Livestock risk protection subsidies changes on producer premiums

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Abstract

Purpose – Livestock Risk Protection (LRP) insurance can reduce losses from price declines for cattle producers, but LRP adoptions has been limited. In 2019 and 2020, LRP subsidies were increased to lower the cost, but it is unclear how much these changes lowered the cost. The objective of this research was to estimate the impact of the subsidy increase on the cost of LRP for feeder and fed cattle by month and for various insurance period lengths and levels.

Design/methodology/approach – The authors collected United States LRP offering data from 2017 to 2021. The authors estimated separate generalized least squares regression for feeder cattle and fed cattle with producer premium as the dependent variable. Independent variables were dummy variables for coverage level, insurance period, month and year as well as dummy variables in commodity years 2019 and 2020 when the LRP subsidy was increased.

Findings – The authors found the subsidy increases did reduce the cost of LRP policies for feeder and fed cattle LRP policies. Producer premiums for feeder cattle LRP polices have declined between $1.41 to $1.90 per cwt and $0.95 to $1.56 per cwt for fed cattle LRP policies depending on the coverage level. Results indicate these subsidy increases did lower the LRP premium costs to producers.

Originality/value – Results show policy implications from the subsidy increases and will be informative to producers when exploring the cost of LRP. This study extends the literature by estimating the reduction in subsidy costs while considering total premiums changed.

Keywords Fed cattle, Feeder cattle, Livestock risk protection, Policy

Paper type Research paper

Introduction

Sudden price declines are not a new risk to cattle producers (Hart *et al.*, 2001; Hall *et al.*, 2003; Belasco *et al.*, 2009), but several events (e.g. Finney County Tyson Foods slaughterhouse fire and supply chain disruptions due to COVID-19) have made this a recurring threat to livestock producers (Lusk *et al.*, 2021; Martinez *et al.*, 2021). Livestock Risk Protection (LRP) insurance is a price insurance policy cattle producers can use to reduce price risk and mitigates losses from sudden price declines. LRP was introduced in 2003 by the United States (US) Department of Agriculture (USDA) Risk Management Agency (RMA), and it allows producers to insure a minimum price level for a certain period. LRP pays policy holders an indemnity at the end of a policy coverage period (insurance period) if a cash price index is lower than the insured price set when the policy is purchased (USDA RMA, 2021a). LRP policies can be purchased daily and tailored for various insurance periods (number of weeks)

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and coverage levels (percent of expected price to insure) as well as insurance on as few as one animal. More specifics about LRP policies are discussed in the following section.

LRP insurance policies can reduce price risk and are relatively effective as other price risk management tools such as futures and options contracts (Coelho *et al.*, 2008; Fuez, 2009; Burdine and Halich, 2014; Merritt *et al.*, 2017; Wei, 2019). Fuez (2009) found LRP and put option contracts were similar in their effectiveness at reducing price risk. Wei (2019) also compared futures and options contracts to LRP. They found LRP was more effective for small cattle producers. However, Burdine and Halich (2014) showed LRP effectively provided a minimum price for producers, but indemnity payments were not likely to be greater than the premium cost. One of the scenarios the study analyzed indicated cattle price would need to decline more than $15 per cwt over the 17-week policy length. This would be an unusually large decline in a short period. Merritt *et al.* (2017) also found some challenges with using LRP for feeder cattle. Selecting the insurance period and coverage level that provided the highest likelihood of receiving a positive payout (indemnity being greater than the cost) depends on various factors such as the month producers were marketing their cattle. They reported receiving an indemnity payment larger than the cost was unlikely.

In practice, there has been limited adoption of LRP by US cattle producers (Hill, 2015). Hill (2015) stated, 7% of US beef cattle producers in their sample had purchased LRP to manage price risk, which was much lower than use of futures and options contracts. Additionally, McKendree *et al.* (2021) found 1% of feedlots in their survey used LRP. These studies give several suggestions to explain the low use of LRP. One reason commonly given for limited use has been the overwhelming number of available insurance period lengths and levels (Burdine and Halich, 2014; Merritt *et al.*, 2017). It is difficult to determine the insurance period length and coverage level that is the best to manage price risk for their operation, suggesting a choice overload problem for producers. Another issue that is frequently mentioned with LRP is the insurance policy is a relatively expensive price risk management tool (Burdine and Halich, 2014; Merritt *et al.*, 2017). Indemnities are often time less than the cost of the LRP policy; thus, a producer might be better off taking the price loss in the market than buying the LRP policy and receiving the indemnity payment (Burdine and Halich, 2014; Merritt *et al.*, 2017).

Starting in July of 2019, the USDA RMA increased the amount of the LRP premium that is subsidized from 13% of the total premium cost to 20% of the total premium cost. Then, in July 2020 (commodity year), a subsidy rate structure was adopted to further increase the premium subsidy. The 2020 subsidy rates were tiered and based on the coverage level. The new subsidy structure is a 35% subsidy rate for a coverage level between 95 and 100%, 40% for coverage between 90 and 94.99%, 45% for coverage between 85 and 89.99%, 50% for coverage between 80 and 84.99% and 55% for coverage between 70 and 79.99% (USDA RMA, 2021a). This change would lower the cost of the premiums, assuming the premium cost did not increase along with the new subsidy rate structure.

Boyer and Griffith (2022) estimated the impact of the 2020 LRP subsidy increase on probability of LRP having a higher price than the actual cash price for feeder cattle. They analyzed if the increased subsidy results in a higher likelihood of the indemnity payment being greater than the cost of the policy. The higher subsidy increased the likelihood of LRP paying a higher indemnity than the cost, but this paper assumed the total premium cost did not change. They note their results are probably optimistic since they do not consider premiums increasing with the subsidy increase. Thus, there is uncertainty concerning the subsidies impact on the producer portion (total cost minus subsidy) of the premium because total premiums could have increased at the same time the subsidy rates were increased, resulting in the subsidy increase providing little assistance. Additionally, Boyer and Griffith (2022) did not consider the impact of the subsidy change on fed cattle LRP policies.

Therefore, this study estimates the impact of the subsidy increase on the cost of LRP for feeder and fed cattle by month and for various insurance period lengths and levels. We use LRP offering data from 2017 to 2021 (commodity years) and estimate a generalized least squares regression. Results will indicate how these subsidy increases impacted the LRP premium cost for producers and will be informative to producers when exploring the cost of LRP.

Livestock risk protection

One of the well-known challenges with feeder cattle futures and options contracts is the contracts are traded in 50,000-pound increments, and many producers do not sell 50,000 pounds of cattle at one time (USDA National Agricultural Statistic Service (NASS), 2021). An advantage of LRP is a policy holder can insure as few as one animal, thus, studies have shown LRP better suits small cattle producers in reducing price risk than futures contracts (Wei, 2019). Purchasers of LRP also have a maximum of 12,000 head they can insure in one federal crop year (July 1-June 30). Also, like futures and options contracts, LRP can be purchased daily.

When purchasing LRP, a purchaser needs to select a LRP insurance period of 13, 17, 21, 26, 30, 34, 39, 43, 47 or 52 weeks and a coverage level which is a continuous range between 70 and 100% of the expected price at the end of the insurance period. The combination of different coverage levels and insurance period lengths results in a lot of options for producers to choose from when purchasing LRP, hence suggesting the choice overload issue as being a barrier to adopt. The expected price changes daily and varies across steers, heifers, brahman and dairy cattle. The contract also specifies if the feeder cattle are less than 600 pounds, 600 to 900 pounds, or fed cattle (1,000 to 1,400 pounds). In 2021, another option was included as unborn cattle. The LRP expected price represents the anticipated price at the termination of the insurance period. For LRP-feeder cattle policies, the expected price is based on the Chicago Mercantile Exchange (CME) feeder cattle futures contracts and indemnified based on the CME Feeder Cattle Index (FCI), which is a cash index for 700 to 899-pound steers in a 12-state region. The LRP-fed cattle policy sets the expected price based on CME live cattle futures contracts and is indemnified based on the weekly five-area weighted average price for slaughter cattle reported by USDA.

Indemnities are zero if the coverage price, which is equal to the expected ending price multiplied by the coverage level, is less than the actual ending price. However, the indemnity is the difference between the coverage price and actual ending price if the opposite is true. LRP premiums depend on the classification of cattle, coverage level, insurance period length, expected termination date and date of purchase. Premiums increase as coverage level and insurance period length increases as well as fluctuate across termination months. A well-documented challenge with LRP is these indemnity payments are typically below the cost of the policy (Burdine and Halich, 2014; Merritt *et al.*, 2017).

Data

Daily LRP offering and actual ending price data were obtained from USDA RMA (2021b). We wrote a program using R Studio to download daily LRP offerings for feeder and fed cattle from January 2017 to June 2021. Data were then cleaned and merged using SAS (SAS Institute Inc., 2003). Data contained information about all the individual offerings of LRP such as offering date (insurance effective date), date of termination, insurance period length, coverage levels, expected ending price, premium, subsidy and actual ending price. Additionally, LRP-daily offerings with insurance periods exceeding 30 weeks are limited; therefore, we excluded LRP policies over 30 weeks from the analysis. An insurance period length of 34 weeks or 238 days would be a long time for feeder cattle or cattle in the feed lot in practice. Also, LRP offerings with a coverage level less than 85% were dropped. Again, there are limited offerings of LRP policies with this coverage level. Other research has also removed these observations from their analysis for these reasons (Merritt *et al.*, 2017).

Figure 1 shows the average total premium, producer premium (total premium minus the subsidy) and the subsidy paid for feeder cattle by month over the timeframe of these data analyzed. Figure 2 shows the same data but for fed cattle LRP policies. These figures demonstrate how subsidies increased when the new subsidy structure was enacted, however, premiums were also increasing. These figures also show the cost to a producer ranged from \$1.66 to \$4.47 per cwt with an average of \$2.80 per cwt for feeder cattle. While fed cattle premiums were lower with an average of \$2.18 per cwt with a range of \$1.26 to \$2.95 per cwt. These figures also demonstrate how premiums increased with the rapid decline in cattle prices during COVID-19.

Table 1 displays the average LRP producer premium by coverage level and insurance period for feeder and fed cattle LRP policies. Producer premium costs increase as coverage level increases for both feeder and fed cattle LRP policies. When insurance period length increased, premiums also increased. Also, fed cattle LRP policies were lower cost than feeder cattle LRP policies, which is due to the general magnitude of prices in that feeder cattle prices are higher than fed cattle prices. Figure 3 shows the average premium for feeder and fed cattle policies by month. Premiums fluctuate across months with premiums peaking in September and October. These data show producer premiums for LRP policies vary by month, coverage level and insurance period for both feeder and fed cattle.

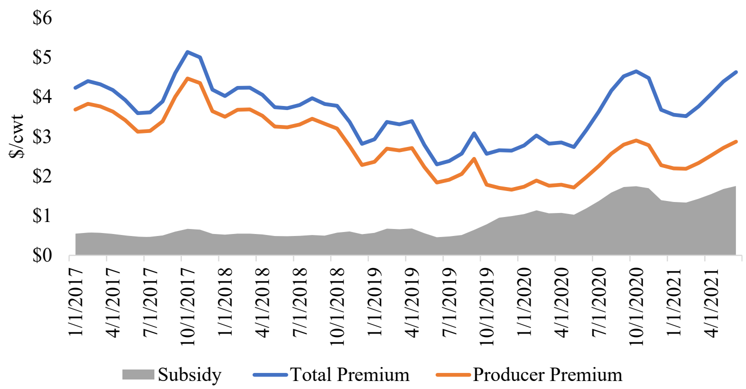

Figure 1.
Average premium, producer premium and subsidy amounts (\$/cwt) for LRP feeder cattle policies

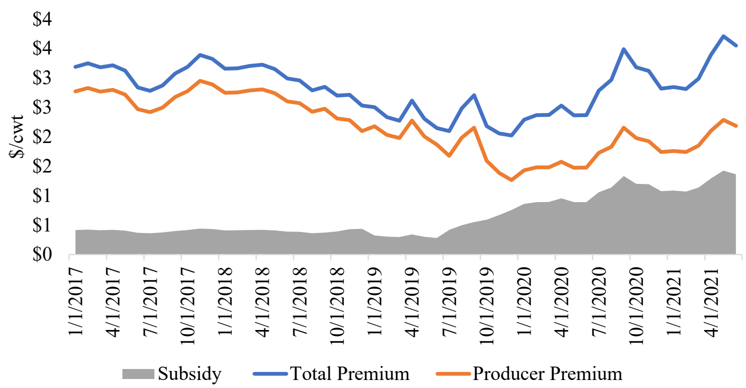

Figure 2.
Average premium, producer premium and subsidy amounts (\$/cwt) for LRP fed cattle policies

Estimation

We estimated two models with producer premium as the dependent variable. One model, feeder cattle LRP producer premium was the dependent variable, and the second model, fed cattle LRP producer premium was the dependent variable. The 2019 LRP subsidy change increased the subsidy from 13% to 20% of total cost. Therefore, the total cost would shift down and not interact with coverage level or insurance period. However, the 2020 subsidy increase was tiered based on coverage level and the minimum subsidy was 35% for a coverage level between 95 and 100%. Since the subsidy increase was different across coverage levels, interaction variables of coverage level with the date when the 2020 subsidy was enacted were created. Other independent variables were dummy variables for coverage level, insurance period, month and year. We estimate the models specified for feeder and fed cattle LRP premiums:

$$P_{ckmt} = \alpha + \sum\nolimits_{c=1}^{3-1}\beta_c L_c + \sum\nolimits_{k=1}^{5-1}\gamma_k P_k + \delta_1 D_{19} + \delta_2 D_{20} + + \sum\nolimits_{c=4}^{3-1}\tau_c L_c \times D_{20} + \sum\nolimits_{m=1}^{12-1}\mu_m M_m + \sum\nolimits_{t=1}^{5-1}\omega_t Y_t + \varepsilon_{ckmt} \quad (1)$$

where P_{ckmt} is the producer premium ($ per cwt) for LRP policy with coverage level c (c = 85–89.99%, 90–94.99%, 95–100%) with insurance period k (k = 13, 17, 21, 26, 30 weeks) in month m (m = January,.., December) in year t (t = 2017–2021); L_c is a dummy variable for

Coverage level	Insurance period 13 weeks	17 weeks	21 weeks	26 weeks	30 weeks
Feeder Cattle (n = 4,747,460)					
Coverage level 85–89.99%	\$0.68	\$0.90	\$1.09	\$1.25	\$1.35
Coverage level 90–94.99%	\$1.49	\$1.82	\$2.10	\$2.30	\$2.43
Coverage level 95–100%	\$3.29	\$3.73	\$4.10	\$4.38	\$4.58
Fed Cattle (n = 1,374,826)					
Coverage level 85–89.99%	\$0.55	\$0.72	\$0.85	\$1.00	\$1.10
Coverage level 90–94.99%	\$1.28	\$1.55	\$1.77	\$1.98	\$2.09
Coverage level 95–100%	\$2.83	\$3.21	\$3.50	\$3.79	\$3.95

Table 1. Average producer premium ($/cwt) for feeder and fed cattle LRP policies by insurance period and coverage level for commodity years 2017–2021

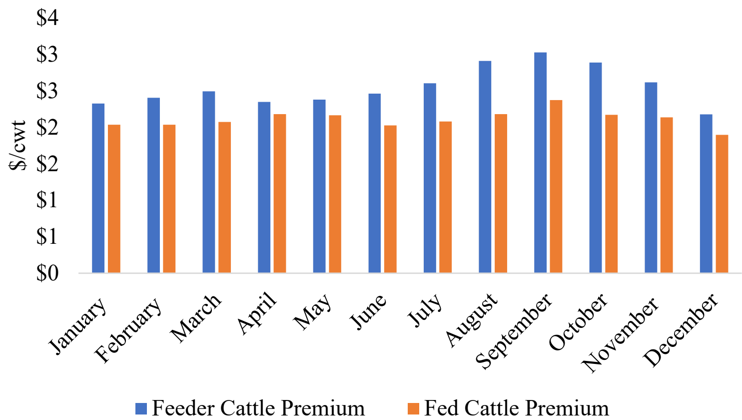

Figure 3. Average producer premium ($/cwt) for LRP feeder and fed cattle policies by month for commodity years 2017–2021

coverage level; P_k is the insurance period dummy variable; D_{19} is an indicator variable for the 2019 subsidy increase and is equal to one after June 1, 2019 (commodity year 2019) and zero otherwise; D_{20} is an indicator variable for the 2020 subsidy increase and is equal to one as of June 1, 2020 (commodity year 2020) and zero otherwise; M_m is a dummy variable for month; Y_t is a dummy variable for year (calendar year); ε_{ckmt} is the error term; and $\alpha, \beta, \gamma, \tau, \delta, \mu$, and ω are parameters to be estimated. The models were estimated with generalized least squares regression assuming multiplicative heteroskedasticity with ROBUSTREG procedure in SAS (SAS Institute Inc., 2003). The variance equation assumed the same independent variables as the mean equation.

Parameter estimates represent dollar per cwt changes in producer premiums for LRP policies. Estimates are used to determine how much the producer premium declined by coverage level for both feeder and fed cattle LRP policies. Since the independent variables are dummy variables, estimates are interpreted relative to the dropped variable. Dropped variables in our model include coverage level of 95–100%, 30-week insurance period, month of December and year 2021. We hypothesize the parameters for the subsidy change were different from zero.

Results

Table 2 shows the estimated parameters for each model. All parameters were significant at the 0.001 level. R-squared was 0.6878 for feeder cattle and 0.7136 for fed cattle models.

Table 2. Estimated parameters for determinants of livestock risk protection insurance premiums for producers

Parameter	Feeder cattle Estimate	Feeder cattle Standard error	Fed cattle Estimate	Fed cattle Standard error
Intercept	6.338	0.0041	5.051	0.0053
Coverage level 85–89.99%	−3.097	0.0016	−2.813	0.0018
Coverage level 90–94.99%	−2.042	0.0016	−1.860	0.0019
Insurance period 13 weeks	−0.960	0.0009	−0.698	0.0013
Insurance period 17 weeks	−0.669	0.0009	−0.491	0.0013
Insurance period 21 weeks	−0.413	0.0009	−0.314	0.0013
Insurance period 26 weeks	−0.171	0.0009	−0.130	0.0014
2019 subsidy	−1.308	0.0029	−0.791	0.0032
2020 subsidy	−1.900	0.0038	−1.561	0.0047
Coverage level 85%–89.99% x 2020 subsidy	0.485	0.0018	0.610	0.0024
Coverage level 90%–94.99% x 2020 subsidy	0.278	0.0019	0.381	0.0026
January	−0.361	0.0011	−0.156	0.0018
February	−0.394	0.0011	−0.187	0.0018
March	−0.403	0.0011	−0.183	0.0017
April	−0.460	0.0012	−0.174	0.0018
May	−0.486	0.0012	−0.185	0.0018
June	−0.484	0.0013	−0.292	0.0019
July	−0.428	0.0014	−0.306	0.0022
August	−0.223	0.0015	−0.261	0.0024
September	0.344	0.0020	−0.021	0.0026
October	0.325	0.0013	0.051	0.002
November	0.173	0.0013	0.072	0.0018
2017	−0.585	0.0037	−0.482	0.0046
2018	−0.843	0.0034	−0.551	0.0043
2019	−0.762	0.0014	−0.514	0.0023
2020	−0.346	0.0007	−0.250	0.0012
Observations	4,747,460		1,374,826	
R-squared	0.6878		0.7136	

Note(s): All estimated parameters were significant at the less than 1% level

Signs for coverage level parameters show premiums declined as the coverage level was lowered for both feeder and fed cattle LRP policies. Feeder cattle LRP policies were $3.01 per cwt lower when coverage level was between 85 and 89.99% relative to similar policy with coverage between 95 and 100%. Likewise, for fed cattle policies, the average premium was $2.81 per cwt lower for coverage between 85 and 89.99% compared to coverage of 95–100%. Relative to the 30-week insurance period, premiums declined for shorter insurance periods. For example, a 13-week LRP policy for fed cattle was $0.69 per cwt lower than the 30-week insurance period. These results show similar directional impacts shown in Table 1. Also, the longer the insurance period, the more uncertainty that price changes could occur. Shorter periods are less likely than longer periods to price swings to result in an indemnity payment. Thus, the longer insurance period, the higher the premium. These premium prices across coverage level and insurance period are like what was reported by Merritt *et al.* (2017).

Premiums were also shown to change across months, which is also represented in Figure 3. This seasonal price change is due to seasonal price changes in cattle markets. For example, typically feeder cattle prices decline in September and October due to more calves being marketed during this period, thus, LRP premiums are higher due to normal declines in feeder cattle prices. While premiums are higher during these time periods, Merritt *et al.* (2017) and Boyer and Griffith (2022) showed LRP is effective in the September, October and November likely because cattle prices are typically declining and the policies available for these months are sold during a time of higher or increasing feeder cattle prices. These same studies also show LRP is not an effective price risk management tool for producers marketing in June, July and August but this is the time when premiums were the lowest. There is less fluctuation in fed cattle LRP premiums relative to feeder cattle premiums. Premiums are the highest for fed cattle LRP policies in September but also increase in April, May, August and October. The fixed effects for calendar year were also significant and negative. Relative to 2021, LRP premiums were lower in previous years, which could be due to several factors. These parameters are intended to account for factors such as annual price volatility and changes in the US cattle supply.

The estimated parameters for subsidy change in 2019 and 2020 were significant and negative. This shows the producer premiums were lowered for feeder cattle and fed cattle in these years. The interaction of the 2020 subsidy changes and the coverage levels are positive and significant and the dropped interaction is the intersection of coverage level 95–100% and the 2020 commodity year subsidy. This means the absolute value of the LRP subsidy was reduced more for higher coverage levels than lower coverage levels. The new subsidy structure in 2020 was a 35% subsidy rate for a coverage level between 95 and 100, 40% for coverage between 90 and 94.99%, 45% for coverage between 85 and 89.99%, 50% for coverage between 80 and 84.99% and 55% for coverage between 70 and 79.99% (USDA RMA, 2021a). It would seem logical lower coverage levels would see a larger reduction in premiums given this rate structure. However, the premium cost for the producer was lowered relative to the total premium cost. Since lower coverage levels already have a lower premium (see Table 1), the higher relative subsidy increase does not reduce premiums as much as a lower relative subsidy increase for more costly policies (i.e. higher coverage levels). For example, a 35% subsidy at a higher coverage level results in a higher absolute premium reduction than a 55% subsidy at a lower coverage level because the premium for the higher coverage level was higher to start with.

Figure 4 shows the absolute reduction in producer premiums across feeder and fed cattle at different coverage levels. The increased subsidy in 2019 reduced the premium cost to producers by $1.31 per cwt for feeder cattle LRP policies and $0.79 per cwt for fed cattle LRP policies. The absolute reduction in fed cattle LRP policies was lower because the price of these policies is lower to start with. The 2020 subsidy increase showed expected trend results for feeder and fed cattle LRP policies. For a feeder cattle LRP policy, the producer premium was reduced \$0.11 per cwt, \$0.31 per cwt and \$0.59 per cwt when the coverage level was 85–89.99%, 90–94.99% and 95–100%, respectively. Producer premiums for fed cattle LRP policies were reduced \$0.16 per cwt, \$0.39 per cwt and \$0.77 per cwt when the coverage level was 85–89.99%, 90–94.99% and 95–100%, respectively. Thus, we show the 2019 subsidy increase lowered the producers' LRP policies for feeder cattle more than fed cattle policies, but the 2020 subsidy increase lowered the producer premium for fed cattle policies more than the feeder cattle policies.

One potential issue to consider with these observed changes in the producer cost of LRP is how this impacts the use of substitute products to manage price risk (forward contracting or options contracts). A lower cost of LRP could encourage more producers to switch from using CME products to LRP which could thin the volume of underlying CME products. This could have implications for CME pricing which the LRP price is based on. This could be an unintended consequence and something worth exploring in future research.

Conclusion

Limited adoption of LRP by US cattle producers and recognition of limitations of the program have resulted in the USDA RMA increasing the subsidy provided to producers when purchasing this product. The goal of this policy change was to reduce the cost and hopefully make LRP a more cost-effective price risk management tool. We determine the impact of the subsidy increase on the cost of LRP for feeder and fed cattle for various insurance period lengths and levels using daily LRP offering data from 2017 to 2021 (commodity years). We estimate a generalized least squares regression for feeder cattle and fed cattle LRP policies.

The results showed that for feeder and fed cattle LRP policies, the premium increased as the coverage level increased and as in the insurance period length increased. Also, premium prices vary by month and are likely driven by the seasonality of cattle prices. We found the subsidy increases did reduce the cost of LRP policies for feeder and fed cattle LRP policies. Overall, producer premiums for feeder cattle LRP polices have declined between \$1.41 to \$1.90 per cwt and \$0.95 to \$1.56 per cwt for fed cattle LRP policies depending on the coverage level. Results indicate these subsidy increases impacted the LRP premium cost for producers.

This paper extends the literature by estimating the reduction in subsidies costs while considering total premiums changed. However, this study is not without shortcomings. We show the new subsidy structure lowers the producer cost of LRP, but we do not know if this reduction will encourage more adoption of LRP. Future research needs to be conducted to address barriers to adopting LRP and if a lower premium impact producers' decision to use

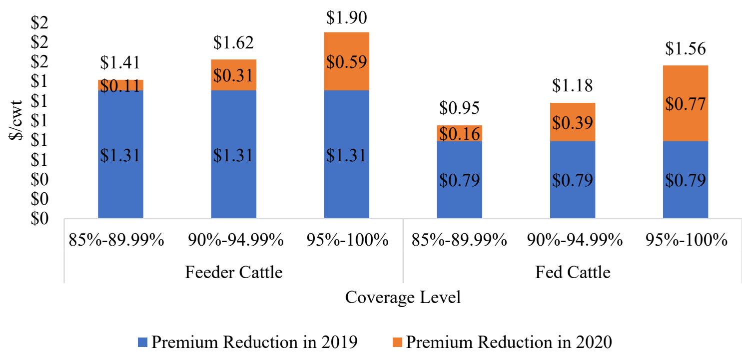

Figure 4.
Reduction in producer premiums for feeder and fed cattle LRP policies from the 2019 and 2020 subsidy increases

LRP to reduce price risk. This same type of study could also compare the cost of a substitute price risk management tool such as forward contracting or put options. Furthermore, while the producer premium did decline for these policies, this paper does not measure how much the total cost of the LRP policies changed with the new subsidy increases. Future work could look at total costs to see if the cost of LRP has changed with the new subsidy rate structure.

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