

Economic & Policy Update

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Economists' Viewpoints Surrounding the Hemp Boom: Part I

As winter extension meetings occur across Kentucky and the nation, the conversation has often steered to the topic of industrial hemp as farmers, and other agribusinesses inquire about an emerging crop in the midst of an overall struggling farm economy. This environment is creating enthusiasm and perceived opportunities for the crop. Although the crop has been produced and marketed for thousands of years, the revitalized hemp market presently contains many new economic opportunities and a wide variety of consumer products, coupled with political, regulatory and marketing challenges and uncertainties for hemp producers, processors, manufacturers, retailers, input suppliers, and consumers.

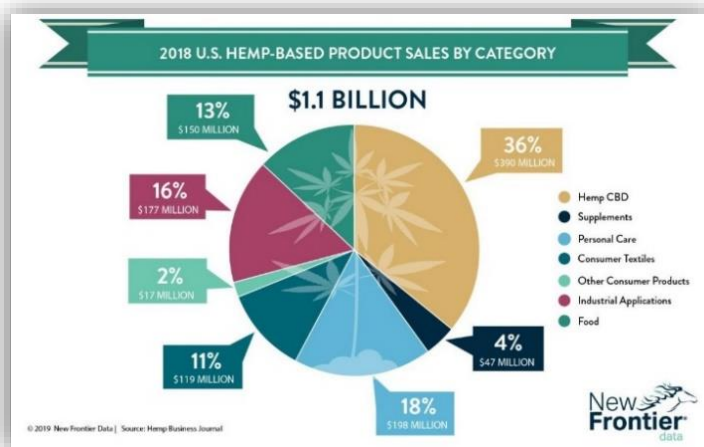
Some of these uncertainties have been addressed by the enactment of the 2018 farm bill, which included language to remove industrial hemp from the controlled substance list, enables hemp farmers to be eligible for federal crop insurance, and allows hemp researchers to apply for competitive federal grants. Despite legislative approval and expanding product sales, regulatory risks still prevail which complicates the long-term outlook for hemp.

In reality, the “economics” of hemp is complex. Economists are challenged in evaluating this crop’s

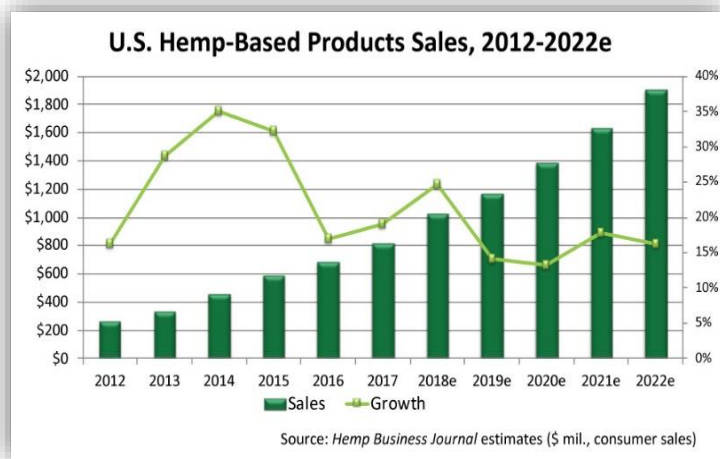
economic potential given an alleged 50,000+ uses for this crop from different parts of the plant, various production methods, an unpredictable policy and regulatory environment, and at least in the short-run, limited market and farm-level data. This article will provide some general “macro” economic issues related to the crop. We will present some farm-level budget and financial analyses in next month’s issue to assist farmers in making production and investment decisions related to this crop.

What We Do Know

While many unknowns surround the economics of hemp, three definitive statements can be made about the evolving hemp industry:



- Hemp can be used as an input for thousands of consumer products.
- Sales of a wide variety of hemp products in the U.S. and worldwide represent a small portion of consumer goods, but have been growing at a relatively brisk pace in recent years (see charts)
- Global production of hemp has declined considerably since the 1950s, but has been rebounding over the past decade in response to growing consumer demand for hemp products, policy changes, infrastructure/business investment, and improved production practices.



While hemp can be used as an input to produce thousands of items, ultimately, businesses contemplating using hemp in their products must find hemp cost competitive with other competing inputs such as synthetic or other natural fibers, alternative oils, and other dietary/health supplements and therapeutic compounds. For farmers, hemp must be profitable relative to other potential crops and agricultural enterprises and competitive with hemp imported from competing countries. Demand for hemp will be shaped by the utility consumers receive from purchasing hemp products, which includes perceived health and

environmental benefits, subject to price levels for hemp products and income constraints.

Hemp is Part of a Global Market

Hemp is produced worldwide in more than 30 countries. Historically, China and Europe have been major players, but over the past two decades, Canada has become a significant player (primarily grain) with the U.S. being its largest customer. Production (and prices) in the Canadian market have been very volatile over the past 20 years with approved production licenses ranging from less than 50,000 acres in 2016 to nearly 140,000 acres in 2017, to reportedly less than 100,000 acres in 2018.

Currently, in the U.S., over 40 states have legislation that have approved production of industrial hemp, with most adjusting to the requirements laid out in the 2018 Farm Bill. Even Alaska has an approved industrial hemp program. U.S. hemp acres have increased from just a few hundred during the early years of the new hemp era in 2014-2015 (primarily Colorado and Kentucky), to over 25,000 acres in 2017, to more than 78,000 acres in 2018.

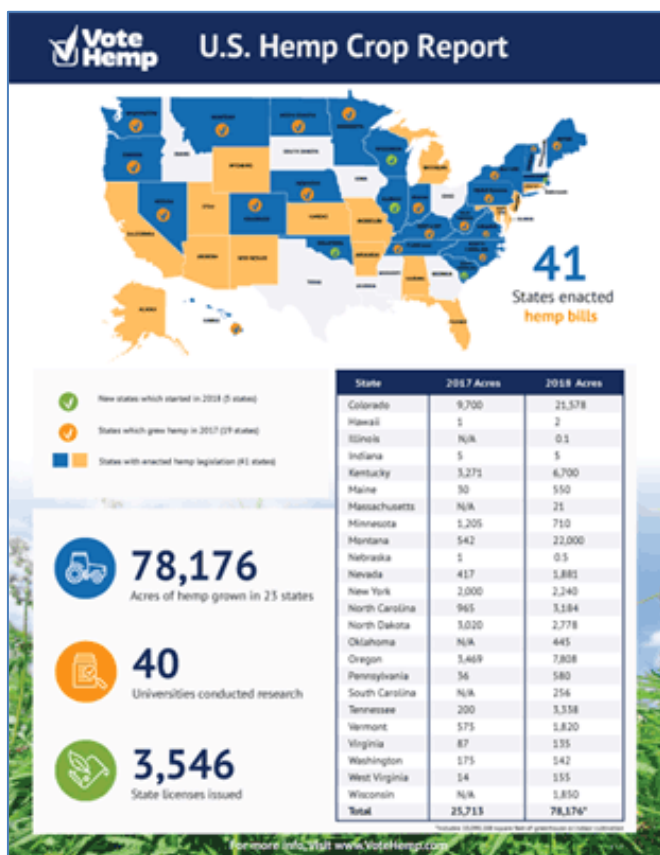
The Kentucky Department of Agriculture approved slightly over 42,000 acres for 2019, consisting of 1,035 farmers and more than 100 processors. This compares to 6,700 planted acres in 2018, comprised of 210 approved growers and 72 approved processors. Based on history, look for Kentucky hemp planted acres to top 20,000 in 2019, with U.S. hemp acreage easily exceeding 100,000 acres.

Despite its production and marketing challenges, some Kentucky farmers have done well during the early years of hemp production, others have had complete/significant crop failures due primarily to weed pressures, while others have had to wait for one, two or more years to receive full payment for their crops.

Following the reintroduction of hemp back into the U.S. market after the 2014 Farm Bill most of the early production centered around the hemp grain and fiber markets where returns were anticipated to compete with other homogeneous grain (corn, soybeans, and wheat) markets. Ultimately in this type of marketing environment, short term profits

and commoditize the market, unless additional barriers to entry for this market are created.

A critical question for the foreseeable future will be can anticipated demand for hemp-derived products continue to outpace expected large increases in hemp production in the United States and globally?



encourage additional supplies that will eventually lead to lower prices and ultimately generating a competitive rate of return, resulting in only the lowest cost producers/areas remaining in business.

The emergence of the CBD market has been sort of a game-changer. CBD currently offers a much higher economic return for hemp producers, but also possess more volatile financial, policy, and regulatory risk than markets for hemp fiber and grain. Likewise, lucrative short-run profits that may exist during the early years of this emerging industry will likely lure additional supply across the U.S. and globally, which will diminish future profit potential

Undoubtedly, competition from Canada and Europe (with established infrastructure, management expertise, and markets), and China (with access to lower wages and lower regulatory standards) will provide competition for U.S. hemp farmers, processors, and associated companies. With more than 40 U.S. states currently positioning themselves for this quickly emerging market, it is not practical to expect (unless product demand grows substantially) that the market can sustain viable hemp production in every state. Hemp processors will not likely locate in every state and considering transportation costs (especially for fiber) and access to markets, technology may dictate that production will ultimately be concentrated in relatively few states where hemp can be grown at the lowest cost of production and transported shorter distances for processing. This suggests that states that can entice processors, manufacturers and infrastructure to locate in their state based on a strong research base of knowledge, an interested and willing/educated grower pool with lowest cost of production for desired quality characteristics requested, along with support from local and state governments, will likely enhance their chances for success in this emerging industry.

Significant price volatility will likely evolve, depending on the supply/demand balance. Plus, with limited access to inputs (e.g., seed, chemicals, labor, specialized equipment) and management expertise slowly evolving, growers can anticipate continued yield variability. Consequently, growers are encouraged to incorporate a wide range of prices and yields over multiple years in their budgeting analysis as the expansion of acres and

companies is expected to put downward pressure on prices in future years.

With any emerging industry, investors of all types will attempt to capitalize on potential market opportunities promising large economic returns. History reveals that some will succeed, while many others will fail. Thus, growers should thoroughly investigate potential buyers to evaluate if they possess sound and sustainable business plans/strategies along with examining up-front investment demands, production requirements, and payment details. Additionally, it might also be advisable to consider alternative market structures, such as vertically-integrated production models to share risk among buyers and sellers and allow buyers greater control over input, use and production practices to control the quantity and quality of a highly-regulated crop.

Access to credit may remain a challenge in the near term as lending institutions will likely require some production history with established hemp returns or other forms of collateral in making lending decisions. Although subsidized federal crop insurance is mandated in the farm bill for hemp, it is unclear when products will become available, given a lack of production history.

Without any safety net for this crop and the infancy of the industry, producers need to understand and be willing to lose their investment in the crop if it fails, the processor goes out of business, or the policy environment changes. If these are not risks the producer is willing to accept or does not have the financial ability to absorb, then hemp may not be the right crop for their operation until these conditions are ameliorated or become more stable.



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Despite all these market and policy/regulatory challenges and uncertainties, Kentucky does have some significant advantages compared to other states thanks to foresight and aggressiveness of many Kentucky policymakers, businesses, and farm leaders. Some of these advantages include:

- getting into the game early to better understand and improve upon many of the production challenges facing this crop.
- developing some of the best production research programs of any state with our land-grant and regional university hemp research programs,
- attracting early/significant investment dollars among hemp businesses/processors into Kentucky
- developing a model administrative oversight program (i.e., the Kentucky Department of Agriculture) that other states are trying to duplicate,
- possessing existing tobacco production experience and infrastructure (barns and equipment) that is adaptable to some hemp production models, which gives Kentucky an advantage over other non-tobacco states. Tobacco companies are investing in the hemp industry and considering the utilization of existing tobacco growers as their grower base.

In our next month's edition, we will look at some hemp budgets and factors individual farmers should consider in evaluating this crop.



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Farm Bill Dairy Subtitle and Changes in Class I Mover Calculation

Much has been made of the new Dairy Margin Coverage (DMC) program in the new farm bill, and rightfully so. The DMC program is much more attractive than the previous Margin Protection Program for Dairy (MPP-Dairy) as it offers higher coverage levels for lower premium rates and even refunds a portion of MPP-Dairy premiums previously paid. I sent some information out shortly after the bill was signed and will do some educational programs once regulations are written. A quick historical look at the DMC program, as if it had been in place over the last several years, suggests that it would have paid out handsomely. Put simply, dairy producers will want to give DMC a very serious look.

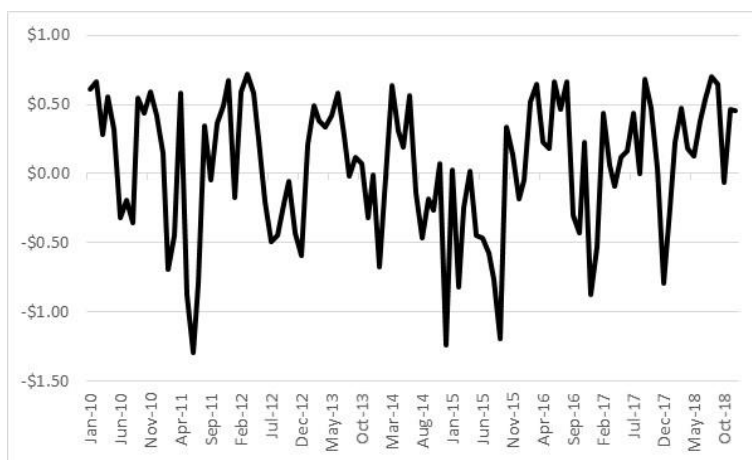
I want to focus on another aspect of the dairy title. There was a change made in the way the class I mover is calculated. Previously, the class I mover was the higher of the advanced class III or advanced class IV skim milk price. Under the new farm bill, the class I mover is defined as the average of the advanced class III and class IV skim milk price, plus \$0.74 per cwt. At first glance, it might appear that this change would raise the overall level of the class I mover over time. However, a look at recent history suggests that is not really the case.

Understand that the new formula only increases the value of the class I mover if the difference between the advanced class III and class IV skim milk price is less than \$1.48. Otherwise, the class I mover would be higher under the previous formula as it would have utilized the higher of the two advanced pricing factors. While \$1.48 sounds like a pretty wide differential, it happens more than one might think. Using monthly data sent to me by Jason Neirman of the Appalachian Milk Marketing Order, this occurred roughly 41% of the time from January 2010 to December 2018.

Figure 1 tells the story best as it plots the difference in the class I mover price using the old formula and new formula. A positive value means the new formula results in a higher price and a negative value means the new formula results in a lower price. A quick glance shows there wasn't a clear advantage either way. In fact, over the 108 months analyzed, the new formula would have raised the class I mover by \$0.05 per cwt on average. Certainly, this does not mean that this same tendency would hold in the future, but from a historical perspective, this potential impact is likely pretty small.

**Figure 1. Class I Mover:
Old Formula minus New Formula
2010-2018 (\$ per cwt)**

Source: USDA-AMS, Author Calculations



In reality, this change probably had more to do with risk management than price levels. By moving to the average plus \$0.74, it might be easier for producers to use milk price risk management tools like futures, options, or Livestock Gross Margin for Dairy (LGM-Dairy) for forward pricing. Under the new formula, there is less concern about which class of milk is driving the class I price (class III or class IV). Also, remember that the new Dairy Revenue Protection (DRP) offers a class pricing option where a producer's milk revenue guarantee is based on a

weighting of class III and class IV futures price. I could see producers choosing to place 50% weight on each class, given the new approach.

While it's not yet clear yet how much impact this will have on risk management, I do think there is potential for less basis variation. For example, a producer managing downside milk price risk by using the CME® Class III milk futures contract will find their hedge less efficient when class IV becomes the driver rather than class III. This concern is not eliminated, but is probably reduced using the new approach. It is also worth noting that this basis issue will be especially true in states like KY, where it is not uncommon for 70% or more of our milk being sold as fluid (class I).



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Swinging for the Fences: High-Input Grain Farming

It is the seventh game of the playoffs, bottom of the ninth, two outs, there is a runner on first, and you are down by one run. You have one of the best relievers in the league on the mound but he is starting to tire after four hard innings and they don't have anyone else left to warm up in the bullpen. Your cleanup hitter is walking toward the batter's box, and your next hitter has been on a tear, batting .400 since September. You have two choices: 1) Try to get your cleanup hitter to just get on base, as a hit in the next at bat would almost surely bring in the lead runner and tie the game. 2) Have your cleanup hitter swing for the fences and try to win the game with one crack of the bat. What do you do?

This above baseball scenario may be a good analogy for many grain farms today in Kentucky and elsewhere. The home team got off to a strong start



in the first five years of the game between 2009 and 2013, then had a string of tough years starting in 2014 when grain prices crashed. When the ace reliever came in at this time he was throwing \$200-300 cash rents and most batters were \$25-75 behind on the swing. But he is tiring now, and most of the pitches are being clocked in the \$150-175 range. Although the home team has a much better chance to connect to get on base and take the game one more inning, it is still tempting to swing for the fences and go for the win.

High-input grain farming is one of the manifestations of swing-for-the-fences approach of the grain-profitability game. After several challenging years, it is tempting to go for the quick win. But will the high-input approach pay, and is it worth taking the chance of striking out in your last at-bat while you are swinging for the fences? This article addresses these questions and will frame the analysis so that readers can decide for themselves if it is worth taking that chance. In order to do this, the baseline profitability for what I'm calling a "conservative input cost" grain farmer is first evaluated and used for context.

Baseline Profitability:

Costs for the conservative-input grain cost farm in western Kentucky are estimated in Table 1 on soil that averages 175 bushels corn and 53 bushels soybeans. Machinery and labor costs include depreciation and overhead costs, as well as an

Table 1 – Projected Costs (per acre) Western Kentucky 2019		
Inputs:	Corn 175 bu	Soybeans 53 bu
Seed	\$85	\$50
Nitrogen	\$70	\$0
P, K, and Lime	\$60	\$45
Pesticides	\$55	\$55
Total Inputs	\$270	\$150
Machinery and Labor	\$137	\$104
Other:		
Drying/Trucking/Storage	\$36	\$7
Crop Insurance	\$20	\$15
Misc.	\$25	\$25
Land Rent	<i>Variable</i>	<i>Variable</i>
Operating Interest	\$11	\$7
Total Other	\$92	\$53
Total Costs	\$499	\$307
<i>Note: Assumes 25 mile one-way trucking, \$2.25/gal fuel</i>		

opportunity cost for operator labor. Fuel costs are based on \$2.25/gallon diesel and 25 mile one-way trucking to the elevator. Think of these input costs as a baseline, or as a "Conservative" input costs approach. Corn and soybean prices used in this analysis are based on forward contracting prices (as of mid-February) for an average of 2019 fall and winter delivery: \$3.90/bu for corn and \$9.40/bu for soybeans.

Table 2 shows a summary of the estimated gross returns for various soil productivities based on the prices and costs noted above. Think of these yields as the long-run expected yields for a particular farm using the lower input cost structure, not year-to-year variability. Costs are adjusted to account for different expected yields. The biggest change in costs is for trucking which adjusts on a 1-1 basis, and storage which in this analysis assumes half the grain is stored before taking to market in the winter. Other costs such as fertilizer are adjusted to some degree based on land productivity. Gross return includes all costs (including depreciation and overhead costs) except land rent. Assuming a 50-50 rotation on the third tier productivity ground, the gross return is expected to be \$197. If this land was rented on average for \$175/acre, the net return, or return to management and risk would be \$22/acre.

Table 2: West Kentucky 2019 (per acre) \$3.90 (elevator) \$9.40 Soybeans (elevator) \$.37-N; \$.42-P; \$.33-K				
Corn Yield (bu)	Soybean Yield (bu)	Gross Return Corn	Gross Return Soybeans	Gross Return Rotation
125	40	\$35	\$94	\$64
150	47	\$114	\$149	\$132
175	53	\$193	\$202	\$197
200	59	\$272	\$251	\$261
<i>Note: Subtract land rent to get Net Return.</i>				

Table 3 shows these estimated gross returns for central Kentucky. The main cost differences are increased trucking costs (assumed 50 one-way miles instead of 25 miles), and higher cost nitrogen (urea

rather than anhydrous). Corn is affected more strongly than soybeans due to more bushels/acre being trucked. Assuming a 50-50 rotation on the third tier productivity ground, the gross return is expected to be \$181 in central Kentucky. If this land was rented on average for \$160/acre, the net return, or return to management and risk would be \$21/acre.

Table 3: Central Kentucky 2019 (per acre) \$3.90 Corn (elevator) \$9.40 Soybeans (elevator) \$.43-N; \$.40-P; \$.33-K				
Corn Yield (bu)	Soybean Yield (bu)	Gross Return Corn	Gross Return Soybeans	Gross Return Rotation
125	40	\$18	\$83	\$51
150	47	\$95	\$138	\$117
175	53	\$172	\$189	\$181
200	59	\$249	\$238	\$244
<i>Note: Subtract land rent to get Net Return.</i>				

The High Input Cost Approach:

Anecdotally, I had been hearing reports the last few years of grain farmers taking a “kitchen-sink” approach to increasing yields. That is, they have been increasing input costs with the expectations that increased yield will more than make up for the increased costs. Working with individual grain farmers the last year with detailed cost figures has confirmed these higher input cost structures on some farms. These additional inputs seem to be spread across the board including higher quality seed, additional fertilizer, and more applications of pesticides including fungicides.

The fundamental question is will these grain farms cover the additional input costs with increased yield? I will not answer the question directly, but will frame the analysis so that we understand how much yield needs to increase for a given additional cost structure, and let the reader assess if they think this is likely to happen.

If we are selling corn for an average price of say \$3.90/bu it is tempting to believe that every additional 100 bushels we can increase yield on a farm we will net \$390.

Unfortunately, this isn’t quite true unless your buyer is going to come out to the field and harvest, transport, store, and dry that extra grain. So far, I’ve been unsuccessful in finding an elevator willing to do that. So if you are in the same position, you need to adjust your average sale price by these extra costs. Table 4 details these costs on a per bushel basis for corn whose total is estimated at \$.48/bu, and soybeans whose total is estimated at \$.40/bu. Once we subtract these additional costs from our expected average sale prices we get the true added benefit from increasing our yield: Roughly \$3.50/bu for corn and \$9.00/bu for soybeans.

Table 4: Added Costs as Yield Increases (\$/bu)		
	Corn	Soybeans
Harvest	\$.10	\$.10
Transport to Storage	\$.05	\$.05
Storage	\$.08	\$.08
Drying	\$.08	\$.00
Transport to Market	\$.17	\$.17
Total	\$.48	\$.40
Note: Assumes half of bushels go to storage		

Table 5 shows the number of bushels that will just cover \$50, \$100, and \$150 increased input cost scenarios. For example, it would take an increased corn yield of 14 bushels to pay for \$50 of additional inputs, or 29 bushels to pay for \$100 of additional inputs. For soybeans, it would take an increased yield of 6 and 11 bushels respectively to pay for \$50 and \$100 of additional inputs. Just for context, if you expected 175 bu/acre corn at the conservative input level, you would need to increase your yield to 204 bu/acre to pay for \$100 of additional inputs. For soybeans, this would mean going for 53 to 64 bu/acre to pay for \$100 of additional inputs. Are

either of these scenarios likely? I will leave it up to the individual reader but I personally would not bet \$100/acre on routinely getting those kind of yield increases without seeing unbiased experiments over multiple years to back this up. Those are substantial yield increases that would be necessary to pay for the additional input costs.

Table 5: Additional Yield Needed to Cover Additional Input Costs (bushels)

Net Price	\$50 Additional Inputs	\$100 Additional Inputs	\$150 Additional Inputs
\$3.50/bu	14	29	43
\$9.00/bu	6	11	17

Note: Net price after additional harvest, trucking, storage, and drying costs.

Again, I do not claim to know with any level of confidence if these increased input costs will pay for themselves. I do know that grain farmers who rent most of their ground have been under tremendous pressure to push yields to pay for the stubbornly high land rents we continue to see in many areas. That may partially explain the push for the high-input cost approach we are seeing. However, it is also possible that some farms got in the habit of applying increased inputs during the boom years from 2009-2013. Paying for these costs would have

been much easier with \$6/bu corn or \$15/bu soybeans. Coming back to our baseball analogy, higher commodity prices in 2009-2013 had the effect of moving the fences in closer to home plate. \$6/bu corn was likely analogous to 275 foot fences down the lines: it would have been very tempting to swing for increased yield during those times. But fly balls that would have just cleared the fences at 275 feet will be easily caught when those fences are moved back to normal distances. In these cases, it may be time to reconsider the strategy of swinging for the fences, especially if just getting on base means there is a good chance of staying in the game to play another inning. At some point that ace closer is going to fall apart.

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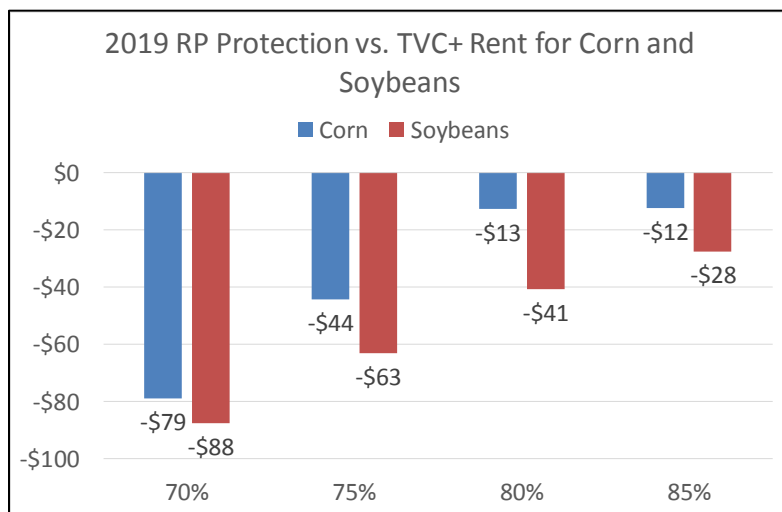
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2019 Revenue Protection Insurance Safety-Net for Corn and Soybeans

The closing prices of the December 2019 corn and November 2019 soybeans futures contract during February provide the initial price guarantee used in crop insurance. As of February 19, 2019, the projected prices for corn and soybeans are \$4.01 and \$9.55 per bushel, respectively. If realized, the 2019 price guarantees are \$0.05 higher and \$0.61 lower from the 2018 price guarantees for corn and soybeans, respectively.

Figure 1 compares the expected crop insurance guarantees for corn and soybeans compared to the budgeted total variable costs and cash rent for each crop. Unlike 2017 and 2018, corn will likely have a better safety net than soybeans this year. Given the budget assumptions, corn revenue protection insurance guarantee at the 75% coverage would have a deficit of \$44/acre while coverage at the 80% level would be \$13/acre below budgeted variable costs and cash rent.

As managers consider the coverage levels purchased for 2019, first take stock of the farm business's financial strength and the availability of working capital to absorb a loss. If the farm's working capital is limited, managers may want to consider increasing coverage to protect the farm's ability to cash flow this fall if there is a yield loss or lower prices. Managers planning to sell grain at harvest should consider risk management tools to lock in a price before harvest. Another large U.S. corn and soybean crop in 2019 will contribute to lower fall prices and create profitability and cash flow challenges. The analysis in Figure 1 assumes APH yields of 185 and 55 bushels, respectively, for corn and soybeans. Total variable costs are budgeted at \$409 per acre for corn and \$267 per acre for soybeans. Rent is assumed to be \$185 per acre for both crops.



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(Figure 1. Revenue Protection Insurance Guaranteed Revenue for 2019 Corn and Soybeans Compared to Total Variable Costs and Cash Rent.)



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