

# The U.S. Corn “*Price Protection Net*” Applied to Kansas for “New Crop” MY 2021/22

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## Summary

An “*all-available-alternatives*” view of the available corn price and revenue “*protection net*” may help in assessing the expected profitability of alternative 2021 fall harvested crops, as well as in how best to manage the risk of unforeseen significant price declines that could occur in Fall 2021 – including corn, soybean, sorghum, wheat and other crops in Kansas.

In particular, this article focuses on Kansas corn marketing and risk management tools. It addresses how 1) forward contracts for harvest delivery, 2) put option minimum price floors, 3) USDA corn marketing loans, 4) corn Revenue Protection insurance, and 5) selected USDA farm program price coverage programs (PLC), may work together to protect Kansas farmers against potential low 2021 U.S. corn price outcomes at fall harvest.

Starting with KSU estimates of 2021 total cost of production of \$3.15 /bu for non-irrigated corn near Salina (NC KS), and \$3.48 /bu for irrigated corn near Garden City (SW KS), on March 2, 2021, forward contract pricing opportunities for October 2021 existed in Salina (\$4.56 /bu) and Garden City (\$4.87 /bu) that cover costs by 40%-45%. Alternatively, put option minimum cash price floors (using basis contracts implicit in the forward contract bids) of \$4.04 /bu in Salina, and \$4.35 /bu in Garden City also cover corn costs by 25%-28%.

USDA Marketing loan rates of \$2.29 - \$2.43 /bu in Salina and Garden City, respectively, are low enough relative to current corn market opportunities to be considered irrelevant. The USDA Risk Management Agency (RMA) Projected Price for corn Revenue Protection crop insurance is \$4.58 /bu for 2021. However, after deducting the uncovered portion of the % APH coverage and adjusting for 100% of APH production, implicit Projected Price coverage declines to the range of \$3.44, \$3.66, and \$3.89 for 75%, 80% and 85% APH coverage of corn.

USDA Price Loss Coverage (PLC) becomes effective for national average corn farm price declines below a \$3.70 Reference Price – similar to the 100% APH implicit price coverage in Revenue Protection – similar to the 100% APH implicit price coverage in Revenue Protection at 80% APH yield selections.. The USDA projected U.S. corn prices to be \$4.30 /bu for “old crop” MY 2020/21, and \$4.20 /bu for “new crop” MY 2021/22, which in the current corn market supply-demand and price situation would negate likely PLC payments for the foreseeable future.

Following is the step-by-step process that will be taken in this paper.

**1. First**, this analysis will focus on **cost of production** from Kansas State University Extension for non-irrigated corn in North Central Kansas (Salina) and irrigated corn in Southwest Kansas (Garden City).

- a. **North Central Kansas Non-irrigated Corn 2021 cost of production** KSU Farm Management Guides 2021. Direct Costs (without fixed machinery and land costs) are estimated at **\$2.20 /bu**, while full economic Total Costs (including machinery and land costs) are calculated at **\$3.15 /bu**. This assumes average non-irrigated corn yields of **120 bushels per acre**.
- b. **Southwest Kansas irrigated Corn 2021 cost of production** KSU Farm Management Guides 2021: Direct Costs (without fixed machinery, land & irrigation system costs) are estimated at **\$2.02 /bu**, while Total Costs (including all machinery, land and irrigation system costs) are calculated at **\$3.48 /bu**. This assumes average irrigated corn yields of **225 bushels per acre**.
- i. Note that irrigation system charges are included at full economic costs of replacing well, pump, gearhead, power unit, and center pivot irrigation system at current market prices with an interest charge.

**2. Second**, current Fall 2021 corn **forward contract pricing opportunities** will be examined. *Resulting net returns prospects relative to cost of production for non-irrigated corn in North Central Kansas (Salina), and irrigated corn in Southwest Kansas (Garden City) as of March 1, 2021.*

- a. **Salina “New Crop” Forward Contract bids = \$4.56 /bu.** (-\$0.20 /bu basis *under* DEC 2021 Corn Futures, Delivery in Oct<sup>2021</sup>)
- i. These “new crop” FC bids cover North Central KS non-irrigated corn **full economic Total Costs of \$3.15 /bushel** by \$1.41 (+45%).
- b. **Garden City “New Crop” Forward Contract bids = \$4.87 /bu.** (+\$0.11 /bu basis *over* DEC 2021 Corn Futures, Delivery in Oct<sup>2021</sup>)
- i. These “new crop” FC bids cover Southwest KS irrigated corn **full economic Total Costs of \$3.48 /bushel** by \$1.39 (+40%).

**3. Third**, combining a) “at-the-money” put options for DEC 2021 Corn, with b) Fall 2021 “new crop” corn basis bids provides a “**put option minimum price floor**” currently available in the markets. *The net returns prospects of these minimum price floors will be examined relative to cost of production for non-irrigated corn in North Central Kansas (Salina markets), and irrigated corn in Southwest Kansas (Garden City markets) as of March 2, 2020.*

- **Step 1 of 3: Identifying the DEC 2021 Corn Put Option Pricing Opportunity:** With DEC 2021 Corn futures closing at \$4.75 <sup>3</sup>/<sub>4</sub> on Tuesday, March 2, 2021, a nearly “at-the-Money” **\$4.70 /bu DEC 2021 Corn put option cost \$0.44<sup>1</sup>/<sub>8</sub> per bushel.**
- **Step 2 of 3: Calculating the DEC 2021 Corn Put Option Minimum Futures Price Floor:** By purchasing a nearly “at-the-money” \$4.70 Strike Price DEC 2021 Corn put option, a net “new crop” **DEC 2021 Corn put option price futures floor of \$4.24 /bu** can be set (i.e., \$4.70 Strike Price - \$0.44 put option premium - \$0.02 broker fee).
- **Step 3 of 3: Calculating the DEC 2021 Corn Put Option Minimum Cash Price Floor:** By first setting up a DEC 2021 corn put option price floor of **\$4.24 /bu**, & then using the basis bid available for “new crop” October 2021 forward contracts, a net “new crop” **DEC 2021 Corn put option cash price floor** can be estimated. *Note: a basis contract could be used with the put option to “lock in” the 2021 harvest deliver basis, but would also result in a bushel delivery commitment.*
  - a. **Salina, KS “New Crop” DEC 2021 Corn Put Option Cash \$ Floor = \$4.04 /bu.** (with a basis contract for October<sup>2021</sup> delivery)
    - i. **“At-the-Money” DEC 2021 Corn Put Option Price Floor = \$4.70 Strike Price - \$0.44 put option premium - \$0.02 broker fee - \$0.20 under basis = \$4.04 /bu**
    - ii. This Put Option price floor of \$4.04 /bu covers North Central KS non-irrigated corn full economic Total Costs of \$3.15 /bu by \$0.89 (+28%).
  - b. **Garden City, KS “New Crop” DEC 2021 Corn Put Option Cash \$ Floor = \$4.35 /bu.** (with a basis contract for October<sup>2021</sup> delivery)
    - i. **“At-the-Money” DEC 2021 Corn Put Option Price Floor = \$4.70 Strike Price - \$0.44 put option premium - \$0.02 broker fee + \$0.11 over basis = \$4.35 /bu**
    - ii. This Put Option price floor of \$4.35 /bu covers Southwest KS irrigated corn full economic Total Costs of \$3.48 /bu by \$0.87 (+25%).

**4. Fourth**, corn marketing loan rates in Saline (North Central) and Finney (Southwest) Counties in Kansas will be considered – focusing on how they compare to corn cost of production from a net returns perspective. *Marketing loans are available for use after crops have been harvested – so are a harvest-post harvest marketing alternative.*

- a. **Salina**<sup>Saline Co.</sup> **Corn Marketing Loan Rate**<sup>USDA FSA</sup> = **\$2.29 /bu.** (Available post-harvest for 9 months)
- i. The Saline County, KS marketing Loan Rate for corn of \$2.29 is \$0.86 /bu, (27.3%) *below* estimated corn Total Costs of \$3.15 /bu..
- b. **Garden City**<sup>Finney Co.</sup> **Corn Marketing Loan Rate**<sup>USDA FSA</sup> = **\$2.43 /bu.** (Available post-harvest for 9 months)
- i. The Finney County, KS marketing Loan for corn is \$1.05 /bu (30.2%) *below* estimated corn Total Costs of \$3.48 /bu..

**5. Fifth**, revenue coverage provided by **Revenue Protection crop insurance** will be examined with consideration of the farmer’s choice of APH percent of yield crop insurance coverage. *Varying selection levels of APH coverage provide varying implicit price protection levels across 100% of crop acreage. It also provides net returns’ risk protection relative to cost for the 2021 corn crop.*

- a. **Revenue Protection** crop insurance provides coverage for within-season grain futures price changes. The **Projected Price** of \$4.58 /bu for 2021 was calculated as the average of daily closes of DEC 2021 corn futures during the month of February 2021 for Revenue Protection insurance policies in Kansas. This **Projected Price** of \$4.58 /bu is used to calculate guaranteed revenue. This revenue guarantee will be compared to actual revenue at harvest, calculated as actual 2021 corn yield times the eventual **Harvest Price**. The **2021 Harvest Price** will be calculated as the October 2021 average of closing prices for DEC 2021 corn futures. The final revenue guarantee calculation uses the higher of the preharvest **Projected price** and **Harvest price**.
- i. Given the design of the price determination mechanism for **Revenue Protection**, its’ primary relevance in grain producers’ marketing strategies is to help manage the risk of corn futures price declines from *pre-planting in February through typical harvest in October*.
- ii. With tangible downside price risk in Fall 2021 in the U.S. corn market, the **Harvest Price** in October 2021 for corn **Revenue Protection** has the potential to be \$0.50-\$1.00 or more per bushel lower than the **\$4.58** corn futures **Projected Price** in February 2021.
- b. The RMA **Projected Price** of \$4.58 /bu for 2021 corn crop revenue coverage, provides full production for the APH election (i.e., for 50% through 85% APH coverage), but none for the “deductible” remaining percent of APH yields for each farm.
- i. To figure the implicit RMA projected price for coverage spread over 100% of APH yield, the % APH coverage is multiplied by the \$4.58 /bu RMA Projected Price. For example, while for the 75% APH selection the Projected Price of \$4.58 provides the price bushels are coverage at, for the full 100% of APH yield, the implicit coverage price is  $\$4.58 \times 0.75 = \$3.44$  /bu.

**6. Sixth, USDA Farm Program Price Loss Coverage (PLC) will be assessed for its corn price and net returns coverage characteristics for these North Central and Southwest Kansas locations.**

- a. **Agricultural Risk Coverage at the County Level (ARC-CO)** provides revenue-based coverage as opposed to the price-driven coverage of PLC. The focus here is on PLC coverage - avoiding complications of Olympic average county-level yields and national prices on farm program payments.
- b. The **delayed timing of farmer's PLC payments** presents a challenge when considering their price risk management coverage for "new crop" MY 2021/22. The price-determined part of a farmer's 2021 PLC payments for corn are based on 12-month (September 1, 2021 – August 31, 2022) "new crop" 2021/22 marketing year average prices. Any PLC payments for corn in 2022 will not be given to farmers until October 2022.
  - i. In comparison, any PLC payments to be received in October 2021 will be based on the 12-month (September 1, 2020 – August 31, 2021) "old crop" 2020/21 marketing year season average prices.
- c. **Reference Price**<sup>U.S. Corn</sup> is \$3.70 /bu. for both "old crop" MY 2020/21 and "new crop" MY 2021/22.
  - i. **PLC payments based on the \$3.70 /bu. Reference Price**<sup>U.S. Corn</sup> **will be made on 85% of base acres.** It follows that equivalent PLC price coverage distributed over **100% of base acres** are estimated to be **\$3.145 /bu.** (i.e., \$3.70 x 0.85).
  - ii. **Expected PLC Payment in October 2021 for "old crop" MY 2020/21:** The USDA's February 9<sup>th</sup> WASDE report projected "old crop" MY 2020/21 corn prices to be \$4.30 /bu – higher than the \$3.70 /bu **Reference Price** – equaling \$0.60 /bu PLC payment. The heavier weighting of September 2020 through February 2021 (first 7 months of the marketing year) that is used by USDA to calculate the "old crop" MY 2020/21 average price of \$4.30 /bu, makes it unlikely that U.S. corn prices will decline enough during March-August 2021 to drop the average price (\$4.30) down to the \$3.70 Reference Price, and cause a PLC payment for corn for "old crop" MY 2020/21.
    1. **On 85% of base acres:** As stated above, during what remains of "old crop" MY 2020/21 (through August 2021) the marketing year average of \$4.30 is unlikely to drop \$0.60+ down to the PLC Reference Price of **\$3.70 /bu.** Therefore, **PLC program payments in October 2021** are likely to be **\$0.00** ( $\$3.70^{RP} < \$4.30^{U.S. MY Avg.}$ ) for 85% of base acres.
    2. **On 100% of base acres,** these PLC payments in October 2021 will still equal \$0.00 per bu..
  - iii. **PLC Payment in October 2022 for "new crop" MY 2021/22:** At the **February 18-19, 2021 USDA Outlook Conference**, the "new crop" MY 2021/22 corn price was projected to be \$4.20 /bu – indicating that there will be likely be a \$0.00 /bu. PLC payment in October 2022.
    1. It is possible that in response to high corn market price prospects in 2021 that U.S. corn acreage will increase significantly, and that absent a major crop problem, a "large" 2021 U.S. corn crop will occur, causing an increase in projected U.S. corn ending stocks in "new crop" MY 2021/22. Supply-demand factors could cause U.S. corn prices to decline \$0.50-\$1.00+ into Fall 2021 down to \$3.20-\$3.70 per bushel from the USDA's current projection of \$4.20 /bu. If so, PLC payments in October 2022 would range from **\$0.50 /bu** ( $\$3.70^{RP} > \$3.20^{U.S. MY Avg.}$ ) to **\$0.00 /bu** ( $\$3.70^{RP} = \$3.70^{U.S. MY Avg.}$ ).

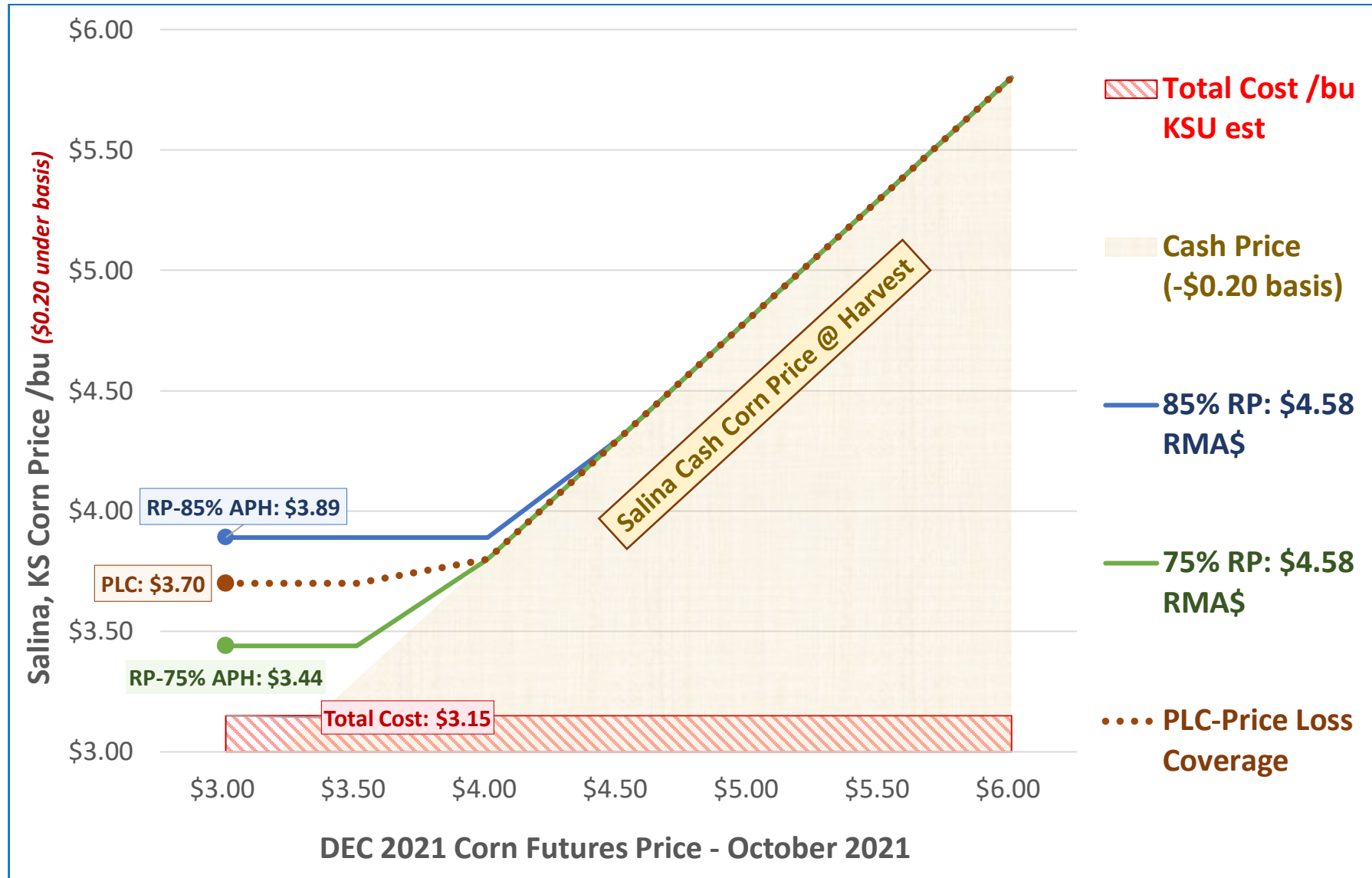
**Table 1** presents an accumulation of the information presented in steps #1 through #6 above, for the Salina (North Central KS) non-irrigated corn production example, and the Garden City (Southwest KS) irrigated corn production example. **Figures 1a and 1b** illustrate how these price protection tools work together to help corn producers in the Salina, KS area. **Figures 2a and 2b** illustrate how these price protection tools work together to help corn producers in the Garden City, KS area.

**Figures 1a and 2a** focus on price protection tools available through the USDA programs of the a) **Farm Service Agency (FSA)** in terms of **Price Loss Coverage (PLC)**, and b) **Risk Management Agency (RMA) Revenue Protection crop insurance coverage**. **Figures 1b and 2b** emphasize how **Forward Contracts** and **Put Option Price Floors** can protect from corn price declines.

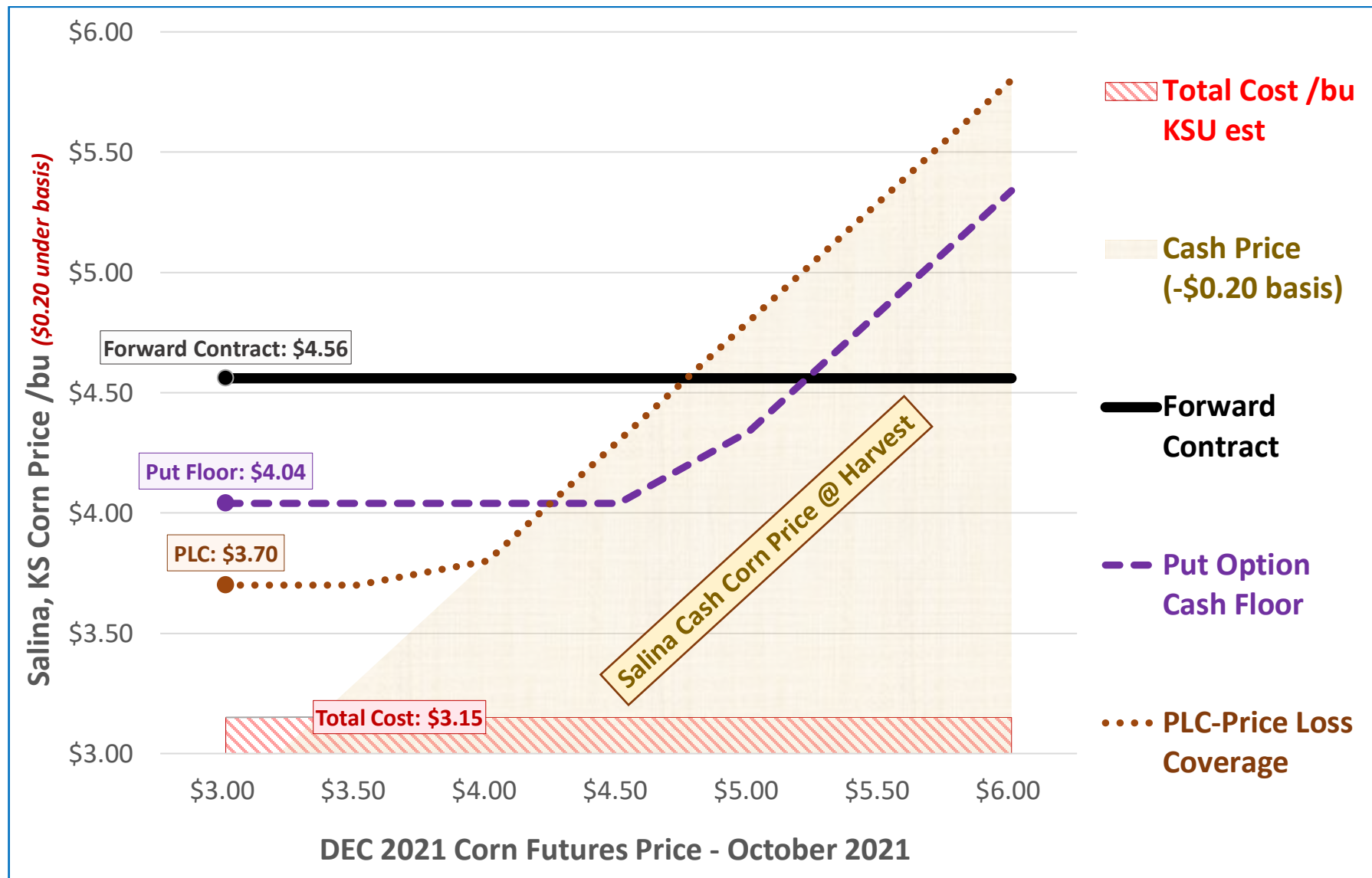
**Table 1. Comparison of North Central (Salina) & Southwest (Garden City) Corn Costs, Prices, and USDA Price Support as of March 2, 2021**

	North Central KS Non-irrigated Corn	Southwest KS Irrigated Corn
Cost of Production – Direct Costs <sup>KSU</sup>	\$2.20 /bu @ 120 bu/ac	\$2.02 /bu @ 225 bu/ac
Cost of Production – Total Costs <sup>KSU</sup>	\$3.15 /bu @ 120 bu/ac	\$3.48 /bu @ 225 bu/ac
Forward Contract \$ <sup>3/2/2021</sup>	\$4.56 /bu <sup>Oct2021 Delivery</sup>	\$4.87 /bu <sup>Oct2021 Delivery</sup>
Buy Put Option + Basis Contract <sup>3/2/2021</sup>	\$4.04 /bu <sup>Oct2021 Delivery</sup>	\$4.35 /bu <sup>Oct2021 Delivery</sup>
Marketing Loan	\$2.29 /bu <sup>9 months post-harvest</sup>	\$2.43 /bu <sup>9 months post-harvest</sup>
Revenue Protection \$ - 85% APH	\$4.58 <sup>@85% APH</sup> — \$3.89 <sup>@100% APH</sup> <i>Insurance BasicUnit = \$67 /ac</i>	\$4.58 <sup>@85% APH</sup> — \$3.89 <sup>@100% APH</sup> <i>Insurance BasicUnit = \$49 /ac</i>
Revenue Protection \$ - 80% APH	\$4.58 <sup>@80% APH</sup> — \$3.66 <sup>@100% APH</sup> <i>Insurance BasicUnit = \$47 /ac</i>	\$4.58 <sup>@80% APH</sup> — \$3.66 <sup>@100% APH</sup> <i>Insurance BasicUnit = \$32 /ac</i>
Revenue Protection \$ - 75% APH	\$4.58 <sup>@75% APH</sup> — \$3.44 <sup>@100% APH</sup> <i>Insurance BasicUnit = \$35 /ac</i>	\$4.58 <sup>@75% APH</sup> — \$3.44 <sup>@100% APH</sup> <i>Insurance BasicUnit = \$21 /ac</i>
Revenue Protection \$ - 70% APH	\$4.58 <sup>@70% APH</sup> — \$3.21 <sup>@100% APH</sup> <i>Insurance BasicUnit = \$28 /ac</i>	\$4.58 <sup>@70% APH</sup> — \$3.21 <sup>@100% APH</sup> <i>Insurance BasicUnit = \$14 /ac</i>
Revenue Protection \$ - 65% APH	\$4.58 <sup>@65% APH</sup> — \$2.98 <sup>@100% APH</sup> <i>Insurance BasicUnit = \$24 /ac</i>	\$4.58 <sup>@65% APH</sup> — \$2.98 <sup>@100% APH</sup> <i>Insurance BasicUnit = \$10 /ac</i>
PLC Payment: <u>\$3.70<sup>RP</sup></u> Less <b>\$4.20</b> <sup>US Avg\$</sup>	\$0.00 <sup>85% Base Ac.</sup> / \$0.00 <sup>100% Base Ac.</sup>	
PLC Payment: <u>\$3.70<sup>RP</sup></u> Less <b>\$3.95</b> <sup>US Avg\$</sup>	\$0.00 <sup>85% Base Ac.</sup> / \$0.00 <sup>100% Base Ac.</sup>	
PLC Payment: <u>\$3.70<sup>RP</sup></u> Less <b>\$3.70</b> <sup>US Avg\$</sup>	\$0.00 <sup>85% Base Ac.</sup> / \$0.00 <sup>100% Base Ac.</sup>	
PLC Payment: <u>\$3.70<sup>RP</sup></u> Less <b>\$3.45</b> <sup>US Avg\$</sup>	\$0.25 <sup>85% Base Ac.</sup> / \$0.21 <sup>100% Base Ac.</sup>	
PLC Payment: <u>\$3.70<sup>RP</sup></u> Less <b>\$3.20</b> <sup>US Avg\$</sup>	\$0.50 <sup>85% Base Ac.</sup> / \$0.42 <sup>100% Base Ac.</sup>	
PLC Payment: <u>\$3.70<sup>RP</sup></u> Less <b>\$2.95</b> <sup>US Avg\$</sup>	\$0.75 <sup>85% Base Ac.</sup> / \$0.64 <sup>100% Base Ac.</sup>	

**Figure 1a. Corn PLC & RMA Revenue Protection Price Coverage - basis Salina, KS as of March 2, 2021**

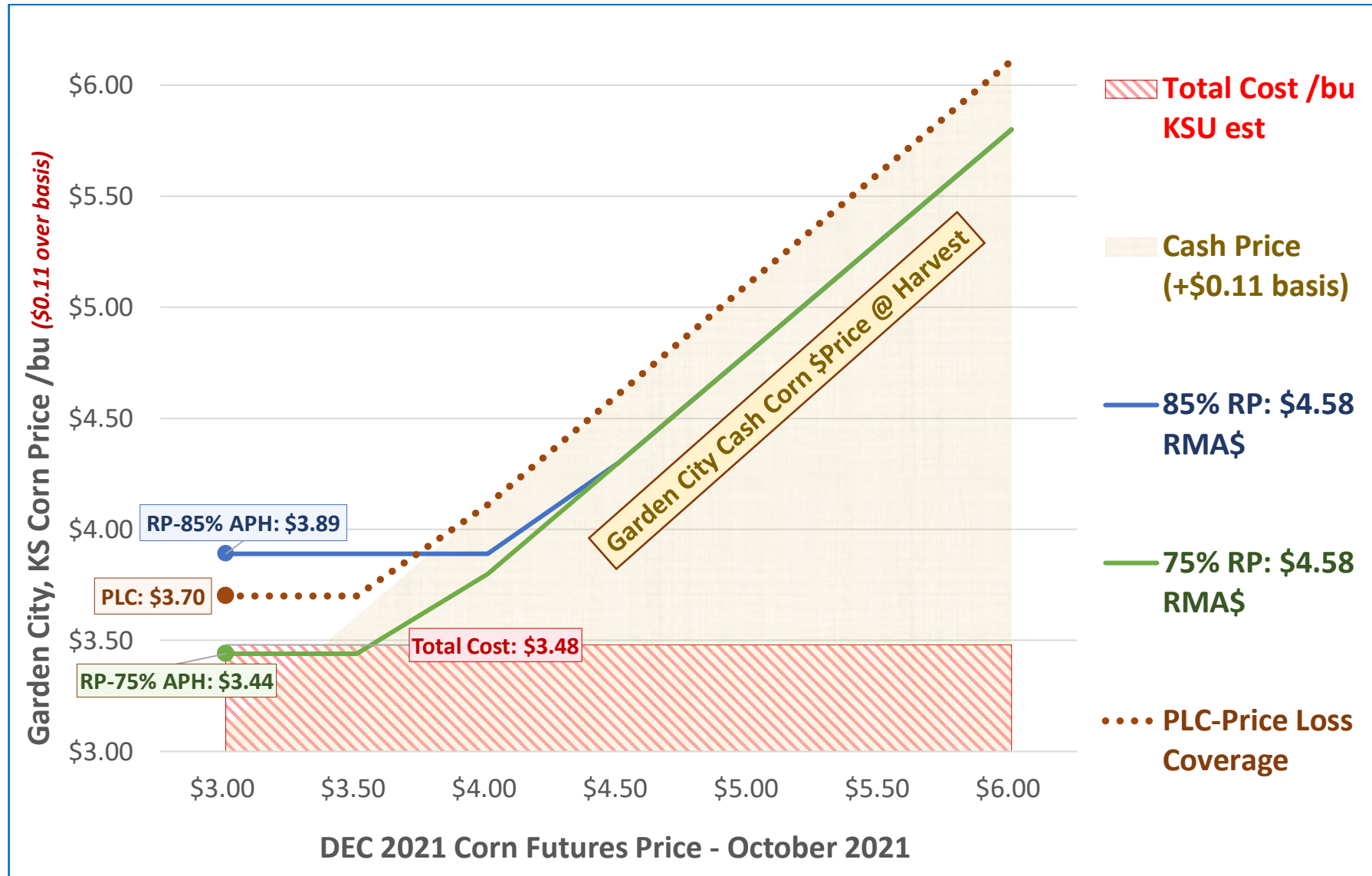


**Figure 1b. Corn Forward Contract & Put Option Price Protection Scenarios - basis Salina, KS as of March 2, 2021**





**Figure 2a. Corn PLC & RMA Revenue Protection Price Coverage - basis Garden City, KS as of March 2, 2021**



**Figure 2b. Corn Forward Contract & Put Option Price Protection Scenarios - basis Garden City, KS as of March 2, 2021**

