

Risk Management Tools and Strategies for Arkansas Corn and Soybean Producers: Implications of Mississippi River Transport Disruptions

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I. Introduction and Background

The last few weeks have been very dry in Arkansas. Normally, dry weather during the harvest season would be welcome news for crop farmers as it presents ideal harvest conditions, minimizing the likelihood of high moisture discounts on grain or other quality and quantity losses associated with harvest delays. However, the current drop in local grain prices is due to another issue borne from the drought that has affected much of the country this year. Low water levels in the Mississippi River have caused grain barge rates to increase, which causes grain buyers at local grain elevators to reduce their bids for grain delivered.

When water levels drop in the marine highway system, barge drafts are reduced (U.S. Army Corps of Engineers, 2022). A barge draft is the distance between the waterline and boat, or the barge hull structure, and increases with the amount of weight present on the barge. The average barge with a draft of 9 feet can hold 1,500 tons of grain which equates to about 59,000 bushels of corn, 55,000 bushels of soybeans, and 53,500 bushels of rice (USDA-AMS, 2022). Each reduced foot of draft results in 150-200 fewer tons, or anywhere between 5,500 to 7,500 bushels depending on the crop, of grain capacity on a barge (Iowa Soybean Association, 2022). If barge drafts decrease for vessels carrying grain, this means the cost to transport grain downriver, or the grain barge rate, increases since it takes more barges to move the same amount of grain.

Barge freight rates are established by the U.S. Inland Waterway System using a percent of tariff system, and a list of benchmark rates¹ for ports along the Mississippi River is given in Table 1 below. Barge freight rates for the Mississippi River at New Madrid, Missouri near Memphis, Tennessee have skyrocketed since the beginning of September (see Figure 1). The 3-year average percent of tariff rate indicates weekly barge freight rate tends to oscillate around 400 percent of tariff, or about \$12.56/ton². For the week of October 4, 2022, the barge freight rate is over 2400 percent of tariff, or \$75.36/ton, which means the cost to transport grain from Memphis to the port of New Orleans is roughly six times higher than average. The increase in transportation cost is usually reflected in lower cash grain bids at country grain elevators which results in a weakened, or widened, basis.

II. Basis

Grain futures contracts are traded on commodity exchanges, such as the Chicago Board of Trade. The prices prevailing on the exchange for any given contract reflect the forces of global supply and demand. These same supply and demand factors also obviously affect local cash prices. A change in supply and demand conditions will generally move both the futures price and the local cash market price. However, due to a host of factors, cash and futures markets do not always move in lock step.

Basis is the relationship between a local cash market and the futures market. It is defined as the local cash market price minus the price of a specific futures contract for the same commodity at a given point in time. Across the country, cash prices at most locations are below

¹ Benchmark rates are based on the tariff rates from the Bulk Grain and Grain Products Freight Tariff No. 7 which today is no longer applicable (USDA-AMS, 2022). However, calculating the percent of tariff consists of taking the ratio of today's tariff rate to the 1976 tariff rate.

² This figure is found by multiplying the percent of tariff, which in this example is 4.00, by the benchmark rate for the Cairo-Memphis ports which is \$3.14 (see Table 1).

futures prices, and so the basis is usually negative. However, in the South – where grain supply is relatively low compared with the Mid-West, basis is often positive. When the cash price increases more than the futures price, the basis is said to narrow or strengthen. When the futures price increases more than the cash market price, the basis is said to widen or weaken. The relationship between the futures price and the price at local cash markets can change abruptly in response to economic or environmental events, such as low river levels.

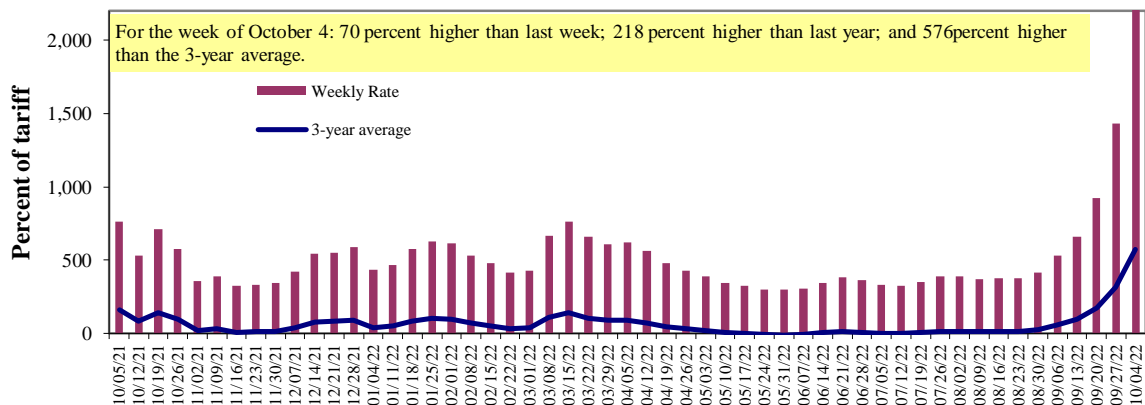
Table 1. Benchmark Freight Rates*

<i>Benchmark</i>	<i>Rate</i>	<i>Ports Included</i>
Twin Cities (TWC)	619	Minneapolis, St. Paul, Red Wing, Shakopee, Winona, MN
Mid-Mississippi (MM)	532	Albany, Keithsburg, New Boston, Rock Island, IL Clinton, Davenport, Muscatine, IA
St. Louis	399	Alton, Chester, E. St. Louis, Faults, IL Cape Girardeau, St. Louis, MO
Illinois	464	Beardstown, Florence, Hardin, Havana, Meredosia, IL
Cincinnati (CINC)	469	Cincinnati, OH
Lower Ohio	446	Louisville, KY
Cairo-Memphis	314	Birds Point, Linda, and New Madrid, MO Hickman, KY Cairo, IL

*Adapted from USDA-AMS Grain Transportation Report Datasets

Figure 1

Mississippi River barge freight rate^{1,2}



¹Rate = percent of 1976 tariff benchmark index (1976 = 100 percent); ²4-week moving average of the 3-year average.

*Source: USDA, Agricultural Marketing Service.

Figure 1. Mississippi River Barge Freight Rate at New Madrid (10/5/2021 to 10/4/2022)

Determinants of Basis

Numerous factors can contribute to changes in basis. Increasingly, factors outside of agriculture are having an impact. An increasing demand for transporting all goods, increasing fuel prices, and increasing interest rates have all acted to widen the gap between futures prices and local cash market prices. For storable commodities such as grain, the basis is jointly determined by transportation costs, storage costs, the cost of financing (interest rates), handling costs and merchandising margins, and local supply and demand conditions. All these factors can vary over time and location and therefore cause the basis to narrow or widen. Thus, the basis is not constant and is often unpredictable.

Basis varies from year to year in response to crop size and demand for storage. Large inventories or a rapid harvest leads to a weaker basis. Low inventories lead to a strong basis – which is a market signal to release stocks from storage. Interest expense is a significant cost of storing grain inventories. As interest rates rise, basis will weaken. Local cash market supply and demand conditions are an important component of basis and one of the most variable. Speculative demand can temporarily bid up futures prices while the demand by cash market buyers remains relatively unchanged. The result is a weaker basis.

Importance of Transportation Costs

Location is a major determinant of basis. As the cost of transporting grain from one location to another increases, basis will weaken. Roughly 16% of U.S. corn production and 48% of soybean production is exported (USDA-AMS, 2022). The Mississippi River is the largest U.S. export channel for corn and soybeans, accounting for more than half of export shipments via barge. Barge transportation is an essential mode of transport for grain and is by far the most cost-effective. One barge can hold the same amount of grain as 16 rail cars or 70 semi-trucks.

In recent weeks, barge carriers and shippers have dealt with increasingly severe low water levels—reducing shipping capacity and resulting in record barge freight rates. Beginning in July, the average level of the Mississippi River at New Orleans was well below the 5-year average and continued to drop. With lower water levels, vessel operators and shippers have had to carry lighter loads per barge because of draft restrictions and fewer barges per tow. According to industry sources, tonnages per southbound barge have been reduced by 20 to 27 percent. Moreover, the number of barges per tow have been reduced by 17 to 38 percent.³

The reduced barge capacity at a time when demand remains high is contributing to rates that are significantly higher than last year. A normal barge tow is 35 barges at 70,000 bushels per barge, moving 2.45 million bushels at a time down the river. The current water level on the Mississippi has resulted in barge tows dropping to 25 barges able to ship about 45,000 bushels apiece, or 1.13 million bushels. According to USDA, as of October 4, the cost per ton to ship from St. Louis to the Gulf was \$90.45/ton, up 218 percent from last year and up 379 percent from the 3-year average⁴.

Impact on Hedgers

When transportation costs increase, these costs are passed on to farmers in the form of a lower cash price – implying a more negative basis. Changes in basis, either by weakening or strengthening, will determine the profit or loss of a futures hedge. The purpose of hedging is to

³ American Commercial Barge Line's *Daily River Conditions* report, as of October 6, 2022.

⁴ USDA Agricultural Marketing Service *Grain Transportation* report, as of October 6, 2022.

protect the producer of a commodity from major declines in the cash price of that commodity. If cash and futures prices advance or decline by the same amount, the direction in which price moves is irrelevant: any loss in the cash market will be offset by a corresponding gain in the futures position, or any loss on futures will be offset by a matching gain in the cash market.

However, if the change in the cash price is more or less than the change in the futures price, the hedger will have a gain or loss that's equal to the change in the basis. The behavior of basis – that is, the relationship between changes in cash prices and changes in futures prices – ultimately determines the effectiveness of a hedge. In fact, hedging is often described as trading price risk for basis risk. Because basis is generally less variable than price, this is typically an attractive risk management strategy. In periods of basis volatility, though, hedging effectiveness can be significantly reduced, as the following examples will illustrate.

Example 1: Short Hedge with a Stable Basis

On June 1 a “short” hedge is established in anticipation of October soybean sales by selling (“shorting”) the November soybean futures contract at a price of \$15.00. Basis is expected to be +30 cents per bushel in early October when the hedge will be lifted (i.e., cash price \$0.30 per bushel higher than the November futures price). Thus, the cash price expected to be realized from this hedge is \$15.30 (i.e., futures price + basis).

Time	Cash	Futures	Basis
June 1	\$15.30 (expected)	\$15.00	+\$0.30 (expected)
Oct. 1	\$14.00	\$13.70	+\$0.30 (actual)
	LOSS \$1.30	GAIN \$1.30	\$0.00

On October 1, the hedge position is lifted by offsetting the initial futures position (i.e., buying a November soybean contract) and selling cash soybeans. Let's say that cash soybeans are selling at \$14.00 and November futures are trading at \$13.70. When the hedge is lifted, the basis is unchanged from its expected value of +30. The producer has lost \$1.59 in cash market. However, the cash market losses are entirely offset by a matching profit in his futures position. By adding the futures profit of \$1.59 to the cash price of \$14.08, the producer was able to protect the initial cash price of \$15.67 (\$14.08 + \$1.59).

Example 2: Short Hedge with a Weakening Basis

In this example, on October 1 when the hedge is lifted, cash soybeans are selling for \$12.70 and November soybeans are trading at \$13.70 (same as in Example 1). When the hedge is lifted, the basis is -1.00 (or a dollar under) instead of the +30 that was expected when the hedge was placed. In other words, the basis has weakened by a total of \$1.30 per bushel. This is an unfavorable basis change for a “short” hedger – cash prices have fallen by more than futures prices have gone up so that the hedges cash market loss is not fully offset by the futures market gain.

From June to October, the producer has lost \$2.60 in cash market. Furthermore, due to weakening basis, the cash market losses are only partially offset by the \$1.30 profit in his futures position. By adding the futures profit of \$1.30 to the October cash price of \$12.70, the producer was able to achieve a net price of \$14.00 (\$12.70 + \$1.30). Note the difference

between \$14.00 and the initial expected cash price of \$15.30 equals \$1.30, which is the amount of weakening that occurred in the basis from June to October.

Time	Cash	Futures	Basis
June 1	\$15.30 (expected)	\$15.00	+\$0.30 (expected)
Oct. 1	\$12.70	\$13.70	-\$1.00 (actual)
	LOSS \$2.60	GAIN \$1.30	-\$1.30
Net Price: \$12.70 + (\$1.30 – 2.60) = \$14.00			

III. Seasonal Issues

Supply Pressure at Harvest

The low water levels on the Mississippi river couldn't have come at worse time as harvest is when the demand for barges and hence freight costs are at their highest levels. The low water levels have added to the seasonal impact on freight rates pushing them to historically high levels. The backlog and reduced flow of barge traffic has resulted in a glut of soybeans being stored at river terminals along the Mississippi and this has also caused basis to drop at these locations. As facilities fill up their storage capacity, immediate demand for soybeans and corn falls and river elevators drop their spot cash bids to farmers. Of course, it is not unusual for basis to weaken under harvest pressure. Basically, anything that puts stress on post-harvest infrastructure (storage, transportation, processing) – including normal seasonal supply pressure – contributes to a weaker basis. However, the impact of this year's low water levels greatly exacerbates this seasonal affect.

Priced vs. Unpriced Volume

From a pre-harvest risk management perspective, farmers who had hedged their expected grain production earlier in the year by forward contracting or booking with elevators were less exposed to the severe basis drops this harvest compared with farmers who still haven't priced their grain. Drawing from our short-hedging examples, even farmers who had tried to lock in prices using futures hedges during the pre-harvest marketing window would have been negatively impacted by the weakening in the harvest basis. Of course, many farmers were hesitant to book too much of their grain earlier in the year – despite record high prices – because of widespread drought conditions. Such weather-related events increase the likelihood of not being able to produce the grain needed to deliver on forward contracts. Non-delivery of grain results in a penalty to farmers whereby elevators charge a fee to farmers based on the amount of grain undelivered and the current price of that grain. If this had been a normal growing season, a greater percentage of soybeans would likely have been priced further in advance of harvest. This is an underappreciated, but very real, negative impact on farmers of this year's adverse weather.

IV. Other Factors

On-Farm Storage

One way for farmers – who haven't yet priced their grain – to mitigate the negative price impact of the weak harvest basis is to use on-farm storage and deliver their grain in the post-harvest marketing window. The River Market basis and forward cash bids for the November – January delivery period are much higher than the current harvest spot bids. For farmers with their own storage bins this presents an opportunity to store grain and lock in good prices on forward contracts for the November – January delivery period.

Export of Soybeans vs. Local/Regional Consumption of Corn

In order to understand the level of exposure this supply chain disruption has on row crops grown in Arkansas, we present data on U.S. exports on the major row crops grown. Corn and soybeans have accounted for roughly 65-75% of total exports among major row crops since the 2013/14 marketing year (Figure 2).⁵ For soybeans, exports and domestic crush dominate among the uses of soybeans produced in the U.S. with exports consistently accounting for about 50% of soybean consumption in the U.S. (Figure 3). However, exports accounts for less than 20% of corn consumption with over 80% of the use being attributed to domestic consumption in the form of corn for feed, seed, or for biofuels (Figure 4).

The key implication is that the soybean market will most likely fare worse than the corn market because we consume most of the corn we produce domestically. Since we export a significant amount of our soybean production, and the majority of those are shipped out of the Port of New Orleans, lower levels in the Mississippi River will impact the domestic soybean market to a greater extent relative to the corn market. Additionally, as of early October, corn harvest is essentially complete in Arkansas at nearly 100% harvested while soybean harvest in Arkansas is just getting started at nearly 40% harvested according the weekly USDA-NASS *Crop Progress* report as of October 4, 2022.

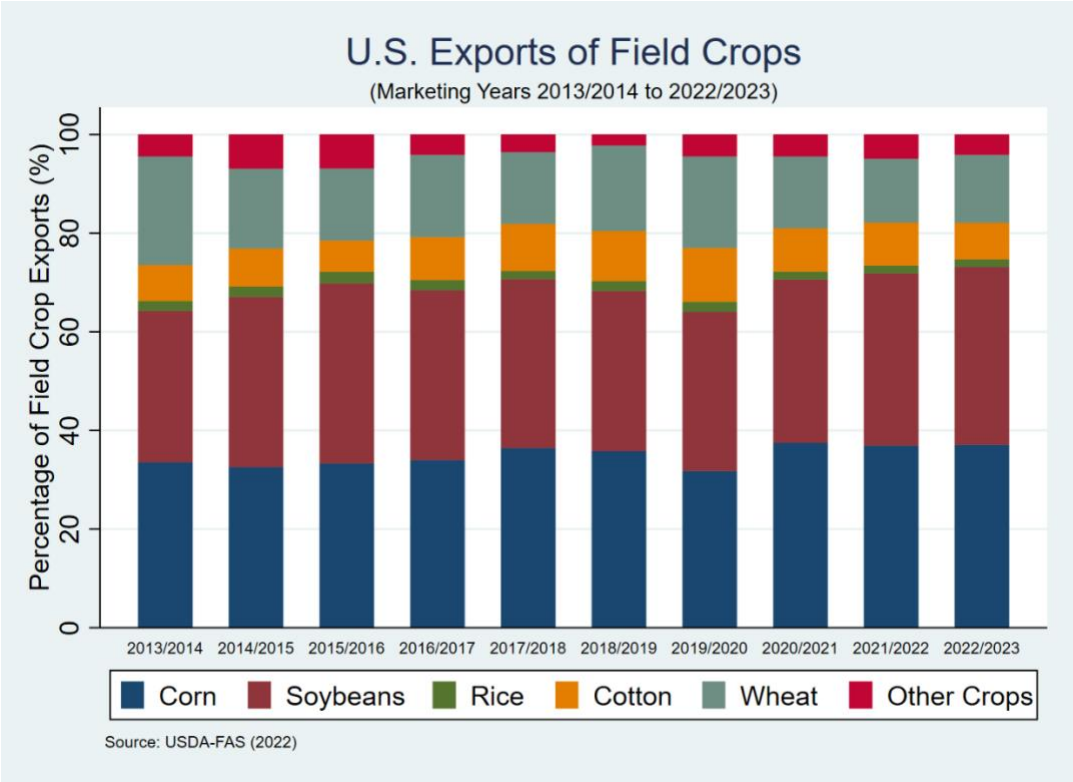


Figure 2. Breakdown of U.S. Exports Across Major Row Crops

⁵ In Figure 2, we consider exports for corn, soybeans, rice, cotton, winter wheat, barley, oats, rapeseed, sunflower seed, and rapeseed.

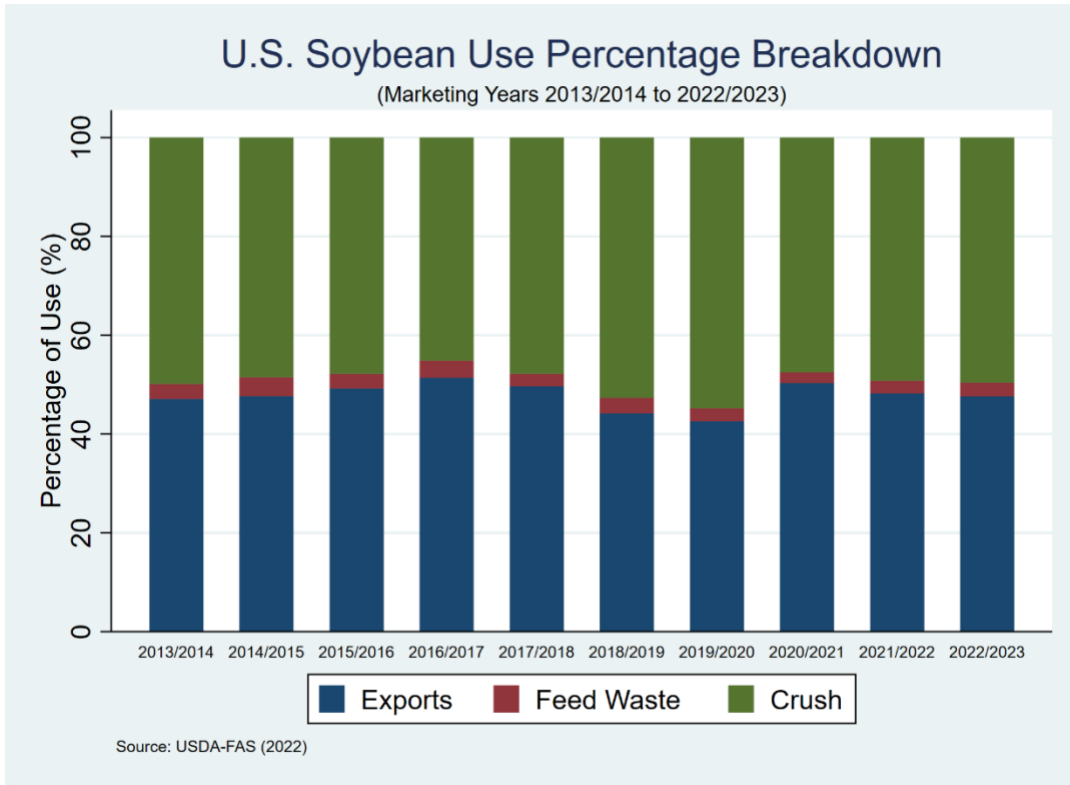


Figure 3. U.S. Soybean Use Percentage Breakdown

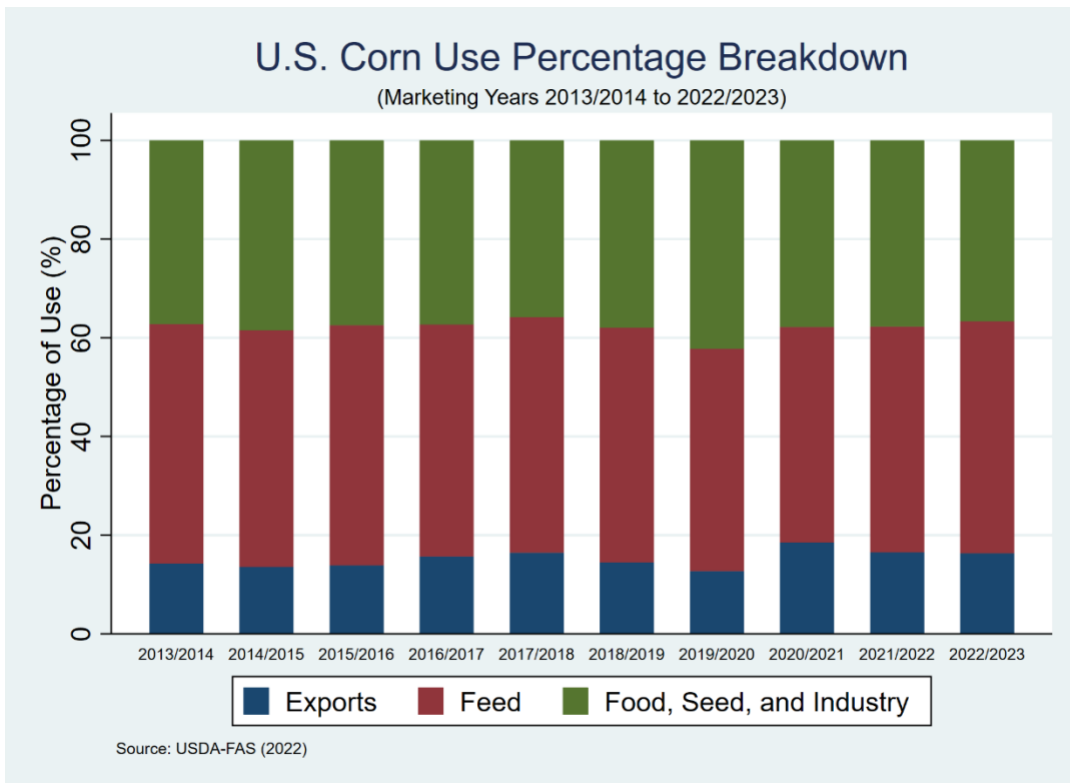


Figure 4. U.S. Corn Use Percentage Breakdown

V. Risk Management Implications for Farmers

Producers have many tools available to them to mitigate the potential revenue losses resulting from lower-than-expected yields or from lower-than-expected prices at harvest. One way to manage both risks is to buy revenue insurance, such as Revenue Protection (RP) or Revenue Protection - Harvest Price Exclusion (RP-HPE). Another tool available is forward contracting, which allows a producer and a grain elevator to enter into a contractual agreement where a producer will deliver a specified number of bushels at an agreed upon price at a specified time of delivery. We will unpack each of these tools, give examples of how each tool works on its own, then give an example of how these tools could work in conjunction with one another in the context of the current price environment.

Revenue Protection

Revenue Protection (RP) provides protection against price and production risk. Coverage is based on a revenue guarantee which is the product of expected yield measured by a farm's Actual Production History (APH), the higher of the Projected Price or the Harvest Price, and a coverage level to be chosen by the producer. The APH is the average of a producer's yield for a given insured unit across the years for which a producer has approved yields. The minimum amount of recorded annual yields to establish an APH is four consecutive years, and the maximum amount is ten. If four years of annual yield history is not available, one or more Transition Yields (T-yields) calculated by RMA for the county in which the insurable unit is located will be substituted into the yield history.

The revenue guarantee is set based on the higher of the Projected Price and the Harvest Price, both of which are determined by the USDA Risk Management Agency. The Projected Price is determined for each crop by taking an average of the daily closing futures prices across a 30-day window, in early spring just prior to when planting would normally occur, for a given crop's harvest month contract. Similarly, the Harvest Price is determined for each crop by taking an average of the daily closing futures prices across a 30-day window, in fall when harvest would normally occur, for a given crop's harvest month contract. For example, for soybeans in Arkansas, the Projected Price is the January 15 to February 14 average daily settlement price on the November futures contract. The Harvest Price is the October average settlement price on that same contract. A table of Projected Price and Harvest Price discovery periods by crop and their respective harvest month futures contracts is given below (see Table 2).

Table 2. Price Discovery Periods (USDA-RMA)

Crop	Projected Price	Harvest Price
Corn	1/15 - 2/14	8/15 - 9/14
Cotton	1/15 - 2/14	10/1 - 10/31
Rice	1/15 - 2/14	9/1 - 9/30
Soybeans	1/15 - 2/14	10/1 - 10/31

Note: Price Discovery periods for all covered program crops can be found in the Commodity Exchange Price Provisions ([Link](#))

The last piece of the revenue guarantee is the coverage level. RP has eight coverage level options to choose from which range from 50-85% in 5% increments.⁶ An important aspect of crop insurance which sets it apart from typical Property and Casualty insurance is that the premium paid by the producer is partially paid for by the U.S. government in the form of a subsidy. A table of coverage levels and their respective subsidy rates, which is the portion of the premium paid by the government, is given below (Table 3). These subsidy rates are the same across all program crops, which include corn, cotton, rice, soybeans, wheat and others, and are the same across all states and counties.

Table 3. Subsidy Rates for Products Administered by USDA-RMA

Coverage Level	Basic & Optional Subsidy	Enterprise Unit Subsidy
50%	67%	80%
55%	64%	80%
60%	64%	80%
65%	59%	80%
70%	59%	80%
75%	55%	77%
80%	48%	68%
85%	38%	53%

Note: Percentages indicate portion of premium paid by the government.

In calculating the indemnity received, the farm's realized revenue will be calculated by taking the product of a producer's actual yield and the Harvest Price determined by RMA. If the realized revenue is less than the revenue guarantee, then an indemnity equal to the difference in the revenue guarantee and the realized revenue is paid. If the realized revenue is greater than the revenue guarantee, then no indemnity is paid.

Revenue Protection - Harvest Price Exclusion

Revenue Protection - Harvest Price Exclusion (RP-HPE) also provides protection against price and production risk but at a cheaper premium than RP. This is because RP-HPE revenue guarantees are only based on the APH yield, Projected Price, and coverage level. The RMA-determined Harvest Price is not considered in calculating this revenue guarantee and so does not provide the opportunity for a higher revenue guarantee calculation at harvest time if prices increase during the growing season. The RP-HPE indemnity is calculated in a similar way to RP with the key difference being the RP-HPE revenue guarantee is found only by using the Project Price and does not allow for the option to use the higher of the RMA-determined Project Price or Harvest Price.

Forward Contracting

Another way for a producer to manage price risk, but not production risk, is by establishing a forward contract with country grain elevator. A forward contract transfers ownership of physical grain from a seller to a buyer at some agreed upon time in the future. A key aspect of forward

⁶ In addition to these coverage levels, there is catastrophic coverage (CAT) available. The coverage levels listed here are often considered "Buy-Up" coverage levels because these levels buy up beyond CAT. Buy-Up coverage by far dominates the types of coverage in recent years whereas CAT dominated coverage level choices after it was first introduced in the 1994 Federal Crop Insurance Act to provide a way for producers to buy minimal coverage at a fee so they could participate in countercyclical commodity programs offered in Title 1 of the 2002 farm bill.

contracting is a producer is obligated to deliver bushels of grain to the grain elevator with which they entered into the contract at the agreed upon price and agreed upon time. This means that if a crop loss occurs, a producer may have to compensate the grain elevator monetarily rather than by the physical product that was promised. In recent years in Arkansas, around half of the crop is booked prior to harvest for delivery to grain elevators. Currently, in the 2022 harvest season, about 40-60% of the Arkansas soybean crop is booked for delivery to local grain elevators via forward contracting.

The Jointness of Revenue Protection and Forward Contracting

While both risk management tools are effective ways to mitigate price risk, revenue insurance and forward contracting do not have to be used independently and may be more complementary in some years relative to others. This section provides five different scenarios to use these tools both independently and jointly in order to minimize revenue losses felt by the lower Mississippi River transportation disruptions. We will use soybean prices and yields from the 2022 growing season and provide per acre returns over cost in each scenario. Key parameters are given below:⁷

- APH Yield = 53 bu/acre
- Realized Yield = 43 bu/acre
- Projected Price (USDA-RMA) = \$13.69/bu
- Harvest Price (USDA-RMA) = \$13.77/bu
- Spot Price (USDA-AMS) = \$13.15/bu
- Operating Expenses and Interest (UADA) = \$532.30/acre
- Crop Insurance Premium (85% RP) = \$25.00/ac
- Crop Insurance Premium (85% RP-HPE) = \$21.00/ac

Scenario 1: No Crop Insurance, No Forward Contracting

In this scenario, a producer chooses to take the spot price at the local grain elevator for their soybeans and yield came in about 10 bushels per acre below expected production per acre. If this were the case, revenue would be \$559/ac (43 bu/acre X \$13.15/bu) and net revenue would be \$33.15/ac.

Scenario 2: 85% RP Crop Insurance, No Forward Contracting

Using crop insurance premium data from Poinsett County, AR, we will now provide an example of using RP crop insurance. Based on the parameters above, it appears the actual yield fell relative to the APH yield and the Harvest Price increased relative to the Projected Price so the Harvest Price will be used for the revenue guarantee calculation. This also means the revenue guarantee will be greater for RP than for RP-HPE but at a higher premium.

- Expected Revenue (APH Yield X Harvest Price) = \$729.81/ac
- Revenue Guarantee (Expected Revenue X 85% Coverage Level) = \$620.34/ac

⁷ APH Yield is based on the projected average yield across the state of Arkansas. Projected and Harvest Prices are from the USDA-RMA Price Discovery Calculator, Spot Price is from USDA-AMS Daily Cash Grain Bids week of October 7, 2022, Operating Expenses and Interest cost are from University of Arkansas System Division of Agriculture Crop Enterprise Budgets, crop insurance premiums for RP and RP-HPE come from the USDA-RMA Cost Estimator and are for Poinsett County, AR. For analysis using a different coverage level, contact Dr. Hunter Biram.

- Realized Revenue (Actual Yield X Harvest Price) = \$592.11/ac
- Indemnity (Revenue Guarantee - Realized Revenue) = \$28.23/ac
- Indemnity net of Premium (Indemnity - Premium) = \$3.23/ac
- Net Revenue with RP Indemnity (Spot Price X Actual Yield + Net Indemnity) = \$36.38/ac

In this scenario, RP at 85% coverage would allow a producer to recover \$3.23/ac which is about 10% of the net revenue from Scenario 1.

Scenario 3: 85% RP-HPE Crop Insurance, No Forward Contracting

Again, using crop insurance premium data from Poinsett County, AR, we will now provide an example of using RP-HPE crop insurance. Under the assumptions made above, the revenue guarantee for RP-HPE will be less than the revenue guarantee for RP. However, the premium paid by the producer will be less for RP-HPE relative to RP.

- Expected Revenue (APH Yield X Projected Price) = \$725.57/ac
- Revenue Guarantee (Expected Revenue X 85% Coverage Level) = \$616.74/ac
- Realized Revenue (Actual Yield X Harvest Price) = \$592.11/ac
- Indemnity (Revenue Guarantee - Realized Revenue) = \$24.63/ac
- Indemnity net of Premium (Indemnity - Premium) = \$3.63/ac
- Net Revenue with RP Indemnity (Spot Price X Actual Yield + Net Indemnity) = \$36.78/ac

In this scenario, RP-HPE at 85% coverage would allow a producer to recover \$3.63/ac which is about 11% of the net revenue from Scenario 1.

Scenario 4: No Crop Insurance, Forward Contracting

Forward contracting mitigates price risk by ensuring harvested bushels will be sold at a certain price. However, a major source of uncertainty with forward contracting is the ability to deliver physicals bushels at harvest time due to yield loss from weather and other unforeseen risks (i.e. fertility, pests, weeds, etc.). For this scenario, we will add in another key parameter and assume soybean plantings amount to 1,000 acres. At the current anticipated yield given by the APH yield, we would expect total delivered bushels at harvest to be 53,000 bushels (53 bu/ac X 1,000 acres). This allows us to measure the number of bushels to be delivered to the local grain elevator at harvest.

Historically, local cash prices tend to be more favorable in the months of June and July relative to the harvest months of September through November because of lower stocks. On June 7, 2022, the cash bid at West Memphis was \$15.80/bu for October - November delivery (USDA-AMS, 2022). Other Arkansas grain elevator locations along the Mississippi River were also at this price. With the cash bid price for October - November delivery \$2.11 above the RMA Projected Price, let's say this producer decides to enter into a forward contract with the local grain elevator at West Memphis by promising to deliver 30,000 bushels at \$15.80/bu in the time frame of October - November. We will break down the revenue by bushels that are and are not under contract with the local grain elevator.

With a realized yield of 43 bu/ac, this producer has 43,000 bushels that will need to be delivered to the local grain elevator. Part of these bushels (i.e., 30,000) will go to the West Memphis elevator the producer entered into a forward contract with, and the remaining bushels (i.e.

13,000) may also be delivered to the West Memphis elevator but at the spot price of \$13.15/bu rather than \$15.80/bu.

- Revenue on first 30,000 bushels (43 bu/ac X \$15.80/bu) = \$679.40/ac
- Net Revenue on first 30,000 bushels (\$679.40/ac - \$532.30/ac) = \$147.10/ac
- Revenue on remaining 13,000 bushels (43 bu/ac X \$13.15/bu) = \$565.45/ac
- Net Revenue on remaining 13,000 bushels (\$565.45/ac - \$532.30/ac) = \$33.15/ac
- Weighted Average Net Revenue⁸ = \$112.92/ac

Relative to the scenario where no risk management tool was used (Scenario 1), total net revenue increased from \$33.15/ac to \$112.92/ac (i.e., 340% increase).

Scenario 5: 85% RP Crop Insurance, Forward Contracting

In this last scenario, we will incorporate the two risk management tools described above by simply adding the net indemnity for RP to the net revenue under forward contracting.

- Net Revenue with RP and Forward Contracting (\$3.23/ac + \$112.92/ac) = \$116.15/ac
- Net Revenue with RP-HPE and Forward Contracting = (\$3.63/ac + 112.92/ac) = \$116.55/ac

Conclusion

We have given the price implications of low water levels in the Mississippi River, implications for hedgers, and risk management tools for producers to consider in the 2023 growing season. Low water levels in the Mississippi River cause barge drafts to decrease which results in less grain being loaded per barge and more barges required to transport grain downriver. This results in increased transportation costs which are reflected in lower cash grain bids offered by grain buyers at local elevators to farmers, which weakens basis. The key to whether a hedge will be profitable depends on the expected basis when the hedge is initiated and the actual basis when the hedge position is closed out, where an unfavorable basis change for a “short” hedger results in a cash market loss to not be entirely offset by futures market gains.

Exports account for a much greater share of the U.S. soybean crop than of the corn crop, which implies soybean producers will experience a larger impact from the complications on the Mississippi River. The planted acreage⁹ for the 2022 crop in Arkansas is broken down into 54% soybeans, 19% rice, 12% corn, 11% cotton, and 4% other crops which further emphasizes the significance of this event to Arkansas producers.

One immediate risk management strategy we recommend is to store grain until the winter months where current cash bids for delivery appear to have stronger basis and to consider the benefit of higher prices at a future delivery date relative to storage costs. Two other tools available which may prove helpful in the upcoming 2023 growing season and future growing

⁸ Here, we must calculate a weighted average net revenue based on the price received by each portion of the harvested crop. About 70% (30,000/43,000) of the net revenue on the first 30,000 bushels received the \$15.80/bu forward contracted price, and about 30% (13,000/43,000) of the net revenue on the remaining 13,000 bushels received the \$13.15/bu spot price. Therefore, the calculation will be: (\$147.10/ac X 0.70) + (\$33.15/ac X 0.30) = \$112.92/ac.

⁹ Percentages are based on USDA-NASS Quick Stats data (quickstats.nass.usda.gov). The total acreage measure for row crops considers winter wheat, long- and medium-grain rice, upland cotton, corn, soybeans, peanuts, and oats.

seasons would be to consider revenue insurance such as RP and RP-HPE or to engage in forward contracting by taking advantage of stronger basis in the summer months prior to harvest. These tools may be used independently or jointly, and the best risk management strategy for a producer considering these tools may differ across farms.

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