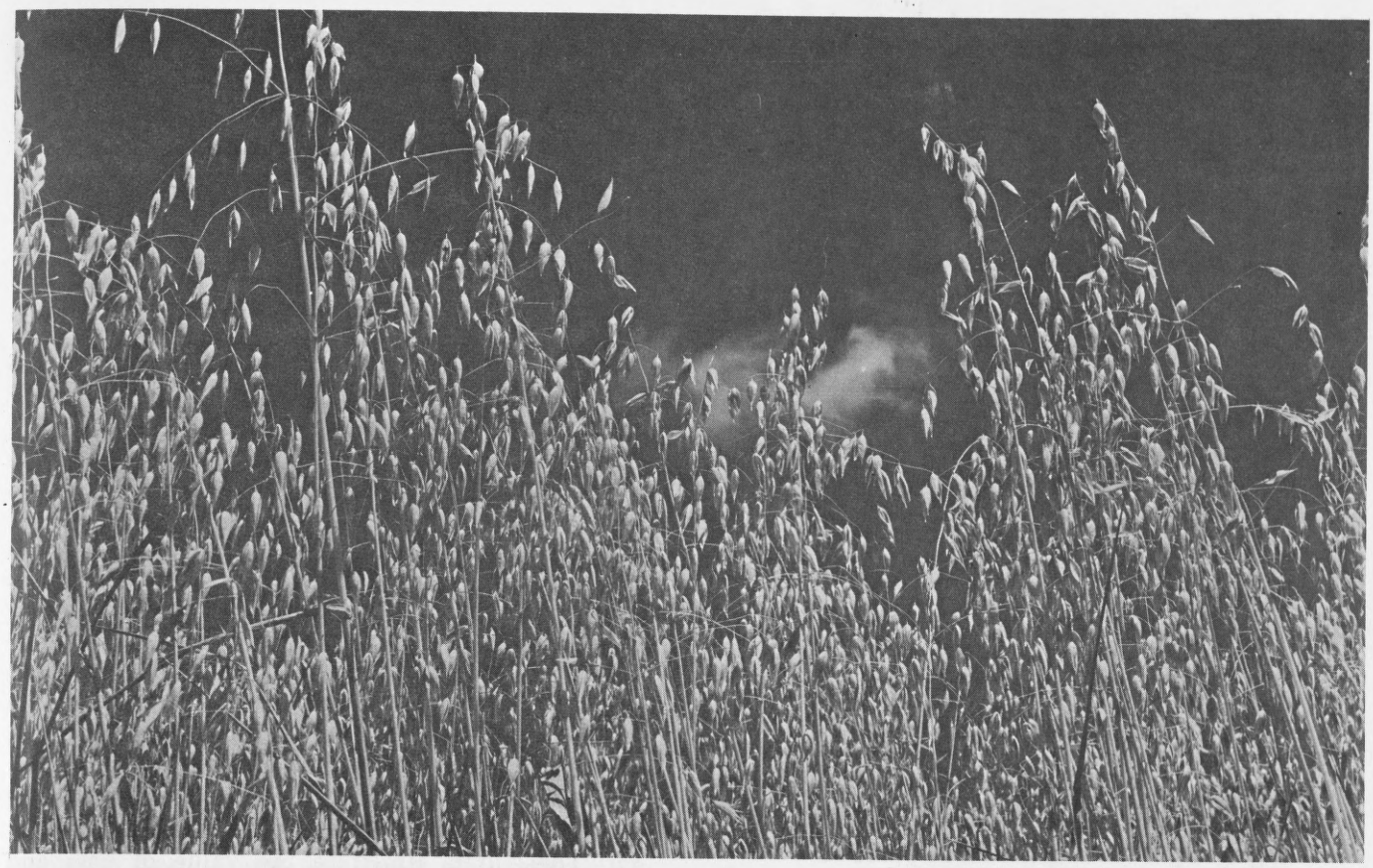

HARVESTING CEREALS FOR FORAGE . . . In North Dakota

Kenneth L. Larson and Jack F. Carter

Cereals are major crop species in North Dakota. They are adapted to the climate conditions in the state and farmers are acquainted with their culture. Cereals are grown primarily for grain production but occasionally are used for pasture, hay or silage.

As a forage crop, oats has been most commongrown[1]. Relatively little information is available on the forage yielding potential of wheat and barley at various stages of growth. This investigation evaluated the merits of wheat, barley and oats for forage throughout the growing season.

Materials and Methods

Oats, wheat and barley were planted on May 7, 1964, April 30, 1965, and May 17, 1966. Oats also were planted for forage on May 1 in 1963. The varieties planted were varied from year to year (Table 1).

Table 1. Varieties of oats, wheat and barley planted for forage at Fargo, 1963-66.

Year	Variety		
	Oats	Wheat	Barley
1963	Ajax	—	—
1964	Marion	Selkirk	Traill
1965	Lodi	Selkirk	Trophy
1966	Lodi	Chris	Dickson

Planting rates for the oats, wheat and barley were 2.0, 1.5, and 2.0 bushels per acre, respectively. Six-inch drilled row spacing in four replicates was used throughout the study. Previous cropping on the experimental sites was fallow in 1963 and 1964, flax in 1965, and sorghum in 1966. No fertilizer was applied. Crops were harvested at various stages of growth for dry matter and protein yields.

[1]Carter, J. F., and K. L. Larson. 1964. **Oats, peas and vetch for hay and silage in North Dakota.** N. Dak. Agric. Exp. Sta. Bul. 447. 8 pp.

Dr. Larson is associate professor and Dr. Carter is professor and chairman, Department of Agronomy.

Table 2. Tons dry matter per acre of wheat, oats and barley for forage harvested at several stages of growth at Fargo, 1963-66.

Stage	Tons of dry forage produced per acre				
	1963[1]	1964	1965	1966	1964-66 Ave.
		WHEAT			
Tiller	—	.22	.31	.11	.21
Jointing	—	.55	.99	.48	.67
Early Boot	—	.88	1.85	1.52	1.42
Milk	—	2.16	2.96	3.06	2.73
Dough	—	3.24	4.00	3.92	3.72
Mature	—	2.92	3.46	3.47	3.28
		BARLEY			
Tiller	—	.59	.43	.22	.41
Jointing	—	.96	1.12	.90	.99
Boot	—	1.46	1.89	2.22	1.86
Milk	—	2.85	2.13	2.87	2.62
Dough	—	4.36	3.41	3.80	3.86
Mature	—	4.07	3.69	3.58	3.78
		OATS[2]			
Tiller	.58	.30	.38	.12	.27
Jointing	1.58	.80	.91	.61	.77
Boot	2.09	1.21	1.69	1.58	1.49
Milk	3.22	2.84	3.84	3.22	3.30
Dough	3.65	3.60	4.10	4.03	3.91
Mature	2.98	3.32	4.04	3.75	3.70

[1]Wheat and barley were not planted in 1963.
[2]Yields of 1963 are not included in average.

Results

Tons of dry forage per acre produced at various stages of growth are shown in Table 2.

Highest forage yields of the three cereals were obtained when the grain was in the dough stage, which is slightly late for best hay quality. Moisture percentage of the plants at this stage was approximately 65 per cent, which is desirable for silage making. Oats and barley produced more dry forage than wheat at the earlier growth stages. In later stages of growth wheat was nearly equal in production to oats and barley.

Protein analyses of the forage were made in 1964 and 1965 (Table 3). Per cent protein was high in the three cereals at the earlier stages of growth and decreased as the plants matured. Farmers in need of high protein forage early in the season will find these cereals adequate. The rate of dry matter production increased more rapidly than the rate of decrease in per cent protein, which resulted in higher pounds of protein per acre at the milk stage in oats and dough stage in wheat and barley.

Table 3. Average per cent and pounds per acre of protein in oats, wheat and barley forage at various stages of growth at Fargo, 1964-66.

Stage	Per cent protein[1]			Pounds protein/acre[2]		
	Oats	Wheat	Barley	Oats	Wheat	Barley
Tiller	23.8	22.4	24.2	129	94	198
Jointing	18.6	18.8	17.6	286	252	348
Boot	14.2	16.4	14.7	423	466	547
Milk	10.8	11.4	11.5	713	622	603
Dough	8.4	10.1	9.2	657	751	710
Mature	8.5	9.6	8.6	629	630	650

[1]Per cent protein is average of 1964-65 samples.
[2]Pounds protein per acre calculated with 1964-65 per cent values.

In 1965 and 1966, grain was harvested from the plots at maturity. These yields and a comparison of the market value of the crops harvested for grain and forage are shown in Table 4. The market value of the grain is based on the North Dakota Crop and Livestock Reporting Service's seven-year average (1963-1969) of prices received during July.

Table 4. Forage and grain yields of oats, wheat and barley harvested at the dough stage and at maturity, respectively, at Fargo, 1965-66.

Crop	Tons dry matter/acre			Estimated value	Bushels/acre			Estimated value
	1965	1966	Ave.		1965	1966	Ave.	
Oats	4.10	4.03	4.06	$48.72	106	92	99	$50.49
Wheat	4.00	3.92	3.96	$47.52	36	34	35	$54.60
Barley	3.41	3.80	3.60	$39.60	68	63	66	$57.42

Price per bushel of oats, wheat and barley was $0.51, $1.56 and $0.87, respectively. The average price for alfalfa hay during the same period was $17.07 per ton. Assuming that good oats and wheat hay or silage is worth $12.00 per ton of dry matter, the value of the oats and wheat for forage per acre was $48.72 and $47.52, respectively.

These data illustrate the value of oats and wheat in a forage-livestock enterprise and suggest that farmers might give more consideration to the use of cereals as a source of forage.

In seasons of severe drouth or heavy infestation of wild oats, harvesting of these cereal crops for forage may be more profitable than harvesting them for grain.

The value of oats and wheat hay and silage exceeds the value of barley because the rough barley awns can cause serious mouth disorders in livestock. However, barley awns are not as serious a problem in silage as in hay. The value of barley hay and silage per acre at an assumed $11.00 per ton is $39.60.

Summary

Oats, wheat and barley are valuable for pasture, hay and silage as well as for grain. Highest dry matter and protein yields of forage per acre were obtained when the grain was in the dough stage, except for higher protein yield of oats at the milk stage.

Rough awns make barley less favorable for hay and silage, and it is better utilized early for pasture. Oats and barley are more productive than wheat at the earlier stages of growth but in the later stages of growth wheat is nearly equal to oats and barley.