
ECONOMICS

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Locoweed Poisoning Causes Economic Losses for Yearling Stocker Enterprises

Les P. Owen, L. Allen Torell, and J. David Graham

Economic losses from locoweed poisoning vary with the degree of poisoning and are estimated to average \$282/head for severely poisoned animals.

Differences in production for cattle poisoned by locoweed have not been quantified and are known to vary considerably from year to year and from ranch to ranch. Thus, much of the information used in developing an economic model for evaluating economic losses from locoweed poisoning is based on the experiences of knowledgeable livestock producers in northeastern New Mexico, as described at meetings and ranch visits held during summer 1997. Grazing trials conducted by various researchers with New Mexico State University and the U.S. Department of Agriculture, Agricultural Research Service (USDA-ARS) provided research-based estimates of animal performance expected with increasing levels of locoweed intoxication and following alternative management options (See *Degree of Locoweed Poisoning Predicts Yearling Stocker Performance*, p. 71).

Estimating economic losses from locoweed poisoning requires definition of key production and economic parameters for a cost and return comparison, including assumptions about expected yearling average daily gain (ADG), the length of time until cattle performance is negatively impacted by locoweed consumption, the expected recovery period once cattle are removed from locoweed infested pastures, and the proportion of the yearling herd intoxicated to different degrees during a typical year. We have detailed these basic assumptions (table 1).

Economic losses from locoweed poisoning were estimated using a “with” and “without” poisoning comparison. This comparison is not made, however, between a situation where the total herd is poisoned as compared to no locoweed poisoning at all. Poisoning of the entire herd is not typical or expected. While widely variable, ranchers estimate that during a typical year, 68% of the herd will not consume locoweed in high enough quantities to significantly impact animal performance. An estimated 25% of the herd will be moderately intoxicated and 7% will be severely poisoned from eating the weed.

Once intoxicated animals are identified, prudent ranchers do not let them continue to eat locoweed. Ranchers generally recognize that to not remove intoxicated animals from the rest of the herd will result in increased and significant economic losses. Therefore, intoxicated animals are generally removed from the main herd. In some cases, animals are removed once they are observed eating the poisonous plant, but the most common strategy is to pull the animals from the pasture once visible signs of locoweed poisoning are observed.

A few ranchers participating in rancher meetings sold intoxicated animals immediately after the poisoning problem was diagnosed, but it was most common to heal the animals in a recovery area with supplementation for 60 to 120 days before sale. The cost of the healing process is considered in the economic comparisons presented below.

The estimated costs and returns for a typical northeastern New Mexico yearling stocker operation are detailed (table 2) with alternative levels of locoweed poisoning. We summarized these differences in costs

and returns on a \$/head basis for yearlings that are moderately and severely poisoned by locoweed, as compared to yearlings that are not poisoned by the weed. The difference in gross returns (\$68 for moderate, \$184 for severe) are due to reduced livestock performance and the resulting lighter sale weights. With the assumed *loco and pull* management option in place, yearlings are rehabilitated so that the visual symptoms of locoweed poisoning are gone by the time of sale, thus no price reduction for intoxicated animals was included.

While in recovery, moderately intoxicated steers were assumed to be supplemented with 1 lb/head/day cottonseed cake for 57 days. This results in an added \$7/head supplementation cost for cattle in the moderately poisoned category. Severely intoxicated cattle are supplemented with 10 lb/head/day alfalfa and 1 lb/head/day corn for 120 days while in the recovery area. Additional feed costs for severely poisoned animals are then estimated to be \$98/head.

Economic losses from locoweed poisoning are substantial and include both reduced sales value and increased production costs. Net ranch income, which measures the net return to operator labor, management, investment, and risk, was reduced by \$75/head for moderately poisoned cattle and \$282/head for severely poisoned cattle.

Estimated economic losses from locoweed will change from those estimated here as market conditions and input costs change. We evaluated several different beef price situations, including the high price years of 1991 through 1994 and the relatively low price years of 1995 and 1996. Because net returns for yearling operators are determined by the margin between purchase and sale price along with other production costs, and because this average price differential has not changed much recently (except for a narrowing of the margin as prices decreased in 1995 and 1996), the economics of yearling stocker production and the economic losses from locoweed poisoning were estimated to be similar for each of the recent production years. An average of 1990 through 1996 beef prices was used in the economic model.

Economic losses to locoweed poisoning for yearling stocker operations in northeastern New Mexico, 1997.

	Moderate	Severe
	(\$/head)	
Lost gross revenue from diminished livestock performance	\$68	\$184
Added costs for rehabilitating locoweed-poisoned animals	7	98
Net difference in net ranch income	75	282

Note: Detailed calculations are shown in table 2. The comparisons for moderate and severe locoweed poisoning are made relative to the nonintoxicated category.

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Table 1. Economic model definition for northeastern New Mexico during a typical year.

Model parameter	Definition	
1. Date yearlings are turned out on rangeland	May 1	
2. Sale date	October 15	
3. Length of yearling grazing period	167 days	
4. Number of cattle purchased	550 head	
5. Livestock weights		
a. Weight of cattle at purchase	430 lbs	
b. Weight of cattle at sale	Variable with amount of poisoning	
6. Percent of herd in locoweed intoxication category		
a. Nonintoxicated	68%	
b. Moderate	25%	
c. Severe	7%	
7. Seasonal death loss by intoxication category		
a. Nonintoxicated	1%	
b. Moderate	2%	
c. Severe	3%	
8. Expected ADG (lb/head/day) for nonintoxicated cattle	1.84	
9. Variation in ADG over grazing season for moderately and severely intoxicated cattle.		
Average ADG, moderate (lb/head/day)	1.07	
Average ADG, severe (lb/head/day)	0.42	
Event	Moderate	Severe
a. Days after entering pasture until ADG is affected by locoweed poisoning	21	21
b. Days with declining ADG	9	24
c. Days after entering pasture until visual signs of poisoning are observed	30	30
d. Days of weight loss (negative ADG)	0	30
e. Minimum ADG	0	-0.30
f. Days until positive gain resumes once moved to recovery area	7	60
g. Days until peak gain is reached on the rebound after moving to recovery area	50	120
h. Maximum ADG during recovery	1.50	1.00
i. Supplemental feeding during recovery	1 lb/head/day of cottonseed cake (\$250/ton)	1 lb/head/day of corn (\$350/ton) and 10 lb/head/day of alfalfa (\$128/ton)
10. Ranch size, inputs used, production costs, and overhead expenses	Various cost categories defined for typical northeast New Mexico ranch	
11. Beef prices		
Base purchase price (\$/lb) for 450 lb steer	\$0.90	
Base sale price (\$/lb) for 650 lb steer	\$0.78	

Table 2. Cost and return estimates for *loco and pull* management.

Number	\$/CWT	Sale weight (CWT)	Total (\$)	\$/head purchased			Weighted average
				No loco	Moderate loco	Severe loco	
I. Gross returns							
370 Non-loco steers	\$76.00	7.37	\$207,244	\$554.13			
135 Moderate-loco steers	\$78.00	6.35	\$66,866		\$486.29		
37 Severe-loco steers	\$74.00	5.20	\$14,238			\$369.81	
Total			\$288,348	554.13	486.29	369.81	524.27
II. Costs							
A. Variable costs							
1. Feed:							
29.2 Purchased hay	Tons	128	3,738	1.63	1.63	78.43	7.01
1.0 Grain	Tons	352	352	0.64	0.64	0.64	0.64
2.2 Corn	Tons	350	777	0.00	0.00	21.00	1.47
3.8 Cottonseed cake	Tons	250	962	0.00	7.13	0.00	1.78
7.7 Protein supplements	Tons	253	1,948	3.54	3.54	3.54	3.54
2.0 Salt	Tons	130	260	0.47	0.47	0.47	0.47
7.0 Minerals	Tons	323	2,261	4.11	4.11	4.11	4.11
Total			10,298	10.39	17.52	108.19	19.02
2. Livestock Expenses:							
550 Purchased steers	CWT	4.30	91.76	217,008	394.56	394.56	394.56
Miscellaneous other expenses				24,739	44.98	44.98	44.98
Total				241,747	439.54	439.54	439.54
Total variable costs				252,044	449.93	457.06	458.56
B. Fixed costs							
Total fixed costs				21,855	39.74	39.74	39.74
Total costs				273,899	489.67	496.80	498.30
C. Net ranch income							
				14,448	64.46	-10.50	25.97
Proportion of yearling purchased							
				68%	25%	7%	100%

Adapted from medium-sized yearling stocker enterprise budgets presented in the *New Mexico Livestock Cost and Return* series, 1996. Assumes that 550 head of yearling steers are purchased. The feed costs of healing intoxicated animals are included in the appropriated expenses categories.

Healing Locoweed-Poisoned Cattle Before Sale Decreases Economic Losses

L. Allen Torell, Les P. Owen, and J. David Graham

Allowing locoweed-poisoned cattle to recuperate is a better economic choice than immediately selling animals with visible signs of poisoning.

It is discouraging to notice that part of your herd has been into the weed. It is widely recognized that at the very least intoxicated animals must be moved to a locoweed-free area. Then extended rehabilitation with supplemental feeding is required before eventual sale in the fall. Another option is to haul the animals directly to the sale barn. We compared the economics of these two options—immediate sale versus *loco and pull* management, using the economic model described in *Locoweed Poisoning Causes Economic Losses for Yearling Stocker Enterprises*, (p. 76).

According to that article, if *loco and pull* management is practiced and intoxicated animals are moved to a locoweed-free area and supplemented for an extended period of time before sale, net ranch returns are estimated to be \$64/head for animals not affected by locoweed poisoning, negative \$11/head for moderately intoxicated animals, and negative \$217/head for those severely poisoned by locoweed. For locoweed-intoxicated cattle, a loss is expected with the 1990 to 1996 average beef prices used in the enterprise budget assessment. The added cost of the supplements and rehabilitation, and especially the reduced sale weight, eliminates profit for locoweed-intoxicated animals.

Detection of animals eating locoweed is difficult and influenced greatly by how closely cattle are monitored. In this cost comparison, we assume poisoned animals are identified 30 days after entering a locoweed-infested pasture. If sold after this 30-day period, animals purchased at 430 pounds would weigh about 480 pounds. Significant production expenses would already have been incurred as animals were received and prepared for the grazing season. It also would be obvious to knowledgeable buyers that severely intoxicated animals had been into the weed. Correspondingly, northeastern New Mexico ranchers estimate a price discount of 10 to 85% would be expected, depending on the severity of poisoning. In the analysis, we used a 50%-price discount for severely poisoned animals and 10% for those moderately poisoned. This is similar to the estimates provided by Kansas researchers, in which the characteristics and prices received for animals sold at Midwestern livestock auctions were studied. A discount for feeder cattle of 33% was estimated for animals that were stale, sick, and had a rough, dull coat. An additional discount of 46% was noted for animals with lumps, bad eyes, and lameness—conditions that are common for locoweed-poisoned animals.

Immediate sale of poisoned animals results in significantly higher economic losses from locoweed, relative to rehabilitating the animals on the ranch for an extended period before sale (table 1). With 1990 to 1996 average beef prices and with price discounts assumed for intoxicated cattle, the economic loss per animal increases by \$103/head for moderately intoxicated animals and by \$68 for severely intoxicated animals, if animals are sold immediately instead of rehabilitated. Letting animals heal before sale is clearly a better economic choice.

In our budget assessment, cost items did not include a land charge, because we assumed the rancher had a locoweed-free area on the ranch, and the calculated net ranch income is a residual return to unpaid resources including land (table 1). As assumed in the analysis, a locoweed-free area would be needed for four and one-half months to rehabilitate animals. The added losses from immediate sale suggest a substantial amount could be spent to acquire the needed locoweed-free area.

Table 1. Economic losses to locoweed poisoning for yearling stocker operations in northeastern New Mexico, following alternative marketing strategies (\$/head).

	<i>Loco and pull management</i>		<i>Immediate sale</i>		<i>Added loss from immediate sale</i>	
	Moderate	Severe	Moderate	Severe	Moderate	Severe
Gross returns	\$486	\$370	\$376	\$204	-110	-166
Added costs for recovering locoweed-poisoned animals	7	98	0	0	7	98
Net difference in net ranch income	-11	-217	-114	-285	-103	-68

Note: Except for supplementation costs, production costs are assumed to be the same as shown in table 2 of *Locoweed Poisoning Causes Economic Losses for Yearling Stocker Enterprises* (p. 76). Many of these costs are incurred at the time of yearling purchase and other variable costs do not substantially change without major changes in herd size. A 10% and 50% sale price discount is assumed for moderately and severely intoxicated animals, respectively.

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The Economic Value of Having a Locoweed-free Area

L. Allen Torell, Kirk McDaniel, Les P. Owen, and J. David Graham

Rangeland devoid of locoweed is worth nearly \$8 per acre. With this relatively high economic value, spraying silky crazyweed is an economically feasible alternative provided the treatment lasts two years.

As shown in *Healing Locoweed-Poisoned Cattle Before Sale Decreases Economic Losses* (p. 80), economic losses from locoweed poisoning increase substantially if poisoned animals are sold immediately and, especially, if they exhibit visible signs of poisoning when sold. A better choice is to heal affected animals on the ranch for an extended period with range forage, supplemental feeds, and extra care. We have called this strategy *loco and pull* management because grazing animals are left in locoweed-infested pastures until visual signs of poisoning are observed, then they are moved to locoweed free areas for rehabilitation.

Through the added effort and expense of *loco and pull* management a net return of \$103/head can be recovered for moderately poisoned animals, with 1990 to 1996 average beef prices. Severely poisoned animals do not gain as well and require additional feeding and care, thus, net returns recovered from the healing process are reduced to \$68/head (table 1 in *Healing Locoweed-Poisoned Cattle Before Sale Decreases Economic Losses*, p. 80). When the relative number of moderate and severely poisoned animals on the ranch are considered (assumed to be 25% and 7% of the herd, respectively in our analysis) the weighted average value of healing intoxicated animals is estimated to be \$95.34/head.

The value of rehabilitation can be converted to a \$/acre value by considering the standard stocking rate allowance used in northeastern New Mexico of 15 acres per yearling for a 6-month grazing season. The rehabilitation period assumed in the economic evaluation is 4½ months, thus the equivalent grazing allowance for this shorter grazing season would be 12 acres/head. The \$95.34/head rehabilitation value means, then, that the value of a locoweed free area is \$7.95/acre ($\$95.34/\text{head} \div 12 \text{ acres/head}$). This assumes that a locoweed-free pasture exists on the ranch and poisoned steers and heifers can be moved to this area, fed additional supplements, and rehabilitated before sale in late fall.

In many cases, especially during those years when locoweed infests major areas, northeastern New Mexico ranches do not have locoweed-free pastures. When this is the case, at least three management options exist. First, affected animals can be sold immediately after diagnosing that they are poisoned by locoweed. As discussed above, and as shown in *Healing Locoweed-Poisoned Cattle Before Sale Decreases Economic Losses* (p. 80), this is not the preferred alternative. Substantially more money is lost per head from the early sale of visibly intoxicated animals as compared to healing the animals on the ranch.

A second alternative is to spray locoweed in some pastures and selectively move intoxicated animals to these locoweed-free areas. This requires early planning because locoweed must be removed by spraying before the grazing season begins. It also is important to determine whether silky crazyweed or woolly locoweed is causing the problem. As discussed in *How Long Does Locoweed Control Last?* (p. 62), woolly locoweed is a cyclic plant with a relatively short expected life span. The weevil, *Cleonidius trivittatus* is believed to largely keep woolly locoweed from being a persistent problem (see *Common Loco-*

weed-Feeding Insects, p. 42). Silky crazyweed, however, is long-lived and can be expected to persist without control.

Using one of the recommended spray treatments, the cost of chemical control is estimated to average \$14 to \$16/acre with aerial application. As shown in *Controlling Locoweeds with Herbicides* (p. 52), excellent control of the poisonous plant can be expected and treatments will generally last from 2 to 6 years. As shown above, the annual economic benefit of having a locoweed-free area is estimated to average \$7.95/acre. This means a herbicide treatment must last at least two years (the year of control plus one more) for the treatment to be economically feasible. If the spray treatment is made the previous fall, or in the spring before the start of the grazing season, and the treatment provides a locoweed-free area for two years, a 12.6% rate of return would be realized on the investment.

Leasing locoweed-free rangeland from a fortunate neighbor is another way that locoweed intoxicated animals can be healed. Considering forage value to be the amount of added losses from forced sale of intoxicated animals if alternative locoweed-free forage is not found, ranchers could afford to spend more than \$23/month/head to lease locoweed-free forage for moderately poisoned animals and \$15/month/head for severe ($\$103 \div 4\frac{1}{2}$ months = \$22.88/month/head for moderately poisoned animals and $\$68 \div 4\frac{1}{2}$ months = \$15.11/month/head for severely poisoned animals). Average rangeland lease rates with care of cattle provided are currently less than these amounts.

As described by northeastern New Mexico ranchers at meeting held in summer 1997, about a third of the herd will likely become intoxicated with locoweed to some degree during a typical year. This suggests that every 150 yearlings purchased will potentially require a section (640 acres) of rangeland that is locoweed-free. Or, given the annual variability in the degree of the locoweed problem, about one quarter to one third of the ranch needs to remain locoweed-free for rehabilitation of locoweed intoxicated animals before sale.

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Averting Cattle from Consuming Locoweed Can Save Money

Les P. Owen, L. Allen Torell, Michael H. Ralphs, and J. David Graham

Conditioning cattle to avoid eating locoweed is estimated to increase net ranch returns by \$32 per head.

Cattle can be trained to avoid eating certain plants through a process known as conditioned feed aversion. Cattle and other animals associate sickness with ingesting certain feeds. By feeding cattle fresh locoweed and then dosing them with an emetic, such as lithium chloride, to induce sickness, they have been trained to avoid eating locoweed. In fact, present and past research has shown a high success rate for training cattle to avoid eating poisonous plants using the feed aversion technique.

The economic model described in *Locoweed Poisoning Causes Economic Losses for Yearling Stocker Enterprises* (p. 76) was used to estimate the potential benefits of averting stocker cattle. The economic model assumes that the *aversion* process is 100% successful, meaning that all averted cattle will remain nonintoxicated throughout the grazing season. Research shows this is the expected result for naive cattle that have not previously eaten locoweed. Cattle that have eaten locoweed and consider it an acceptable feed require two or three treatments before they will stop eating the weed.

We compared the economics of *feed aversion* to what we have called *loco and pull* management, where intoxicated cattle are removed from the herd and given feed supplements to rehabilitate them from the visual symptoms of locoism before sale. A detailed budget for *loco and pull* management is presented in *Locoweed Poisoning Causes Economic Losses for Yearling Stocker Enterprises* (p. 76). With this option, locoweed-eating cattle are allowed to become intoxicated by the poisonous weed and then additional costs are incurred to rehabilitate these animals.

We assumed that no animals would begin to eat locoweed, and rehabilitation of poisoned animals would not be required following the aversion treatment. This treatment requires that fresh locoweed be harvested and presented to hungry animals. Care must be taken to assure that the resulting sickness is associated with the consumption of locoweed and not a desirable forage species. Thus, animals are confined overnight and observed until the locoweed is consumed. They are then given 200 mg/kg of body weight of lithium chloride to induce sickness. The lithium chloride treatment and the labor to harvest the locoweed, administer the treatment, and monitor cattle is estimated to cost \$7/head. The economic payoff from the treatment is that no animals in the herd become poisoned by locoweed.

The net economic benefit from averting cattle was estimated to be \$32/head treated. As shown in table 1, this results largely from the added livestock sales from averted animals, but an estimated \$2/head cost savings also results. This savings occurs because the cost of the aversion was \$2/head less than the supplemental feed costs that would have been required to rehabilitate intoxicated animals without the aversion treatment. This will be highly variable, however, and will depend on the cost of supplemental feeds and how many animals would have been poisoned without the aversion treatment. We assumed 25% and 7% of the herd would have been moderately and severely poisoned without the aversion

treatment. It is the improved performance of this part of the herd that economically justifies the aversion treatment.

In the economic model, we decreased the proportion of the herd potentially affected by locoweed from the assumed levels defined above, while keeping the relative number of moderately and severely poisoned animals the same. By doing this, we could determine at what point the *aversion* treatment and *loco and pull* management would be economically equivalent. We estimate that if more than 9% of the herd (7% moderate and 2% severe) would have been poisoned by locoweed, the *feed aversion* treatment would be superior to the *loco and pull* management strategy. At levels below this point, the cost of averting the entire herd would be greater than the production losses realized given the small number of animals that would have been poisoned.

Table 1. Economic benefits of conditioned feed aversion.

	<i>Loco and pull management</i>	Feed aversion treatment (\$/head purchased)	Benefit of <i>aversion</i>
Gross returns	524	555	31
Supplement feed costs for rehabilitation	-9	0	9
Cost of aversion	0	-7	-7
Net ranch income	26	58	32

Note: Estimates for the *loco and pull* strategy are a weighted average over the entire herd by percent of yearlings in each intoxication category. The *aversion* estimates are based on the total herd remaining as nonintoxicated but with a \$7/head cost for the aversion.

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