Ag Decision Maker

A Business Newsletter for Agriculture

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Estimating costs of crop production vital for 2020 farm businesses

By Alejandro Plastina, extension economist, 515-294-6160, plastina@iastate.edu

Thin profit margins in corn and soybean production have become the norm over the past five years, increasing the need for proper budgeting and marketing strategies among crop producers. The latest issue of the Iowa State University Extension and Outreach "Estimated Costs of Crop Production" reports average cost estimates for Iowa farms in 2020, and provides guidelines to help farmers calculate their own costs of production.

On average, the total cost of corn and soybean production in Iowa is expected to decline by 4% from last year (Figure 1). When looking

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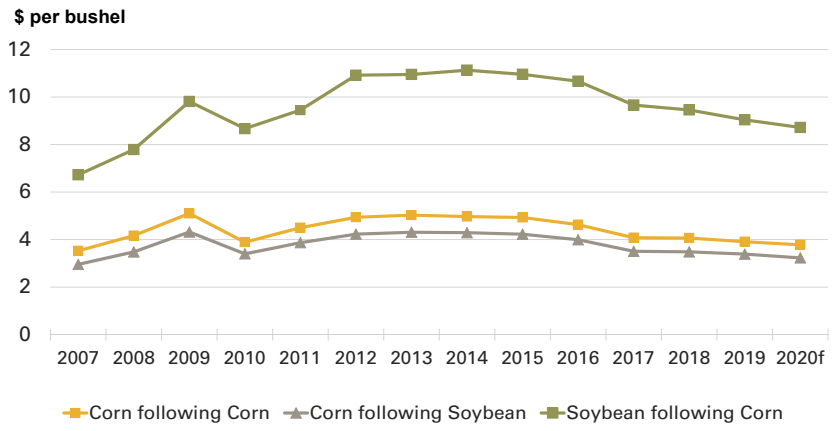
Figure 1. Costs of crop production in Iowa



Source: Iowa State University Estimated Costs of Crop Production

NEW IN JANUARY 2020...
The *Iowa Farm Outlook* and *Ag Decision Maker* newsletters have merged! The same great information is now in one newsletter from ISU Extension and Outreach Economics Department!

Handbook updates

For those of you subscribing to the handbook, the following updates are included.

Crop Planning Prices – A1-10 (1 page)

Estimated Costs of Crop Production in Iowa – 2020 – A1-20 (13 pages)

Historical Costs of Crop Production – A1-21 (2 pages)

Livestock Planning Prices – B1-10 (1 page)

Historical Cattle Prices – B2-12 (5 pages)

Suggested Closing Inventory Prices – C1-40 (2 pages)

Please add these files to your handbook and remove the out of date material.

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Inside . . .

IOWA STATE UNIVERSITY
Extension and Outreach

Ag Decision Maker is compiled by extension ag economists Ann Johanns, aholste@iastate.edu extension program specialist

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at specific categories, costs increased for labor, insecticides, and corn seeds, but declined for other categories.

The estimated costs of production for continuous corn are $3.81, $3.78, and $3.76 per bushel for expected yields of 164 bushels per acre, 182 bpa, and 200 bpa, respectively. The estimated costs of production per bushel for corn following soybeans are $3.22, $3.23, and $3.23, assuming 179 bpa, 199 bpa, and 219 bpa, respectively.

Cost of production estimates, per bushel, for herbicide-tolerant soybeans are $8.89, $8.72 and $8.57 assuming 50, 56, and 62 bushels per acre, respectively. The total cost per bushel of soybeans is projected at $8.72 for non-herbicide-tolerant beans at 56 bpa, according to the report.

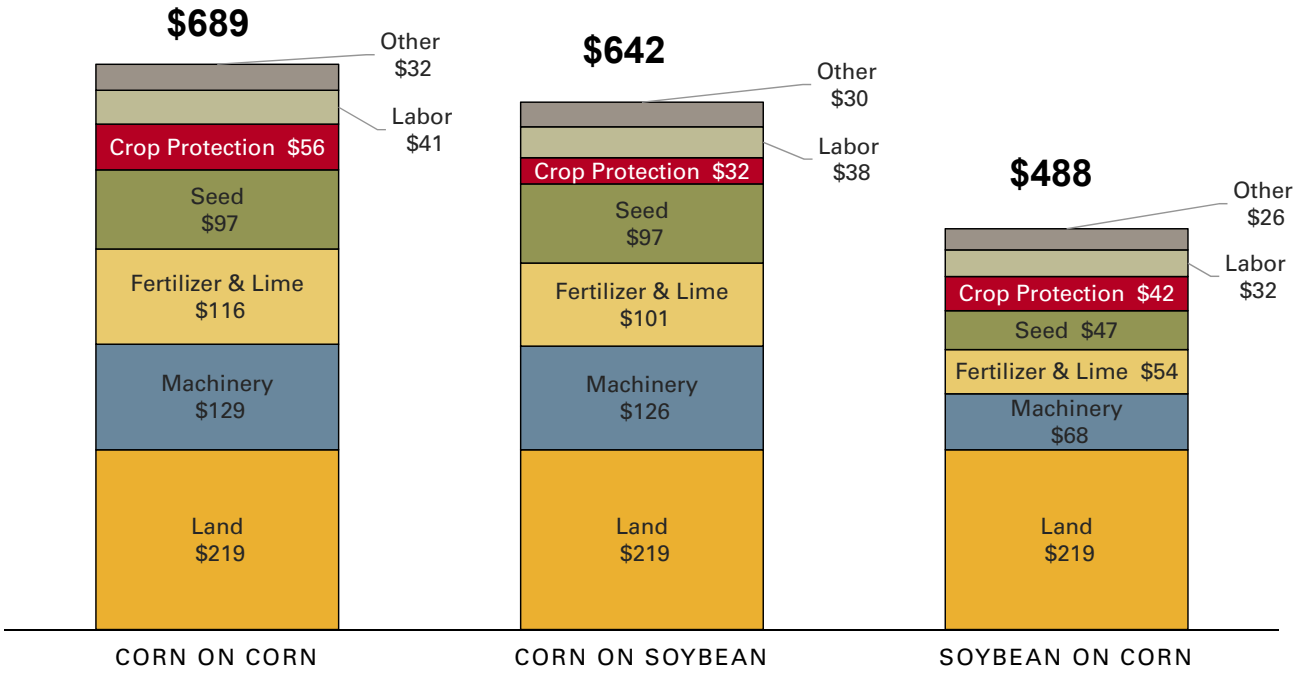
The cost estimates are representative of average costs for farms in Iowa. Very large or small farms may have lower or higher fixed costs per acre. The full report is available online through the Ag Decision Maker website, www.extension.iastate.edu/agdm/crops/pdf/a1-20.pdf. The publication also includes budgets for alfalfa hay establishment with an oat companion crop and by direct seeding. Annual production costs for established alfalfa or alfalfa-grass hay as well as a budget for maintaining grass pastures are included. Actual costs can be entered in the column for "Your Estimates," or by using the electronic spreadsheet Decision Tools on the Ag Decision Maker website, www.extension.iastate.edu/agdm/crops/html/a1-20.html.

Breakdown of costs for 2020

For corn, land represents approximately 33% of the total costs of production (Figure 2). Values of $183, $219, and $255 per acre rent charges for the low, medium, and high quality land were assumed. The variable costs represent just over half of the costs of production. Of the variable costs, nitrogen and seed costs account for 43% of the costs for either continuous or rotated corn. Nitrogen cost is projected 10% lower than in 2019, at 34 cents per pound, and seed 1% higher at $257 per bag. Machinery costs are projected to decline by 5% primarily due to lower drying costs.

Land represents 45% of the total cost of production for soybean, while variable costs account for an additional 40%. Seed and fertilizers amount to 45% of the variable costs. Phosphorus was charged

Figure 2. Costs of crop production in Iowa – 2020 ($ per acre)



Source: Iowa State University Estimated Costs of Crop Production

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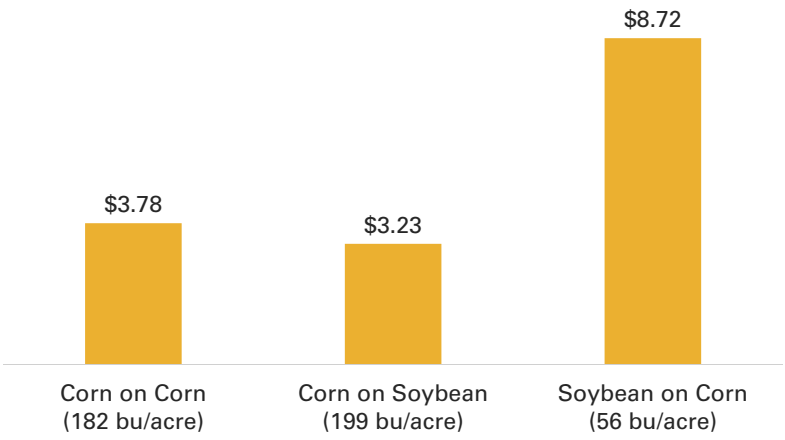
at 34 cents per pound, or 18% below 2019 costs, while potassium remained stable at 31 cents per pound.

Profitability prospects for 2020

There is substantial uncertainty regarding crop prices in the coming season. The most recent US Department of Agriculture projections for 2020-2021, published in October 2019, put the average US farm prices for corn and soybean at $3.40 and $8.85. In this scenario, soybean production would only be profitable for operations with medium and high yields, but the profitability margins could be very tight (Figure 3). A continuous corn system would not be able to cover all costs, even with high yields, and corn production following soybean would generate $30-$40 per acre in profits.

Figure 3. Break even prices ($ per bushel)



Source: Iowa State University Estimated Costs of Crop Production

Current futures prices seem to indicate that corn and soybean prices might average $3.90 and $9.50 per bushel in 2020-2021, respectively. In this optimistic scenario, soybean production would generate profits ranging from $30-$60 per acre. Similarly, continuous corn and corn following soybean would generate, respectively, $15-$27 and $121-$147 per acre in profits.

Current and future developments in trade, oil prices, and weather can steer the profitability outlook in different directions. Given that those factors are outside the control of farmers, it is critical to contain the controllable costs as much as possible to break even and hopefully make a profit in 2020-2021.

Cost calculations

Knowing costs is key, as it is to understand the assumptions behind the budgets used in their calculations. When using the Iowa State cost of production estimates for 2020, keep several things in mind. First, fertilizer and lime costs include volume and early purchase discounts. Second, farmers paying land rents higher than the ones projected in the report might face higher costs of production. Operator landowners on fully paid land will have much lower accounting costs, since the cash rent used in the report will only be an opportunity cost and not a cash cost (as it is for tenants).

Since 2019, reference yields for corn and soybean budgets in the annual ISU Extension and Outreach report reflect 30-year trend yields. In the latest projections used for the 2020 report, yields for corn following soybean were increased by one bushel per acre, while yields for corn following corn and soybean following corn remained unchanged. Starting in 2020, the average cost of lime is adjusted to account for regional differences in lime application practices (ag lime quality and quantity, and frequency of application). Such methodological adjustment resulted in a one-time increase in the cost of lime per acre from $5.71 in 2019 to an estimated $12.49 in 2020. In future editions of the report, the annual adjustment in the yearly cost of lime should reflect only changes in average prices.

Conclusions

Producers need to have a strong grasp of their own production costs. Costs of production are not seeing the rapid fluctuations that were seen in recent years, but the trade war and other events create a lot of uncertainty when it comes to profitability on individual operations.

Thinking about the US-China trade deal

By Chad Hart, extension economist, 515-294-9911, chart@iastate.edu

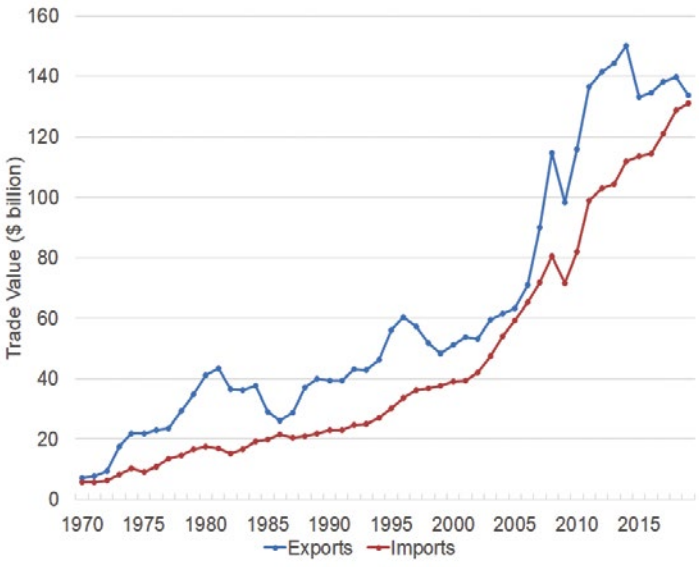
Many of the issues that loomed over the crop markets in 2019 continue to loom large in 2020. Weather conditions, specifically an 'over' abundance of soil moisture, threatens to create planting problems. International trade remains on shaky ground, with tariffs still in place. Biofuel markets are adjusting and re-adjusting to policy. And because of that, crop futures prices are floating in roughly the same range as they were this time last year.

While there have been a number of market movers (issues that change the direction and intensity of price moves) over the past year, most of these movers cancel each other out. The weather problems limit supplies and should push prices higher, but the trade disputes and tariffs limit usage and offset the price impacts. With the passage of the USMCA and the signings of trade deals with China and Japan over the past few months, there is some positive news on the trade front. But as the market reaction to the US-China trade deal signing indicated, the crop markets aren't interested in the political deals, but in actually seeing trade flows change due to these deals.

International trade has become a very valuable component for US agriculture. As Figure 1 shows, the value of agricultural products moving both into and out of the US has more than doubled since 2000. While crop prices have dropped dramatically since 2012, US agricultural export values remained fairly firm. Over the past five years, US agricultural exports have held between $130-140 billion. And while imports have also risen significantly over the past couple of decades, agriculture remains one of the few sectors in our economy where the US holds a trade surplus. The recent trade disagreements have diminished that trade surplus, but overall trade values remain robust.

The progress on multiple trade deals signals the potential for significant shifts in agricultural trade. My own interpretation of the trade deals is as follows: the USMCA and Japan deals concentrate on solidifying existing trade flows, rather than significantly expanding trade opportunities. Canada, Mexico, and Japan have been major agricultural markets for the US for quite some time. These new deals maintain and protect those relationships, with the prospects for continued, but limited growth. The China deal, on the other hand, has the potential to fundamentally shake up global trade flows. To see why, it's important to understand the current agricultural export picture. Figure 2 breaks down US agricultural export values by market destination. The middle (blue) line is the value of ag exports to countries where the US has a free trade agreement. Canada and Mexico represent roughly two-thirds of the volume here. The bottom (red) line is the value of ag exports to China. Prior to 2000, China was a very small market for US agriculture. Ag trade between the US and China ramped up significantly and quickly after 2000, peaking at roughly $25 billion in 2012. Between 2012 and 2017, US ag export values to China slowly declined, mainly due to the general reduction in ag prices. The outbreak of the trade fight between the US and China and the imposition of tariffs led to the steep drop in export values in 2018. But even before the signing of

Figure 1. Agricultural trade flows



Source: USDA-FAS

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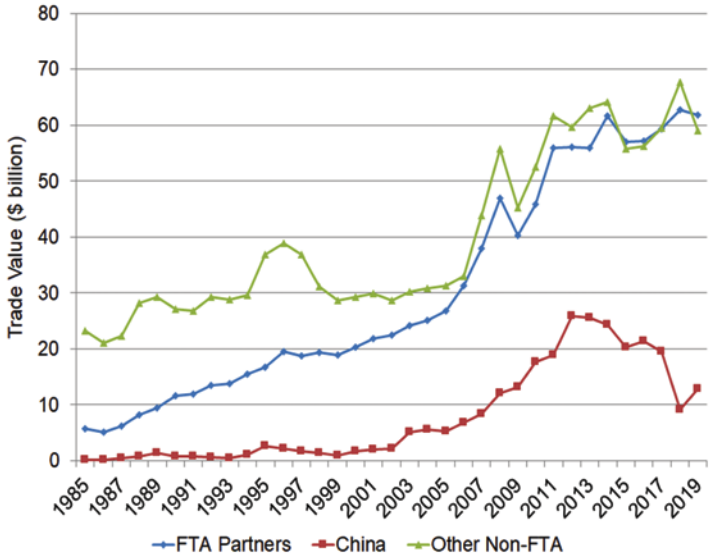
the Chinese trade deal, we were seeing some recovery in ag trade flows to China. The top (green) line is the value of ag exports to the rest of the world. This line shows that we rely on significant trade flows outside of China and free trade partners. To put it another way, ag trade is more complicated than the big three markets of China, Canada, and Mexico.

The "phase one" deal alters the ag trade landscape as China has agreed to specific targets for agricultural purchases for this year and next. The deal uses 2017 as the base year for trade. As Figures 2 and 3 show, Chinese agricultural purchases totaled roughly $19.5 billion that year. For 2020, China agreed to purchase $12.5 billion more in ag products than the base. So that puts 2020 US ag exports to China at $32 billion (you may see higher amounts in other publications; they are including forestry and ag-related products, such as infant formula and pet food). For 2021, the target is $19.5 billion more than the base, so that's $39 billion in ag sales to China. These two targets alone guarantee a significant surge in sales to China, far eclipsing the record sales from 2012. The text of the deal also includes a statement indicating that the growth in US ag exports to China set in these two years is projected to continue through 2025. Figure 3 outlines those projections. If those projections from the deal are accurate, ag trade with China will grow to exceed what we ship currently to our free trade partners or to the rest of the world.

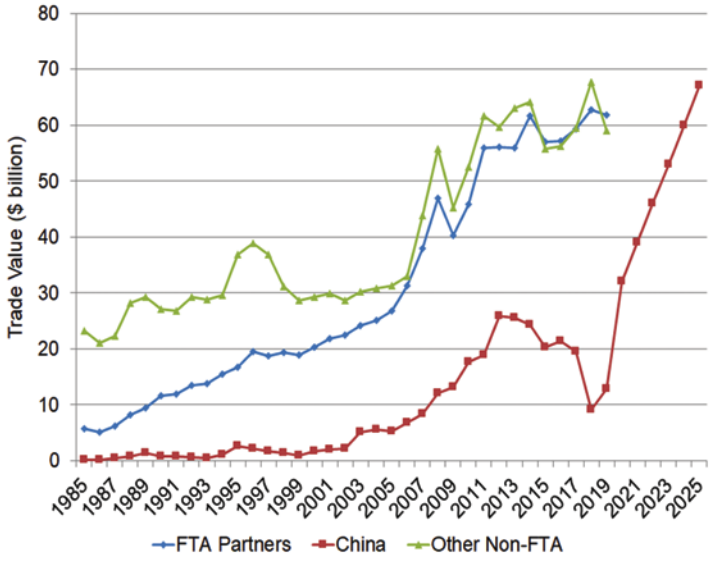
Traders are sorting through four big questions right now. One, will China follow through on these commitments over the next two years? Two, how secure are those projections for continued ag trade growth beyond 2021? Three, what will the product mix be as China increases its ag purchases? Four, what happens to our other markets as this agreement is fulfilled? My thoughts on these questions are mixed. I do think that China will follow through on the deal for the next two years. The outbreak of African Swine Fever there has created a significant protein gap for China. The deal contains language easing trade rules for meats between the two countries. So it makes sense that China would expand meat purchases from the US, fulfilling two objectives at once, filling in the protein hole, while also meeting the trade targets. While soybeans were the largest portion of previous ag sales to China, I expect meat, especially pork, to take the leading spots in our future sales to China. The product mix will shift, moving to more value-added products (which helps hit the dollar value targets).

Figure 2. Export market segments



Source: USDA-FAS

Figure 3. Projected export flows under the "phase one" deal



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However, I am significantly less secure on the projections beyond 2021. The deal does not lock those values in place. It only states that both countries currently think the trade flows would continue to develop that way. If the projections are anywhere close to holding, they imply significant shifts in global trade flows. US agriculture will become even more reliant on Chinese demand. My largest concern is what will happen to our other markets. This deal will likely crowd some of them out. Just because China has agreed to buy more doesn't mean we just get to add that to the total. In fact, we are already seeing that potential for crowding out currently. Over the past few months China has reestablished itself as the top market for US soybean. As China moved back in, we have numerous other markets in retreat for soybean exports. Sales to the European Union, Mexico, Japan, Indonesia, South Korea, and Canada have fallen. With trade, there can be significant slippage, gains in one area are often offset by losses elsewhere. In this case, forcing sales to China will likely cost US open sales to the rest of the globe.

Economics spur expansion and help guide where hogs are produced

By Lee Schulz, extension livestock economist, 515-294-3356, lschulz@iastate.edu

The December USDA Hogs and Pigs report indicates producers continue expanding. The Dec.1, 2019 hog breeding herd was 6.461 million head, 135,000 head or 2.1% higher than a year ago.

The expansion pace may be accelerating. Based on producer responses to surveys, USDA raised December-February 2019-2020 US farrowing intentions by 19,000 sows from the first estimate in September to the second in December (Figure 1).

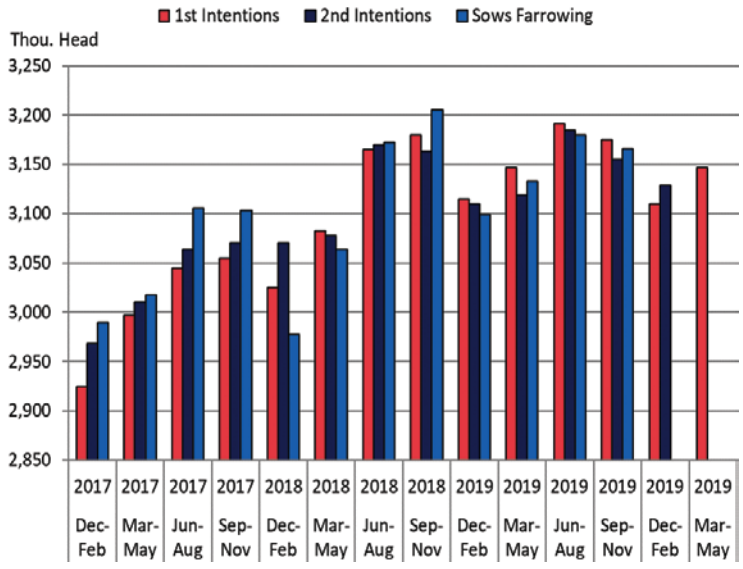
Corn supplies are plentiful and the futures board is offering producers the ability to lock in a robust margin. Disease pressures so far this winter have been minimal. Producers striving to minimize new disease introduction is likely why operations and inventory numbers have been rising in traditionally less pig dense states.

As producers continue to make both short-term and longer-term decisions in managing their operations and inventories, it is important to recognize that economics are driving the expansion and regional differences exist. The ability to have pigs located where grain basis is traditionally very weak and grain farmers eager to access manure as a fertilizer resource makes it tough for any other location in the world to compete for environmentally friendly and low cost production.

Data provide confirming evidence

States with the largest uptick in the breeding herd from Dec. 1, 2018 to Dec. 1, 2019 were: Illinois +30,000 head, South Dakota +25,000, Missouri +20,000, Wisconsin +16,000, Kentucky +13,000, and Kansas, Ohio, and Pennsylvania each added 10,000

Figure 1. Quarterly US sows farrowing and intentions



Source: USDA National Agricultural Statistics Service

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Economics spur expansion and help guide where hogs are produced, continued from page 6

head. These states have their largest breeding herds in one, two or even three decades in some cases. South Dakota's breeding herd inventory of 280,000 head is the largest since 1964.

I suspect USDA's surveys continue to pick up the expansion in sow inventory due to the construction of new sow units. According to the Census of Agriculture, these eight states netted an increase of 812 operations with breeding inventory (farrow to wean, farrow to feeder, and farrow to finish) from 2012 to 2017. Quite possibly some of the recent surge in breeding inventory may be because some of the new units were first populated with females at the end of 2017 and are now getting to full inventory. Also, sampling for previous quarterly reports may have missed some expansion that got captured for the December report which uses a more detailed sampling technique.

The "December Hogs and Pigs" report includes all hogs and pigs, breeding, and market inventory estimates for each of the 50 states. The quarterly reports in March, June, and September include individual published state estimates for the 16 major hog producing states, and aggregates the remaining 34 states to comprise the US total. Because the source of expansion was both inside and outside the major hog producing states, the granularity of the December report, is important.

Iowa continues to have the largest breeding herd (including sows, gilts and boars). As of Dec. 1, 2019, Iowa accounted for 15.6% of the total US breeding herd inventory. North Carolina (13.9%), Illinois (9.1%), Minnesota (8.8%), and Missouri (7.6%) round out the top five.

Farrowings could rise further

Sows farrowing over the next two quarters were estimated to be above a year earlier. Sow slaughter during September-November equaled about 24% of the sows farrowing during the quarter, a relatively modest turnover rate that is just under the previous five-year average.

Nationally, 2019-2020 intentions for December-February 2019-2020 look in-line with the breeding herd. Intended sows farrowing are up 1% from a year earlier, while the breeding herd was up 2.1%. If realized, the ratio of sows farrowing to breeding herd would be 48.4%, which is in line with the last few quarters. But, the farrowing ratio has been as high as 49% for the quarter. A possibility exists that farrowing numbers may end up being higher, especially with a larger breeding stock.

Where could December-February 2019-2020 sows farrowing be larger? In Illinois, intended sows farrowing were unchanged from a year earlier, while the breeding herd was up 5.4%. The ratio of sows farrowing in December-February to the Dec. 1 breeding herd would drop to 45.8%, compared to a five-year average of 49% and 48.2% last year. Similarly, the South Dakota farrowing to breeding herd ratio would be 48.2% for the coming quarter, which would be 1.5 percentage points above last year, but below the five-year average of 52.2%. The potential declines could be aberrations, or, more sows could in fact be farrowed than previously estimated. Of course, this assumes no revisions to breeding herd estimates. Wisconsin and Kentucky could also see larger farrowings because of the rise in breeding herd (sow) numbers. Collectively this could boost the output potential of the US hog industry.

Hog supply large, and rising

Market hog inventories on Dec. 1 were 3.1% larger than a year earlier (Table 1). Most of the rise was in the heavier weight groups, which will primarily affect first quarter 2020 production. The states of Iowa, Minnesota, North Carolina, Illinois, Indiana, Nebraska, Missouri, Ohio, Kansas, Oklahoma, and South Dakota accounted for nearly 90% of the market hog inventory.

Iowa, which by far has largest market hog inventory, saw a big change, increasing from 22.58 million head in December 2018 to 23.79 million head in 2019, a change of 1.21 million head. This was the largest year over year increase in Iowa since 2006 to 2007. Utah, Ohio, and South Dakota each increased over 200,000 head of market hogs compared to last December. Nebraska added 200,000, Kentucky added 137,000, and Minnesota added 100,000 market hogs. Following the breeding hog additions, Wisconsin's market hog inventory rose by 29,000 head.

Missouri saw the biggest drop year-over-year, decreasing its market inventory from 3.18 million to 2.76 million, or 420,000 head. Missouri's market hog inventory of 3.18 million head in December 2018 was unusually high, the highest since December 1980. The 2.76 million head in Dec. 2019 is similar to the 2015-

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2017 average. Missouri's 20,000 head increase in the breeding herd surely consisted of more gilts being held for breeding and contributed to the decrease in market supplies of slaughter hogs.

Rounding out the top 10 market hog inventory states, Kansas was up 80,000 head, Oklahoma up 65,000, Indiana up 60,000, and North Carolina was unchanged, while Illinois decreased 80,000 head, which was likely related to an increase in gilt retention.

How and why costs vary

The recently updated estimates from USDA's Economic Research Service (ERS) of production costs and returns offer an opportunity to improve our understanding of regional variation in the US hog production. USDA ERS considers feeder to finish returns in three different regions, as well as the country as a whole (see Figure 2). These estimates, as well as documentation on how the estimates are derived, are available from USDA ERS, www.ers.usda.gov/data-products/commodity-costs-and-returns/.

Table 2 provides a summary of how production costs and returns per hundredweight (cwt) of gain varied regionally in 2018. Overall, the significant variation across regions reflects a host of factors. Table 2 also highlights how Southern Seaboard production zones are characterized on average by larger operations than those in the Northern Crescent and Heartland. This gives them the ability to spread fixed costs such as labor, managerial ability and equipment over a larger volume of animals, reducing per-head expenses. This is referred to by economists as economies of scale. Note the regional ranges for total cost are larger than for operating cost variations. Lower operating costs were the main reason why the return over operating cost were highest in the Heartland.

Table 1. USDA quarterly hogs and pigs report summary

	United States			Iowa		
	2018	2019	2019 as % of 2018	2018	2019	2019 as % of 2018
December 1 inventory (1,000 head)						
All hogs and pigs	75,070	77,338	103.0	23,600	24,800	105.1
Kept for breeding	6,326	6,461	102.1	1,020	1,010	99.0
Market	68,745	70,877	103.1	22,580	23,790	105.4
Under 50 pounds	21,858	22,128	101.2	5,650	5,960	105.5
50-119 pounds	19,369	19,696	101.7	7,450	7,550	101.3
120-179 pounds	14,323	14,976	104.6	5,260	5,680	108.0
180 pounds and over	13,195	14,076	106.7	4,220	4,600	109.0
Sows farrowing (1,000 litters)						
Jun – Aug	3,172	3,180	100.3	575	540	93.9
Sep – Nov	3,205	3,166	98.8	570	530	93.0
Dec – Feb [1,2]	3,099	3,129	101.0	530	520	98.1
Mar – May [3]	3,133	3,147	100.4	530	520	98.1
Sep – Nov pigs per litter	10.76	11.09	103.1	11.20	11.35	101.3
Sep – Nov pig crop (1,000 head)	34,496	35,101	101.8	6,384	6,016	94.2

Full report, https://downloads.usda.library.cornell.edu/usda-esmis/files/rj430453j/8910k879r/5t34t1418/hgpg1219.pdf

[1/] December preceding year. [2/] intentions for 2019/20. [3/] 2020 intentions.

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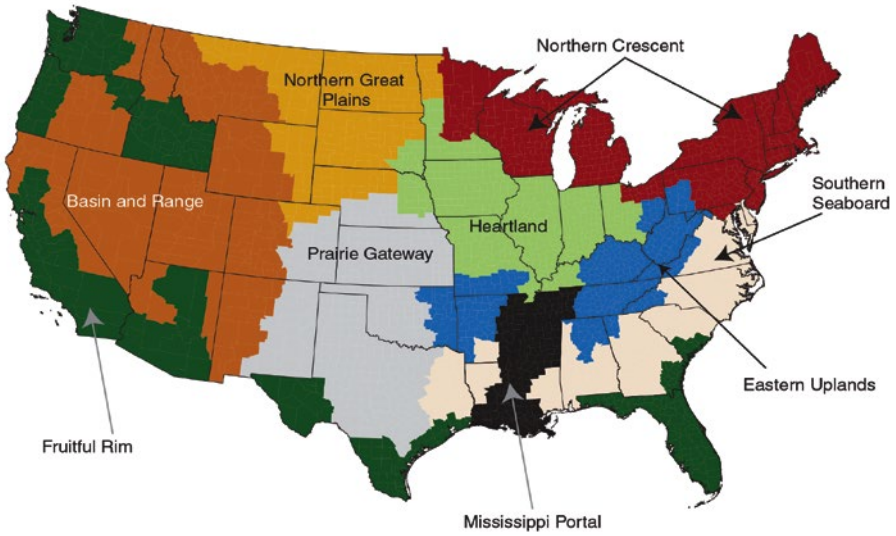
Economics spur expansion and help guide where hogs are produced, continued from page 8

Table 2. Hog feeder to finish production costs and returns per hundredweight gain, 2018

	Regions				
	United States	Northern Crescent	Heartland	Southern Seaboard	Range across regions
Gross value of production					
Market hogs, $	54.94	57.86	55.76	59.89	4.13
Feeder pigs, $	0.13	0.22	0.12	0.31	0.19
Other, $	7.04	6.43	5.97	3.37	3.06
Total, gross value of production, $	62.11	64.51	61.85	63.57	2.66
Operating costs					
Total, feed costs, $	29.08	33.14	30.59	30.15	2.99
Feeder pigs, $	20.42	23.37	17.85	28.32	10.47
Nursery pigs, $	3.51	2.13	4.68	0.19	4.49
Other, $	5.18	4.72	6.01	2.94	3.07
Total, operating costs, $	58.19	63.36	59.13	61.60	4.23
Allocated overhead					
Hired labor, $	0.71	0.53	0.69	0.87	0.34
Other, $	11.56	13.42	12.82	9.23	4.19
Total, allocated overhead	12.27	13.95	13.51	10.10	3.85
Costs listed					
Total, costs listed, $	70.46	77.31	72.64	71.70	5.61
Net					
Value of production less operating costs, $	3.92	1.15	2.72	1.97	1.57
Value of production less total costs listed, $	-8.35	-12.80	-10.79	-8.13	4.67
Size of operation					
Market hogs (head sold/removed)	7,588	5,402	7,394	15,566	10,164
Feeder pigs (head sold/removed)	29	42	24	164	140

Source: USDA Economic Research Service

Figure 2. US farm resource regions



Source: USDA Economic Research Service

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Economics spur expansion and help guide where hogs are produced, continued from page 9

A much deeper and multi-year assessment is warranted, yet is beyond the scope of this article. However, all industry stakeholders should appreciate the key role of economies of scale.

At the aggregate level, this warrants consideration when assessing types of operations likely to grow during national herd expansion and persist during herd contraction. Such discussions are common today throughout the industry. How size of any given operation compares to others and the corresponding implications stemming from economies of scale in a commodity industry warrant similar recognition.

Commercial slaughter and price forecasts

Table 3 contains the Iowa State University price forecasts for the next four quarters and the quarterly average futures prices based on Dec. 23, 2019 settlement prices. The futures price forecasts are adjusted for a historic Iowa/southern Minnesota basis. The table also contains the projected year-over-year changes in commercial hog slaughter.

Table 3. Commercial hog slaughter projections and lean hog price forecasts, 2020

	Year-over-year change in commercial hog slaughter (percent)	ISU model price forecast, negotiated Iowa/ southern Minnesota ($/hundredweight)	CME Futures (12/23/19) adjusted for all producer sold purchase arrangements Iowa/ southern Minnesota basis ($/hundredweight)
Jan-Mar 2020	3.89	70-74	71.76
Apr-Jun 2020	2.52	80-84	81.56
Jul-Sep 2020	2.74	81-85	83.21
Oct-Dec 2020	2.26	69-73	70.95

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Internet Updates

The following Decision Tools have been updated on www.extension.iastate.edu/agdm.

2018 Farm Bill Payment Estimator by County for ARC-CO and PLC – A1-33 (Decision Tool)

Estimated Costs of Crop Production in Iowa - 2020 – A1-20 (Decision Tools)

Current Profitability

The following tools have been updated on www.extension.iastate.edu/agdm/info/outlook.html.

Corn Profitability – A1-85

Soybean Profitability – A1-86

Iowa Cash Corn and Soybean Prices – A2-11

Season Average Price Calculator – A2-15

Ethanol Profitability – D1-10

Biodiesel Profitability – D1-15