

Farm Mechanization FACTSHEET



BRITISH
COLUMBIA

Ministry of Agriculture, Food and Fisheries

Order No. 240.100-4

Agdex: 726

September 1983

FORAGE HARVESTING, STORAGE AND FEEDING LOSSES

THE MECHANICAL EFFICIENCIES INVOLVED IN CONVERTING HAY TO MEAT

Raising livestock can be thought of as a series of steps which convert sunlight and soil nutrients into meat.

Step 1: Select forage varieties for yield, protein content and digestibility.

Step 2: Develop and maintain a healthy forage stand through proper seeding and fertilization.

Step 3: Harvest the forage crop at the optimum stage with minimum loss.

Step 4: Store the crop with minimal loss.

Step 5: Feed the forage with minimal loss.

Step 6: Provide an optimum environment for the livestock to convert the forage into meat.

NONE OF THE ABOVE STEPS IS 100% EFFICIENT. THIS FACTSHEET WILL LOOK AT LOSSES INCURRED IN STEPS 3, 4 AND 5.

STEP 3

How much of a standing crop of hay is lost before it ends up in storage? (**Table 1**).

Harvesting loss refers to the physical loss of forage plants and plant parts, which fall to the ground and are not recovered. Raking under any conditions can result in very high leaf loss (the most valuable part of the plant).

NOTE

The values listed in **Table 1** are estimates. Under poor management, the losses can be much higher.

TABLE 1	APPROXIMATE DRY MATTER LOSSES DURING HARVEST (%)			
	UNDER GOOD MANAGEMENT (REFERENCE #2, 3)			
	SILAGE (65% M.C.)	ROUND BALES	LOOSE STACKS	SQUARE BALES
Harvesting loss	2%	5%	10%	3%
Respiration and Weathering Loss	4%	9%	9%	10%

Respiration is the process that converts plant material into heat, water vapour and carbon dioxide. The process will occur for a short period of time after the forage is cut.

Weathering refers to the bleaching and washing of the forage crop by sun and rain, respectively. Weathering occurs between cutting and the time the crop is placed in storage and results in the degradation and removal of plant nutrients.

STEP 4

How much of the forage crop that goes into storage never comes out again?

TABLE II APPROXIMATE DRY MATTER LOSSES DURING STORAGE (%) UNDER GOOD MANAGEMENT (REFERENCE # 2, 3)				
	SILAGE	ROUND BALES	STACKS	SQUARE BALES
Storage	10%	6%	10%	3%
Loss				(sheltered)

For silage, a 10% dry matter loss is typical in an upright concrete stave silo.

A bunker silo typically has losses of 15%.

Properly formed round bales stored on a dry, well-drained site exposed to minimal rainfall will lose approximately 6% D.M. It can easily be higher.

The dry matter loss in loose stacks is highly variable and depends largely on operator skill in forming the stacks.

Square bales stored outside on a poorly drained site can easily suffer dry matter losses of 15%.

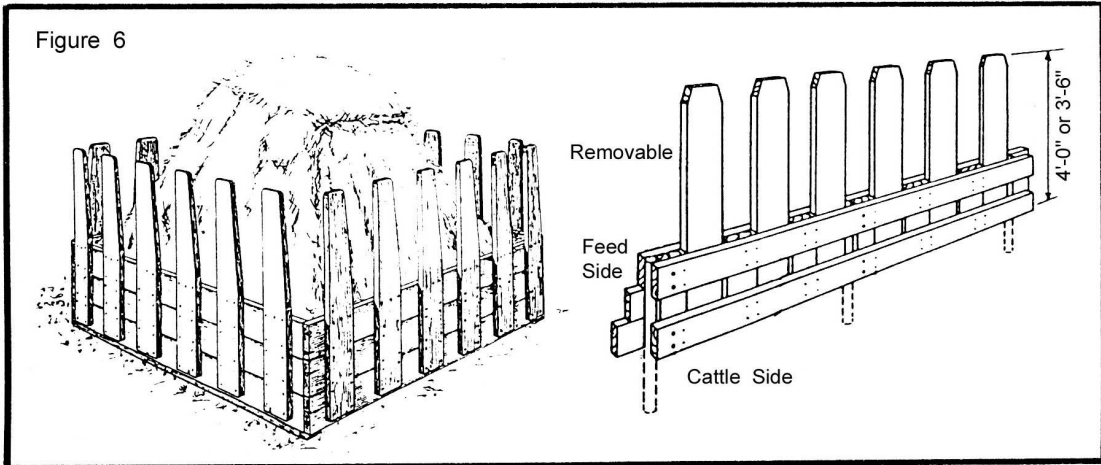
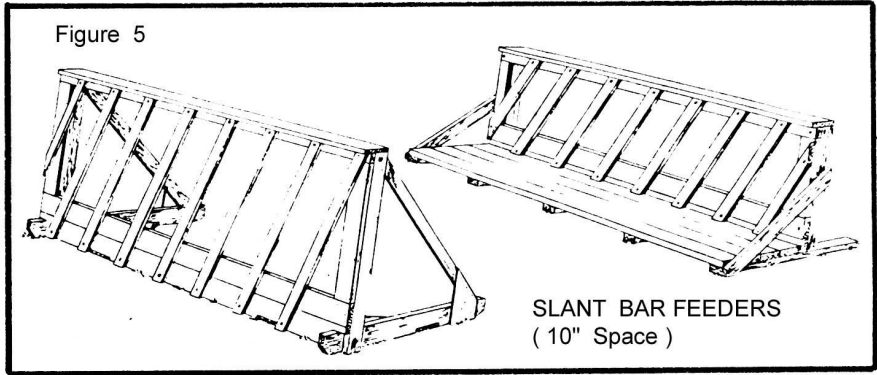
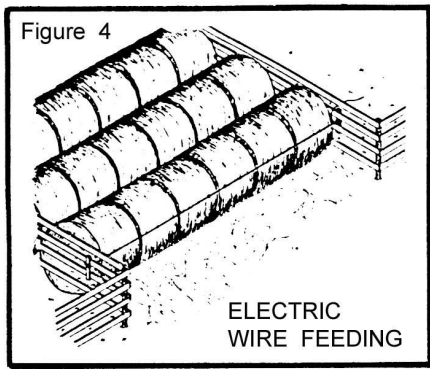
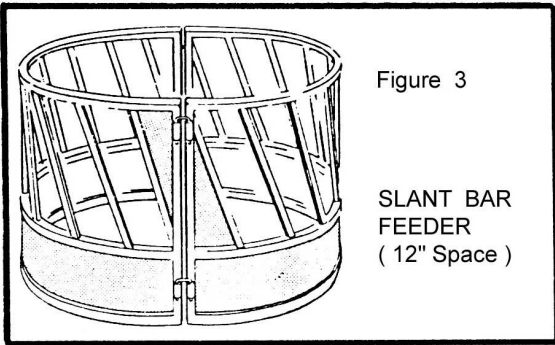
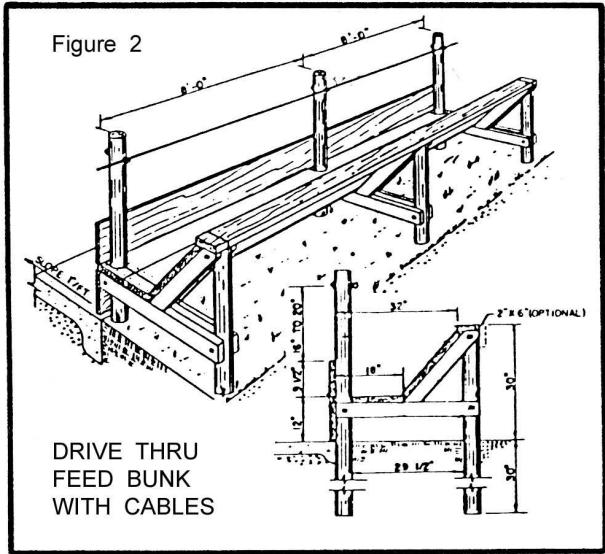
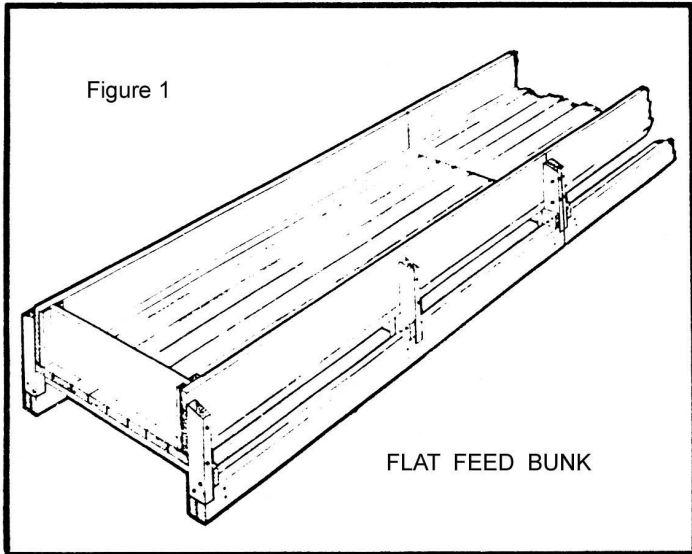
STEP 5

How much of the forage that goes into the feed bunk is lost before it goes into the livestock? (Table III).

The superscripted values in Table III are documented in the reference. The majority of the values are the author's estimate.

There are two factors that contribute to feed bunk loss.

TABLE III APPROXIMATE FEEDING LOSSES (%) FOR VARIOUS BEEF CATTLE FEEDING METHODS				
FEEDING METHOD	SILAGE	ROUND BALES	LOOSE STACKS	SQUARE BALES
Free Access	← 40 to 65 % loss ¹ →			
Flat Feed Bunk	35%	40%	40%	40%
Drive thru feed bunk with cables	30%	35%	35%	35%
12" spaced round slant bar feeder	25%	31% ¹	30%	30%
Electric wire full feed	20%	25% ¹	25%	25%
10" space slant bar feeder (collapsible)	15%	21% ¹	20%	20%
Collapsible wooden tombstone feeder	15%	20% ¹	20%	20%



The first is the length of the forage. This determines whether or not the animal can contain the forage inside its mouth or whether it hangs out of the edge of the mouth and falls to the ground.

The second factor is the difficulty the animal has in removing its head from the feed bunk. If the head can be easily removed then the animal can back up and drop feed on the ground.

ECONOMIC SUMMARY

If we assume that a tombstone feeder is used and that forage is valued at \$80/ton (hay equivalent) then for each ton of forage standing in the field the values of forage lost are summarized in **Table IV**.

CONCLUSION

The numbers presented in this factsheet are realistic and conservative estimates of the losses that occur in

forage handling and feeding. However, the feed bunk losses which are not referenced are extrapolations and should not be taken at face value. They should be used only as a basis for discussion until measured values are available.

The purpose of this factsheet is to point out the high losses that occur even under good management and to show where they occur.

On average, **25%** of the value of the standing forage crop is lost before it enters the animals' digestive tract.

If this loss is related to the land base and if forage yield (standing) is 1 ½ tons/acre, then the loss is \$30/acre when hay is valued at \$80/ton. Is this acceptable? In today's economic climate, farmers and cattlemen must **minimize** these obviously undesirable losses

TABLE IV VALUE OF TOTAL LOSSES OF FORAGE FED IN A TOMBSTONE FEEDER AT \$80/TON HAY EQUIVALENT VALUE				
	SILAGE	ROUND BALES	LOOSE STACKS	SQUARE BALES
Harvesting	\$1.60	\$4.00	\$8.00	\$2.40
Respiration and Weathering	3.15	6.85	6.50	7.75
Storage	7.50	4.15	6.55	2.10
Feeding	10.15	13.00	11.80	13.55
TOTALS	\$22.40	\$28.00	\$32.85	\$25.80

REFERENCES

- Hay Feeder Evaluation Report**, 1978
Structures Specialist,
Manitoba Agriculture
- Forage Nutrient Losses**
E.M. Soder,
1978 Stockmen's Conference, BC
- Economics Of Forage Equipment And Feeding Systems**
O.H. Friesen,
Cattlemen's Short Course, 1980
Banff, Alberta
- Beef Handbook – Housing And Equipment**
Midwest Plan Service, Iowa State Univer.
Ames, Iowa 50011
- Beef Cattle Feeding Systems**
Agricultural Engineering Services Section
Family Farm Improvement Branch,
Saskatchewan Agriculture,
Regina, Saskatchewan S4P 3V7
- Canada Plan Service**
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