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ECONOMICAL, ALTERNATIVE FEEDS FOR SHEEP
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The costs of feedstuffs for sheep can vary daily. Causes of these variations include season of the year, geographic location, climate and competition between man and domestic animals for common feedstuffs. Although producers may not be able to control these variables, using constant, relative feeding values of alternative feed sources can increase sheep production's economical efficiency. Knowing how to use relative feeding values becomes especially important when one realizes that feed can account for 70% of lamb production's total cost.
This publication compares the relative feeding values of different feedstuffs for sheep and converts them into practical values so producers can feed for highest economic efficiency.

Relative Feeding Values of Concentrate (Energy) Feeds

Shelled corn provides more usable energy to sheep than any other common source, except fat. Therefore, it is given an index value of 100 and the relative feeding value of each energy source is expressed as a percentage of this value. These are shown in Table 1. The values for wheat, ground ear corn and molasses are valid only when fed according to the recommendations in the footnotes.
Since these values are based on usable energy, varying amounts of the different sources must be fed to provide energy and performance equal to that shelled corn provides. These values are shown in the second column. No changes in dietary protein, minerals or vitamins are necessary if the alternate energy sources are substituted for shelled corn as Table 1 recommends.

Table 1. --Relative Feeding Values of Concentrate (Energy) Feeds for Sheep (Lb for Lb)

Feedstuff	**Relative feeding value, %[a]**	**Lb. required to provide energy equal to 1 lb of corn**
Shelled corn	100	-
Sorghum grain (milo)	95	1.05
Barley	90	1.10
Oats	80	1.25
Wheat[b]	105	0.95
Ground ear corn[c]	88	1.14
Liquid molasses[d]	70	1.43

[a]All sources compared with shelled corn with a value of 100.
[b]When fed at not more than 50% of the total ration grain.
[c]95% ground ear corn mixed with 5% wet molasses.
[d]When fed at not more than 5% of the total ration.

Relative dollar values are a function of the relative feeding values. They are harder to compute because feedstuffs differ in their weight per bushel (Table 2).

Table 2.- Weight/Bu of Some Concentrate (Energy) Feeds

Feedstuff	**Lb/bu**
Shelled corn	56
Milo	60
Barley	48
Oats	32
Wheat	60
Ear corn	70

Computation of the relative dollar value/bu for any grain, compared with corn, can be calculated with the following formulas (using oats as an example):

lb of oats/bu x value of shelled corn/bu
---------- = equivalent value/bu
lb of shelled corn/bu

which is

32 lb/bu x $4.00/bu
---------- = $2.29/bu
56 lb/bu

Then:

equivalent value/bu x relative feeding value (%) = relative dollar value

which is

$2.29/bu x 80% for oats = $1.83/bu

This illustration says: If corn costs $4/bu, the same performance can be expected when sheep are fed oats worth $1.83/bu, even though 1.25 lb of oats must be fed for each pound of shelled corn.
Several concentrate sources (milo, ground ear corn and wet molasses) are sold by the pound rather than the bushel. To compare these sources with those sold by the bushel, make the following calculations (using milo as an example):

value of shelled corn/bu x 100
---------- = value/100 lb of shelled corn
lb of shelled corn/bu

which is

$4.00/bu x 100
---------- = $7.14/100 lb of shelled corn
56 lb/bu

Then:

value/100 lb of shelled corn x relative feeding value of milo (%) = equivalent value/100 lb of milo

which is

$7.14/100 lb of shelled corn x 95% for milo = $6.78/100 lb of milo

This illustration says: If corn costs $4/bu, the same performance can be expected when sheep are fed milo worth $6.78/100 lb even though 1.05 lb of milo must be fed for each pound of shelled corn.
These formulas were used to calculate the relative dollar values of different concentrate feedstuffs when the value of shelled corn ranges from $2 to $4/bu (Table 3).
To read this table: Determine the value of shelled corn per bushel, then read down that column. Any time the alternative concentrate has a value less than that of shelled corn, the alternative source is the most economical buy.
Example 1 -- if shelled corn costs $3/bu and you can buy barley for less than $2.31/bu, barley is the most economical buy.

Table 3. --Relative Dollar Values of Concentrates for Sheep

	Shelled corn ($/bu)				
Relative value ($/bu.)[a]	**2.00**	**2.50**	**3.00**	**3.50**	**4.00**
Barley	$1.54	$1.93	$2.31	$2.70	$3.09
Oats	0.91	1.14	1.37	1.60	1.83
Wheat[b]	2.25	2.81	3.38	3.94	4.50
Ear corn[c]	1.92	2.46	3.02	3.57	4.12
Relative value ($/100 lb)[a]					
Milo	$3.39	$4.24	$5.09	$5.94	$6.78
Ground ear corn[d]	3.14	3.92	4.71	5.49	6.28
Liquid molasses[e]	2.50	3.12	3.75	4.37	5.00

[a]Calculations have been adjusted for differences in weight/bu and relative feeding values.
[b]When fed at not more than 50% of the total ration grain.
[c]Unground.
[d]Includes cost of grinding pins mixing with 5% liquid molasses.

[e]*When fed at not more than 10% of the total ration.*

Example 2 -- if shelled corn costs $3/bu and ear corn can be purchased and processed for less than $4.71/100 lb, ear corn is the most economical buy.

Although ear corn is a common and excellent source of energy for sheep, it differs from the other common energy sources because it must be ground and mixed with molasses to have a relative feeding value of 88% (Table 1). Whole ear com is marketed by the bushel, but after grinding and mixing with molasses it is marketed on a per 100 lb basis. Therefore, both whole (unprocessed) and processed (ground plus 5% molasses) values are presented in Table 3.

To determine the total processing cost of ear corn, refer to Table 4. Use this table in the following way: if liquid molasses costs 5¢¢/1b and the cost of grinding ear corn is 20¢¢/100 lb, the total cost for processing each bushel of ear corn is $0.32.

Table 4. --Cost of Processing Ear Corn ($/Bu)[a]

	Liquid molasses (¢¢/lb)				
¢¢/100 lb.	**3**	**4**	**5**	**6**	**7**
20	$0.25	$0.28	$0.32	$0.35	$0.39
25	.28	.32	.35	.39	.42
30	.32	.35	.39	.42	.46
35	.35	.39	.42	.46	.49
40	.40	.42	.46	.49	.53
45	.45	.46	.49	.53	.56
50	.50	.49	.53	.56	.60

[a]*Processing cost includes grinding plus mixing 5 lb of liquid molasses per 95 lb of ground ear corn.*

Once the cost of processing ($/bu) and the price of whole ear corn ($/bu) are determined, these two values added together equal the total cost of ground ear corn per bushel. Then, this value can be compared with shelled corn (Table 5). To use Table 5, read down the shelled corn column until you find the current price. Then, read across to find the maximum price that can be paid for processed ground ear corn. For example, assume the price of shelled corn is $3/bu. The maximum price that can be paid for ground ear corn is $3.30/bu. If molasses is 5¢¢/1b and grinding costs 25¢¢/100 lb, the total processing cost is 35¢¢/bu (Table 4). If whole ear corn costs $2.86/bu, then the total cost of processed ground ear corn is $2.86 + $0.35 = $3.21/bu. Since $3.21 is less than $3.30, ground ear corn is the most economical buy, even though 1.14 lb must be fed to obtain performance equal to that obtained from 1.0 lb of shelled corn.

Table 5. --Relative Dollar Value Of Shelled Corn and Ground Ear Corn for Sheep

If shelled corn is ($/bu)	Ground ear corn must be less than ($/bu)[a]
1.80	1.98
2.00	2.20
2.20	2.42
2.40	2.64
2.60	2.86
2.80	3.08
3.00	3.30
3.20	3.52
3.40	3.74
3.60	3.96
3.80	4.18
4.00	4.40
4.20	4.62
4.40	4.84

[a]*Total value= whole ear corn ($/bu) plus processing cost ($/bu).*

Relative Values of Common Roughages Fed for Energy

Under practical conditions, the amounts of concentrates and roughages need to be adjusted to provide required energy for maximum economic efficiency. As is the case with concentrates, not all sheep producers feed the same roughages. These roughages differ in relative feeding values and price.

The relative feeding values (for energy) of roughages are compared with shelled corn in Table 6. Corn silage has a low comparative feeding value because it contains about 60% water and only about 40% dry matter, whereas shelled corn usually contains only 10% water and 90% dry matter. When corn silage is compared with shelled corn, on an equal dry matter basis, its relative feeding value is increased to 83%.

Table 6. --Relative Feeding Values of Some Common Roughages Fed to Sheep for Energy (Lb for Lb)

Energy source	Relative feeding value, %[a]	Lb required to provide energy equal to 1 lb of corn
Shelled corn	100	-
Corn	37	2.67

silage[b]		
Alfalfa hay	58	1.75
Clover hay	55	1.81
Orchardgrass hay	54	1.85
Fescue hay	38	2.63
Timothy hay	28	3.57
Bluegrass hay	26	3.85
Grass-legume hay	56	1.79

[a]*All sources compared with shelled corn with a value of 100.*
[b]*40% dry matter corn silage.*

When compared with shelled corn, roughages contain much more fiber and much less starch. Alfalfa, clover and other legume hays should be fed primarily to provide protein. Therefore, when compared with shelled corn they have relatively low feeding values as suppliers of energy. Grass hays are relatively poor sources of both protein and energy for sheep, particularly if they are harvested after the vegetative maturity stage.
The relative dollar values (per ton basis) of the roughages in Table 6 can be compared with shelled corn by using the following procedure (orchardgrass hay as an example):

value of shelled corn/bu x 100
---------- = value/100 lb of shelled corn
lb of shelled corn/bu.

which is

$3.00/bu x 100
---------- = $5.36/100 lb of shelled corn
56 lb/bu

Then:

value/100 lb of shelled corn x relative feeding value of orchardgrass hay (%) = equivalent value/100 lb of orchardgrass hay

equivalent value/100 lb of orchardgrass hay x 20 = equivalent value/ton

which is

$5.36/100 lb of shelled corn x 54% for orchardgrass hay = $2.89/100 lb x 20 = $57.89/ton of orchardgrass hay

Table 7 shows the equivalent values of roughages (per ton) when shelled corn costs from $2 to $4/bu. To read Table 7, find the price of-shelled corn. Then, read down the column to find the equivalent value of the roughage in question. If that roughage can be purchased for less than the value shown, it is a more economical buy than shelled corn at its respective price per bushel. For example, if shelled corn sells for $2.50/bu and orchardgrass hay can be bought for less than $48.17/ton, the hay is the most economical buy even though 1.85 lb of the hay must be fed for each 1 lb of shelled corn to obtain equal performance.

Table 7. --Comparison of the Relative Dollar Values of Shelled Corn ($/bu) and Some Roughages ($/ton) Fed to Sheep for Energy

Relative value ($/ton)	Shelled corn ($/bu)				
	2.00	**2.50**	**3.00**	**3.50**	**4.00**
Corn silage[a]	$26.40	$33.00	$39.66	$46.25	$52.84
Alfalfa hay	41.41	51.74	62.18	72.50	82.82
Clover hay	39.27	49.06	58.96	68.75	78.54
Grass-legume hay	39.98	49.95	60.03	70.00	79.97
Orchardgrass hay	38.56	48.17	57.89	67.50	77.11
Fescue hay	27.13	33.90	40.74	47.50	54.26
Timothy hay	19.99	24.98	30.02	35.00	39.98
Bluegrass hay	18.56	23.19	27.87	32.24	37.13

[a]*40% dry matter silage.*

The roughages in Tables 6 and 7 will seldom be an economical replacement for shelled corn (or other concentrates) energy in sheep rations for two reasons.
First, the roughages contain more fiber than concentrates. This fiber is not used for energetic purposes (growth, milk production and wool production) as efficiently as the starch of concentrates.
Second, the legumes should be fed as a protein, not energy source. However, always remember each productive purpose of the sheep requires a different amount of ration concentrate and roughage for optimum efficiency.

Relative Feeding Values of Some Protein Supplements
Table 8 shows the relative feeding and dollar values of some protein supplements fed to sheep. Soybean meal is given a value of 100. The values (dollars/ton) for linseed meal, cottonseed meal and alfalfa hay were derived by multiplying the cumulative feeding values (90, 100 and 36) by the respective soybean meal price (dollars/ton). For example, if soybean meal sells for $200/ton, alfalfa hay

must cost less than $72/ton to be an economical purchase.

Table 8. --Relative Dollar Values of Some Protein Feeds for Sheep ($/Ton)

Source	Relative feeding value, %	Shelled corn ($/bu)						
	150	175	200	225	250	275	300	
Soybean meal (44%)[a]	100							
Linseed meal (43%)	90	$135	$158	$180	$203	$225	$248	$270
Cottonseed meal (43%)	100	150	175	200	225	250	275	300
Alfalfa hay (16%)	36	54	63	72	81	90	99	108

[a]*Values in parentheses indicate crude protein content.*

Summary
Specific feeds should be fed to sheep to provide specific nutrients, i.e. energy and protein. Although alternative feedstuffs can provide these nutrients, they can vary in weight per bushel, relative feeding value and relative price. All these factors must be considered together when determining which feeds will produce greatest profits. Only when the cheapest feeds produce the desired performance will maximum economic efficiency be attained.