption is also increasing globally, especially within developing countries (Mottaleb et. al. 2018).

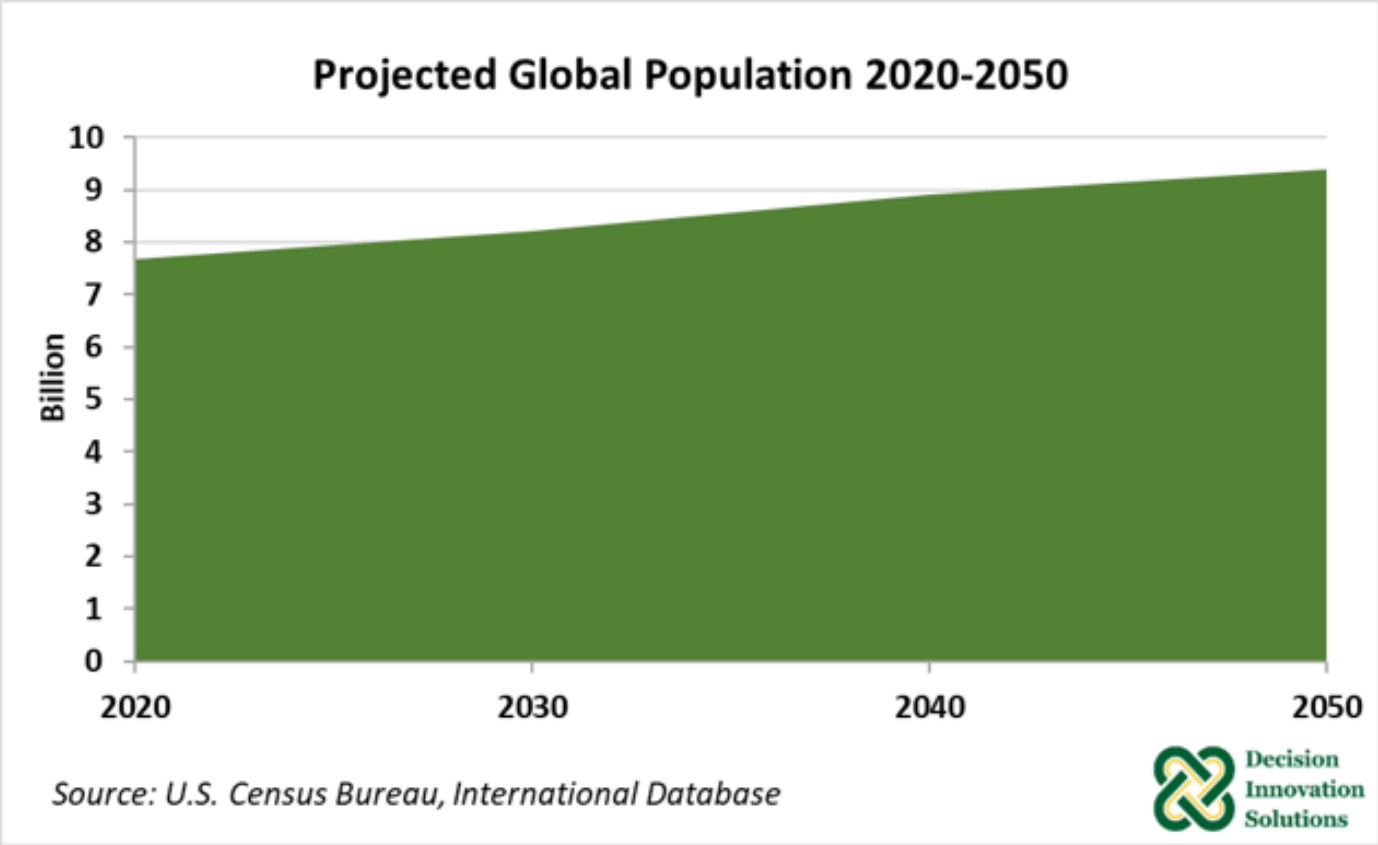

Figure 4. Projected Global Population 2020 - 2050

An increase in population and per capita food consumption has increased the overall demand for grains across the world. There is a high demand for exports of grains across the world. The U.S. has only been a marginal participant in meeting this increased demand of world markets due to the foregone production caused by CRP land idling. Hence this new demand is mostly met by competing countries such as: Argentina, Australia, Brazil, China, South Africa, and countries within the EU and FSU.

Arable land is a resource that should be protected; but the Conservation Reserve Program, although important, has resulted in a reduction in agricultural production (Hellerstein, 2017) and impacted the United States' ability to contribute to the increasing global demand. Can the United States maintain a competitive standing in the global food production arena with millions of arable acres idling? Or, is there another way in which the trade-off between conservation and competition can be lessened while ensuring global food security?

References:

- Hellerstein, Daniel M. "The US Conservation Reserve Program: The evolution of an enrollment mechanism." Land Use Policy 63 (2017): 601-610.
- Mottaleb, Khondoker Abdul, Gideon Kruseman, and Olaf Erenstein. "Evolving food consumption patterns of rural and urban households in developing countries." British Food Journal (2018).

RECENT ARTICLE

RECENT TRENDS IN THE U.S. & IOWA'S AG MACHINERY INDUSTRY: 2021 LEADS WITH STRONG SALES

By Brittni Echols
Research Analyst

As a research analyst for Decision Innovation Solutions, Brittni helps develop, manage, and analyze data and solutions to assist clients in making informed and strategic business decisions.

Recent trends experienced within the U.S. as a whole and within the state of Iowa go to show the important, and more prominent, role the agricultural machinery industry plays within the wider agricultural industry and economy.

U.S. Sales

The COVID-19 pandemic has resulted in widespread economic hardship across multiple industries: Many have faced the uncertainty of whether they would be able to maintain acceptable levels of production to serve their customers. Despite these negative trends seen in other industries, the 2021 U.S. market for agricultural machinery has been experiencing double-digit growth, outperforming previous years.

According to the Association of Equipment Manufacturers, 39 percent more tractors and combines were sold between January and April compared to the same period last year – primarily driven by an increase in the sales numbers of tractors below 100 HP. During April alone over 40,800 farm tractors, and more than 480 self-propelled combines, were sold in the U.S. (Figure 1).

Iowa Exports

Iowa is a major exporter of agricultural equipment and machinery: According to the U.S. Census Bureau, 2020 exports of tractors and self-propelled combines from Iowa generated over 1.7 billion dollars.

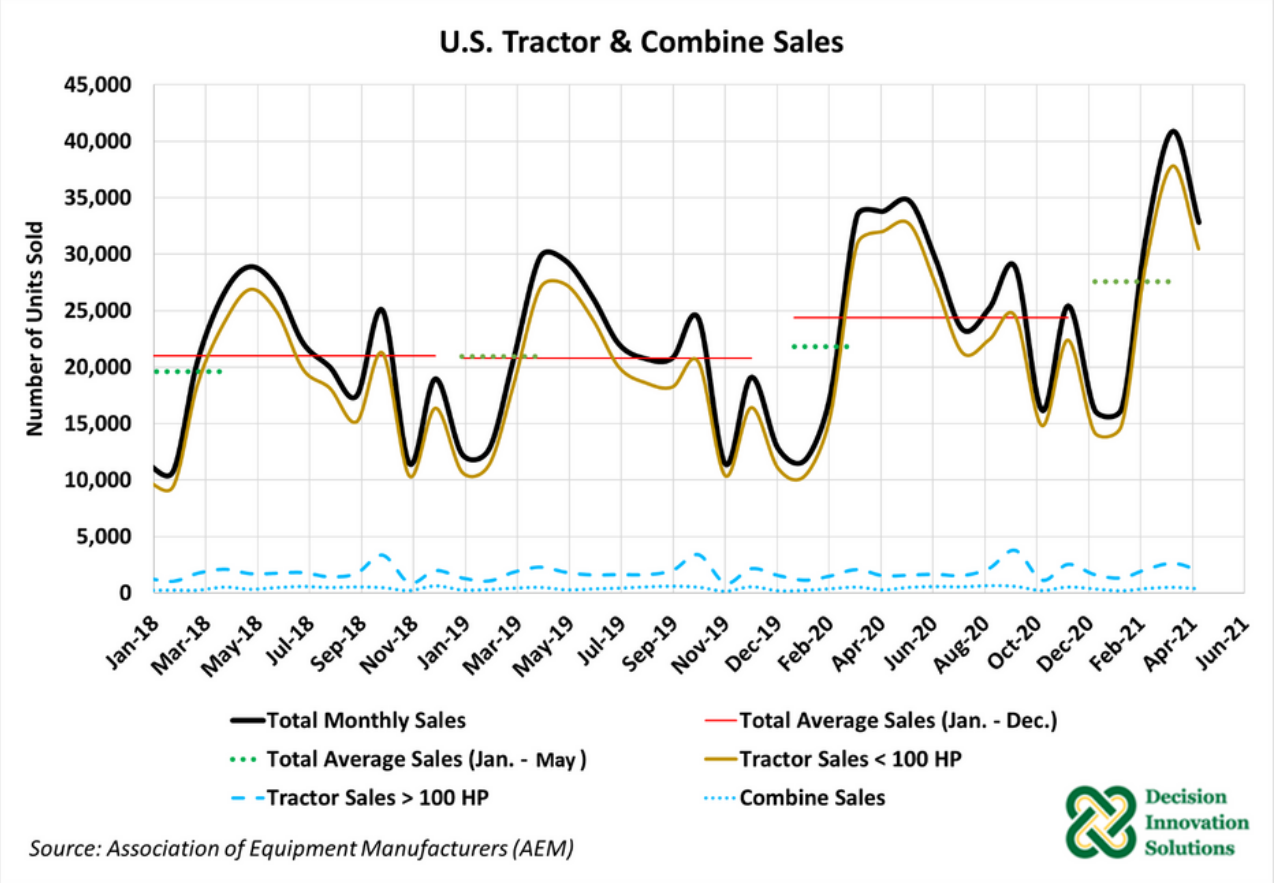

Figure 1. US Tractor & Combine Sales

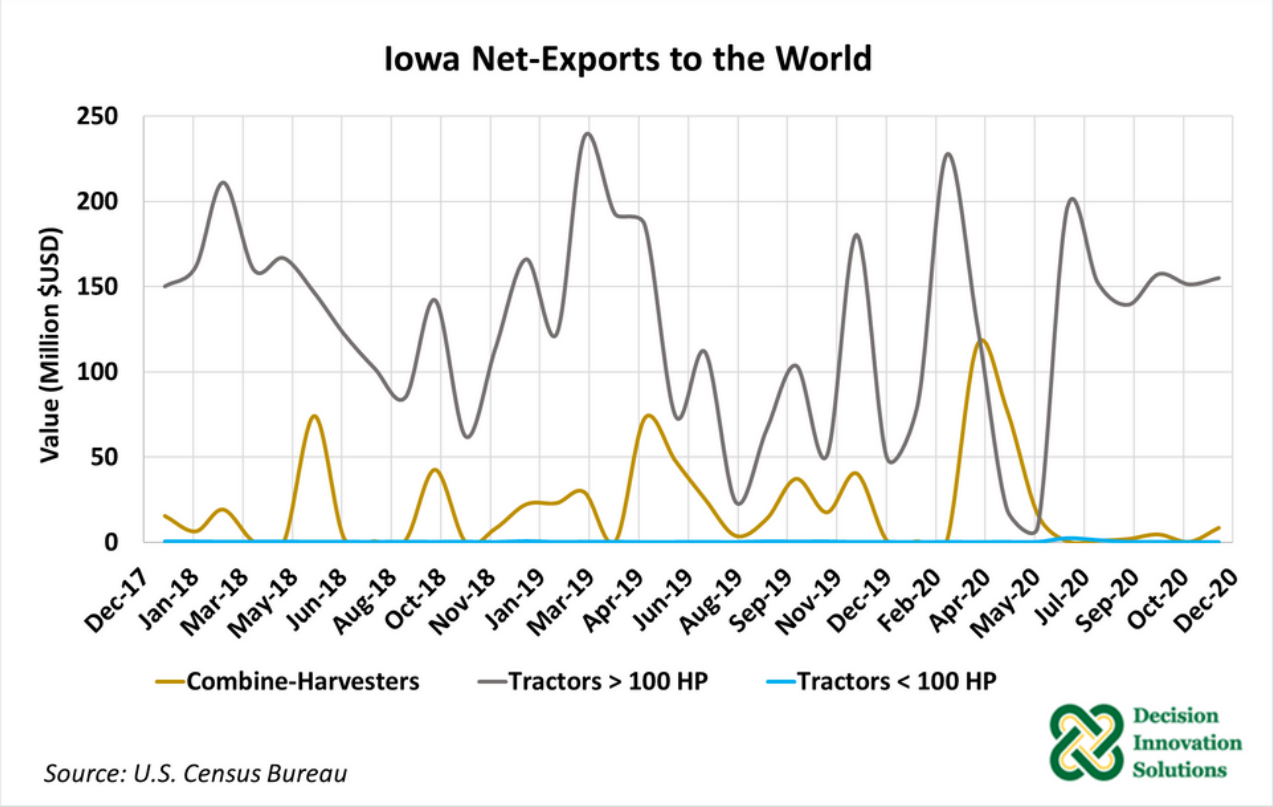

Figure 2. Iowa Net Exports of Tractors

Exports of tractors – greater than 100 horsepower – and combine harvesters continue to support Iowa's position as a net exporter of agricultural equipment and machinery (Figure 2) – It is important to note that in some cases credit for export is the point where shipments are consolidated, not where they are manufactured.

With Iowa as a leading state in crop and animal production, it is understandable that tractors and combines are essential to many operations. Following the pattern for the entire U.S., Iowa's agricultural producers in oilseed and grain farming owned most of the tractors in the state in 2017 (Figure 3). Pre-harvest and post-harvest machinery are essential in these enterprises. Beef cattle ranching/farming and other crop farming, which includes hay farming, are the next agricultural activities with the largest number of tractors in Iowa.

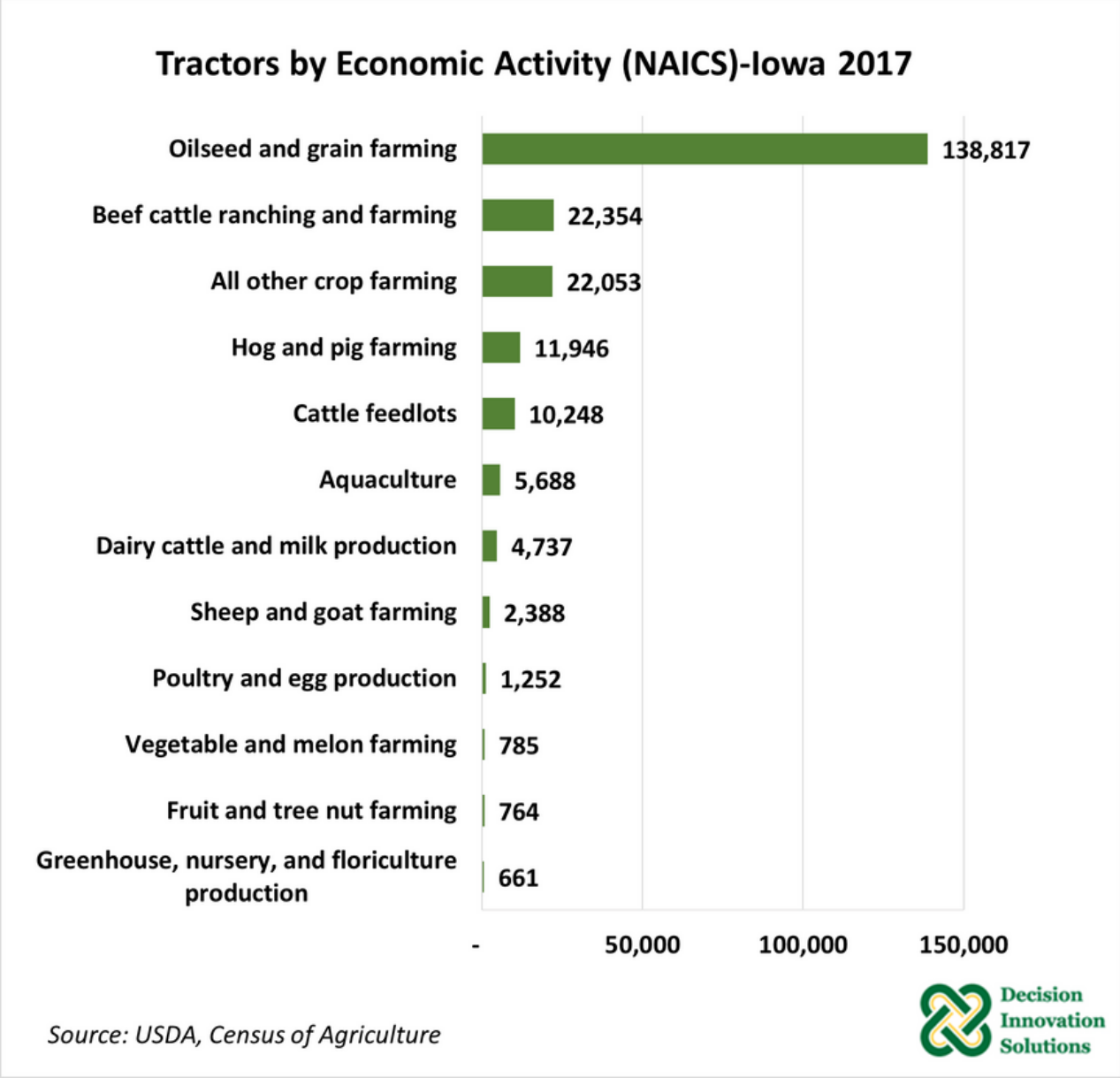

Figure 3. Tractors by Economic Activity (NAICS) - Iowa

Iowa Agricultural Machinery Numbers

According to census data, in 2017 there were 221,693 tractors and 34,960 self-propelled combines in Iowa. Sioux, Dubuque, and Kossuth counties lead the state with the total number of combines and tractors in inventory during 2017 (Figure 4). Although the total number of farm operations and tractors in Iowa has decreased since 1997, the number of large tractors (greater than or equal to 100 PTO horsepower) has increased in the same period in agricultural activities. Considering the large number of, and many applications for tractors across the state, it is also notable that census data shows that Iowa's agricultural land, building, and asset values have more than quadrupled since 1997.

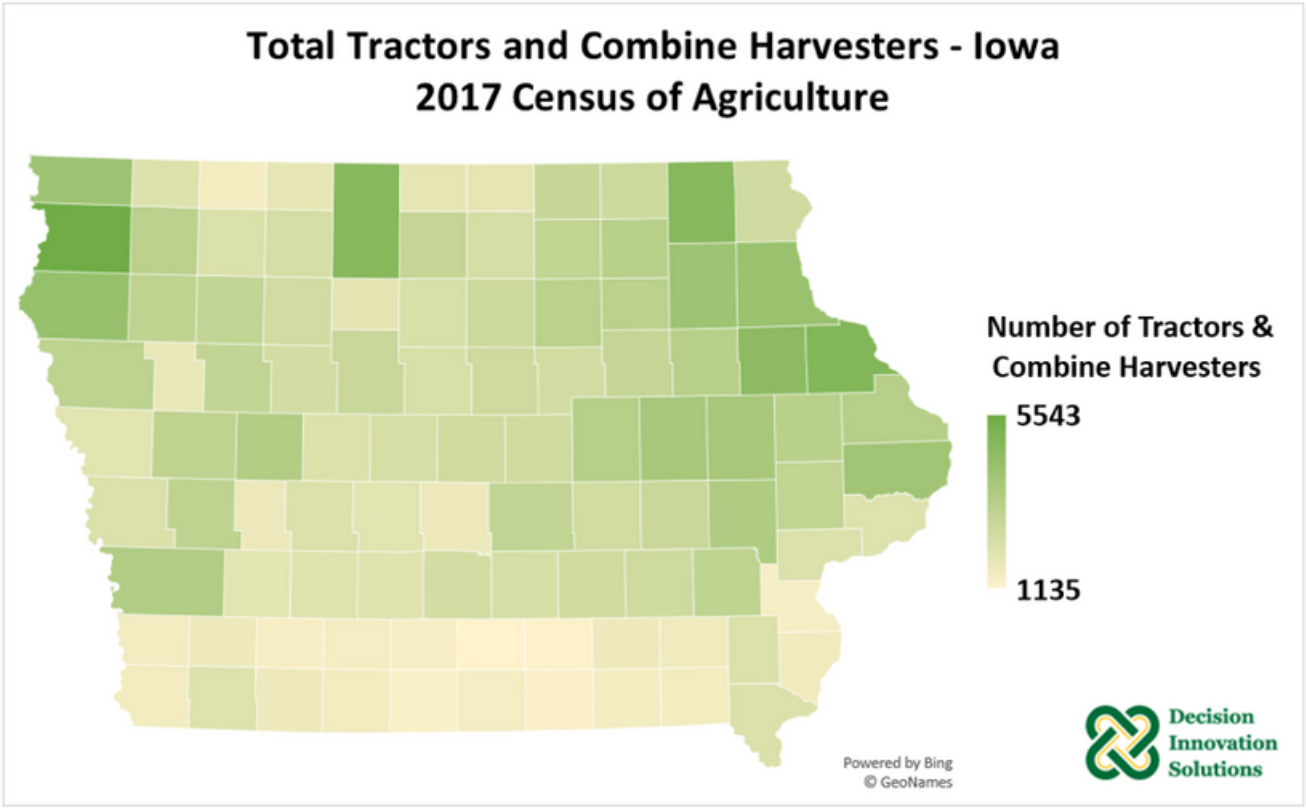

Figure 4. Total Tractors and Combine Harvesters - Iowa

Iowa Tractor Expenses

Tractor expenses in Iowa have fluctuated since 2003. Over the fifteen years, the share of production expenses was highest in 2012 with 6 percent of production expenses being tractor expenses. During the last five years, the average tractor expenses were about 2.4 percent of production expenses. Figure 5 shows the variations of tractors and other self-propelled machinery expenses per operation since 2003. The decade-high per operation annual expense was over $18,000 in 2012 for tractors and self-propelled machinery expenses.

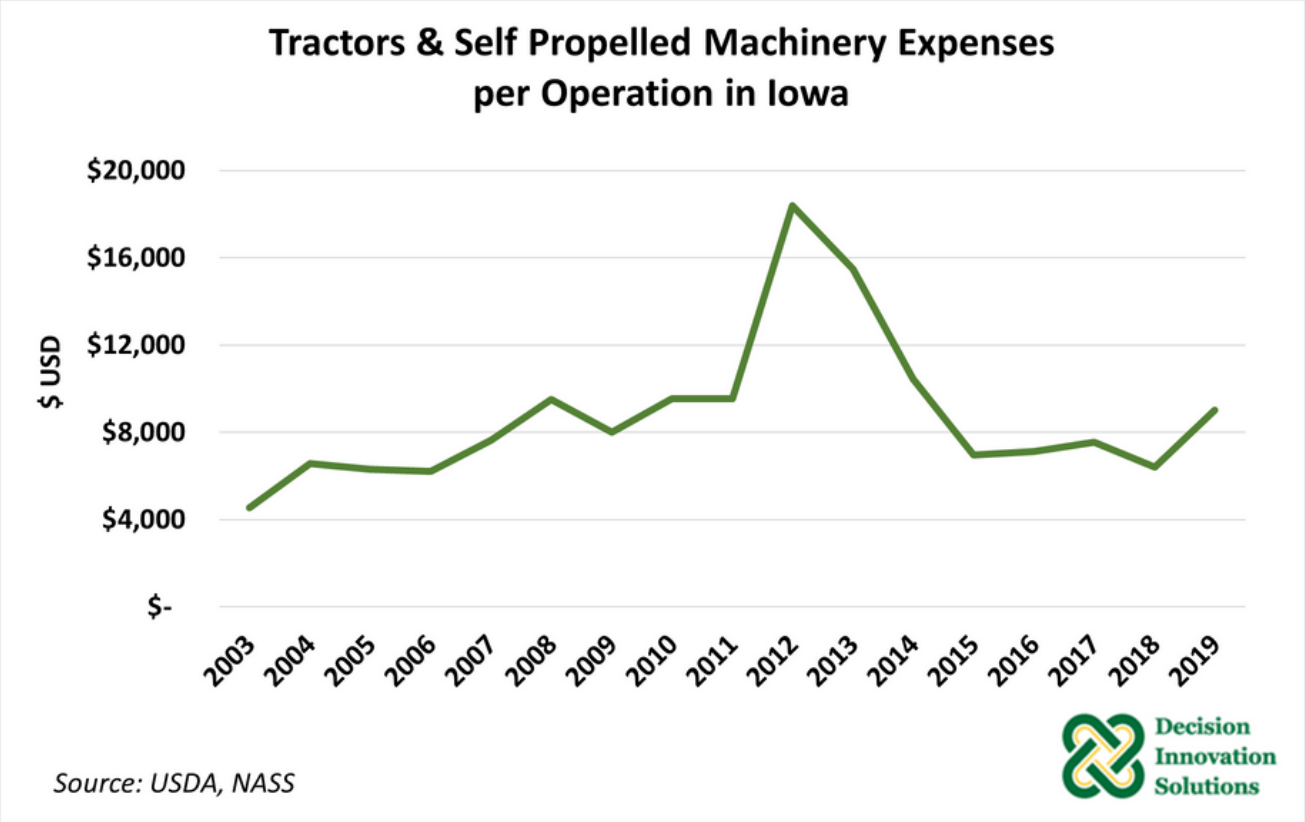

Figure 5. Tractors & Self-Propelled Machinery Expenses per Operation - Iowa

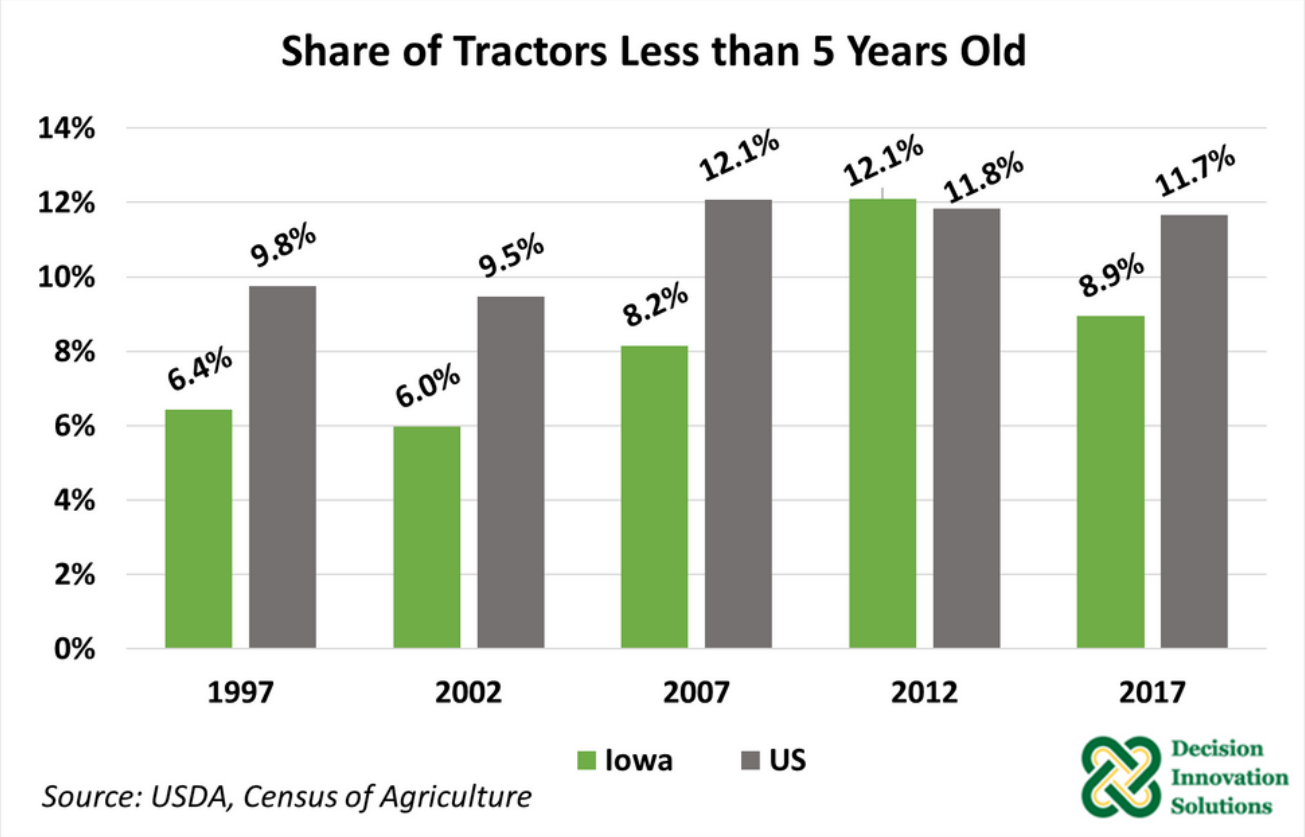

Figure 6. Share of Tractors Less than 5 Years Old

U.S. and Iowa Tractor Demographics

According to census data, around 12 percent of the tractors in the U.S. are less than 5 years old (Figure 6). Within the State of Iowa, tractors less than five years old make up around 9 percent of the total – an increase since 1997. Advancements in technology and precision farming are likely supporting factors for the increase in new tractors. Along with this, keeping machines while under warranty helps producers avoid costly repairs not covered by warranty. Lastly, the demand for tractors may also be attributed to pressures from global population increase and the need to produce more food to feed the world.

Technological Advancements

Tractors and combines have undergone many changes over the years. Advancements like GPS guidance, onboard monitoring systems and assisted steering have helped to increase farming efficiency and precision. Greater connectivity via the IoT (internet of things) as a tool to exchange data information between devices is incorporated in planters, prayers, combines, and tractors. The benefit of this technology is that operators can anticipate failures before they happen and quickly diagnose failures if they occur. IoT technology allows combines to, for example, make internal adjustments automatically as sensors tell the machine to adjust the sieves. Implementing IoT into agriculture machinery has improved productivity and reduced other expenses.

As these machines become more advanced, increases in the expenses of the machinery have been observed according to USDA, NASS reports. It is important that farmers and ranchers extract added value from these technologies to ensure efficiency. Multiple companies are researching technologies for the next generation of farm equipment. Innovations in large farm equipment such as driverless operation – which may help alleviate labor shortages, or all-electric tractors – which provide environmental and potential performance benefits, leave much to look forward to for the future of tractors and combines.

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