farmdoc CELEBRATING 20 YEARS

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ILLINOIS Agricultural & Consumer Economics

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farmdoc Celebrates 20 Years of Progress



A Message from Scott Irwin, *farmdoc* Team Leader

he farmdoc project was started in 1999 (remember Y2K?), when online information systems specifically for agriculture were relatively new. The original version of the farmdoc website was ground-breaking because it was the first to provide

"one-stop shopping" for information and tools to aid decision-makers in Corn Belt agriculture. With initial funding from the Illinois Council on Food and Agricultural Research, we created an integrated website offering information and decision tools on agricultural finance, agricultural policy, crop insurance, farm management, law and taxation, and marketing and outlook. In today's world of instant Google searches for any kind of information imaginable, this may not seem like a very big deal, but it was. People loved being able to find everything from the agricultural economists at the University of Illinois in one place.

The original *farmdoc* website turned out to be just the first step. Spurred on by the mobile device and social media revolutions, people began to desire multi-platform accessibility to information and have it presented in a condensed format. In response, we created the *farmdoc daily* site in 2011. This site has had from the beginning the audacious goal of publishing one new article of research-based analysis each business day. The articles on *farmdoc daily* quickly earned a place on the must-read list of farmers, educators, journalists, traders, market analysts, and policymakers around the globe. We are still going strong over 2,000 articles later.

In 2016, the *Farm Policy News* site was added to the *farmdoc* family of websites in order to provide updates on current developments relating to the farm economy and U.S. farm policy. The social media component of the project was upgraded at the same time. There are now multiple ways to connect with *farmdoc* through email updates, Facebook, Twitter, LinkedIn, Instagram and YouTube.

The overall goal of the *farmdoc* project is the same today as in 1999 — to provide U.S. Corn Belt crop and livestock producers with constant access to integrated information and expertise to better manage their farm businesses. Along the way, the *farmdoc* project has been honored with numerous awards, including the Team Award from the College of ACES at the UI (three times) and the Distinguished Group Extension Award from the Agricultural and Applied Economics Association (three times).

In view of all this, we thought it was appropriate to celebrate the 20th anniversary of *farmdoc*. The celebration included the following events:

- Publication of a nine-part series of *farmdoc daily* articles looking back and thinking ahead to the next 20 years (https://farmdocdaily. illinois.edu/category/areas/other/20th-series and reprinted in this booklet)
- A webinar entitled "Is *farmdoc* the Future of Agricultural Extension?" (https://farmdoc. illinois.edu/event/september-10-2019-isfarmdoc-the-future-of-agricultural-extension)
- A College of ACES seminar entitled, "*farmdoc* at 20: What Have We Learned?" along with a panel discussion by original members of the *farmdoc* team
- A celebration luncheon at the Colonnades Club in Memorial Stadium on the University of Illinois campus attended by over 200 friends and supporters of *farmdoc* (see picture gallery on following pages)

We had an amazing time celebrating the first 20 years of *farmdoc*. The luncheon was a very special event. In our busy and hectic lives, it is all too rare that so many leaders in Illinois agriculture gather together in one place. Hopefully it won't be another 20 years before we do it again.

We are grateful to everyone that has supported us over the years. All we can say is THANK YOU!

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Dr. Kimberly Kidwell, ACES Dean, welcoming guests at the farmdoc 20th Anniversary Celebration, held September 13, 2019 at the University of Illinois in Urbana, Champaign.





Rich Guebert, farmer and President of Illinois Farm Bureau making comments during the panel



A Celebration 20 Years in the Making



(ABOVE) Dr. Scott Irwin, farmdoc team leader addressing guests

(LEFT) Matt Ginder of Compeer and Aaron Johnson of Farm Credit Illinois accepting a gift of appreciation from the farmdoc team.

(BELOW) The farmdoc team





Dr. Sean Fox, ACE Department Head, welcoming guests





(ABOVE) Todd Gleason, MC for the event (LEFT) Cathy Strick and Melissa Warmbier, event coordinators

(BELOW) The assembled crowd for the event





farmdoc team enjoying remarks by Gary Schnitkey

(BELOW) Dr. German Bollero, Dr. Shelly Richardson-Nichols, Dr. Sean Fox, and Dr. Kim Kidwell, current ACE administrators, accepting a gift of appreciation from the farmdoc team



Dr. Robert Jones, Chancellor of the University of Illinois, providing remarks





SWAG for the day!



Dr. Robert Hauser and Dr. Sarahelen Thompson, former ACE faculty and administrators, accepting a gift of appreciation from the farmdoc team



Michael Robinson of Westchester Group accepting a gift of appreciation from the farmdoc team



The panel having fun!



Rod Weinzerl of Illinois Corn Marketing Board accepting a gift of appreciation from the farmdoc team



Dwight Raab, Illinois FBFM, accepting a gift of appreciation from the farmdoc team



John Reifsteck of Growmark accepting a gift of appreciation from the farmdoc team

farmdocdaily

farmdoc at 20: How Did We Get Here and What Have We Learned?

By Scott Irwin

Department of Agricultural and Consumer Economics University of Illinois

September 3, 2019 farmdoc daily (9): 163

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Permalink: https://farmdocdaily.illinois. edu/2019/09/farmdoc-at-20-how-did-we-gethere-and-what-have-we-learned.html

This is the first in a series of articles celebrating the 20th anniversary of farmdoc.

he farmdoc project is celebrating its 20th anniversary this year. Going back to the beginning in 1999, the stated goal of the project was to provide, "one stop 'webshopping' for agricultural risk management research and outreach for Illinois farmers and agribusinesses." Over the last 20 years, the project grew and changed more than any of us could have imagined at the start. As part of our 20th anniversary celebration, we have prepared nine farmdoc daily articles that provide an overview of the major subject matter areas addressed, highlights important contributions, and reviews changes that occurred during the last two decades. Today's article, the first in the series, provides an overview of the development of *farmdoc*, presents data on the impact of the project, and offers some lessons that we have learned along the way.

Development

The *farmdoc* project began in 1999 with initial funding from the Strategic Research Initiative for Information Systems and Technology of the Illinois Council on Food and Agricultural Research (CFAR). It was obvious at the time that farmers and others in the agricultural sector were rapidly increasing their use of the Internet, desired information and decision analysis that was in an easily "consumable" form, and conveniently available online. A founding principle of *farmdoc* was that substantial demand existed and would continue to exist in the future for Extension programs dealing with traditional problems of commercial agriculture, such as agricultural finance, law, management, marketing, and policy. We set out to meet this demand by providing agriculture decision-makers with round-the-clock access to integrated information and expertise.

The various stages in the development of *farmdoc* over the last 20 years can be categorized into four major "versions," as outlined below:

1999, Version 1.0: Our first website was named Illinois Grain Risk Outreach, or *IGRO* for short. It was quite modest and was really just a webpage with links to existing webpages for farm financial analysis spreadsheets, crop insurance tools, and evaluation of market advisory services (AgMAS). We quickly abandoned the name and changed it to Farm Decision Outreach Central, or *farm. doc.* We later dropped the dot and shortened the name to *farmdoc* because it was easier to write and that was the way everyone said the name anyway. It has stuck ever since and is now an easily identifiable brand in the agricultural sector.

2000, Version 2.0: After gaining some experience with the first version of our website, we decided it was worth trying to use the new web technology as the centerpiece of a modern 21st century Extension program for commercial farms in Illinois. The first key step was hiring a website designer to help us figure out how to organize our material and design an attractive looking site. The second key step was the realization that we had to organize ourselves much differently to take advantage of this new delivery technology. This was the point when our "web-first" Extension delivery model was born. It entailed forming a team of faculty members with various Extension, teaching, and research appointments who agreed to place all of their Extension-oriented materials at the website and brand everything under the *farmdoc* umbrella. This was a momentous change compared to the traditional organization of Extension programs (see Irwin et al., 2004).

2003, Version 3.0: The next major revision of the *farmdoc* website included new and improved navigation and several additional sections. Much to our surprise, we learned early on that newsletters and other publications posted at the site, rather than tools or data, represented the bulk of the use. So, we reorganized the site in recognition of this reality. Another big change was the addition of a sponsorship program. The initial success in the early years led us to believe that a "web-first" model was the wave of the future, but continuing and staffing the project meant that we had to confront the issue of funding on a continuing basis. We considered advertising even at this early date, but it was very clear from conversations with farm users that this would be highly problematic. We were told over and over that the real value of *farmdoc* was the unbiased, third-party analysis that we provided. Farmers strongly feared that advertising would compromise our work. So, we adopted a public radio/TV sponsorship model that was more acceptable to our farm users. This has proven to be a workable funding mechanism and we continue to use it today.

2011, Version 4.0: By the mid-2000s, the smart phone and blogging revolutions were in full swing. We experimented in 2005 by developing a new site, *farmgate*, that used blog technology to present news and research summaries several times a week. We then made the decision to launch an entirely new website in 2011 called *farmdoc daily*. In recognition of the need to stay relevant in a 24/7 news and information cycle, we came up with the audacious idea of publishing one article of original analysis on "Corn Belt farm economics" each and every business day.

Over 2,000 articles later, we are still publishing *farmdoc daily* articles at this pace.

2016, Version 5.0: The next technological revolution occurred with social media. In response, we hired a social media manager for farmdoc and started another site called Farm Policy News that publishes several agricultural policy and economics news summaries each week. The project began pushing content through Twitter, LinkedIn, Instagram, and Facebook. The objective was to further expand the use of articles, news summaries, decision tools, and data found at our three websites (farmdoc, farmdoc daily, and Farm Policy News). Individual farmdoc team members also became active on social media and contributed to this objective.

2019, Version 6.0: Despite our "web-first" model, the *farmdoc* team never stopped offering traditional face-to-face Extension meetings. For example, we have offered a series of five regional meetings across Illinois every December that we call the "Illinois Farm Economics Summit." These meetings regularly attract over 800 people in total. We also began experimenting with webinars in the last few years and these have been growing in popularity. In recognition of the ongoing "youtube" video revolution, a video and webinar manager was hired for the project. The intention is to offer a rich menu of video content as another vehicle for expanding use of *farmdoc* material.

Impact

An effort like *farmdoc* does not lend itself easily to traditional measures of Extension program quality and impact. Web traffic statistics provide an important indicator of the breadth of usage and impact for a digital Extension program like farmdoc. Figure 1 shows the annual number of unique visits to *farmdoc* project websites since 2002. Visits to the original *farmdoc* site increased rapidly through 2007, peaked at 1.5 million, declined for a few years, and then stabilized right around 1 million per year. The addition of the farmdoc daily site in 2011 ushered in a period of explosive growth in total project visits, with more than 3 million in each of the last three years. To put this in perspective, an annual total of 3 million visits implies an average of 8,200 visits made to the three project websites each and every day through the year.



Visits to *farmdoc* sites occur regularly from every state in the U.S., but are most concentrated in Corn Belt states that account for about half of U.S. visits. The footprint of the project is now global, with almost 20 percent of visits occurring outside of the U.S. and from nearly every country in the world.

Table 1 is an effort to put usage of *farmdoc* more in the context of traditional Extension programs. Here, "digital contacts" are represented by website page requests and Twitter feed impressions over 2014 through 2018. Measured this way, the project has an astonishing amount of engagement with users, rising from 12 million contacts in 2014 to over 41 million in 2018. Much of this meteoric rise is associated with the increasing role of Twitter as a first point of contact. Finally, it is noteworthy that nearly 16 million page requests were made to the farmdoc daily site in 2018. Since daily articles are the only content posted at the site, this means that the vast majority of the page requests are the result of people requesting and (presumably) reading the articles.

The *farmdoc* project has been fortunate to receive a number of awards and recognitions, and these provide another indicator of impact:

- Distinguished Group Extension Program Award, Agricultural and Applied Economics Association (formerly American Agricultural Economics Association): 2002, 2014, 2016
- Team Award, College of Agricultural, Consumer, and Environmental Science, University of Illinois at Urbana-Champaign: 2004, 2010, 2013
- Donald A. Holt Achievement Award, Illinois Council on Food and Agricultural Research: 2008
- Selected as one of two organizations nationwide to develop policy decision tools for implementing the 2014 farm bill
- Team members regularly consulted by government officials regarding a wide variety of policies in agricultural trade, price support, and biofuels

		Website Pag	Twittor				
Year	farmdoc	farmdoc daily	Farm Policy News	farmbill Toolbox	Impressions	Total	
2014	5.3	6.1	NA	0.4	0.2	12.0	
2015	7.3	11.5	NA	0.2	1.8	20.7	
2016	5.3	13.5	0.0	NA	3.6	22.4	
2017	5.3	9.5	0.8	NA	9.5	25.1	
2018	4.4	15.9	6.6	NA	14.4	41.2	

Table 1. Digital Contacts for *farmdoc*, 2014 - 2018

• A team member recently served a term as the agricultural economist on the President's Council of Economic Advisors

In sum, these indicators show that *farmdoc* has become the gold-standard for innovative Extension programs directed towards commercial agriculture. The information found on *farmdoc* websites and social media has earned a place on the "must read" list of farmers, educators, journalists, traders, market analysts, and policymakers, not only in the U.S., but around the globe.

Lessons Learned

Based on our experience of the last 20 years, we want to offer five lessons that are helpful in understanding why *farmdoc* has been successful.

#1: Talent. Our innovations in the use of digital technology would be interesting but of limited impact without the team of extraordinarily talented individuals that have been the core of farmdoc from the start. The team members write the articles, develop the decision tools, and create new datasets. Without this "knowledge power" there is no lasting demand for the output of farmdoc.

#2. Shared Vision. The farmdoc team coalesced around a well-defined mission from the very beginning. We provide analysis, tools, and data to help commercial farmers in the Corn Belt make better decisions in their operations. Having such a well-defined vision has helped us avoid "mission creep" over the years and from getting pulled in too many directions. It helps that the bulk of team members grew up on farms.

#3. Funding. We were extremely fortunate to receive over \$300,000 in start-up funding from the Strategic Research Initiative for Information Systems and Technology of the Illinois Council on Food and Agricultural Research (CFAR). It is hard to imagine a project like this ever getting off the ground without this funding. The annual budget for the project is now about \$250,000 per year (not accounting for faculty time), and the funding base consists of sponsorships, gift funds, grants, and Extension funds. It hardly needs saying that obtaining funding at this level on a continuing basis is a challenge.

#4. Freedom. We did not realize it at the time, but we were very fortunate to be able to develop a new Extension model without any constraints from formal Extension administration. This allowed us to experiment without worries about repercussions from within the organization. If we failed, and we certainly had our share, we just moved on to try the next idea. Flexibility and quick adaptation in the digital world are absolutely essential.

#5. Low Overhead. From the beginning, we have adopted a decentralized and lean management structure for the project. A key priority is to minimize overhead time costs to team members. This helps maximize flexibility and speed of response to changing issues and problems in Corn Belt agriculture. A good example of this principle in action is the management system for *farmdoc daily*. There is no formal editorial review system for the daily articles. Individual team members are 100 percent responsible for quality control. We maintain a group calendar app and team members sign up for slots and then write

the articles. This management philosophy is crucial to making work on *farmdoc* appealing to busy faculty and staff, particularly those that do not have Extension appointments.

Closing Thoughts

The *farmdoc* project has been on quite a ride the last 20 years. Little did we imagine when we developed our first webpage in 1999 that it would be the first step in the development of a digital Extension platform with an audience in the millions. Regardless of where technology takes us in the next 20 years, our core mission will remain the same—providing integrated information and analysis on Corn Belt farm economics. We hope you enjoy this series of articles celebrating the 20th anniversary of *farmdoc*.

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farmdocdaily

Grain Price Outlook: farmdoc Twentieth Anniversary

By Todd Hubbs

Department of Agricultural and Consumer Economics University of Illinois

September 4, 2019 farmdoc daily (9): 164

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This is the second in a series of articles celebrating the 20th anniversary of farmdoc.

ommodity outlook at *farmdoc* provides timely analysis of commodity markets important to the Corn Belt from a fundamental perspective. The output consists of a weekly outlook and applied analysis articles on issues related to price fundamentals. On Monday of each week, an article focuses on issues driving prices and influencing the marketing decisions of producers across major commodities. Over the last two decades, applied research articles addressing a variety of topics related to commodity price analysis appeared on *farmdoc* websites. While the vast majority of articles focus on corn and soybean markets, analysis on hogs, cattle, and wheat also provide information to producers.

The weekly outlook comes out every Monday and derives from many decades as a leading extension program providing analysis of commodity markets. A variety of authors participated in weekly articles over the years. The advent of *farmdoc* triggered the move from a weekly mailer to the online format. Under the *farmdoc* banner, weekly articles were provided primarily by Darrel Good and Chris Hurt (Purdue University). Darrel provided analysis on grain markets and Chris wrote the outlook for hogs and cattle. In recent years, Jim Mintert (Purdue University) took on the role of cattle outlook and Todd Hubbs moved into the role of grain market analyst.

Articles using applied research analysis address a wide-ranging variety of issues since the onset of *farmdoc*. The applied research articles tend to be on topics of immediate interest to commodity markets. However, many articles explore structural changes to underlying fundamentals and the implications of these changes. All of these articles focus on sound economic thinking and methodology to explore the evolving nature of agricultural markets. Topics encompass diverse areas of inquiry. Crop yield forecasting models, stocks-to-use price modeling, market advisory service effectiveness, and a wide variety of issues related to supply and demand fundamentals covered many of the research areas addressed on farmdoc.

The last two decades witnessed significant changes in commodity markets. These changes presented challenges and opportunities for market analysis. A key narrative during the previous twenty years emphasized the imperative to feed a rapidly growing population. Higher incomes promised the possibility of changing diets throughout much of the developing world along with population growth. In conjunction with these macro-drivers underlying changes in commodity markets, the fundamentals witnessed a shift in the mid-2000's with the passing of the Renewable Fuels Standard and the ascension of China to the WTO. These events changed the nature of demand and supply across all commodity markets and provided the impetus for some key findings in *farmdoc* commodity analysis.

In the last twenty years, numerous applied research efforts out of the commodity outlook team produced some meaningful successes. This section highlights a few of the important works. Research on the pricing performance of market advisory services, the AgMas project, represented a considerable emphasis on applied market analysis in the early days of *farmdoc*. This work provided an unbiased and rigorous evaluation of advisory services for producers through the early 2000s. The demand shifts in the mid-2000s gave rise to research on the era of new prices in grain markets that helped to frame both short- and long-run prospects for major row crops in Illinois. A series of articles laying out the economic rationale for price dynamics under evolving demand scenarios helped in understanding marketing and price expectations. In conjunction with research on price expectations, considerable effort went into explaining and evaluating USDA report forecasts and estimates. Convergence performance in futures contracts motivated research on the causes and solutions of these issues to help in hedging performance and efficient contract design.

As we look to the future, the work on commodity outlook analysis at *farmdoc* appears set to remain a prominent area of investigation. Recent developments in trade bring U.S. shares of world markets into focus over the short- and longrun. The waning impact of the RFS requires considerable analysis of the implications for commodity markets. As the U.S. adjusts to the changing nature of world demand and supply in what looks to be a turbulent 21st century, the need for unbiased analysis of commodity market fundamentals remains.

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Irwin, S., D. Good, J.M Filho, R. Batts. "The Pricing Performance of Market Advisory Services in Corn and Soybeans Over 1995-2004." AgMas Project Research Report 2006-02, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, April 2006.

farmdocdaily

farmdoc and *farmdoc daily* Crop Insurance Contributions – 20 Years and Counting

By Bruce Sherrick and Gary Schnitkey

Department of Agricultural and Consumer Economics University of Illinois

September 5, 2019 farmdoc daily (9): 165

Recommended citation format: Sherrick, B. and G. Schnitkey. "*farmdoc* and *farmdoc daily* Crop Insurance Contributions – 20 years and counting." *farmdoc daily* (9): 165, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, September 5, 2019.

Permalink: https://farmdocdaily.illinois. edu/2019/09/farmdoc-and-farmdoc-dailycrop-insurance-contributions-20-years-andcounting.html

This is the third in a series of articles celebrating the 20th anniversary of farmdoc.

n preparation for the 20th Anniversary of the *farmdoc* program, we are highlighting several of the central themes that have persisted through time and are identifying some of the ways in which the *farmdoc* program has responded to, and continues to contribute to, producers' key decisions. Among the most important risk management activities – dramatically highlighted by this year's weather and developing production

situation - involves the ever-changing crop insurance options that a producer has access to, and their interactions with other government programs. Simply put, crop insurance is the central part of many producer's risk management programs and is among the most visible components of the federal farm programs. In response, the *farmdoc* team has developed several tools and educational materials to help make sense of the complex decisions faced related to crop insurance, and to government farm programs in general. The purpose of this post is to simply document the general features of the federal crop insurance program through time, and to highlight the ways some of the tools can be used to improve farm-level decision making.

Growth in importance of Crop Insurance

First, to understand the growth through time and current importance of the programs, see Figure 1 which shows the total program liability and premiums through time from 1989 to present. The total liability, or amount of insurance in place, peaked in 2013 at almost \$124 billion and has averaged just under \$110 billion per year over the most recent decade. Total premiums, or the amount paid for the insurance, has averaged just over \$10 billion over the past decade. Program wide, the premium rate, or the cost per dollar of liability, has been around 9% since the advent of revenue-based insurance.



Impressively, the Federal Crop Insurance Corporation supports nearly 200 different crop/policy combinations from corn, soybeans, and wheat, to crops such as triticale, sesame, walnuts, processing pumpkins, and nearly every commercially important crop grown by US producers. The program volume is heavily concentrated in corn, soybeans and wheat however, with nearly 70% of the total program liability and premiums represented by those three crops alone, and with usage concentrated in the corn belt, and wheat growing regions.

Figure 2 shows the insured acres through time for these three crops by total insured acres (both revenue and yield products), and Figure 3 shows the percentage of the total planted acres of each of these crops is insured in some form in the federal crop insurance programs. It is very impressive to see that the vast bulk of the total production is insured, and in fact, there are policy objectives that are intended to encourage participation to a point that is great enough that



ad hoc disaster programs can be realistically limited. In short, crop insurance seems to be performing largely as intended in providing a meaningful safety net for the majority of commercially important acreage, especially in the major row crop regions.

Complex Farmer Decisions

The previous graphs belie the complexity of the decisions that individual producers face annually when deciding on the type, level, and units of production to insure. In general, a producer can choose to insure their farm-level production, and then choose between yield or revenue insurance; or insure with a county-level product (somewhat akin to a group policy). Within each type of insurance, there are coverage level elections from 50% to 85% in most cases for farm level products, and from 70% to 90% for county-based products. There are then unit decisions related to the aggregation of production for optional, basic, enterprise, and whole-farm insurance; and to complicate further, revenue insurance can be purchased with or without the option to increase the guarantee if prices increase. Additionally, many insurance payments related to other federal program payments based on coverage (e.g. supplemental coverage options), and thus the total relationship to revenue risk extends beyond the insurance coverage chosen. Finally, there are then a dizzying number of private product add-ons that allow options such as determination of the indemnity price on an interval other than that provided for in the federal product, or rearrangement of insured units, or the ability to buy-up the indemnity price or coverage level, and so forth. Conservatively, if one considers only the coverage level, practice options, the choice of farm or group policy, coverage factors in group products, and the unit structure, most producers have well over 100 possible policy choices each year. While the vast majority of producers of the major row crops choose some form of revenue insurance, the cost per acre depends directly on previous production experience, and on the level of coverage (which determines the underlying subsidy structure as well). Moreover, every single county has a different rate structure and the rates paid by individuals in each county further depend on both coverage level differentials and production ratios relative to county expected levels. Finally, the prices for both the premiums and the indemnification are determined in windows each year based on futures prices and local time windows for averaging. For example,

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5%	0.64	1.22	1.81	400	0.46	0.88	1.22	400	0.55	0.98	1.47	100	
0%	0.88	1.77	2.52	437	0.50	1.08	1.56	437	0.75	1.35	1.98	109	
5%	1.21	2.89	3.97	473	0.59	1.62	2.39	473	1.03	2.13	3.07	118	
0%	1.79	4.33	5.81	509	0.80	2.29	3.30	509	1.47	3.03	4.28	127	
5%	3.01	6.88	8.95	546	1.25	3.44	4.98	546	2.25	4.47	6.22	136	
0%	6.01	11.60	14.56	582	2.56	6.01	8.37	582	4.20	7.15	9.78	146	
5%	12.18	18.93	22.98	618	5.36	9.94	13.29	618	7.89	10.98	14.76	155	
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	120%	95	80%	Revenue	120%	95%	80%	Guarantee	9	120%	95%	80%	Guarante
0%	5.9	4.67	393	542	4 12	3 26	2 75	542		4 72	3 74	3 15	136
5%	9.49	7.51	633	581	5 73	4 54	3.82	581		6.29	4.98	4 19	145
	3.43	7.01	0.00		5.75		5.02	501		0.25	4.50		
0%	15.93	12 61	10.62	520	9 7 9	7.75	6.53	620		11 46	9.07	7 64	155
0% 5%	15.93	12.61	10.62	520 558	9.79	7.75	6.53	620		11.46	9.07	7.64	155

Exp Yield: 193.60

Proj. Price \$4.00

Vol. 0.15

corn projected prices in much of the corn belt are determined by averaging the futures prices on the December contract during trading days in February, with the volatility factor calibrated to the final five trading days' outcomes.

farmdoc Tools in Response

Sound confusing? It can be – and that fact led to the development of the *farmdoc* tools highlighted in this post. At the core of the problem is the ability to quickly compare prices across products available to a producer in a given location with a specific background experience, with myriad other conditions determined by the producer and in most cases in a short window of time around the two-week window during which most insurance can be purchased annually. Fortunately, one of the major crop insurance tools available at the *farmdoc* website is a quoting system that dramatically simplifies the quoting difficulties. Each spring, *farmdoc* provides updated and complete one-stop quoting software to allow a producer to compare virtually all possible combinations of insurance and coverage for their own farm situation. First released in 2001, the *iFARM* Crop Insurance tools have now been accessed and used literally several million times over the years by producers, agents, and others interested in quick and concisely organized quotes for their own cases.

Figure 4 above shows a case for Champaign County Illinois for one of the most extensively utilized tools in the form of the *iFARM Crop* Insurance Premium Calculator.¹ This type of information would take hours upon hours to recreate one quote at a time using other commonly provided methods; and thus, the intent was to allow producers to have ready and free access to as much information as needed to become fully informed about their crop insurance choices and options. The calculator is available for the vast majority of the central US and has over 800 county cases included. Additionally, the basic architecture has been broadly distributed for others to use in developing their own versions of their quoter systems, but the on-line *iFARM* version remains one of the most extensively used tools at our site. As can be seen in the figure below, the user enters only a few key pieces of information and can immediately retrieve a full array of indicative quotes for virtually all the most popular combinations of crop insurance products and coverage options available. Given the incredibly compressed time period (generally two weeks) each spring during which crop insurance purchases are completed, having timely and easily accessed information provided in an easily interpreted format is viewed as a very meaningful contribution. (A downloadable version of the quoter is also available for those who need to be able to access the information when not on-line.)

While the premium and guarantee information provided by the tool dramatically reduced the "search cost" and information asymmetry around crop insurance costs by location and circumstance, producers also consistently asked for information to evaluate the implications of different types of coverage. Early educational seminars could allow an audience at a time to see, for example, that many of the group products actually paid much more than they cost through time depending on location, but that the payments were less correlated with on-farm revenue shortfalls than were the revenue products with harvest price options for guarantee increases. This persistent line of inquiry led to the development of one of the largest scale crop insurance simulation programs known to exist at the time of its deployment, and to this date remains one of the most extensive analytical tools for crop insurance available for free. Figure 5 on the following page shows just a couple of example screen shots for the Champaign county case identified above. Approximately 800 other counties are available with the tool.²The Crop

Insurance Payment Evaluator has been migrated from a set of individual computers to be now run on the National Center for Supercomputing Applications (NCSA). It performs a large scale numeric simulation utilizing estimated price and yield distributions for the on-farm case evaluated against the actual crop insurance products being offered each year and then provides the user with a set of outputs including information on the likelihood of payment, the size of expected payments, the correlation with crop revenue, the net cost of insurance through time, and probabilistic information about the likelihood of achieving different revenue outcomes with each option of insurance. Producers with less concern about a specific year's revenue might opt for example for the highest average payback, while a producer with concern about specific cash flow requirements might choose the option to maximize the likelihood of achieving that goal. Again, the purpose of the development and deployment of the tool was to respond to producer needs with a high quality and complete source of objective information that a producer can access on their own time to help improve the quality of their crop insurance usage decisions.

Finally, after insurance has been purchased, but before harvest, producers are critically interested in pricing of their crops and in the potential for different price outcomes after the production is in a situation that it can be "priced". Many marketing and price information services exist, and producers have access to near real time futures price data at the touch of a screen in most cases. What seemed to be missing, however, was the ability to quickly assess probabilistic information about price movements. For example, if the current futures prices for December corn is \$3.60, what is the likelihood that it will be above the \$4 projected price by expiration, or what is the probability of a decline of more than \$.10. To address this type of information, another tool was developed that uses a broad array of traded option information to deduce the market's aggregate "beliefs" about the likelihood of price changes and provides producers and others with both a visual display of the uncertainty inherent in the market, and a means to test the likelihood implicit in market prices of price movements to specific levels. The tool focusses on corn and soybeans and for the major traded months most relevant to the settlement of crop insurance, and provides tabulations of the likelihood of prices

Figure 5. *iFARM* Crop Insurance Payment Evaluator



Estimated Net Average Cost of Insurance

Coverage						ARP-	
Election		YP	RP-HPE	RP	AYP	HPE	ARP
	50%	\$-0.20	\$-0.44	\$-0.32			
	55%	\$-0.59	\$-1.13	\$-0.80			
	60%	\$-1.40	\$-2.49	\$-1.81			
	65%	\$-2.51	\$-4.53	\$-3.26			
	70%	\$-4.64	\$-7.78	\$-5.88	\$-6.37	\$-10.71	\$-8.94
	75%	\$-7.28	\$-12.08	\$-8.61	\$-10.77	\$-17.26	\$-13.51
	80%	\$-10.52	\$-17.25	\$-11.54	\$-13.95	\$-24.75	\$-18.63
	85%	\$-14.69	\$-23.69	\$-14.49	\$-20.25	\$-31.89	\$-22.52
	90%				\$-27.18	\$-38.77	\$-26.46

The table above contains long run average net costs of insurance by product and election level. Net cost is defined as farmerpaid premium less average payment recieved. A negative value indicates that the product pays back more on average than the farmer-paid premium for the case farm considered.



Select Crop: crop: Com V

Futures Month: Dec **V**

Year:

Results

The charts below show the current Dec 2019 corn price distribution at expiration in two related forms. The top shows the cumulative probability distribution for expiration prices and can be interpreted by identifying a price of interest and reading the associated probability on the left axis. The lower chart contains the same information in a probability density form. The associated tables tabulate the information from the charts by price and probability.

Price at Expiration Prob Below



rice at Expiration	Prob Below
\$2.50	0.01%
\$2.75	0.29%
\$3.00	3.29%
\$3.25	16.04%
\$3.50	41.76%
\$3.75	69.94%
\$4.00	88.61%
\$4.25	96.77%
\$4.50	99.29%



At Exp	piration
Prob Below	Price
5%	\$3.06
15%	\$3.24
25%	\$3.35
35%	\$3.44
45%	\$3.53
50%	\$3.57
55%	\$3.61
65%	\$3.70
75%	\$3.80
85%	\$3.94
95%	\$4.17

 Enter Price to Evaluate:
 4.00

 The implied distribution indicates that there is a 88.61% probability that the price will be below \$4.00 at expiration.

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and of the prices at pre-tabulated probabilities in near real time from market prices.³ A screen shot is provided in Figure 5 showing the tool for December corn as of September 4, 2019 at the close. For convenience in evaluating crop insurance, the projected price of \$4.00 was entered in the evaluation box near the bottom of the page. In this case, the market currently views the likelihood of the price at expiration exceeding the projected price (and thus for the Harvest Price option to be in effect) to be about 11.39%, or the probability for prices being at or below \$4.00 of being 88.61%. This tool solves for these likelihoods using a fitting routine across all traded options that results in the lowest overall pricing error within the current market prices. As such, it provides a reasonably defensible representation of the likelihoods and equivalently, the risk price of insuring against price movements of a given magnitude. The upper portion of the graph shows the likelihood of prices being at or below pretabulated price levels, and the lower section shows equivalently, the prices at pre-tabulated probabilistic levels. Producers and marketing professionals use this tool to assess the changing probabilities of price movements around significant market events as well.

In addition to these standing tools, we have built dozens of other specific use "toolkits" and applications to support producers', crop insurance professionals, and policy-makers' needs for objective and reliable information related to crop insurance, and we intend to continue to create and maintain the most extensive suite of crop insurance evaluation tools possible as the program continues to evolve to meet producer needs. For the past 20 years, the *iFARM* Crop Insurance Tools were intended to provide producers with insights needed to make informed crop insurance decisions most suitable for their own operations. We believe that the *farmdoc* family of websites provides an incredibly convenient platform for the ever evolving two-directional communication that identifies meaningful questions, and helps provide resources to address the needs of our broad set of stakeholders.

We look forward to continuing to serve the agricultural community for the next 20 years and beyond.

Visit the crop insurance tools section of *farmdoc* on the web at: http://farmdoc.illinois.edu/ cropins/

¹ https://farmdoc.illinois.edu/decision-tools/premium-calculator

² https://farmdoc.illinois.edu/decision-tools/payment-evaluator

³ https://farmdoc.illinois.edu/decision-tools/price-distribution

farmdocdaily

Farm Policy Perspectives: 20th Anniversary of the *farmdoc* Project

By Jonathan Coppess, Nick Paulson, Gary Schnitkey

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Gardner Policy Series

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This is the fourth in a series of articles celebrating the 20th anniversary of farmdoc

n 1999, farm policy was transitioning into the modern era of decoupled support systems and an emphasis on crop insurance. As part of this 20th Anniversary commemoration series, this article reviews the farm policy developments over those years and the contributions of the *farmdoc* project.

Background

During the mid-1990s, commodity prices briefly spiked. Figure 1 illustrates Marketing Year Average (MYA) prices for the years 1990 to 2018 as reported by NASS, as well as Congressional Budget Office (CBO) May 2019 forecasts through 2023 (dashed line). Figure 1 also indicates the farm bill debates during this era. In 1999, the farmdoc project was founded. The years prior were consequential for farm policy. In 1994, Republicans won a majority of the seats in the House of Representatives for the first time in 40 years and Congress enacted the most consequential changes to farm policy in history in 1996. The Federal Agricultural Improvement and Reform Act of 1996 (FAIR) revised farm payment programs by decoupling payments from prices and planting decisions. It eliminated the target price and deficiency payment system created in 1973 and replaced it with Agricultural Market Transition Assistance (AMTA) payments. AMTA provided seven years of fixed contract payments on fixed contract (base) acres, using a percentage per crop of a total amount of funding per fiscal year; total funding decreased yearover-year through 2002.

A financial crisis in Asia starting in 1997 damaged export markets and prices, severely tarnishing the decoupled AMTA payment system. Beginning in 1998, Congress increased and then doubled AMTA payments to offset the impact of low prices through annual ad hoc appropriations legislation. This was the farm economic and policy situation under which the *farmdoc* project started.

The farm policies designed to respond countercyclically to prices, yields or revenues have undergone a slow evolution. In 2000, Congress reformed the federal crop insurance program, codifying revenue-based protection and substantially increasing premium subsides. The 2002 Farm Bill returned price-based payments in the form of the Counter-Cyclical Payments (CCP) program, in addition to continuing fixed annual (direct) payments; both programs remained decoupled from planting decisions. In 2005 and 2007, Congress created and then increased the Renewable Fuels Standard (RFS) bringing about further changes to the farm economy which, in turn, produced changes in farm policy. The impact on prices can be seen clearly after 2005, beginning with corn; an impact that was soon felt in farm policy.

The 2008 Farm Bill introduced a revenue-based option for farmers in the Title I commodities payment programs. Known as the Average Crop Revenue Election (ACRE), it provided farmers with an option to the fixed-price based CCP that included moving average prices and statewide yields as a method for providing better assistance to farmers, particularly when costs increased faster than production efficiency but adjusting if productivity increased faster than costs (Zulauf et al., 2008). Under partisan budget pressures and high crop prices during the Great Recession, the 2014 Farm Bill eliminated direct payments, assistance which had been in place since the 1996 Farm Bill created AMTA. In place of this annual payment, the 2014 Farm Bill offered farmers a five-year choice between a fixed price program, Price Loss Coverage (PLC), or a revenue-based program, Agriculture Risk Coverage (ARC) at either the county or individual farm levels; the *farmdoc* project led efforts to help inform farmers about this decision for their crops and farms (farmdoc daily, February 20, 2014; February 13, 2014). The 2018 Farm Bill continued the PLC/ARC program election for farmers with minor revisions and updates (farmdoc daily, December 12, 2018).

Adding perspective to the farm economic and policy background during the last 20 years, Figure 2 illustrates a comparison of the cash income from all farm payments to the cash income of all crop receipts, as reported by USDA's Economic Research Service (ERS). Total payments are represented as a percentage of the income from crops; similar to Figure 1, the farm bill debates are highlighted. Figure 2 presents a snapshot of the interplay between farm economics and policy, with increases in the relative size of payments during times of economic stress and decreases in better times.

Discussion

Fast forward 20 years and the farm economic situation is once again caught in a struggle. First, a return to relatively lower prices since the peak



during the 2012 drought, driven mostly by strong yields. Second, the impact on prices from a trade conflict initiated by President Trump and focused on China with significant damage to the growing export markets there, especially for soybeans. The impact of the trade conflict began with the 2018 marketing year but expected to continue in the 2019 marketing year (see, *farmdoc daily*, October 11, 2018).

Farm assistance programs are generally designed to be counter-cyclical in nature, responding with payments when prices, yields or revenue have fallen below pre-determined levels; lower prices likely to reduce revenues and income from crops, partially offset by program payments. For 20 years, the *farmdoc* project has informed farmers about the policies designed to assist with risk management and provide assistance during down cycles. It has evolved to include *farmdoc daily* articles such as those cited herein and additional efforts to help farmers navigate the economic



cycles and the policies designed to help.

Recent additions to the *farmdoc* project are the variety of tools for helping farmers, businesses and policymakers better understand farm economic issues and policies; readily-accessible and easy-to-use examples of translating and demonstrating research. Many examples can be found on the Farm Analysis Solution Tools (FAST) section of the *farmdoc* project (https://farmdoc.illinois.edu/fast#tools); a few specific examples will be discussed further.

For the 2014 Farm Bill, the farmdoc project led a consortium of universities that received farm bill funding to develop a web-based decision tool developed in partnership with Watts & Associates; the tool known as the Agriculture Policy Analysis System (APAS) was supported by the Farm Bill Toolbox (*farmdoc daily*, January 15, 2015; September 30, 2014; July 10, 2014).Figure 3 is from APAS tool run for McLean County, Illinois, in 2014. Subsequent research developed an understanding the value of these tools to farmers and landowners (*farmdoc daily*, December 8, 2017).

In 2016, the *farmdoc* project released an online calculator for crop insurance that was developed in partnership with the National Center for Supercomputing Applications (NCSA) at the University of Illinois (*farmdoc daily*, February 2, 2016). Figure 4 as included in the release article as an initial run of the tool for a case farm and the most recent article on crop insurance using the tool was in March ahead of the closing date for purchasing coverage (*farmdoc daily*, March 1, 2019). The tool is available for use on the *farmdoc* project website: https://farmdoc.illinois.edu/crop-insurance.

Figu	re 4. Case	Farm Inforn	nation from	the <i>ifarm</i> Paym	ent Evaluato	or	fdd
\$ Resu	ılts				View graph of r	evenue probabilities	
Case Farm Info	Est Premiums	Avg Payments	Freq Payment	Net Cost of Insurance	Avg Gross Rev	Target Probability	
Value at Risk Inform	mation						
Case Farm Iı	nformatior	ı					

			Farm Yield (bu/acre)	County Yield (bu/acre)
Farm Average Yield	183.40 bu/acre	30% of years yields below:	172.79	175.12
Farm Std Dev of Yield	24.21 bu/acre	20% of years yields below:	164.07	168.02
County Average Yield	183.40 bu/acre	10% of years yields below:	151.03	157.26
County Std Dev of Yield	19.60 bu/acre	5% of years yields below:	139.50	147.58
Average Futures Price	14.17 /bu	Farm Trend-Adjusted APH	183.00 bu/acre	
Std Dev of Price	0.97 /bu	County TA Rate	1.74 bu/acra/year	
Avg Harvest Cash Basis	0.35 /bu	Farm APH (ref)	174.00 bu/acre	
Avg Gross Crop Rev	692.28 /acre			

Price and Volatility data as of Feb 1, 2016.

Figure 5. Central High IL Case Farm Simulation University of Illinois Gardner Farm Income & Policy Simulator									
Central High - \$25/Acre MFP	Base Year 2018	2019	2020	2021	2022	2023			
Corn Price/Yield (bu/acre)	\$3.60 / 237	\$4.50 / 185	\$3.90 / 211	\$3.85 / 213	\$3.86 / 215	\$3.87 / 217			
Soybean Price/Yield (bu/acre)	\$8.90 / 74	\$9.00 / 55	\$9.00 / 63	\$9.11 / 64	\$9.07 / 64	\$9.29 / 65			
Net Farm Income	\$175,508	-\$17.868	\$13,072	\$5,831	\$2,404	\$10,313			
Net Worth (Millions)	\$3.86	\$3.85	\$3.78	\$3.71	\$3.64	\$3.57			
Current Ratio	1.61	1.55	1.41	1.28	1.17	1.07			
Debt/Asset Ratio	26.5%	27.6%	30.1%	32.4%	34.7%	36.9%			
Debt Coverage Ratio	202.6%	59.1%	84.2%	76.9%	73.5%	77.5%			

In 2017, the *farmdoc* project introduced the Gardner Agriculture Policy Program to coordinate and prioritize policy-related research, analysis and articles (*farmdoc daily*, January 27, 2017). This work included articles for the Gardner Policy Series (https://farmdoc.illinois.edu/policy) and continued efforts to develop tools, such as the Gardner Farm Income and Policy Simulator which provides case farm simulations of financial analysis (*farmdoc daily*, March 6, 2018). Figure 5 is a table from a recent article using the simulator (*farmdoc daily*, July 23, 2019).

Recently, the Gardner program, in partnership with NCSA and a cooperative agreement with USDA's Office of the Chief Economist, released a new tool that estimates payments for ARC and PLC under the 2018 Farm Bill (*farmdoc daily*,



August 20, 2019). Figure 6 is from a run of the tool and it is available on the *farmdoc* website: https://fd-tools.ncsa.illinois.edu/.

Conclusion

From articles to tools, the *farmdoc* project continues to provide timely, relevant and usable information to farmers, businesses and policymakers. With the flexibility and adaptability that the internet offers, the *farmdoc* project can continue to adjust and adapt with changing times, policies and issues. The project, led by the Gardner program, will continue focusing analysis on the traditional categories for farm economics; the programs designed to assist farmers with the risks and challenges confronting them. As the list of risks and challenges for agriculture expands, however, the project's focus will expand as well. Building on existing efforts, expansion begins with conservation policy—especially soil erosion and water issues such as nutrient loss reductions—as well as trade, and necessarily will encompass climate change and food policy.

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farmdocdally

Weekly Farm Economics: Farm Management in *farmdoc*

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This is the fifth in a series of articles celebrating the 20th anniversary of farmdoc.

It was the best of times, it was the worst of times.

eturns to Corn Belt agriculture from 2006 through 2013 were among the highest ever as corn and soybean prices increased during the build-up of ethanol production capacity. This boom period was bracketed; however, by two lower-income periods. Throughout this economic environment, farm management efforts within *farmdoc* have grown and evolved to match the modern producer's decision needs. Today, the Farm Management area of *farmdoc* is the only sustained outreach effort funded by the University of Illinois Extension directed at the economic management of farms in Illinois.

A Brief History of Agricultural Economic Times

As Scott Irwin noted (farmdoc daily, September 3, 2019), farmdoc began in 1999. The year before, hog prices hit extreme lows, with some independent farmers reporting \$10 per cwt prices for live hogs. Many independent producers exited the industry ("exited" is such a stale term for the heart-rending nature of this discussion for many, but we can think of no better descriptor). While we knew it was coming, 1998 marked the symbolic end of independent hog production being a large market force in Illinois. While some independent farmers carry on, and more power to them, the majority of hog production occurs in highly integrated systems with centralized economic decisions made by an integrator or packer. Illinois has some excellent integrators. But most business decision-makers are far away, with the largest hog company in the United States being owned by a Chinese governmentalsponsored firm.

In 1998, corn and soybean prices fell, ushering in an era of very tight times for corn and soybean farmers. The late 1990s and early 2000s saw corn prices at or below \$2.00 per bushel, with loan deficiency payments (LDPs), Agricultural Market and Transition Act (AMTA) payments, and Market Loss Assistance (MLA) payments were significant sources of income. Government receipts often made up one-third of gross farm revenue during this period. This period resulted in a focus on the financial viability of farms, and *farmdoc* developed tools and educational materials to address these issues.

Corn and soybean prices were much higher from 2006 through 2013. The building of ethanol production capacities increased corn use, resulting in higher corn prices. Soybean prices increased as well, partially in response to higher corn prices, and also because of the growing demand for soybeans from China. Incomes were very good for corn and soybean farms. Farms built financial reserves, and many operations brought the next generation into their farming operations. Competition for renting and owning farmland grew, and both cash rents and farmland prices increased substantially.

All good times come to an end, at least in commodity-based agriculture. Corn and soybean prices declined after 2013 because of above trend-line production for several years in a row. The result was another period of financial strain on Illinois grain farms. Most farms have survived this time reasonably well, sometimes reducing financial reserves that were built up during the period from 2006 to 2013. Still, major adjustments have not occurred, particularly in cash rents, and farmland prices have remained reasonably resilient as well. Hopes continue for better corn and soybean prices, perhaps due to low harvest elsewhere in the world. Those hopes have not been realized and may be extinguished as the China-U.S. trade dispute continues.

The swings in prices and incomes are accompanied by an increased concentration in all phases of agricultural industries, with that no more evident that in the seed and genetics sector. There used to be many independent hybrid seed producers in Illinois, with a handful still remaining. Now there are only the "big three" of seed genetics: 1) Bayer, 2) Syngenta, and 3) Corteva. Bayer acquired Monsanto in 2018. One wonders what Bayer – a staid, conservative German company – will do with the go-go Monsanto, a company that pushed GMO trait development more than any company, and which now faces additional pushback against glyphosate related products. Time will tell. Syngenta is owned by a Chinese firm. Corteva is the only American owned company of the three, and whether that matters or not is usually a matter of personal opinion.

Increasingly, we hear of the next revolution in agriculture being related to data science, data analytics, big data, digital agriculture, artificial intelligence, and machine learning. Advances in these areas may again revolutionize agricultural production, with control of these technologies being developed in tech-centric corridors, and often in remote locations. Much capital has been invested in these data enterprises, so far with little payout, but with some real changes (consider GPS planting and drone scouting technologies). While one can be skeptical of the claims made by big data proponents, lessons from the hog industry suggest that structural changes can occur rapidly, and can be precipitated by external events. How digital agriculture plays out remains to be seen. One would expect it to have significant changes on agricultural production in the long run.

Maintenance of soils and reducing soil erosion has long been concerns of farmers and agriculturalists. Societal concerns are shifting and now include more emphasis on nutrient runoff. Non-commodity production is small, but growing, including the growth of organic production. While low food costs have been a driving force in much policy, one senses some changes in direction. Consumers are desiring certain intrinsic characteristics in their food products, which are difficult to describe and could be subject to change. Consumers may demand or request that farmers change their production practices. How farmers react to those forces will be greatly influenced by management, and must be done in an environment of narrow margins.

Evolution of Farm Management and Outreach Efforts in *farmdoc*

The *farmdoc* program began at a time when extension resources in the Department of Agricultural and Consumer Economics (ACE) were very low. Through happenstance, many highly productive extension and farm management faculty retired from ACE roughly at the same time including Tom Frey, Harold Guither, Royce Hinton, Dick Kessler, Dave Lins, Al Mueller, John Scott, Del Wilken, and many others. While none of these individuals worked on *farmdoc*, their intellectual legacy is felt throughout the content of the farmdoc website. Downsizing in the Department, and shifts in priorities within ACE, resulted in fewer replacements than the number of individuals who retired.

At that time, remaining ACE personnel formed the efforts that began farmdoc, with some of those faculty focusing in the management and finance areas. Gary Schnitkey and Dale Lattz worked in the management area. Paul Ellinger and Bruce Sherrick worked in the finance area. Over time, a number of other individuals have contributed to these efforts as well. Notably, Ryan Batts is the long-serving coordinator of FAST tools. Many graduate student theses are reported on, or serve as the basis for other products in *farmdoc*. Fortunately, the team that developed the farm management area did so driven by the needs of producers rather than by their specific areas of appointment, and that turned out to be one of the great synergies of *farmdoc*.

Primary management efforts and innovations were originally delivered in three primary areas. The first is in written newsletters and posts. The lapsed Illinois Farm Economics: Facts and Opinions publication was begun again and made into an electronic publication. On the older versions of farmdoc Facts and Opinions was a bi-monthly publication. The Weekly Outlook by Darrel Good and Todd Hubbs and Facts and Opinions were some of the most used on *farmdoc*, confirming the importance of the written word and analysis, and leading to farmdoc daily, an unheard and so far not repeated commitment of producing written analysis on commercial agriculture on a daily basis by a land grant University. Facts and Opinions evolved into the Weekly Farm *Economics* series. Through this series, we have addressed the most important management decisions faced by Illinois grain farms including financial management and benchmarking, crop choice, machinery management and benchmarking, farm bill and other program choices, income outlook, farmland rental decisions, and characteristics of profitable farmers; and we have done so in a timely manner and with a mechanism for distribution that makes these efforts immediately available to producers.

The second innovation was FAST tools, a series of Microsoft Excel spreadsheets that address management on farms. Paul Ellinger brought leadership to this program which has morphed into more than 30 tools addressing financial management, farm management, risk management, farm bill analysis, and crop insurance. Tools often serve as the analysis vehicle for the Weekly Farm Economics articles. In addition to developing the spreadsheet, FAST workshops have been conducted around Illinois using a portable microcomputer lab. Use of spreadsheets remains strong, with a spike in use this spring as many used FAST to analyze prevented-plant alternatives. Work continues on FAST, with efforts to move these to more online tools.

The third effort are background resources. While not exactly "sexy", these resources are the "DNA" of a management program and include Crop Budgets, Historical Crop Costs, Financial Benchmarks, Lease Forms, Lease Fact Sheets, Cost of Machinery Operations, and farmland prices over time. These are maintained in the management and finance sections of *farmdoc*. Many use these resources to set cash rents for farmland, set custom rates for machinery, evaluate the financial performance of their business, guide their development of pro forma cash flows and financial statements and make crop choice decisions. We use these resources frequently to address important, current topics. For instance, recent decisions related to planting crop late or taking prevented-planting insurance began with crop budgets. Without those crop budgets, the basis upon which to make these decisions would not exist.

Themes in Management on farmdoc

Farming in Illinois is highly competitive with very narrow margins. There will be fewer farms in the future than there are today. While many topics are addressed in the management section, much of the content is targeted at this reality.

We pick three themes to illustrate the breadth of our efforts. Over time, one of the mainstays of our programs is analyzing the financial performance of farms. We have developed balance sheet, cash flow, and other evaluation tools in FAST. Financial benchmarks have been developed to indicate whether a farm is strong or weak in a particular area, including a red, yellow, green light scale. Interest in financial analysis ebbs and flows, with much emphasis occurring during the financial difficult times in the late 1990s and early 2000s. Interest is increasing again, and we have spent a great deal of effort discussing management of working capital.

Crop economics drive many decisions, and crop budgets are key to managing that process. Their importance increased around 2013. We identified a switch in profitability, with soybeans becoming profitable than corn from 2014 to 2018, particularly in southern Illinois. Acres in Illinois have shifted to soybeans. Moreover, margins have narrowed to such an extent that \$100 needed to be cut from expenses in order for there to be no erosions in working capital from cash rent farmland, leading many farmers to evaluate the cost structure on their farms

Only about 30% of the farmland in Illinois is owned by the same individuals that farms the

land. That percentage is lower on commercial grain farms. Relations and dynamics between farmers and landowners are extremely important and sensitive. Since 2013, our research reported on *farmdoc* suggest the need to reduce cash rents. We have developed FAST spreadsheets to evaluate cash rents and presented variable cash leases in order to aid farmers and land owners in their negotiation processes. Due to the very competitive nature of the rental market you can't be a grain farmer if you don't have farmland - rents have not fallen as much as have returns. These dynamics continue to play out, as lenders watch working capital erode, perhaps necessitating more dramatic changes in the near future.

Extension Resources

Over the life of *farmdoc*, state budgets within Illinois have not been kind to the University or Extension, and some very good administrators at the University of Illinois and Extension have had to make some very tough decisions. Unfortunately, those decisions often resulted in the reduction of personnel devoted to agriculture and farm management in particular. Now, the management section of *farmdoc* is currently the only significant effort within Extension that addresses management issues related to Illinois farms.

Elimination of funding related to management occurred in three areas. The Illinois Farm Business Farm Management (FBFM) is a farmerowned cooperative that provides accounting and financial consulting services to Illinois farms. FBFM has over 60 full-time field staff servicing over 5,000 farms representing about one-quarter of the acres farmed in Illinois. It is the premiere farm accounting service in the country. FBFM began in the 1920s as an extension program. It did what Extension administrators want: it began generating revenues. FBFM was so successful at generating revenue that fees paid by farmers now fully pay the salaries of all FBFM personnel. The University of Illinois used to fund some state staff to aid FBFM in analyzing data and providing outreach. That no longer occurs. FBFM still is provided office space in Mumford Hall, but one wonders how long that will last. Staff in ACE work with FBFM and analyze the data from FBFM farms. The relationship is synergistic. FBFM data serves as the basis for many of the publications in the management section of *farmdoc*. We view FBFM staff as our own direct personal link to

farmers. Without FBFM data and the working relationship with FBFM, the management section of *farmdoc* would be seriously deteriorated.

The second relates to the elimination of the Farm Management Team in Extension. Members of the Farm Management Team were located throughout the state and provided many programs to Illinois farmers. Financial management training and providing lease programs were mainstays. Individuals within this program were instrumental in running Rural Route 2, a program designed to aid farmers facing financial stress. Annie's Project, an educational program targeted at women, was started by a member of this team. This team was eliminated in one of the reorganizations within Extension. As an administrator said at that time: "Well, we have *farmdoc.*"

Finally, the old farm advisor positions within Extension were eliminated before *farmdoc* began. However, some of the former farm advisors continued in Extension in other positions and provided many useful insights into agriculture. Extension resources remain in agriculture, primarily in the Commercial Agriculture and Small Farm teams. Few of those efforts focus on economic management of farms.

Back to the Future

Farm management may not be the oldest profession known to man, but it has to rank up there. Known texts on farm management exist from the Roman Empire (see, for example, Roman Farm Management: The Treatises of Cato and Vero). Management of farms and the provision of a stable and cost-effective food supply has been key to societies' progression for a very long time and will continue to be in the future. As a result, the study of farm management will continue in some form, even if under different titles.

The tasks of a farm manager can be stated rather simply. A farmer must manage production in a timely manner such that the revenue from sale of products exceed expenses by the required margin. If the operation currently is successful at generating required margins, the farm manager still needs to improve the operation and likely expand that operation because margins always seem to decline from agricultural production. Expansion usually requires debt capital, resulting in risks that could jeopardize the future of the operation. Weigh those risks carefully! At the same time, plans need to be made for the succession of managers, usually with the transfer of management from an older and younger generation. This transfer often is a difficult period entailing some risks. Remember to do estate and tax planning. Also, plan for any contingency that could have a devastating impact on the farm such as the untimely death or disability of a key manager, divorce, loss of a significant part of the operation, or some other untold disaster. Plan production such that it results in maintenance and improvement of soils. Decide which of the many new technologies that come available are profitable and adopt those, while not adopting the duds. Market crops and livestock at the appropriate time and decide on the correct risk management tools. Make sure that relationships with land owners are well maintained. Unlike

popular impression, most Illinois farms are family operations, so try to have a work-life balance and not let the farms' fortunes impact the family dynamics too much. If those tasks can be mastered, there is a reasonable chance of success in farming, but remember that agriculture is a fickle beast.

Into these tasks, we in the management section specifically and *farmdoc* in general have provided information that is useful in that complex decision environment. Over the years, we appreciate our readers and users of *farmdoc*. We thank you for the many compliments over the years. We also value the critiques and criticisms. We take those seriously in our attempts to improve *farmdoc*. We look forward with hope to the future.

farmdocdaily

Biofuels Markets and Policy: 20th Anniversary of the *farmdoc* Project

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This is the sixth in a series of articles celebrating the 20th anniversary of farmdoc.

hen the *farmdoc* project started in 1999 biofuels markets and policy were barely on the radar screen. However, production and use of biofuels in the U.S. grew very rapidly starting around 2005 due to a combination of factors. Two factors stand out: i) the large increase in real crude oil prices through 2008, and ii) implementation of the Renewable Fuel Standard (RFS), first in 2005 and then amended in 2007. The increase in crude oil prices is crucial as it made biofuels more competitive in the marketplace and led to a political reaction that spurred the passage of the RFS legislation through the U.S. Congress. The RFS mandates have been highly controversial, particularly in the petroleum refining sector, and subject to almost continuous legal challenge. Regardless, biofuels rose to become an important driver of prices in grain and oilseed markets. If one wanted to understand price dynamics in grain and oilseed markets since 2005, you had to understand what was going on in biofuel markets. The farmdoc team has played a leading role in understanding the complex interplay between biofuels policy and markets and the implications for grain and oilseed markets. The purpose of this article is to review key developments in biofuels markets and policy since 2005 and highlight the important contributions made by the *farmdoc* team to better understanding the implications for agricultural markets.

The RFS

We start with a review of the RFS, since this policy is central to understanding the evolution of biofuels production and use. The RFS was established by the Energy Policy Act of 2005 and was substantially expanded as part of the Energy Independence and Security Act (EISA) of 2007. The 2005 statute is generally referred to as "RFS1" and the 2007 statute as "RFS2." Since its inception, the program has been administered by the U.S. Environmental Protection Agency (EPA). The RFS2 statute required the EPA to establish volume requirements for four categories of biofuels for each year from 2008 through 2022: cellulosic biofuel, biomass-based diesel, total advanced biofuel (which includes biomassbased diesel), and renewable fuel (referred to as conventional ethanol here). The difference between the total advanced mandate and the total of the cellulosic and biodiesel mandate is referred to as the undifferentiated advanced mandate and can be satisfied by a combination of qualified advanced biofuels. Conventional biofuels are generally assumed to be cornbased ethanol but this is actually not explicitly required by the RFS legislation. Instead, cornbased ethanol generally has been the cheapest alternative for this category that also meets the environmental requirements of the RFS. The conventional biofuels mandate is referred to as the conventional ethanol mandate for the

Figure 1. Statutory U.S. Renewable Fuels Standards, 2008-2022 40 Cellulosic Biodiesel 35 Undifferentiated Conventional 30 Min. 20% GHG Reduction **Gallons** (billion) 25 20 15 Min. 50% GHG 10 Reduction 5 0 2015 2008 2009 2010 2012 2013 2014 2016 2017 2018 2019 2020 2022 2021 2011 Year

remainder of this article in order to be consistent with the most common term for this particular RFS mandate.

Figure 1 shows the statutory RFS volume standards from the 2007 legislation. The basic logic behind the standards was to rely almost entirely on "first generation" conventional ethanol in the early years and then transition to greater reliance on "second generation" advanced cellulosic ethanol. This is seen in the cap on conventional ethanol at 15 billion gallons starting in 2015 and the increase in cellulosic from 3 billion gallons in 2015 to 16 billion gallons in 2022. The total RFS mandate for biofuels maxes out in 2022 at 36 billion gallons. Note that the biodiesel mandate was established as a minimum of one billion gallons per year from 2012 through 2022, with larger amounts subject to EPA approval.

The mandated targets for cellulosic biofuels were very aggressive from the outset given that industrial-scale production was virtually non-existent at the time RFS2 was passed in 2007. While several plants have been built in the last decade, cellulosic ethanol production has struggled to reach a few million gallons. The vast bulk of what has been produced in this category is actually captured landfill gas in liquid form, which qualifies as a cellulosic biofuel due to the breakdown of paper lignin in landfills. The low production totals from all sources has caused the EPA to use its RFS waiver authority to write down the cellulosic mandate to very low levels relative to statutory levels each year to date. The total advanced biofuel mandate has also been written down in conjunction with the write down in the cellulosic mandate.

The Blend Wall

The E10 blend wall is the main reason that the RFS became so contentious. This issue arose because regulation in the U.S. has traditionally limited the ethanol content of gasoline blends to a maximum of 10 percent by volume. Consequently, the theoretical maximum amount



of ethanol that can be consumed is 10 percent of total gasoline consumption. At the time the RFS was passed in 2007, it was commonly projected that U.S. gasoline consumption by 2015 would be 150 billion gallons. So, it is no surprise that the cap on the conventional ethanol mandate in 2015 was set to 15 billion gallons, exactly 10 percent of projected gasoline consumption. The problem is that actual gasoline consumption began falling almost as soon as the RFS was passed due to the combined effects of high real crude oil prices and the onset of the Great Recession. This meant that by 2013 the conventional ethanol mandate as specified in the RFS statute began to surpass the E10 blend wall.

Understanding what happens when the conventional ethanol mandate exceeds the E10 blend wall requires some understanding about how compliance under the RFS works. Obligated parties under the RFS are refiners and importers of gasoline and diesel. On annual basis, the Environmental Protection Agency (EPA) issues rulemakings about the volume of biofuels that each party must demonstrate is blended into final surface transportation fuel for that calendar year. Compliance is demonstrated by turning in to the EPA tradeable credits known as the Renewable Identification Numbers, or RINs for short. A RIN is created when a biofuel is produced and travels with the fuel as it moves through the supply chain. Obligated parties can obtain RINs by blending biofuels themselves or buying the credits from non-obligated parties.

As shown in Figure 2, the price of D6 ethanol RINs exploded in early 2013 as the conventional ethanol mandate exceeded the E10 blend wall for the first time. In a matter of months, the price of ethanol RINs went from a few cents to nearly \$1.50 per gallon. While there have been many charges of manipulation to explain the price explosion, and subsequent RIN price volatility, there is actually a simple explanation. The RFS contains a "nesting" feature whereby advanced biofuel RINs, principally biodiesel, can be used to not only meet the biodiesel and advanced mandates but also the conventional ethanol mandate if need be. So, when the ethanol mandate began to exceed the blend wall the gap between the two had to be filled by something besides corn-based ethanol, and that something was biodiesel. In essence, biodiesel became the marginal gallon for filling the conventional ethanol mandate and ethanol RINs began closely tracking the much, much more expensive price of D4 biodiesel RINs.

Starting in 2013, the equivalent of political trench warfare broke out between petroleum refiners and biofuel producers. On one side, refiners and their political allies argued that the "RFS was broken" and that the dramatic increase in RINs prices was substantially harming their operating profits. On the other side, biofuels and agricultural groups argued that the RFS was intended by Congress to be a technology forcing program and that the high RIN price reflected the unwillingness of the petroleum refining industry to make the investments that would lower the cost of breaching the blend wall via higher ethanol blends such as E15 and E85.

Much like the trench warfare of World War I, the years since 2013 have seen an ebbing and flowing of which side had the upper hand in the political battle over the RFS. For example, the Obama Administration EPA cut the conventional ethanol mandate in 2014-2016 a total of 2.24 billion gallons under pressure from refiners. The EPA's authority to make these cuts was immediately challenged by biofuel and agricultural groups, and in July 2017 a U.S. Federal Appeals Court ruled against the EPA. More recently, the Trump Administration EPA granted an unprecedented number of small refinery waivers (SREs) for the 2016-2018 compliance years. The SREs were granted retroactively, which effectively cut the RFS mandates by a total of 4.05 billion gallons. A firestorm of protest erupted from biofuel and agricultural groups, which continues to the present. Numerous efforts have been made in recent years to reconcile the interests of the two sides in implementing the RFS to no avail.

farmdoc Contributions

The *farmdoc* team had a unique opportunity to help write the "first draft" on the economics of biofuel markets and policy because everything was so new. Some highlights in this regard include:

- Ethanol and biodiesel plant profitability: Early on, representative models of ethanol and biodiesel plants were developed and used to track production profits. This led to further analysis of the factors driving changes in profitability over time, as well as analysis of such issues as the shut-down price of ethanol plants as the price of corn increased. The profit estimates now published at least annually serve as a widely-used benchmark.
- Ethanol demand and the RFS: When the RFS was first implemented there was limited understanding of the nature of the demand for ethanol. This issue came to a head in 2012 when the U.S. experienced a historically severe drought in the Corn Belt and corn production was curtailed dramatically. Many argued that the RFS conventional ethanol mandate should be waived under these circumstances. Our analysis was among the first to show that waiving the mandate would not necessarily reduce ethanol use because ethanol was a competitive component of the gasoline blend due to its octane value. In other words, gasoline blenders would continue to use ethanol up to the E10 blend wall so long as it was priced at or below the price of gasoline.
- Biodiesel demand and the RFS: A major question regarding the implementation of the RFS mandates emerged once the conventional ethanol mandate began to exceed the E10 blend wall in 2013. Specifically, what was the least cost alternative for obligated parties when filling the gap between the conventional ethanol mandate and the E10 blend wall? Most of the discussion of this issue centered on expanding the use of higher ethanol blends, such as E15 and E85. Our analysis cast doubt on the feasibility of expanding the use of higher ethanol blends and indicated that biodiesel was more likely to fill the conventional gap. With rising mandate levels over time, this implied that the demand for biodiesel would rise to previously unheard of levels. This also had the crucial implication that demand pressure from rising RFS mandates, once ethanol use reached the E10 blend wall, would be felt in oilseed markets rather than the corn market. The role of biodiesel as the "marginal gallon" in filling the gaps in the RFS is now a generally accepted assumption in modelling the impact of the RFS on biofuel and grain markets.

- Economics of RIN pricing: When RIN prices exploded in 2013 there was virtually no analytical foundation on RIN pricing to help understand what was driving the prices so high. The key insight we provided was based on the observation that biodiesel was the marginal gallon (least cost) for filling the gap between the conventional mandate and the E10 blend wall. This meant that whenever the conventional mandate exceeded the blend wall the price of a D6 ethanol RIN equaled to the price of D4 biodiesel RIN. When the conventional mandate was below the blend wall, D6 RIN prices would decouple from D4 RIN prices and return to being determined by E10 blending economics, which typically meant a D6 price of only a few cents. Much of the volatility D6 ethanol RIN prices over time could be traced back to changing market expectations of the likelihood of being in either state. This meant that RIN price volatility could be explained by the "fundamentals" rather than market manipulation or speculation.
- Biodiesel supply: When biodiesel is the • marginal gallon (least cost) for filling the gaps in the RFS mandates the characteristics of the biodiesel supply curve play a key role in setting the level of all RIN prices. We provided some of the first empirical estimates of the biodiesel supply curve by taking advantage of unique market circumstances when the biodiesel tax credit expired at the end of a calendar year. The identified curves revealed that the biodiesel supply elasticity was much higher than previously suspected. This had the further implication that increasing the demand for biodiesel as RFS mandates increased would not pressure biodiesel and biodiesel feedstock prices as sharply as many feared.
- SREs and demand destruction: A major controversy has swirled around a seemingly obscure provision of the RFS that allows small refineries to be exempted from mandated volume requirements. The policy of the EPA in recent years has been to issue large numbers of small refinery waivers (SREs) retroactively but not adjust the percentage standards to reflect these waivers. The result is in an effective across-the-board cut in mandated volumes. The distribution of the reductions on the physical demand for different biofuels has been hotly debated. Our analysis shows little impact on the physical demand for ethanol because the vast majority of ethanol in the U.S. is consumed in the form of E10 and ethanol generally has been price competitively in the E10 gasoline blend. The bulk of the demand destruction of SREs has been borne by biodiesel because biodiesel is the marginal gallon for filling the gaps in the RFS mandates. We estimated that the economic value of this damage to the biodiesel industry has been in the billions of dollars.

Closing Thoughts

Understanding biofuels markets and policy has been an essential part of analyzing agricultural markets for much of the last 20 years. This has opened up study of topics unimagined two decades ago, such as RIN pricing and the supply of biodiesel. The *farmdoc* team has played an important role in helping understand the complex interplay between biofuels policy and markets and the implications for grain and oilseed markets. We look forward to continuing this tradition in the future.

farmdocdaily

farmdoc 20 Year Retrospective on Agricultural Trade (In Chart Form)

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This is the seventh in a series of articles celebrating the 20th anniversary of farmdoc.

or some of us, 1999 doesn't feel like it was that long ago. We were two years into the Asian financial crisis, and commodity prices were in the dumps. We were watching the release of the Matrix, living la vida loca while worrying whether modernity was about to collapse with Y2K. Near the end of the year, we saw riot police and protesters clash at the "battle in Seattle". Numerous NGOs representing environmentalists, sustainable development, labor, and anti-globalization activists took to the street to protest the beginning of the current round of WTO trade talks, and their perceived exclusionary nature. Up until then, it felt like the march to global free trade was inevitable, but protesters raised concerns particularly about the non-tariff components of trade deals, such as intellectual property rights or investment protections as well as governance and inequality. These protests foreshadowed the north-south divide that has come to define the current round of trade negotiations. Two years later, the talks restarted in Doha, and have been limping along ever since. While much has been decided (such as eliminating export subsidies, reducing caps on tariffs and domestic support), a number of sticking points have kept the global trading system from getting a new deal.

Trade liberalization continued to quietly move ahead since the ill-fated Seattle ministerial meeting. With the multilateral trade talks stalled, bilateral and regional trade agreements have proliferated, with the U.S. signing 12 since 1999, and the EU, 18. (See Figure 1). For the U.S., these agreements have included treaties with Australia, South Korea, Chile, Colombia, Peru and a regional agreement with many Central American and Caribbean countries. Average tariff rates have followed suit, dropping to just slightly over 5% in 2017 (World Bank).

Agriculture was relatively late to the trade agreement game, and reductions in tariffs on agricultural products lag those in other sectors. Before the Uruguay round of the Global Agreement on Tariffs and Trade GATT), agriculture was largely excluded from trade talks since it was seen to be such a politically sensitive sector. Many countries wanted to protect their producers in the name of domestic food security, which had made agricultural tariffs and distorting domestic subsidies very difficult to change. With the 1995 WTO, changes to the EU Common Agricultural Program along with the 1996 Farm Bill, agriculture, particularly in much of the developed world, dramatically moved away from price supports, import protection and export subsidies, to rely more on risk management tools and, at least at first, direct payments. That said, there is more room for movement. Despite agricultural import tariffs having fallen since the Uruguay Round Agreement on Agriculture, they are still high compared to tariffs on other goods



(see Figures 2 and 3: South Korea has the highest average agricultural import tariff at 57%.)

Other large shifts in agricultural trade were generated by the entry of China into the WTO in late 2001. While it has generated controversy and, ultimately, sparked the trade conflict initiated by this Administration, trade liberalization with China has been very positive for American agricultural exports, as we've highlighted in earlier *farmdoc* reports.

U.S. farmers and agricultural exports responded to this more open trading regime. U.S. agricultural

Figure 2. Map of Average Most Favoured Nation (MFN) Import Tariffs on All Goods, 2017



Figure 3. Map of Average Most Favoured Nation (MFN) Import Tariffs on Agricultural Products, 2017



Figure 4. Annual Value of U.S. Agricultural Imports and Exports, 1990-2018

exports have increased about 3.5% per year in real dollar terms since 1999 (Figure 4). Imports of agricultural products have also increased, but agriculture remains one sector where the U.S. has a trade surplus. This past twenty years followed almost 10 years of little real growth in U.S. agricultural exports. This relatively flat export growth came despite large increases in agricultural export value to Canada and Mexico (4.4% real growth per year from 1990 to 1999) and high growth to Central and South American markets. These increases were offset with drops in exports to east and southeast asian economies who were suffering from the currency crisis.

The past twenty years of export growth and trade agreements means that in 2018, our primary export markets were our two NAFTA (USMCA) trading partners, followed by China, which together take about 40 to 45 percent of total US agricultural exports. All three markets have grown dramatically since 1990. China dropped from being the largest market in 2017, which can be seen in Figure 5. After that the EU and Japan are our two next largest markets, but the value of U.S. agricultural products that they import has risen much more slowly over the past 20 to 30 years than our top three markets, and more slowly than exports to other countries. Potentially more of a surprise are the next 9 largest export markets for U.S. agriculture, many of which have grown rapidly in recent years. Notably the U.S. signed bilateral trade agreements with two of these markets, Colombia and South Korea in 2012, and with Australia in 2004, the next largest export market for the U.S. after those countries (Figure 6).

In summary, since 1999, growth in U.S. agricultural exports has picked up, in particular to developing country markets. As can be seen from Figure 7, from 1999 to 2018, the fastest growing export market region was South Asia, followed by China and Southeast Asia. If instead we use 2017 as the end point, China and Hong Kong would be in the lead, with an annual growth in U.S. ag export value of over 12%, but with the trade dispute, their imports are down substantially in 2018.

The other big change in the last twenty years has been what we export. We have seen a large growth in intermediate and consumer products exports - for example meat (as noted in our earlier *farmdoc* article from 2017). While bulk exports (grains and oilseeds) are still very important, consumer-oriented products have now overtaken them in export value (see Figure 8).

fdd 160,000,000 -Canada 140,000,000 -Mexico 120,000,000 -China and Hong Kong EU28 100,000,000 -Japan 80,000,000 Other 60,000,000 40,000,000 20,000,000 0 1990 Source: authors calculations based on FATUS data



Figure 5. Value of U.S. Agricultural Exports by Top Destination Markets



Figure 8. Value of U.S. Agricultural Exports by Value Group



Now in 2019 we're in the situation of having (still) stalled multilateral negotiations, while fighting trade disputes on several fronts, with agriculture facing the brunt of the tariff salvos (see prior farmdoc reports: August 2018; April 2018). The march towards free trade does not feel as assured as it might have 20 years ago, at least from the vantage point of the United States. Meanwhile, our trading partners are not standing still. The EU signed a trade agreement with Japan last year, and Canada two years before that, and in June of this year, just announced an agreement with Mercosur. The trans-pacific partnership is underway without the U.S., and the EU is currently in negotiations with Australia and New Zealand, along with its existing agreements with a number of ASEAN countries, and both New Zealand and Australia have free trade agreements with China. While the last 20 years have shown us some dramatic changes in what we export and to whom, the next few years could well dictate how secure those markets are for U.S. agriculture in the years to come.

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Law and Taxation: A Retrospective of 20 Years

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This is the eighth in a series of articles celebrating the 20th anniversary of farmdoc.

n many respects, the development of law is an evolutionary process, adjusting slowly to the evolving needs and values of society. Certainty and stability with respect to property rights, regulatory programs and the tax structure provide a solid foundation for long-term business planning, elements especially important in the agricultural context. The Law and Tax section of farmdoc over the past twenty years has analyzed and provided legal interpretations of many of these incremental changes. Examples of this evolutional approach include the law related to drainage, fences, and contracts. In some areas, however, the law has moved at a rapid pace to keep up with technological innovation, novel business strategies, changing land use patterns

and complexities of the tax code. In our short summary below, we highlight just a few of these legal developments and make a few bold predictions about what key topics may arise in the next twenty years.

The Farm Lease: A Foundation of Agricultural Production

In Illinois and many other Midwestern states agricultural producers rent more land than they own. So in a very substantial way, the Farm Lease is a foundation for agricultural production. Historically, many farm leases were oral leases – perhaps a tribute to the honesty of farmers and farmland owners. But farm leases should be in writing for many reasons.

Farmdoc provided a new avenue for encouraging farmland owners and operators to memorialize their oral agreements in writing. And when farmdoc expanded its subject matter scope to include "Law and Taxation", farmdoc articles about leasing, including lease forms, were among the earliest Law and Taxation contributions to the farmdoc website. Importantly, farmdoc also served as a collaborative bridge between the department's experts in farm management and its law group, allowing the farmdoc leasing materials to integrate the best of both management and law.

The first twenty years of *farmdoc* have witnessed an evolution in lease language, trends away from the traditional share lease (which often would renew automatically year after year) toward the cash lease (which would be expressly renewed and often revised every year). And these two decades have also witnessed the birth of the flex lease – most typically a cash lease with the amount to cash rent determined by formula utilizing price and yield data as specifically described in the lease. *Farmdoc* has kept pace with these changes and, in some ways, contributed significantly to the continuing evolution of the farm lease.

The Biotechnology Revolution

First commercialized in 1996, genetically engineered plants now constitute a majority

of the corn, soybean and cotton grown in the United States. Much of the early discussion on this topic focused on two key area: the economic consequences of potential commingling of genetically engineered varieties with conventional or organic production supply chains and the parameters of intellectual property protections for this new technology. Other issues included chemical use (whether the quantity would increase and the toxicity decrease) and the potential for further concentration in seed markets that could have a negative impact on consumers (farmers). In Bowman v. Monsanto, 569 U.S. 278 (2013), a unanimous Supreme Court settled the intellectual property debate upholding utility patents for glyphosate-resistant soybeans along with restrictions on seed saving.

With respect to commingling, two issues were at play. First, the potential for pollen to drift to neighboring farms that did not adopt genetically engineered varieties and, second, the potential for post-harvest commingling further along the supply chain such as at the grain elevator or further aggregation source. The pure pollen drift scenario pitting neighboring farmers against each other, fortunately, has not played out in the court system as instances of drift tend to have been handled privately. Post-harvest commingling, however, has resulted in several high-dollar lawsuits. The StarLink litigation was the first nation-wide claim filed on behalf of corn farmers suffering from losses due to the contamination of the food supply chain with the unapproved for human consumption StarLink corn variety. Product recalls, loss of export markets and extensive genetic testing requirements resulted in a precipitous drop in corn prices affecting farmers and the subsequent lawsuit. StarLink-related materials created and posted on *farmdoc* were extremely valuable to farm producers throughout the corn belt in making claims under the StarLink court settlement. A few years later, a similar commingling situation in the rice market resulted in a similar finding of liability for the unauthorized release of Liberty Link Rice that resulted in product recalls and collapse of export markets. The StarLink and Liberty Link Rice cases firmly established the viability of common law negligence and nuisance claims for damages arising from the commingling of food/feed supply chains with genetically engineered products not yet approved for general commercial release. A third contamination incident with Syngenta's

MIR 162 "Viptera" corn not yet approved for export to certain major markets built on law developed in these two prior cases, resulting in even more extensive liability for the seed developer.

Although much of the legal uncertainly accompanying the biotechnology revolution has been resolved, in the current trade environment, export restrictions and/or tariffs on commodity crops present an avenue to inflict economic and political pain. A more subtle approach in future trade disputes could be further delayed approvals for new genetically engineered crop varieties, such as in the Syngenta litigation, triggering additional liability and disruption in commodity markets.

A Changing Tax Code, the One Certainty in Life

The substantial changes to the federal tax code since *farmdoc* started twenty years ago are simply too extensive to summarize. More recently, the 2018 Tax Cuts and Jobs Act imposed a variety of changes, some quite complicated while others more straightforward. Two provisions warrant a brief mention for their potential impact on farmers.

The qualified business income deduction (QBID) has many complicated aspects, but they only affect certain taxpayers. Farmers, however, that do qualify for the QBID deduction can save substantial taxes. QBID itself is too complicated to discuss in this review article, but if you are a farmer, be sure your tax professional is familiar with IRC §199A and discuss its potential application to your operation.

Another major change was with IRC §1031 likekind exchanges (LKE). Under the 2018 law, a LKE is only available for real property exchanges. Farmers will continue to exchange one piece of farm equipment for another. For example, some farmers will trade tractors or combines each year. These exchanges are no longer tax deferred, but that may not increase their income tax. The revised tax code treats each piece of equipment that is relinguished as if it was sold, and therefore will probably create taxable income. On the other hand, the newly acquired equipment is eligible for the immediate write-off under IRC §179. The limit on IRC §179 was increased to \$1 million and the phase-out threshold was increased to \$2.5 million. Both of these amounts will be increased each year based on inflation.

On the Horizon?

It is always risky to make predictions about the direction of the law, but two general themes could incite revolutionary changes in the legal landscape as opposed to the otherwise evolutionary developing of the law in the agricultural context: big data and global climate change.

Much has been written about the potential of massive data flows to enhance production efficiency. This, of course, raises privacy and data ownership concerns in an uncertain legal environment. The capability to generate and analyze data also could prompt enhanced traceability and verification demands from producers and input suppliers. One rapidly developing aspect is the use of blockchain technology not for cryptocurrency purposes, but rather promoting supply chain integrity. These potential changes in response to end user demands may not be part of new or enhanced government regulatory programs, but rather developments in the private law of contacts and commercial norms embedded in the agricultural supply chain. In sum, data can be a powerful tool, but could also give rise to new contract-based responsibilities.

With respect to climate change, farmers are adept at making needed adjustments to changing weather patterns. The future may also bring accompanying regulatory changes. Although unlikely in the near term, some statutory or regulatory change with respect to greenhouse gases is foreseeable. What that program will look like and whether agriculture will enjoy exemptions similar to those embedded in other regulatory programs applicable to general business operations, will be key questions hashed out at the federal and state level. One tangential aspect of a renewed focus on land use issues in the greenhouse gas context could spill over to the water arena. The Des Moines Water Works litigation was a shot across the bow with respect to potential legal changes to the status of farm drainage, and the TMDL for the Chesapeake Bay was another wake up call for non-point source pollution in the agricultural context. The technical, political and legal challenges of reducing non-point source pollutant loads in the Mississippi River and Gulf of Mexico would pale in comparison to the complexities of the Chesapeake Bay watershed. This may be another area where enhanced traceability and monitoring associated with the big data revolution could provide new pathways for pollution reduction, as well as potential responsibilities for the agricultural community.

Whatever the future brings, a strong *farmdoc* team imbedded with a robust law and taxation component should be able to identify and distill these new developments. Providing agricultural producers and policy makers with practical insights and guidance will be a valuable contribution in an ever changing political, legal, economic, and natural environment.

In conclusion, we hope that over the years we have provided interesting and relevant analysis to the broader agricultural sector and look forward to what new legal developments the future will bring that we can share with the *farmdoc* community.

farmdocdaily

farmdoc and *farmdoc daily:* Farm Real Estate Markets - 20 Years and Growing

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This is the ninth in a series of articles celebrating the 20th anniversary of farmdoc.

s part of the 20th Anniversary of the *farmdoc* program, we are highlighting several of the central themes that have persisted through time and are identifying some of the ways in which the *farmdoc* program has responded to, and continues to contribute to the ability for producers, investors, and ag-sector participants to improve their business decisions.

The purpose of today's post is to provide a brief retrospective of some of the activities

in the *farmdoc* program related to farmland and farmland rental markets, and to provide a signal toward future activities for which we have adopted the tagline: *"Advancing Farmland Markets through Research and Information."*

As a result of the central role farmland plays in most agricultural operations, there is considerable interest in the fundamental market forces which impact farmland sales and rental markets among farmers, landowners, and agricultural lenders. Interest in farmland markets is also very strong in the investment community as farmland has demonstrated remarkably resilient investment characteristics of positive correlation with inflation, and low or negative correlation with equity returns; and thus it provides very desirable diversification benefits. And, for context, it is also important to be able to overlay farmland markets with other features of the broader economy that change through time and affect evaluations of the relative performance of farmland and rental markets. This has led the *farmdoc* project to also develop strong repositories of historic data on other features affecting farmland markets and to provide a broad set of tools and data resources supporting those in the sector. The *farmdoc* project also has developed several exceptionally strong and notable connections to stakeholder groups that we will use to organize some of the remaining materials. But first, some context.

Farm Real Estate as an Asset Class – a Brief Summary

Part 1. Farmland occupies a central role in the U.S. ag sector balance sheet with current value in excess of \$2.5 trillion accounting for more than 83 percent of all assets on the farm sector balance sheet (USDA-ERS, 2019). Table 1 on the following page shows summary information about the US ag sector through time (also available in more complete form back to 1960 with farm numbers, lender shares, and other related data sourced from USDA and related sources at our website: https://farmland.illinois. edu/tools-and-data/ at the tool titled "US Ag Sector Balance Sheet Data." Numerous other

1970 1980 1990 2000 2010 2015 2017 2019(f) (\$ millions, except ratios - source ERS-USDA) **Farm Assets** 278,823 1,000,422 840,609 1,203,215 2,170,832 2,909,653 2,993,055 3,077,398 Real Estate 202,418 782,820 619,149 946,428 1,660,114 2,395,363 2,469,495 2,564,334 Non Real Estate 217,602 221,459 76,405 256,787 510,718 514,290 523,559 513,065 Farm Debt 48,501 162,432 131,116 163,930 278,931 356,738 393,048 426,666 **Real Estate** 208,769 27,238 85,272 67,633 84,724 154,065 236,058 263,654 Non Real Estate 21,263 77,160 63,483 79,206 124,865 147,969 154,990 163,014 Equity 230,322 837,990 709,493 1,039,285 1,891,902 2,552,915 2,600,007 2,650,730 **Selected Indicators** Debt/Equity 21.1% 19.4% 18.5% 15.8% 14.7% 14.0% 15.1% 16.1% Debt/Assets 17.4% 16.2% 15.6% 13.6% 12.8% 12.3% 13.9% 13 1% Real Estate/Equity 87.9% 93.4% 87.3% 91.1% 87.7% 93.8% 95.0% 96.7% Real Estate/Assets 72.6% 78.2% 73.7% 76.5% 82.3% 78.7% 82.5% 83.3% Real Estate D/Total D 56.2% 52.5% 51.6% 51.7% 55.2% 58.5% 60.6% 61.8%

Table 1. Selected Balance Sheet Characteristics of US Agricultural Sector

tools supporting farmland markets are also available in that section including a utility to compare State Level Values and Returns, a Farmland Indexing utility, a model to show Farmland Correlation by holding interval, and a visualization tool to examine Returns to Alternative Investments).

Part 2. Farm Incomes: "Farmland is worth what it can earn" is a guote that we would tend to attribute most directly to Professor Peter Barry - one of the true pioneers in developing formal modeling methods to better understand farmland markets. As early as the 1980s, he was instrumental in developing a view that considered farmland in the context of other investments, and began to introduce the notion that financial theory applies to all asset markets, not just to exchange traded equities and debt securities. (as an important sidebar, professors Peter Barry, Chet Baker, Dave Lins, Tom Frey, Paul Ellinger, and several others dating all the way back to the formation of the first and original institutions in the Farm Credit System attributed to UI faculty member H.C.M. Case; each made monumental contributions to the area of agricultural finance. farmdoc in general, and the farmland markets section could not exist without the broad and solid foundation laid at the University of Illinois by the true pioneers in ag finance).

One way to summarize the performance of farmland as a financial asset is to view rental rates as a form of income to a land owner. and to simply see how it has in fact fared as an investment. Figure 1 does so for a few states in the Midwest in two complementary forms. The top panel shows the yields on a 10-year Treasury investment along with rental returns for farmland in the Midwest. The bottom panel shows the capitalized values of rent - in other words, what farmland prices would be if returns were required to equal the 10-year Treasury rates - along with actual prices. What is notable is that the only stark departure where farmland appears overpriced relative to its fundamentals (which are relative to broader market yields) was in the early 1980s when a debt-side farm crisis fueled a run up and then collapse of farmland values. Several articles in the farmland section of farmdoc daily have developed these ideas much more completely through time, but a summary of the general findings is that farmland markets do largely behave as predicted by financial theory, but they do react more slowly and more smoothly due to their longer income cycles than do other financial investments. In the lower panel, the departure from the cap-rate that is evident over more recent periods is largely viewed as a result of quantitative easing efforts and low interest rates to which farmland markets have demonstrated somewhat muted responses. These



\$14,000 \$12,000 IL Farmland Value ••••• IL Capitalized Value Farmland Value - \$/Acre \$10,000 IA Farmland Value ••••• IA Capitalized Value \$8,000 IN Farmland Value ••••• IN Capitalized Value \$6,000 \$4,000 \$2,000 \$0 2013 2015 2017 2019 1971 1973 1975 1979 1983 1985 1987 1989 1993 1995 1999 2003 2005 2009 2011 1981 1991 1997 2001 2007 1977

are just examples of the types of analyses that have appeared in the *farmdoc daily* and *farmdoc* projects through time.

Part 3: Farmland as an asset class and the financialization/professionalization of farming:

While not part of the original farmdoc effort, it is also notable that the NCREIF Farmland Index reporting system that serves as the largest and most commonly referenced measure of farmland investment performance (by region, crop type, management type, etc.) was developed and verified at the University of Illinois, and we continue to provide leadership and support of that activity (original members included professors David Lins, Bruce Sherrick, and Cheryl DeVuyst). The index which now is comprised of over 900 properties and \$10 billion in asset values remains supported by farmdoc personnel and serves as an important two-way connection to both the investment and research communities for consistently accounted measures of return to farmland investments. We continue to serve on the research and education committees of NCREIF and recently began a quarterly webinar series to document the "state of ag" and to highlight current issues impacting farmland investments.

These features are not only noted at farmdoc. Biff Ourso, Nuveen's head of real assets, recently delivered a keynote at an investing conference under the title of "Farmland is an Asset Class... Now What?" which pointed out the key structural and fundamental features in which farmland markets exist. Atomistic ownership, thin markets, connections to government programs, systemic risk features (i.e., weather events), and exposure to foreign trade effects provided an intriguing "green screen" behind the asset class against which numerous projections can be made. Thus, while the long-term thesis around growing populations, growing incomes, and performance as a diversification asset remain valid, changes continue to occur with potential to dramatically alter the historic nature of farmland markets. Among the "headline level issues" are the impacts of growing requirements for production methods and verification of practices that convey preferred attributes to consumers; awareness of implications (both pro and con) for carbon footprint impacts of animal and intensified ag production; increased international integration; sophistication of technology used in production; urban/rural interface issues; and capital market

sophistication that can "handle" uniqueness of ag assets including the role in ESG driven investment strategies. And all this is resolving in a market with only about 1% annual turnover under independent arm's-length transactions. What is clear is that these issues will increasingly drive both pricing and the structure of ownership and control going forward, and will result in continued evolution of the stakeholders for the farmland information at *farmdoc*, and we will continue to provide leadership and service to those involved.

Some Highlighted farmdoc Responses

Over the 20-year history of the *farmdoc* project, farmland markets have experienced multiple transitions. The era of low, but relatively stable commodity prices in the 1990s and early 2000s coincided with stable to moderately increasing land values and rental rates. The commodity price and farm income boom from the mid-2000s to 2013 coincided with more rapidly rising farmland values and rental rates. Lower commodity prices since 2013 have resulted in stable to moderate declines in farmland values and rental rates relative to market peaks. Each of these eras have introduced unique challenges for farmers, landowners, and lenders, and each has to some degree influenced the nature of the response that have had the greatest impacts.

One obvious and significant contribution with practical significance is to provide independent and impartial support for both landowners and renters as a significant portion of farmland in the U.S. (roughly 40 percent of all cropland and pasture) is operated under some form of rental or lease agreement. The rental rates and other design features of farmland leases have important implications for both farm operators and farmland owners and there are numerous resources on farmdoc and dozens of archived articles on farmdoc daily in the "farmland prices and rents" category documenting current lease trends and values. Links to frequently used Leasing Forms and Leasing Facts on farmdoc have been accessed hundreds of thousands of times over the years, and continue to serve as basic templates for vast numbers of lease contracts across a wide portion of the country. To simplify many of the incredibly complex issues related to the financial implications of lease terms, and to evaluate the financial implications of farmland purchase (including financing options, crop budgets, investment horizons, and other features) we have also developed a

suite of tools within the FAST (Financial Analysis and Solution Tools) section of the *farmdoc* project that directly support farmland market participants. A partial list (with links to access at the website) includes:

- Cash Rent with Bonus
- Farm Rent Evaluator
- Land Purchase Analysis
- Farmland Lease Analysis

Members of the *farmdoc* team also use these tools to do external programming and hold seminars focused on the use of the suite of FAST tools more broadly, and also provide support to the lending community with the same outreach activities.

Some Other Responders

One of the most notable elements of the farmland-market related activities in *farmdoc* is the deep connections with and service to other groups that share common interests and overlaps with the stakeholder groups. Space prevents even a modest listing, but a couple of examples will help make the point that this section of the project has become an important network structure for others in the industry as well.

ISPFMRA: In Illinois, we are fortunate to have one of the strongest, and most active chapters of the ASFMRA in the Illinois Society of Professional Farm Managers and Rural Appraisers. We interact with them directly, serve on their executive teams, and most importantly, leverage their extensive network to complete and publish what is now perhaps the longest running and most extensive survey of actual farmland transactions, with professionally evaluated explanations of regional trends. The annual publication provides direct evidence of the actual movements in professionally managed farmland lease terms, and provides unbiased information about farmland transactions as screened for legitimacy by dozens of professional teams around the state. From this publication, the public can both locate proximate professional resources if interested in buying or selling land, and can identify local market conditions that most closely affect them.

FBFM: In addition to an incredibly strong professional farm management community in Illinois, we also benefit immeasurably from access to what we regard as the nation's best Farm Business-Farm Management organization (admittedly a biased view, intentionally so perhaps, from having a 20-year shared history). FBFM has, as noted in an earlier posts this week, provided the gold-standard in farm-level records and has served as the background data source for literally dozens of projects, and ongoing series published at farmdoc. Brad Zwilling, Dwight Raab, Dale Lattz, and numerous others have made immeasurable contributions to the understanding of rental market trends and land values in the state, and *farmdoc* reflects verified expertise as a result of that interaction. Simply put, the Illinois FBFM has the most accurate and complete set of farm-level production records ever assembled, and the *farmdoc* team has both benefitted from, and contributed to that resource as well.

TIAA-CREF/TIAA/TIAA-Nuveen: TIAA-CREF is generally viewed as providing the initial business case for successful development of a public investment platform for agricultural investments (earlier pioneers including Murray Wise, and others are not being ignored). After a series of carefully sequenced moves to establish an acquisition and management structure, they quickly grew to over \$1 billion by 2010 and around that time began to note the need to promote independent and broadly available research and data sets supporting the industry as well. Over the following years, TIAA-CREF underwent several growth epochs, fund launches, name changes (dropping CREF, merging with Nuveen), and expansions to other areas in natural resource and agricultural investing while developing an international portfolio of agricultural properties. What has not changed is their deep commitment to supporting independent research on issues affecting the asset class. As a result, TIAA provided support to develop the TIAA Center for Farmland Research - a wholly independent research center at the University of Illinois, with a focus on farmland and issues affecting agriculture. The TIAA Center in turn provides support to farmdoc as well and symbiotically promotes the program that will allow research related to farmland markets, at the institution that has been among the most active, to be able to maintain that distinction indefinitely.

Summary Observations

Members of the *farmdoc* team have consistently provided documentation of trends in farmland valuation, farmland rental rates, and lease

design as well as analysis to aid stakeholders in decision making. The factors affecting farmland values and rental rates have received a considerable amount of attention in other parts of the program as well as the same factors that affect farmland markets permeate every other element of the agricultural sector. These include standard demand and supply fundamentals ultimately impacting the returns to traditional crop production, as well as potential returns from alternative land uses and other factors such as development pressure and increasing outside investment activity. These all exist in an evolving regulatory framework, with changing consumer demands, uncertain international trade relationships, morphing government programs,

and constant technological innovations. While these will each continue to change through time, the need for continued documentation, analysis and provision of tools for independent analysis will always be relevant, and we expect to continue to Advance Farmland Markets through Research and Information.

Visit *farmdoc* and related farmland focused sections on the web at:

- https://farmdoc.illinois.edu/
- https://farmland.illinois.edu/
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