ECONOMIC ANALYSIS OF USING MIXING EQUIPMENT FOR GROWING HEIFERS

J.J. Wagner[1], D. Peterson[2], R. Hanson[3] and H.L. Miller[4]
Departments of Animal and Range Sciences and
Economics and Southeast South Dakota Experiment Farm
CATTLE 88-14

Summary

Seventy-two Simmental cross and Charolais cross heifers (475 lb.) were utilized in a growing study to estimate the economic value of using a mixer wagon and feed scale to feed light cattle a high roughage diet. Cattle fed the mixed diet gained an additional 22.6 lb on 61.2 lb less dry matter over the 133-day trial than did cattle fed the unmixed diet. Annual ownership and repair costs were assumed to equal $2356. If yearling feeder cattle sold for $80/cwt and if corn, hay and corn silage were worth $90, $80 and $25 per ton, respectively, it would take a minimum of 114 head of feed for 133 days each year to pay annual costs for the wagon. The economic analysis of the data from this trial suggests that even relatively small cattle feeding operations should strongly consider investing in a mixer wagon with a scale.

(Key Words: Feedlot, Mixing Equipment, Economic Analysis.)

Introduction

Many farmer feeders do not have feed scales or mixer wagons to feed cattle. They feel that they cannot afford the expense of this feeding equipment. They feed by what is often referred to as the "front end loader and scoop shovel method". Roughage is often measured by volume using a front end loader or large round bale. Likewise, grain and supplement are measured by volume using bushels, buckets, bags or a scoop shovel.

There are two potential problems associated with feeding by this method. First, feeding by volume can result in tremendous variation in the amount of dry matter offered to cattle, particularly if high silage diets are used. Second, producers are unable to adequately mix diet components under this system. Cattle are given the opportunity to select their own diet. Some cattle may eat predominately roughage. Other cattle may eat predominately concentrate. Other cattle may eat some combination in between. Weighing of feed commodities and feeding them as a completely mixed ration allows cattle feeders more control over the diet. Intake may be stabilized and every mouthful of feed that the cattle eat may contain a proper balance of carbohydrate, protein, vitamins and minerals.

---

[1]Assistant Professor.
[2]Professer, Department of Economics.
[3]Cattle Manager, Southeast Experiment Farm.
[4]Associate Professor.

Performance by cattle fed known amounts of a completely mixed diet will likely be greater than that by cattle fed diet components separately. Differences in performance relative to feed costs and other operating expenses will determine if purchasing, operating and maintaining a mixer wagon and scale is economical for farmer feeders.

The objective of this research was to determine performance differences between cattle fed completely mixed diets with feed deliveries weighed out at each feeding versus cattle fed by volume unmixed diets. A second objective was to evaluate the economics of using a mixer wagon with scales for farmer feeder operations.

Materials and Methods

Beginning in mid-October, a total of 72 Simmental cross and Charolais cross heifers (475 lb) were purchased from four South Dakota locations and transported to the Southeast South Dakota Experiment Farm near Beresford. Upon arrival, cattle were allowed access to long stem grass hay and water overnight. During a two week receiving period, heifers were fed a standard 60% concentrate starter diet. Once all cattle were assembled, they were shrunk overnight, weighed, ear tagged, vaccinated (IBR, BVD, PI_3, 7-way clostridial bacterin), dewormed, stratified by weight and breed and allotted to eight 9-head pens. The trial started November 4, 1987, and lasted 133 days.

Four pens of heifers were fed ad libitum amounts of a completely mixed grower diet (Table 1). The appropriate amounts of corn silage, ground hay, high moisture corn and supplement for all four pens were weighed into the mixer wagon (Schwartz three auger mixer, 2 ton capacity) and thoroughly mixed prior to feeding. Precise amounts of this total mixed ration were weighed out to each of the four pens of heifer. The four remaining pens of heifers were fed the same diet. Total amount of feed offered to these cattle was approximately the same as the total amount of feed offered to the cattle fed the completely mixed diet. Feed commodities were not mixed prior to feeding and individual feed deliveries to each pen were estimated by volume. The total amount of corn silage, ground hay, high moisture corn and supplement needed for all four pens was weighed out and placed in a separate pile for each commodity. One fourth of each pile, as estimated by volume, was placed into the feed bunk for each pen using a front end loader and scoop shovel. All feed for a particular pen was placed in the same bunk. Corn silage, hay, corn and supplement were layered in the bunk in that respective order.

TABLE 1. DIET FED TO HEIFERS DURING GROWING STUDY

Ingredient	Percentage[a]
Corn silage (35% dry matter)	39.27
Alfalfa-grass hay (16% crude protein)	39.27
Ground high moisture corn (72% dry matter)	15.10
Supplement	
Corn grain	5.58
Trace mineralized salt[b]	.50
Cane molasses	.25
Rumensin 60[c]	.02
Vitamin A-30[d]	.01

[a] *Dry matter basis*
[b] *Composition, minimum percentage, NaCl 96.0, Zn .350, Mn .209, Fe .200, Mg .150, Cu .003, I .007 and Co 005.*
[c] *Contains 60 grams monensin per lb.*
[d] *Contains 30,000 IU vitamin A per gram.*

Results and Discussion

Table 2 displays the performance of heifers. Average daily gain was approximately 10.3% greater (P<.05) for the heifers fed the completely mixed diet. Statistical analyses were not possible on feed intake and feed conversion data. Feed deliveries to each of the four unmixed pens were estimated by volume and assumed to be the same for each pen. Average daily dry matter intake of the cattle fed the mixed diet was about 2.7% less than the intake of the cattle fed the unmixed diet. Feed conversion was improved by 11.8% for the cattle fed the completely mixed diet. Over the entire trial these differences in performance amounted to 22.6 lb additional gain per head on 61.2 lb less dry matter for the heifers fed the completely mixed diet.

Economic Analysis. Although the use of a scale-mixer wagon improves the productivity of the cattle being fed, it is a matter of economics as to whether one should invest in such equipment. The following discussion is to help in determining the minimum size of operation which can profitability adopt this technology.

TABLE 2. PERFORMANCE OF HEIFERS FED EITHER MIXED OR UNMIXED DIETS

	Treatment		
Item	**Mixed**	**Unmixed**	**SEM[a]**
Initial weight, lb	476	474	6.37
Average daily gain, lb[b]	1.82	1.65	.06
Daily dry matter intake, lb	16.59	17.05	NE[c]
Feed/gain	9.12	10.38	NE

[a]*Standard error of the mean.* [b]*P<.05.* [c]*Nonestimable.*

The first step in the analysis is to determine the cost of owning and operating a scale-mixer wagon. The information presented in Table 3 represents an Arts-Way[5] mixer wagon equipped with an electronic scale and other most frequently needed options. The prices and technical data were obtained from an Arts-Way vendor, literature and from the Agricultural Engineers Yearbooks.

TABLE 3. ESTIMATED OWNERSHIP AND REPAIR COSTS OF A MIXER WAGON

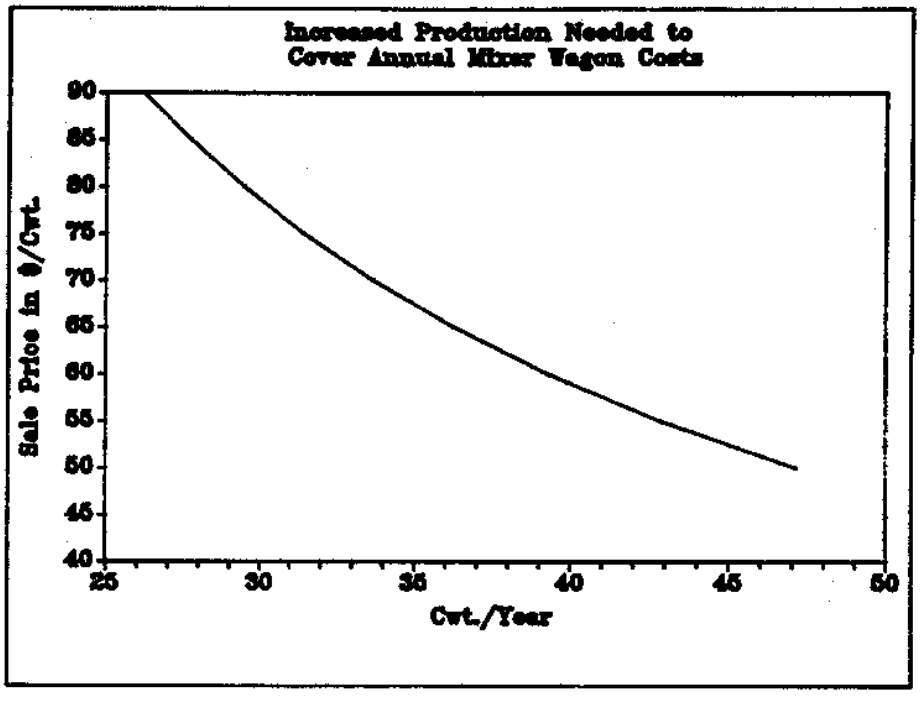
List price	$12,779			
Cash price (20% discount)		$10,223.20		
State sales tax (3%)		306.70		
Total cash cost			$10,529.90	
Less salvage value (15%)			1,579.48	
Depreciable value			8,950.42	
Annual depreciation (10 year life)				$895.04
Annual repair (5% of list price)				638.95
Housing				73.92
Interest on average investment at 12% ($10,529.90 + $1,579.48) x (.12/2)				726.56
Insurance ($2.00 per thousand)				21.06
Total annual ownership and repair cost				$2,355.54

[5]Arts-Way is a registered trademark for Arts-Way Manufacturing Company, Inc., Armstrong, IA. No endorsement of this product is intended or implied.

The cost of the tractor used with the mixer wagon is not included in this analysis. For the size of wagon being evaluated here, a 30 to 40 horsepower tractor is sufficient. Mixing time is short, usually about 10 minutes, and may be done as the wagon is towed to the feed bunk. For the analysis at hand, it was assumed the cost of the tractor needed for the wagon was about the same as the cost saved by not using the present equipment to deliver the feed to the bunk.

The feeding trial shows that during the 133-day feeding period cattle fed the mixed diet gained 22.6 more lb on less feed than did the control group. If these extra pounds are sold as feeder cattle at $.80 per pound, and extra $18.08 is generated per head. Ignoring for the time being that less feed was used, it will take a minimum of 130.3 head on feed for 133 days per year to pay the ownership and operating cost of the wagon ($2356/$18.08 + 130.3). Stated in terms of additional beef produced, it will take 2,944.4 additional lb of beef produced per year to pay the annual costs of the wagon.

If the price of the animals being fed declines, it will take more head or pounds to cover the costs of the wagon. For example, if the price of feeders sold is only $.60 per lb, it will take 3,926 more lb to pay wagon costs. This translates into 173.7 head when each animal gains and additional 22.6 lb by market time, up from the 130.3 head when the price is $.80. The figure may be used to estimate the increased production in pounds, at various sale prices, needed to cover the annual costs of owning and using a scale-mixer wagon.



When including the feed saved, the number of head needed to pay for the wagon is reduced slightly. The more costly the feed, the fewer head it takes to justify the use of a scale-mixer wagon. With the ration used and feeds priced at $2.50 per bushel for corn, $80 per ton for hay and $25 per ton for corn silage, the 61.2 lb of feed (dry matter basis) saved per head has a value of $2.59. When adding this to the $18.08 additional sales per head, it will take 114 head on feed for 133 days per year to pay for the wagon. If the prices of these feeds are decreased to $2.00 for corn, $20 per ton for silage and $50 per ton for hay, feed savings amount to $1.89 per head. If the 22.6 additional lb of gain are sold at $.60 per lb and the feed savings are included, then at least 152.5 head need to be fed annually to pay the annual cost of a wagon.

With performance data available only for growing heifers, it would be very risky to estimate by extrapolation the benefits of a scale-mixer wagon for finishing cattle. The rations are different and we lack the data to determine the increased productivity, if any, when feeding high concentrate rations as are used in finishing. Feeding less bulky finishing rations may likely result in less increase in productivity from mixing, meaning less value from the wagon. Likewise, the price of slaughter cattle is usually less than for feeder cattle, resulting in the increased production being sold at a lower price. On the other side, with the higher cost per cwt of finishing rations, each pound of feed saved means greater benefit from a wagon. Using mixing equipment may allow feeders to use higher concentrate diets, thus improving average daily gain. Any increase in the rate of gain means less days on feed and lower operating costs on the animal being finished, a plus for this piece of equipment. So at this time we cannot make a determination as to the net economic benefit of such a wagon in the finishing lot.

Other Considerations When Investing in a Mixer Wagon. The life of the wagon was estimated at 10 years or 10,000 loads. This would be 1,000 loads per year or 2.74 loads per day. Repair costs will likely increase and life decreases as use is increased above 1,000 loads per year. However, less use will not necessarily mean less increase. Obsolescence is a function of time only, so it is not affected by level of use. From this we can conclude that costs will remain about constant with decreased use, while each load in excess of 1,000 loads per year will increase depreciation and repair costs by $1.53.

In this experiment, approximately 2.30 bushels of feed were required per head per day. Therefore, it took about 306 bushels of feed per head over the 133 days. With a 175-bushel wagon, this is about 1.75 loads per head to bring them from starting weight to sale weight. Using the $80 per cwt sale price and the high prices for feeds, the break-even level of productions to cover annual costs of the wagon is about 114 head per year. Thus, at the break-even level of production the wagon would be used only 199.5 loads per year. Therefore, use could be increased five times and not have an appreciable increase in annual costs of the wagon. Even with cattle selling at $60 per cwt and low priced feeds, there is plenty of reserve capacity. At the lower prices, the break-even level is 152.5 head per year, which would require only 267 loads per year. This would allow for a 375% increase in use without increasing annual costs. A 175-bushel wagon should feed 570 head for 133 days of this ration with a thousand loads. A producer who is putting more pounds of gain on each animal will obviously be feeding fewer cattle from starting weight to sale weight per thousand loads.

The time and labor required using a scale-mixer wagon is another aspect which should be evaluated. While it may take more time to load a mixer wagon with a scale due to the weighing process, the time traveling between the feed bunks and feed storage area with the loader may be reduced. Whether there is a net gain or loss in time depends on the current feed handling techniques vis-a-vis the new. Because most farmers have an older, small tractor which can easily handle the mixer wagon, no additional investment is likely to be needed above the cost of the wagon.

In conclusion, the evidence of this experiment indicates that a mixer wagon equipped with a scale can be a profitable investment for feedlot operators feeding high roughage rations to light cattle. With feeder cattle selling in the $.70 to $.80 range, the break-even level of production is 110 to 160 head on feed for 133 days per year but will depend on how much improvement a particular operation can gain due to more accurate feeding and the value of feed saved.