The Economic Impact of Poisonous Plants on the Range Livestock Industry in the 17 Western States

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HIGHLIGHT: Poisonous plants cause serious economic losses in many areas of the West. However, there is no systematic way of accounting for the magnitude of these losses. A significant proportion of the poisonous plant loss is reflected in annual death loss in livestock and in calf and lamb crop percentages. By concentrating one's effort on the effect of poisonous plants on these measures, one should be in a better position to make reasonable estimates of the economic costs of poisonous plants. Other losses from poisonous plants should be considered as data become available. Based on the assumptions outlined, the economic loss in the 17 western states is about $107 million annually. Poisonous plants have the potential on many ranches of causing financial ruin to the business. It has been shown that poisonous plants can be economically controlled and losses kept at manageable levels.

The following statements typify efforts to assess the economic importance of poisonous plants to the livestock industry. "Poisonous plants cause great losses on the western range in death of animals and in decreased value, essentially through lesser gains" (Stoddart and Smith 1943). "Poisonous plants are a principal cause of economic loss to the livestock industry in the western United States" (Keeler et al. 1978). "Loss from poisonous plants is one of the major economic problems in livestock production" (Sperry et al. undated). "Yearly livestock losses from plant poisoning in the U.S. amount to many millions of dollars" (Gilkey 1958). "Each year these plants exact a costly toll of the livestock of this state, often as much as 8 percent" (Durrell and Newson 1939).

Poisonous plants have been considered a serious problem on western ranges for many years yet there have been few serious attempts to quantify the magnitude of the losses. The reluctance is understandable since one is faced with several problems that seem insurmountable. First, many ranchers do not recognize poisonous plants on their rangelands nor is the task of identifying the cause of death on animals found on the range an easy one.

Estimating losses from veterinarian reports where attempts to save animals or find cause of loss are involved is not adequate. If the veterinarian can offer little aid to the rancher when called concerning a poisonous plant problem, the rancher is not going to call and pay a veterinarian the next time he has problems. What usually gets reported as poisonous plant losses are cases where the loss is severe, and/or it is an unusual case in a given range area.

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Ranchers tend to figure a certain amount of poisonous plant loss in the average annual death loss in their herds. This idea is expressed in a study in New Mexico, "Livestock poisoning from certain native range plants is one of the hazards to ranching in New Mexico" (Norris and Valentine 1957). Thus, some level of death loss is considered a normal cost of doing business and is not given special attention unless unusually heavy losses occur. Therefore, some people contend that poisonous plant losses are part of the normal cost of doing business in a given ranching area and are reflected in the value of the properties, so why worry about them. However, ranching is not a high-profit business that can stand losses without concern about them. Undoubtedly there are cases where it would cost more to control poisonous plants than the value of animals saved would justify, but there are many more cases where loss prevention is profitable.

Losses from poisonous plants affect the economic returns to ranching in several ways. The most obvious is animals that are killed directly from the consumption of these plants. Death is the loss most often associated with poisonous plants and is probably the easiest loss to evaluate. Some poisonous plants do not kill the animal but severely reduce the production from that animal and/or its offspring. This loss would be reflected in weaning weights, percent calf or lamb crop, unmarketable animals due to birth deformities, and reduced longevity of the breeding herd. Probably the least obvious economic loss caused by poisonous plants on rangelands is that the presence of poisonous plants cause the range resource to be used and developed at less than its optimum. For example, the decision on what class of animal to graze (sheep or cattle) could be a result of trying to avoid poisonous plant problems rather than which class of animal is best suited to utilize the rangeland on the basis of available forage and topography. Poisonous plant problems often dictate the season of use of rangelands, thus not allowing these lands to be used as efficiently as they could without this potential danger.

Livestock and range management costs are often higher where poisonous plants are a problem. These costs include plant control costs, fencing, and more intensive management associated with the presence of poisonous plants.

It is much easier to speculate on the ways poisonous plants cause economic losses to the livestock industry than it is to estimate the magnitude of these losses. Given present knowledge on the subject, it is impossible to make objective estimates of the economic loss caused by poisonous plants. The fact that there is very little empirical data on aggregate estimates of the economic losses from poisonous plants

points to an area where some research effort can be expended.

Annual death loss statistics on beef cattle and sheep include animals that died from poisonous plants. Therefore, in the aggregate, poisonous plant death loss must be less than or equal to the total death loss. It is recognized that individual ranchers or ranching areas where poison plants are particularly serious could have losses higher than the overall average death loss to all causes. But one would find himself in a logically indefensible position if he used local figures on poison plant death loss and applied them to a state or group of states and found poison plant death loss higher than the total death loss to all causes. To avoid this trap, let us look at the reported death loss, to all causes, for adult cattle and sheep in the western states.

U.S. Department of Agriculture (1973) reported annual adult cattle death loss at 2% in 1969. Kearl (1967) shows the following annual death losses in Wyoming: cows—1.6%, 1-2 year old heifers—3.0%, and bulls—5%. Gray (1970) estimates death losses on adult cattle in New Mexico at 2.2-2.7%. Roberts and Gee (1963) report cattle death losses ranging from 3-7%. Gray and Baker (1953) reported death losses over the period 1930-52 in Montana; the average for cattle was 3.6%, the high during the period was 5.9%, and the low was 2.4%. Myles (1963) found the average death loss on adult cattle for a 14-year period to be 3.3% in Nevada. Adult sheep losses are usually higher than adult cattle losses. Relatively low salvage value for cull ewes cause ranchers to run them longer than would be the case if they were worth more as culls. Goodsell and Belfield (1973) reported an average death loss on adult ewes at 6.5% for migratory sheep ranches in Utah and Nevada. U.S. Department of Agriculture (1977) reports the number of ewes 1 year and older on January 1 for each state; they also report an "estimate of adult sheep death losses." Based on these figures for the 17 Western States, the average death loss is about 12%.

It appears from the above studies that the adult cattle death loss is somewhere around 3.0% and sheep losses are about 8-10% annually. Again, it should be emphasized that the death loss can be much higher on an individual ranch or in an area where poisonous plants are particularly serious. The economic significance of this will be discussed in detail later. Poisonous-plant-caused deaths in adult cattle and sheep are part of the annual death loss. The exact proportion is not known, but an upper limit on the estimated loss has been set. The number of cows 2 years old and older, excluding dairy, for the 17 Western States is given in Table 1. The total number of cows as of January 1, 1977, is 22,269,000 (U.S. Dep. Agr. 1977). Each 1% death loss in these cows amounts to 222,690 head or $55,672,500, assuming $250 value per head. Suppose one decides that one third of the death loss is due to poisonous plants. In this case the estimated annual value of the death loss because of poisonous plants would be 1% of the total number of cattle or $55,672,500.

Table 1. Number of cows (excluding dairy) 2 years old and older as of January 1, 1977, for 17 Western States.[1]

State	No. of cows (1,000 head)	State	No. of cows (1,000 head)
Utah	335	Montana	1,549
Idaho	608	Washington	355
Wyoming	721	Texas	6,482
Oregon	599	North Dakota	1,060
Colorado	889	South Dakota	1,388
Nevada	298	Nebraska	2,082
New Mexico	644	Kansas	1,690
Arizona	319	Oklahoma	2,259
California	991	TOTAL	22,269

TOTAL = 22,269,000 head

[1] U.S. Department of Agriculture. 1977. Beef cattle numbers, January 1, 1977. Crop Reporting Board, Statistical Reporting Service.

There were about 7,136,000 head of ewes 1 year old and older in the Western States on January 1, 1977 (Table 2). Each 1% loss would amount to 71,360 ewes or a loss of $3,568,000, given the value of a breeding ewe at $50 per head. Since sheep usually spend more time on rangeland than cattle, one could assume the death loss from poisonous plants to be higher. If the poisonous plant death loss is 3.5%, then the value of animals lost would be: $3,568,000 × 3.5 = $12,488,000.

Table 2. Number of sheep, 1 year and older, as of January 1, 1977, for 17 Western States and estimated annual death loss of adult sheep, 1975.

State	Number of ewes[1]	Estimated death loss[2]
Utah	475,000	86,000
Idaho	420,000	37,000
Wyoming	827,000	156,000
Oregon	247,000	40,000
Colorado	426,000	50,000
Nevada	100,000	17,000
New Mexico	400,000	78,000
California	710,000	68,000
Arizona	283,000	25,000
Montana	410,000	80,000
Washington	50,000	12,000
Texas	1,865,000	100,000
North Dakota	158,000	28,000
South Dakota	510,000	45,000
Nebraska	91,000	22,000
Kansas	115,000	14,000
Oklahoma	49,000	6,000
TOTAL	7,136,000	864,000

[1] U.S. Department of Agriculture. 1977. Breeding sheep, 1 year and older, January 1, 1977. Crop Reporting Board, Statistical Reporting Service.
[2] U.S. Department of Agriculture. 1975-76. Meat animals, production, disposition, income. Crop Reporting Board, Statistical Reporting Service.

If one accepts these estimates, the value of poison plant death loss is $68.2 million annually in the 17 Western States. One should remember that there is no way of estimating, with current information, an exact figure on death losses. However, one could consider them "ball park" figures with a limit on the size of the ball park.

Many poisonous plants do not result in the death of animals but they reduce the performance of the animals. It has been stated by some that this loss could be higher than the actual death loss. Pine needle (*Pinus spp.*) abortion, locoweed (certain species of *Astragalus* and *Oxytropis*) caused abortions, and abortions plus birth deformities caused by several other poisonous plants have serious effects on calf and lamb crop production in many areas of the West.

James (1978) reports:

> In recent years plant toxins have been recognized as important causes of reproductive problems. Certain plant toxins have been shown to cause birth defects, embryonic and fetal deaths, and abortions. The estrogen found in certain plants has adversely affected sexual activities and reproduction in some livestock. The locoweeds and plants of the *Astragalus* and *Oxytropis* genera depress spermatogenesis, oogenesis, and general sexual activity in sheep, cattle, and horses.

To be most useful in an economic sense, calf and lamb crop percentages should be calculated on the number of cows or ewes in the breeding herd to the number of calves and lambs marketed or weaned. Calf and lamb death loss up to market or weaning time would be figured in the calf or lamb crop percentage. Lamb and calf crop percentages figured this way are considerably lower than those reported by many U.S. Department of Agriculture statistics. We have been led to believe that there is not much that can be done to improve lamb and calf crop. There appears to be more slack in this measure of performance efficiency than one might suspect. Reduction of poisonous plant problems is one of the areas of research and management where improvements can be made in the reproduction efficiency of the range livestock industry.

The number of calves available for sale could be increased 222,690 head for each percentage point increase in calf crop and each 1% increase in lamb crop would provide an additional 71,360 head of lambs for sale. The value of calves and lambs for each 1% calf and lamb crop would be as follows: follows:

Calves: 222,690 head × $160 = $35,630,400
Lambs: 71,360 head × $ 45 = $ 3,211,200

Poisonous plants could cause reductions in lamb and calf crop by affecting the reproductive capabilities of the breeding herd, and any lamb or calf death loss from birth to weaning. When a lamb or calf is lost, prenatal or postnatal, a rancher loses the opportunity to sell a calf or lamb at weaning. He has essentially incurred all the costs of producing the additional animals because he has to maintain the breeding herd.

Let us assume calf and lamb crop could be increased 1% if we did not have poisonous plant problems. Thus, the cost for lost calves and lambs would be: $35,630,400 + $3,211,200 = $38,841,600.

In summary, if one accepted the above estimates of poisonous plant losses to the livestock industry in the 17 Western States, the loss would be:

Cattle—1% of total adult animals	$55.7 million
Cattle—1% of calf crop	$35.6 million
Sheep—3.5% of total adult animals	$12.5 million
Sheep—1% of lamb crop	$ 3.2 million
TOTAL	$107.0 million[1]

Because of the diversity of local situations and the complete lack of data, no attempt will be made to estimate the losses caused by less than optimum use of the range resources, reduced weaning weights, and the extra cost of management caused by poisonous plants. However, these losses are real and should be included if data were available.

It is hoped that those of you who do not agree with the above estimate will do some serious thinking and research to make better estimates of these losses.

Poisonous plants pose another serious problem to the rancher that was eluded to above. A rancher operating in an area where poisonous plant problems exist may have learned to manage his animals and his rangelands so as to keep death and other losses caused by these plants at manageable levels. Ranchers in this situation have to continually face another problem. At any time, a given set of circumstances can cause them losses of such magnitude that they are ruined financially. For example, a windstorm blows pine trees down and his cattle consume enough needles to cause an abortion rate of 80-90% in his cow herd. A sheep rancher grazes his sheep on a range infested with halogeton. He knows how to manage his herds in such a way that he gets by with low losses for several years. Then a combination of factors occurs at one time and he loses most of his herd in one day.

Dr. Lynn James, Director, Poisonous Plant Research Laboratory, Logan, Utah, provided the following examples of severe losses. All of the following losses were reported from halogeton. Sheep herds grazing on the Utah-Nevada line had losses of 450 head, 600 head, and 800 head. Some 1,200 head of sheep were killed in Antelope Valley, Utah. A Nevada sheep rancher lost 1,300 sheep at one time. Another rancher lost over 2,000 head of sheep over a period of a couple of years.

Locoweed is another poisonous plant that can cause losses severe enough to put a rancher out of business. In 1972 it was estimated that 20% of all cattle in Southwestern New Mexico were poisoned on locoweed. They were not all killed but their productivity was reduced. In 1958 over 6,000 sheep were killed on locoweed in the Uintah Basin of Eastern Utah. In 1964 one rancher lost $125,000; another rancher lost $55,000; and a third rancher lost $65,000 worth of sheep to locoweed poisoning. Abortion rates of up to 100% in cattle and over 70% in sheep were reported from locoweed poisoning.

Tall larkspur (*Delphinium barbeyi Huth*) poisoning caused the death of 103 mature cattle (valued at $25,750) on one Forest Service allotment in Utah in 1958. The average annual loss was 36 head of cattle (valued at $9,000) over a 15-year period (Nielsen and Cronin 1977).

There is not an abundance of material in the literature concerning the economics of poison plant loss prevention. Nielsen and Cronin (1977) reported on the economics of tall larkspur control. Control of tall larkspur plants with chemical herbicides resulted in a 90+ % decrease in cattle death losses. The return on ranchers and Forest Service investment in this project ranged from 65% to 74%. This is an excellent return, much better than most investment opportunities in the ranching business. There was enough tall larkspur on this allotment to cause an average annual loss of 36 adult cattle. Yet this amount of larkspur could be economically controlled if only ten cows were saved each year for ten years. The point is that there are many situations where losses are not as heavy as in the above cited study but could still be controlled economically.

In summary, there appears to be a need and an opportunity for more research on the economic importance of poisonous plants and on the economics of control projects that would reduce these losses. The net result would be a more efficient livestock industry and more food and fiber from our natural resources. It appears that many of these projects are environmentally safe and economically feasible.

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[1] Increases in the supply of beef and lamb of this magnitude would have a negative impact on prices, depending on the elasticity of demand. As more refined estimates of poisonous plant losses are made, this should be given consideration.

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