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Michigan State University Extension Service
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BARLEY, CULL BEANS, AND POTATOES AS FEEDS FOR DAIRY CATTLE

C. F. HUFFMAN AND A. C. BALTZER

A wider use of home-grown crops which are sometimes surplus and unmarketable, as feeds for dairy cattle, would mean a saving of many thousands of dollars to the farmers of Michigan. Home-grown crops which are often undervalued as feeds for dairy cattle are barley, cull beans, and potatoes.

The greatest net return can be secured from these crops, when fed to the dairy cow, only when the ration is properly balanced with other palatable feeds which furnish digestible nutrients most economically. In order to feed these crops properly, it is necessary to know their nutritive value and market price.

BARLEY

Barley has long been a popular feed in Europe where it is fed in place of corn. Barley is a cereal grain similar to corn as the following table shows:

	Digestible Nutrients				
	Dry Matter	Digestible Protein	Carbo-hydrates	Fats	Total Digestible Nutrients
100 lbs. corn.....	89.5	7.5	67.5	4.6	86.7
100 lbs. barley.....	90.7	9.0	66.8	1.6	79.4

Corn has slightly more total digestible nutrients, but less protein than barley. The results of various Experiment Stations show that barley is equal to corn pound for pound in the ration of milking cows, growing heifers, and calves. Like corn, barley is low in protein and should be supplemented with protein rich feeds such as alfalfa hay; or protein concentrates such as wheat bran, linseed oil meal, or cottonseed meal.

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When a pound of barley costs less than a pound of corn, it is economy to replace the corn in the ration with equal amounts of barley. The following table shows the feeding value of a bushel of barley as the price per bushel of corn varies:

Price of Corn per Bushel	Barley is Worth per Bushel
\$0.50	\$0.43
.55	.47
.60	.51
.65	.56
.70	.60
.75	.64
.80	.68
.85	.73
.90	.77
.95	.81
1.00	.86
1.05	.90
1.10	.94
1.15	.98
1.20	1.03
1.25	1.07

Grain Mixtures Containing Barley to be Fed with Alfalfa Hay*

Rations	Digestible Protein	Total Digestible Nutrients
Ration I		
200 lbs. ground barley.....	18.0	158.8
200 lbs. ground oats.....	19.4	140.8
50 lbs. linseed oil meal 34 per cent protein.....	15.1	39.0
4.5 lbs. salt.....		
454.5	52.5	338.6
Per cent.....	11.6	74.5
Ration II		
200 lbs. ground barley.....	18.0	158.8
200 lbs. ground oats.....	19.4	140.8
25 lbs. cottonseed meal 43 per cent protein.....	9.2	19.6
4 lbs. salt.....		
429	46.6	319.2
Per cent.....	10.9	74.4
Ration III		
200 lbs. ground barley.....	18.0	158.8
200 lbs. ground oats.....	19.4	140.8
50 lbs. wheat bran.....	6.3	30.5
25 lbs. cottonseed meal.....	9.2	19.6
5 lbs. salt.....		
480	52.9	349.7
Per cent.....	11.0	72.9

Grain Mixtures Containing Barley to be Fed with Mixed Hay*

Rations	Digestible Protein	Total Digestible Nutrients
Ration I		
200 lbs. ground barley.....	18.0	158.8
200 lbs. ground oats.....	19.4	140.8
50 lbs. wheat bran.....	6.3	30.5
100 lbs. cottonseed meal 43 per cent protein.....	37.0	78.2
5.5 lbs. salt.....		
555.5	80.7	408.3
Per cent.....	14.5	73.5
Ration II		
200 lbs. ground barley.....	18.0	158.8
200 lbs. ground oats.....	19.4	140.8
50 lbs. wheat bran.....	6.3	30.5
150 lbs. linseed oil meal 34 per cent protein.....	45.3	116.9
5.5 lbs. salt.....		
555.5	89.0	447.0
Per cent.....	16.0	80.5
Ration III		
200 lbs. ground barley.....	18.0	158.8
200 lbs. ground oats.....	19.4	140.8
50 lbs. linseed oil meal 34 per cent protein.....	15.1	38.9
75 lbs. cottonseed meal 43 per cent protein.....	27.8	58.7
5 lbs. salt.....		
505	80.3	397.2
Per cent.....	15.9	78.6

Grain Mixtures Containing Barley to be Fed with Timothy Hay or Similar Poor Roughages*

Rations	Digestible Protein	Total Digestible Nutrients
Ration I		
100 lbs. ground barley.....	9.0	79.4
100 lbs. ground oats.....	9.7	70.4
100 lbs. cottonseed meal 43 per cent protein.....	37.0	78.2
25 lbs. wheat bran.....	3.1	15.2
3.5 lbs. salt.....		
328.5	58.8	243.2
Per cent.....	17.9	74.0
Ration II		
100 lbs. ground barley.....	9.0	79.4
100 lbs. ground oats.....	9.7	70.4
75 lbs. cottonseed meal 43 per cent protein.....	27.8	58.6
75 lbs. linseed oil meal 34 per cent protein.....	22.6	58.4
3.5 lbs. salt.....		
353.5	69.1	266.8
Per cent.....	19.5	75.5
Ration III		
100 lbs. ground barley.....	9.0	79.4
100 lbs. ground oats.....	9.7	70.4
50 lbs. wheat bran.....	6.2	30.4
50 lbs. linseed oil meal 34 per cent protein.....	15.1	39.0
100 lbs. cottonseed meal 43 per cent protein.....	37.0	78.2
4 lbs. salt.....		
404	77	297.4
Per cent.....	19.1	73.6

*These mixtures may also be used when silage or root crops are available.

CULL BEANS

Many tons of cull beans are available each year in Michigan for feeding purposes. Investigations have demonstrated that ground cull beans, although unpalatable, are a valuable source of protein when fed with palatable feeds. However, it is not usually advisable to use more than 20 per cent by weight cull beans in the grain mixture.

Cull beans are classed as a protein feed since the analyses show that they contain about 19 per cent digestible protein. Protein is the food substance most likely to be deficient in the ration of milking cows. Consequently, when cull beans are incorporated in the ration, less high priced protein concentrates such as linseed oil meal, cottonseed meal, corn gluten feed, and wheat bran need be purchased.

The results of experiments at the Michigan Agricultural Experiment Station show that two pounds of ground cull beans are equal to one pound of cottonseed meal as a protein supplement in the ration of dairy cattle.

Cooked cull beans are more palatable than ground cull beans. They take up their own weight in water during the cooking process, which accounts for the fact that cooked cull beans contain only one-half as much protein as raw cull beans. Twelve to 20 pounds of cooked beans may be fed per cow daily with no bad effects. Little or no grain is needed as a supplement except for cows producing 30 pounds or more of milk daily. It is usually advisable to add salt to cooked beans. When silage is available, the cooked beans should be fed on top of the silage. Beans give best results when fed with clover or alfalfa hay. When timothy hay or a similar poor roughage is fed, supplement cooked cull beans with a 14 per cent digestible protein grain mixture.

Cull beans may be fed raw when ground. They grind best along with corn, oats or barley. Grain mixtures should not contain more than 20 per cent by weight of ground cull beans due to the lack of palatability of the raw beans.

Although cooked beans are more palatable than raw beans, it is usually advisable to feed ground cull beans, due to the inconvenience and greater cost involved in cooking beans. Cooked or raw beans should be introduced into the ration gradually.

Grain Mixtures Containing Cull Beans to be Fed with Alfalfa Hay*

Rations	Digestible Protein	Total Digestible Nutrients
Ration I		
200 lbs. ground corn or barley.....	15.0	171.4
200 lbs. ground oats.....	19.4	140.8
100 lbs. ground cull beans.....	18.8	71.9
25 lbs. linseed oil meal 34 per cent protein.....	7.6	19.5
5 lbs. salt.....		
530	60.8	403.6
Per cent.....	11.5	76.2
Ration II		
200 lbs. ground corn or barley.....	15.0	171.4
200 lbs. ground oats.....	19.4	140.8
100 lbs. ground cull beans.....	18.8	71.9
25 lbs. cottonseed meal 43 per cent protein.....	9.2	19.5
5 lbs. salt.....		
530	62.4	403.6
Per cent.....	11.8	76.2
Ration III		
200 lbs. ground corn or barley.....	15.0	171.4
200 lbs. ground oats.....	19.4	140.8
75 lbs. ground cull beans.....	14.1	53.9
15 lbs. linseed oil meal 34 per cent protein.....	4.5	11.7
15 lbs. cottonseed meal 43 per cent protein.....	5.6	11.7
5 lbs. salt.....		
510	58.6	389.5
Per cent.....	11.1	73.5

Grain Mixtures Containing Cull Beans to be Fed with Clover Hay*

Rations	Digestible Protein	Total Digestible Nutrients
Ration I		
200 lbs. ground corn or barley.....	15.0	171.4
200 lbs. ground oats.....	19.4	140.8
100 lbs. cull beans.....	18.8	71.9
100 lbs. linseed oil meal 34 per cent protein.....	30.2	77.9
6 lbs. salt.....		
606	83.4	462.0
Per cent.....	13.8	76.2
Ration II		
200 lbs. ground corn.....	15.0	171.4
200 lbs. ground oats.....	19.4	140.8
100 lbs. cull beans.....	18.8	71.9
50 lbs. cottonseed meal 43 per cent protein.....	18.8	39.1
50 lbs. wheat bran.....	12.5	30.5
6 lbs. salt.....		
606	84.5	453.7
Per cent.....	13.9	74.9

*These mixtures may also be used when silage or root crops are available.

Rations Containing Cull Beans to be Fed with Mixed Hay*

Rations	Digestible Protein	Total Digestible Nutrients
Ration I		
100 lbs. ground corn or barley.....	7.5	85.7
200 lbs. ground oats.....	19.4	140.8
100 lbs. cull beans.....	18.8	71.9
50 lbs. linseed oil meal 34 per cent protein.....	15.1	38.5
50 lbs. cottonseed meal 43 per cent protein.....	18.5	39.1
5 lbs. salt.....		
505	79.3	376.0
Per cent.....	15.7	74.5
Ration II		
100 lbs. ground corn or barley.....	7.5	85.7
100 lbs. ground oats.....	9.7	70.4
60 lbs. ground cull beans.....	11.3	43.1
50 lbs. wheat bran.....	6.3	30.5
75 lbs. linseed oil meal 34 per cent protein.....	22.6	58.4
4 lbs. salt.....		
389	57.4	288.1
Per cent.....	14.8	74.1
Ration III		
100 lbs. ground corn or barley.....	7.5	85.7
100 lbs. ground oats.....	9.7	70.4
50 lbs. ground cull beans.....	9.4	35.9
75 lbs. linseed oil meal.....	22.7	58.4
325	49.3	250.4
Per cent.....	15.2	77.0

Grain Mixtures Containing Cull Beans to be Fed with Timothy Hay or Poor Roughages*

Rations	Digestible Protein	Total Digestible Nutrients
Ration I		
100 lbs. ground corn or barley.....	7.5	85.7
100 lbs. ground oats.....	9.7	70.4
75 lbs. ground cull beans.....	14.1	53.9
75 lbs. cottonseed meal 43 per cent protein.....	27.8	58.6
50 lbs. linseed oil meal 34 per cent protein.....	15.1	38.9
4 lbs. salt.....		
404	74.2	307.5
Per cent.....	18.4	76.1
Ration II		
100 lbs. ground corn or barley.....	7.5	85.7
200 lbs. ground oats.....	19.4	140.8
100 lbs. cull beans.....	18.8	71.9
100 lbs. cottonseed meal.....	37.0	78.2
100 lbs. linseed oil meal 43 per cent protein.....	30.2	77.9
6 lbs. salt.....		
606	112.9	454.5
Per cent.....	18.6	75.0
Ration III		
100 lbs. ground corn or barley.....	7.5	85.7
100 lbs. ground oats.....	9.7	70.4
100 lbs. ground cull beans.....	18.8	71.9
200 lbs. linseed oil meal 34 per cent protein.....	60.4	155.8
5 lbs. salt.....		
505	96.4	383.8
Per cent.....	19.1	76.0

*These mixtures may also be used when silage or root crops are available.

POTATOES

Potatoes which fail to meet the requirements of the market, or when very cheap, may be profitably fed to dairy cattle, especially in sections of Michigan where potatoes are a major crop.

Raw potatoes are classed as a succulent feed along with other root crops and silage. The analyses of corn silage and potatoes are similar as shown by the following table:

	Dry Matter	Water	Fiber	Digestible Protein	Carbo-hydrates	Fat	Total Digestible Nutrients
Potatoes.....	21.2	78.8	0.4	1.1	15.8	0.1	17.1
Corn Silage.....	26.3	73.7	6.3	1.1	15.0	0.7	17.7

Potatoes have given about the same results, pound for pound, as corn silage in feeding experiments with dairy cows. However, more care must be taken in the feeding of potatoes since they are usually not very palatable. It is advisable to introduce potatoes gradually in the ration. It is not advisable to feed more than 30 pounds of potatoes per day, although as much as 60 pounds a day have been fed with no apparent bad effects. The potatoes should be run through a root cutter or chopper to prevent the cows from choking on them. They should be fed immediately after milking, since potatoes may give milk an undesirable flavor. The butterfat produced by cows fed potatoes tends to be salvy. This trouble is lessened when potatoes are fed in reasonable amounts along with sufficient nutrients from other feeds to properly balance the ration. The best results are secured when potatoes are fed along with good legume hay, such as alfalfa hay or clover; and with a good grain mixture containing a protein concentrate such as cottonseed meal or linseed oil meal.

Potatoes, when supplemented with the proper grains, do not dry up the cows as is sometimes believed. Potatoes may be fed as a succulent feed along with the grain mixture suggested under barley and cull beans.

