WISCONSIN ALFALFA YIELD AND PERSISTENCE (WAYP) PROGRAM
2008 SUMMARY REPORT

Program Objectives:

1. To verify the yield and quality of alfalfa harvested from production fields over the life of the stand beginning with the first production year (year after seeding).

2. To quantify decreases in stand productivity of alfalfa fields as they age.

2008 Overview:

The year 2008 marked the second year of this project. Once again, UW-Extension agents were asked to identify forage producers who would be willing to weigh and sample forage from a 2007-seeded field and continue to do so for the life of the stand. Ten such fields were identified on six separate farms. Also included in this summary are first and second production year data from eight 2006-seeded fields enrolled in the program at the beginning of the 2007. As is always the case in these types of studies, there is attrition of fields over time. Two of the eight 2006-seeded fields had to be dropped from the study (in one case the field was drastically altered by a gas line installation). Two of the original fields were not able to obtain first-cut yields because of weather complications. Yield and forage quality data for these two farms were excluded for the missed harvest and for 2008 total season summaries. Data was included in summaries for individual cuttings. Similarly, first-cut data for one of the 2007-seeded fields was not available and was omitted for calculating initial cut and total season averages. A summary of all project fields is presented in Table 1.

2007 Weather
Weather conditions varied across locations. A frost in early April delayed initial spring growth at several locations. All sites experienced some degree of dry conditions during the growing season. Drought was especially severe in western Wisconsin.

2008 Weather
May was extremely dry across much of the state. Heavy and frequent rains during early June were the predominant weather anomalies in 2008. In some cases this caused a delay in first-cut harvest date and in one case resulted in the forage being chopped back onto the field. Dry weather returned later in the summer. Overall, the growing season was below normal for growing degree units.

Data Collection
Project fields were identified and an accurate measure of field size was determined (if not previously calculated). Forage yield from an entire project field was weighed (usually this was done with an on-farm drive over scale). Both empty and full weights for all trucks/wagons used were recorded. Beginning in 2008, two forage samples from each harvest were taken and submitted to the Marshfield Soil and Forage Analysis Laboratory (only one sample was submitted per harvest in 2007) for NIR analysis. Data from the two forage samples was averaged and recorded by the local coordinator. Information was inputted into a spreadsheet and shared with the producer following each harvest. At the end of the season, all data was collected and summarized for this report.

Table 1. Field background information

Field #	1st Production Year	County	Seeding Mo/Yr.	Seeding Rate (lb/ac)	Field Size (ac)	Notes
107	2007	Outagamie	05/06	15	103.7	
207	2007	Outagamie	04/06	16	79.3	
307	2007	Outagamie	04/06	16	37.0	no '08 1st-cut data
407	2007	Outagamie	04/06	16	156.7	no '08 1st-cut data
507	2007	St. Croix	08/06	NA	51.0	
607	2007	Waupaca	04/06	15	24.1	dropped for 2008
707	2007	Fond du Lac	04/06	17	15.7	dropped for 2008
807	2007	Fond du Lac	04/06	17	39.7	
108	2008	Chippewa	04/07	15	18.8	
208	2008	Marathon	04/07	15	5.2	
308	2008	Winnebago	05/07	15	115	
408	2008	Winnebago	08/07	15	36.0	
508	2008	Winnebago	05/07	15	22.0	
608	2008	Outagamie	05/07	20	83.7	
708	2008	Outagamie	04/07	16	147.8	
808	2008	Outagamie	04/07	16	53.0	
908	2008	Outagamie	05/07	15	50.3	
1008	2008	Outagamie	08/07	15	194.8	no '08 1st-cut data

Harvest Schedules:

2007 Season:
Cutting dates varied among sites, especially for the initial spring cutting date. Four of the fields were cut five times during the growing season (4 before Sept. 1st + 1 late fall cut in October), three of the fields were cut four times before Sept. 1st, and one field was cut three times, with the final cut on July 17th. The latter was the western Wisconsin site where drought conditions were severe and the producer decided that there was no need for a late fall cutting. A summary of 2007 cutting dates is presented in Table 2.

2008 Season:
Cutting dates for all project fields harvested in 2008 are presented in Table 3. Of the 16 project fields, three were cut three times, eleven were cut four times (all but one of these by the end of August), and two were cut five times. Average first–cut date was 12 days later in 2008 than 2007 (May 22 vs. June 3). However, average 4th-cut date was the same for both years, which was the result of shorter intervals between cutting dates in 2008. The approach for fields in the four-cut harvest schedule was similar with cuttings generally made within a week of June 1, July1, August 1, and September 1 (the exception was a Sept. 17 harvest date for one farm). However, there was a wide variation in how the three-cut schedule was implemented (the final cutting ranged from July 29 to September 3).

Table 2. Summary of 2007 Cutting Dates

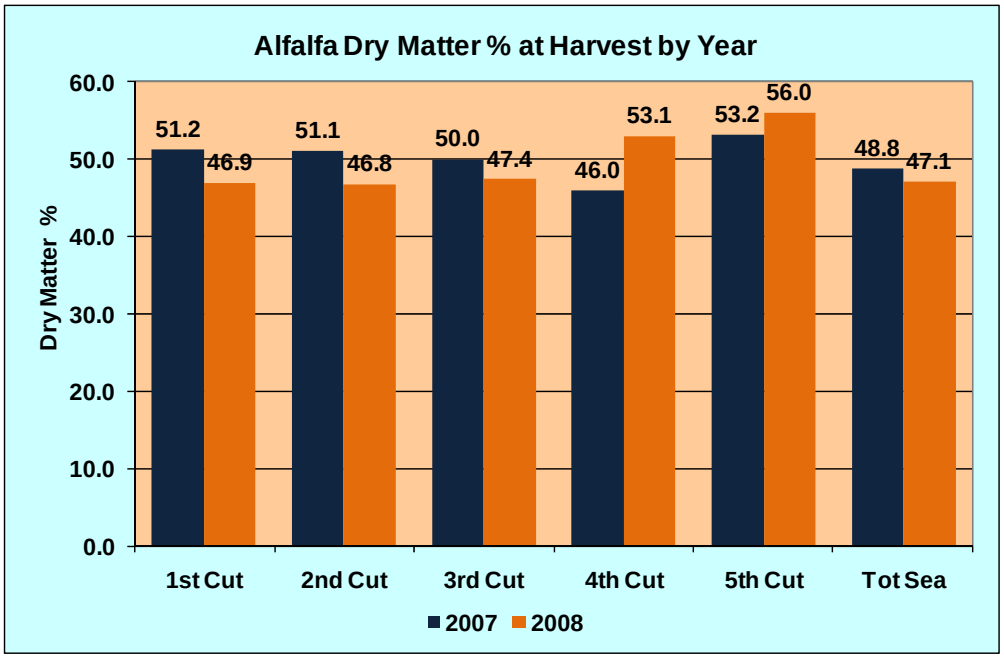
Field ID#	1st Cut Date	2nd Cut Date	3rd Cut Date	4th Cut Date	5th Cut Date
107	22-May	23-Jun	24-Jul	31-Aug	21-Oct
207	22-May	23-Jun	25-Jul	31-Aug	21-Oct
307	22-May	23-Jun	25-Jul	31-Aug	22-Oct
407	23-May	24-Jun	26-Jul	31-Aug	22-Oct
507	16-May	19-Jun	17-Jul		
607	18-May	30-Jun	30-Jul	31-Aug	
707	26-May	29-Jun	31-Jul	30-Aug	
807	29-May	25-Jun	29-Jul	30-Aug	
Mean	22-May	24-Jun	25-Jul	30-Aug	21-Oct
Earliest	16-May	19-Jun	17-Jul	30-Aug	21-Oct
Latest	29-May	30-Jun	31-Jul	31-Aug	22-Oct

Table 3. Summary of 2008 Cutting Dates

Field ID#	1st Cut Date	2nd Cut Date	3rd Cut Date	4th Cut Date	5th Cut Date
107	6-Jun	30-Jun	30-Jul	29-Aug	
207	6-Jun	30-Jun	28-Jul	30-Aug	
307	NA	30-Jun	30-Jul	28-Aug	
407	NA	30-Jun	30-Jul	29-Aug	
507	8-Jun	8-Jul	29-Jul		
807	30-May	5-Jul	5-Aug	17-Sep	
108	6-Jun	13-Jul	14-Aug		
208	23-Jun	30-Jul	3-Sep		
308	27-May	25-Jun	27-Jul	27-Aug	29-Oct
408	27-May	24-Jun	26-Jul	27-Aug	
508	27-May	25-Jun	26-Jul	27-Aug	29-Oct
608	28-May	3-Jul	4-Aug	6-Sep	
708	6-Jun	30-Jun	28-Jul	30-Aug	
808	6-Jun	1-Jul	30-Jul	28-Aug	
908	6-Jun	30-Jun	1-Aug	29-Aug	
1008	NA	1-Jul	29-Jul	31-Aug	
Mean	3-Jun	2-Jul	1-Aug	30-Aug	29-Oct
Earliest	27-May	24-Jun	26-Jul	27-Aug	29-Oct
Latest	23-Jun	30-Jul	3-Sep	17-Sep	29-Oct

Forage Dry Matter at Harvest:

All cuttings for both years were harvested as high moisture haylage except for the second cutting of the 507 field in 2007. This cutting was not included in the summary graph (Figure 1). Harvested forage was slightly wetter in 2008 compared to 2007. October harvested forage tended to be higher in dry matter than other cuttings.



Range for individual fields:

2007:

For individual cutting:
Wettest: 33.9% DM
Driest: 67.6% DM

For total season:
Wettest: 41.6% DM
Driest: 54.2% DM

2008:

For individual cutting:
Wettest: 33.0% DM
Driest: 63.3% DM

For total season:
Wettest: 37.0% DM
Driest: 54.4% DM

Figure 1. Average dry matter of harvested forage by cutting and as a weighted average for the total season (2007 and 2008).

Discussion Point!
Although project participants were not asked about storage structure, there is good reason to believe most of the farms are storing this forage in bunker/pile silos. Average harvested dry matter percent reported in this project for the first two years is well above that recommended by ag engineers to obtain optimum fermentation and silage porosity. Conversely, many nutritionists are recommending drier alfalfa haylage to offset the wetter corn silage component of the diet, decrease the percentage of soluble protein, and to avoid any chance of butyric acid formation. Clearly, the latter strategy is being followed on these farms and presumably many others.

Forage Dry Matter Yield:

Dry matter yield results are presented in Figure 2. Across all fields and cutting schedules, average yield was about 0.5 ton/A less in 2008 compared to 2007 (5.0 vs. 4.5). Variability in yield between fields was primarily a function of cutting schedule and weather for a particular location (Table 4). First production year fields in 2008 yielded only slightly less (0.1 ton/A) than second production year fields.

Discussion Point!
Just how profitable is it to take a 5th cutting in October? During 2007-2008 there were five fields where this cutting strategy was used. The yield range was from 0.34 to 0.88 tons/A (average was 0.58 tons/A). Given the potential for reduced yield in the subsequent growing season (more on this later) and the cost of harvesting such a small amount of forage per acre, is such a practice viable in Wisconsin? Perhaps the "need for feed" might justify the practice in some years, but long term it's likely not a sustainable or profitable management practice.

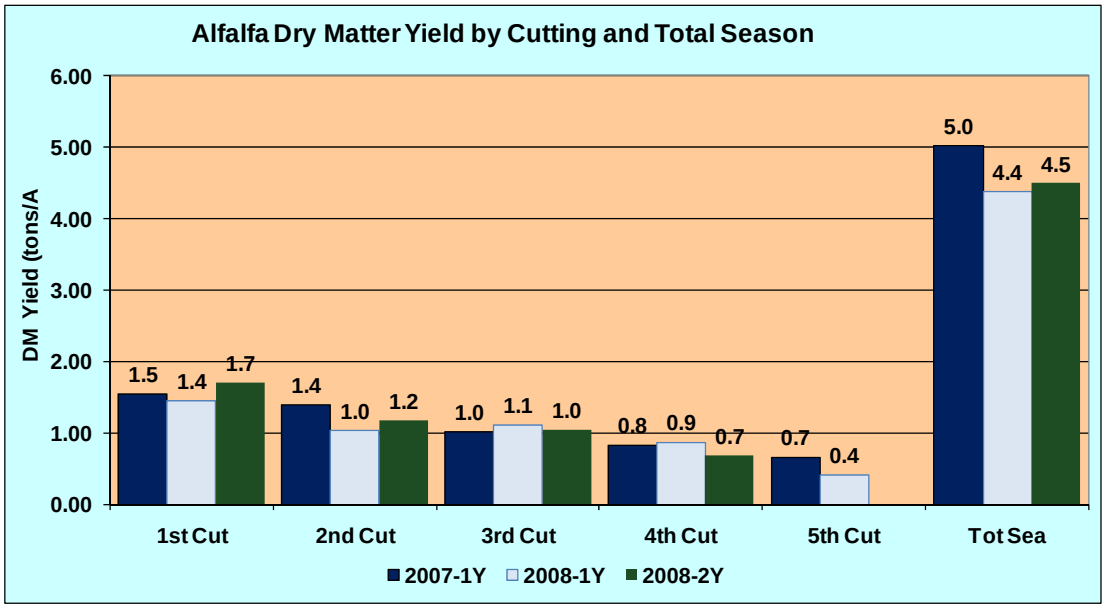


Figure 2. Average dry matter yield by cutting and for the total season. Data is segregated by calendar year (2007 or 2008) and production year (1Y or 2Y).

Table 3. Dry matter yield by cutting and for the total season in 2007

Field ID#	1st Cut DM Yld	2nd Cut DM Yld	3rd Cut DM Yld	4th Cut DM Yld	5th Cut DM Yld	Tot Sea DM Yld
107	1.57	1.53	0.95	0.59	0.34	4.98
207	1.52	1.33	1.00	0.70	0.73	5.27
307	1.54	1.51	1.30	0.90	0.88	6.12
407	1.41	1.57	1.11	0.80	0.71	5.59
507	1.00	1.02	0.37			2.39
607	1.79	1.77	1.20	1.14		5.90
707	1.75	1.23	0.81	0.63		4.41
807	1.79	1.19	1.42	1.10		5.51
Mean	**1.55**	**1.39**	**1.02**	**0.84**	**0.67**	**5.02**
Low	**1.00**	**1.02**	**0.37**	**0.59**	**0.34**	**2.39**
High	**1.79**	**1.77**	**1.42**	**1.14**	**0.88**	**6.12**

Table 4. Dry matter yield by cutting and for the total season in 2008

Field ID#	1st Cut DM Yld	2nd Cut DM Yld	3rd Cut DM Yld	4th Cut DM Yld	5th Cut DM Yld	Tot Sea DM Yld
107	1.28	1.11	1.07	0.43		3.89
207	1.34	1.08	1.14	0.68		4.23
307	NA	0.86	0.91	0.78		---
407	NA	1.14	1.09	0.68		---
507	1.95	1.08	0.76			3.79
807	2.23	1.73	1.31	0.82		6.08
108	1.38	0.74	1.15			3.27
208	2.08	1.54	0.84			4.46
308	1.46	0.83	1.27	0.93	0.45	4.95
408	0.86	0.49	0.85	0.50		2.70
508	2.01	0.72	1.20	0.98	0.37	5.29
608	1.39	1.78	1.54	0.92		5.63
708	1.28	1.05	1.18	0.89		4.40
808	1.81	1.20	1.27	0.79		5.07
908	0.73	0.94	0.89	1.12		3.68
1008	NA	1.06	0.97	0.83		---
Mean	**1.52**	**1.08**	**1.09**	**0.80**	**0.41**	**4.42**
Low	**0.73**	**0.49**	**0.76**	**0.43**	**0.37**	**2.70**
High	**2.23**	**1.78**	**1.54**	**1.12**	**0.45**	**6.08**

Cutting schedule x yield

It's often interesting to look at cutting schedule as a function of yield. The average yield of alfalfa harvested for fields cut 3, 4, or 5 times per year is presented in Figure 3. Not surprisingly, more harvests per year translated to higher total season yields. It should be noted that this is a simple average that did not take into account the previous year cutting schedule. Further, these comparisons are made across a range of environments and locations.

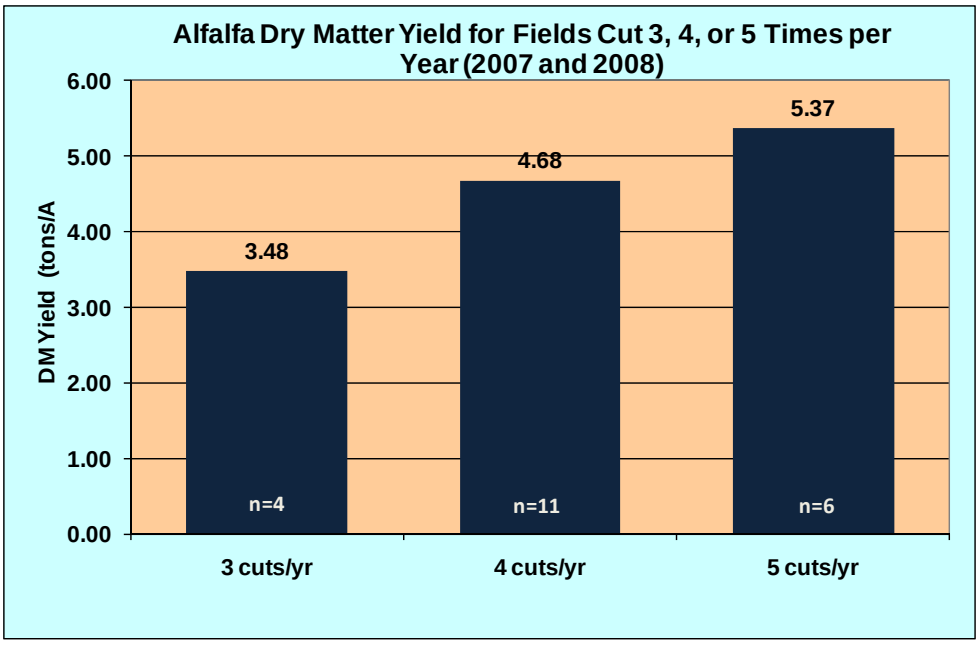


Figure 3. Alfalfa dry matter yield for fields cut 3, 4, or 5 times per year (2007 and 2008).

Alfalfa Persistence:

In-season

An analysis was done to determine the percent of total season yield for each cutting (Table 5). Data was summarized for 3-, 4-, and 5-cut systems. Five-cut fields were also included in the 4-cut summary with the final fall harvest not included in the total season yield. It's significant to note the wide variation in percent yield for an individual cutting. In some cases this is the result of environmental conditions (e.g. drought) previous to the harvest while in other situations it's simply a function of cutting date (Tables 2 and 3).

Table 5. Average percent of total season yield by cutting for 3, 4 and 5 cut harvest systems*

3-cut system (N=4 site years)

	1st cut	2nd cut	3rd cut
Mean	44	33	23
Low	42	23	16
High	47	43	35

4-cut system (N=17 site years)

	1st cut	2nd cut	3rd cut	4th cut
Mean	32	26	25	17
Low	20	15	18	11
High	41	33	32	30

5-cut system (4+1 fall) (N=6 site years)

	1st cut	2nd cut	3rd cut	4th cut	5th cut
Mean	30	23	21	15	11
Low	25	14	19	12	7
High	38	31	26	19	14

* high and low figures are for individual cuttings and will not add to 100%

Between years

Being only two years into the project, it's difficult to draw too many firm conclusions on stand persistence across years. Persistence is influenced over time by the age of the stand, cutting schedule, and environment. For this project, persistence is being measured as a percent of first production year dry matter yield. Persistence data for 2006-seeded fields is presented in Table 6. Only four fields have complete yield information for both 2007 and 2008. Fields 107 and 207 were both cut five times in 2007 and only four times in 2008. Field 507 was cut three times in both 2007 and 2008 but the first production year yield was reduced by extreme drought conditions. Field 807 was cut four times in both 2007 and 2008 and provides the most consistent comparison between years.

Table 6. Alfalfa persistence in the 2nd production year as a percentage of 1st production year yield*

Field ID#	1st Cut	2nd Cut	3rd Cut	4th Cut	Tot Sea
107	82	72	113	74	78
207	88	82	114	96	80
307	NA	57	70	87	NA
407	NA	72	99	86	NA
507	195	106	205		159
807	124	145	92	75	110
Mean	**122**	**89**	**115**	**83**	**107**
Low	**82**	**57**	**70**	**74**	**78**
High	**195**	**145**	**205**	**96**	**159**

*1st production year = 2007

Discussion Point!

Just how much does taking a fall 4th or 5th crop harvest reduce yield of first-cut the following spring? Research indicates the reduction is at least equal to the yield of the fall harvest. This reduction is caused by reduced plant vigor or, in extreme cases, plant death from winterkill. During the first year of this project (2007), Fields 107 and 207 had a 5th-cut taken in the fall while Fields 807 (4-cut) and 507 (3-cut) did not. Figure 4 shows the first-cut yields for these fields in both 2007 and 2008. Note that 2nd-year first-cut yields were lower for both fields cut in the fall of 2007 but higher for those fields (807 and 507) not cut in the fall.

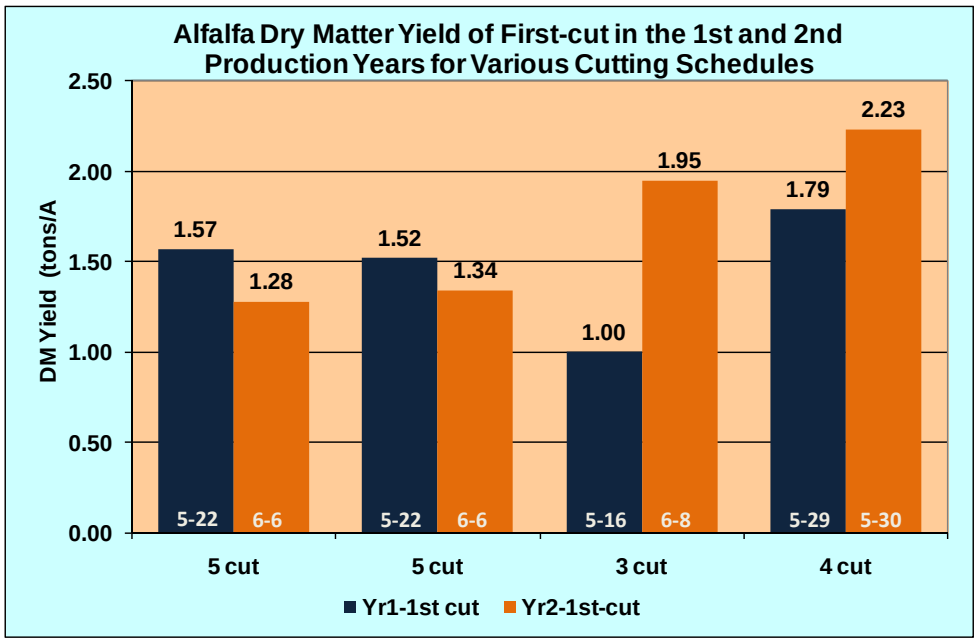
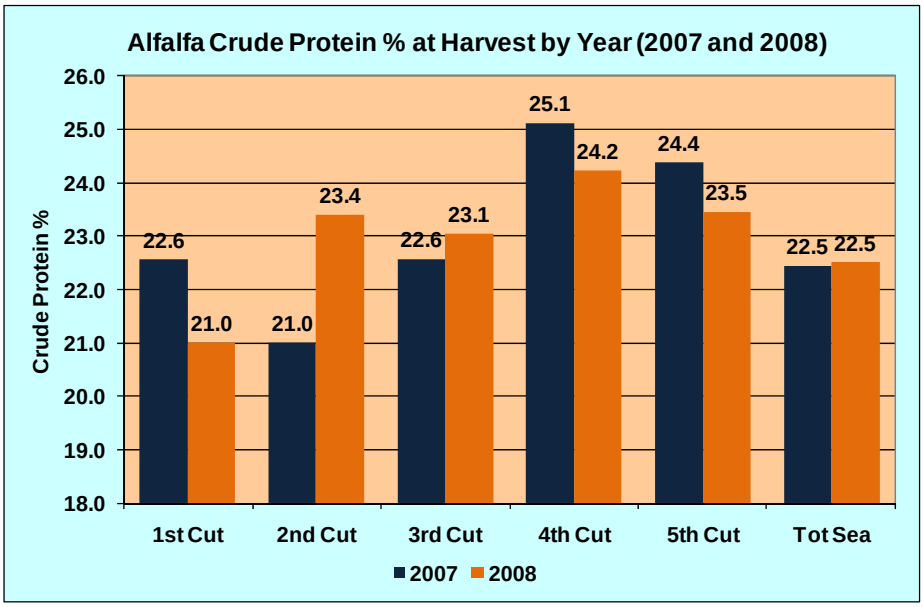


Figure 4. Alfalfa dry matter yield of first-cut in the 1st and 2nd production years for various 1st-year cutting schedules. Cutting dates are displayed at the base of each bar.

Forage Quality:

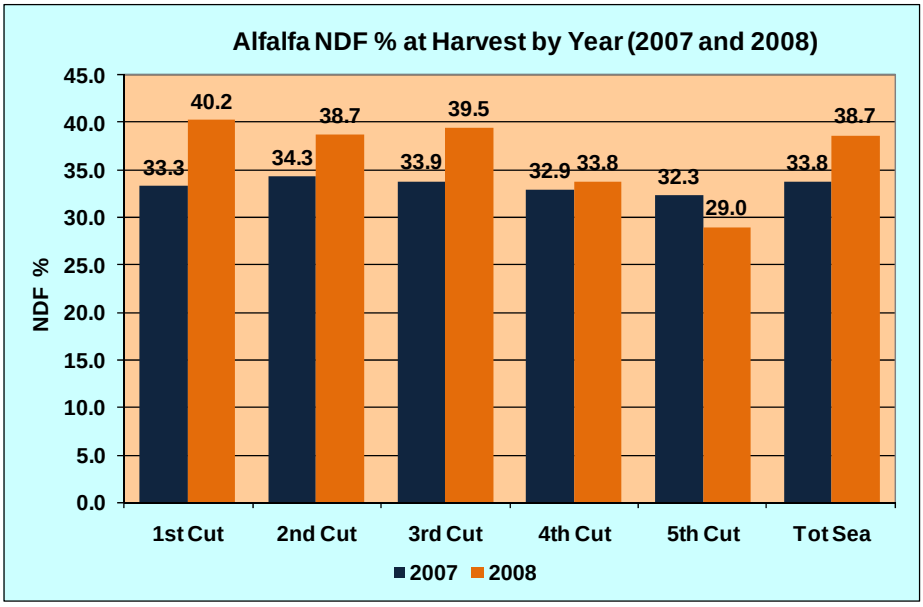
Overall, harvested forage quality was slightly lower in 2008 than 2007, but still what many would consider exceptional. This is somewhat surprising given the amount and frequency of rain that plagued forage producers for much of the early summer. Forage quality, although extremely important, is not the primary focus of this project. However, it is impossible to weigh changes in management to maximize yield and persistence without considering the impact on forage quality. Figures 5 through 9 summarize the forage quality obtained in the project for 2007 and 2008.



CP% range by cutting in 2008:

	High	Low
1st cut	23.1	17.8
2nd cut	26.4	19.5
3rd cut	24.8	20.8
4th cut	26.4	23.4
5th cut	23.5	23.4
Total Season	24.0	19.8

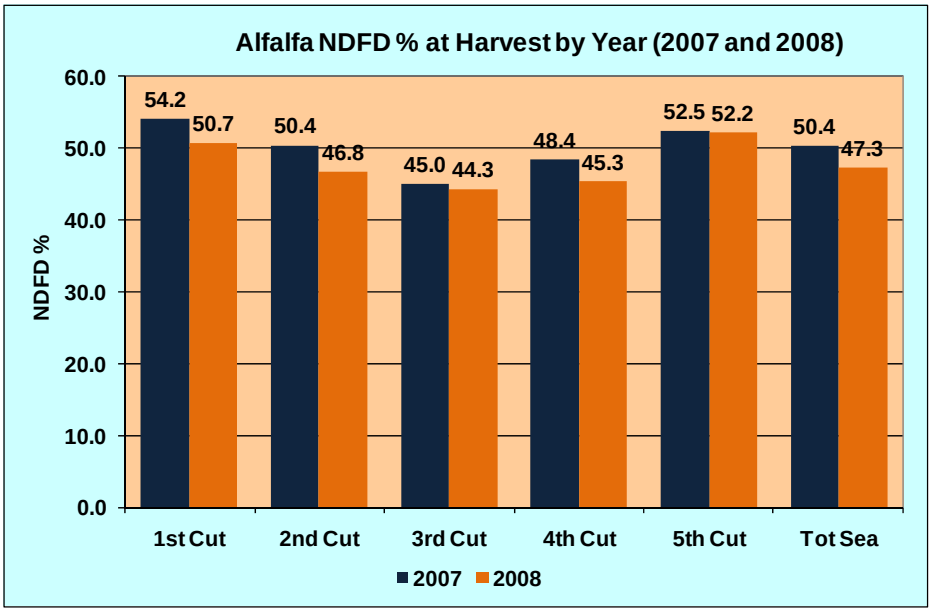
Figure 5. Average crude protein percent by cutting and weighted average for the total season (2007 and 2008)).



NDF range by cutting in 2008:

	High	Low
1st cut	49.7	29.7
2nd cut	48.1	31.9
3rd cut	48.1	31.6
4th cut	36.4	31.4
5th cut	29.0	29.0
Total Season	45.6	32.7

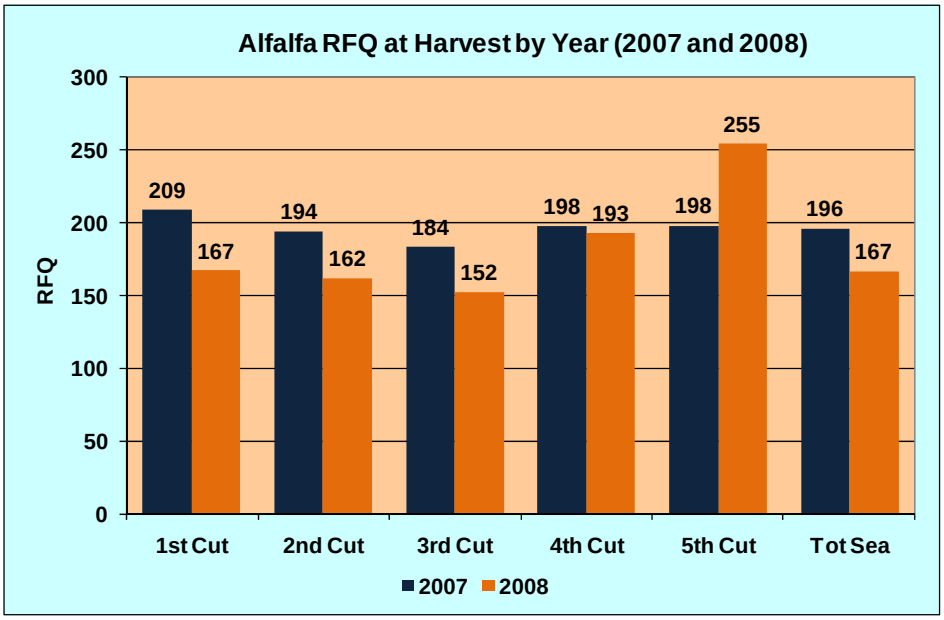
Figure 6. Average NDF percent by cutting and weighted average for the total season (2007 and 2008).



NDFD range by cutting in 2008:

	High	Low
1st cut	56.7	46.3
2nd cut	51.9	40.8
3rd cut	48.2	39.1
4th cut	47.1	41.2
5th cut	52.2	52.1
Total Season	50.5	44.6

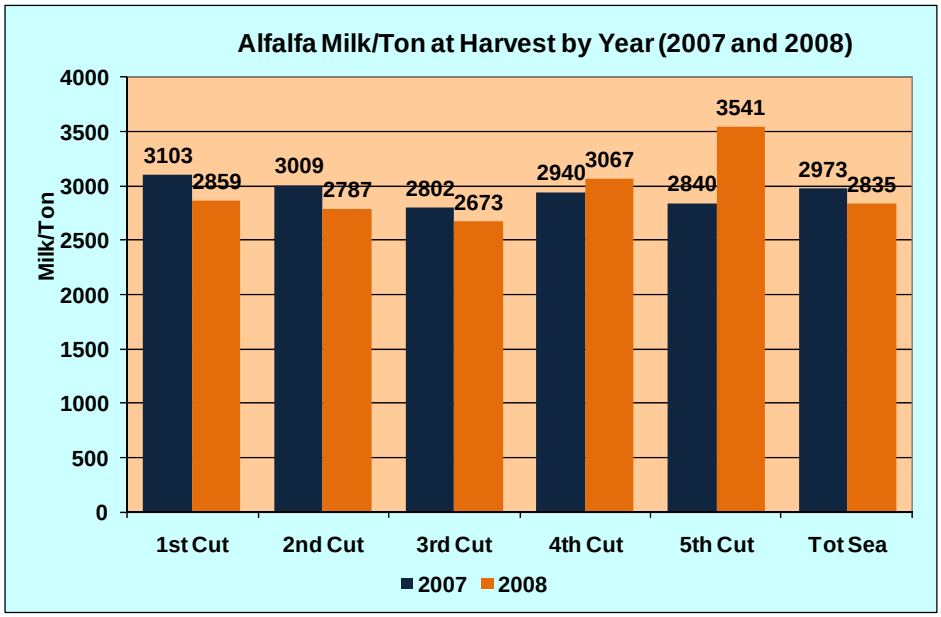
Figure 7. Average NDFD percent by cutting and weighted average for the total season (2007 and 2008).



RFQ range by cutting:

	High	Low
1st cut	244	125
2nd cut	209	108
3rd cut	209	99
4th cut	215	170
5th cut	256	253
Total Season	206	135

Figure 8. Average Relative Forage Quality (RFQ) by cutting and weighted average for the total season (2007 and 2008).



Milk per Ton range by cutting:

	High	Low
1st cut	3453	2522
2nd cut	3091	2236
3rd cut	3059	1941
4th cut	3208	2837
5th cut	3563	3518
Total Season	3079	2562

Figure 9. Average Milk per Ton by cutting and weighted average for the total season (2007 and 2008) .

Discussion Point!

When is forage quality too good? The "knock" on alfalfa is that dry matter yield doesn't compete with corn silage. One strategy to increase yield is to simply delay harvest. Such a strategy lowers forage quality but the more important consideration is whether or not a little lower quality is an acceptable tradeoff for a lot more yield, especially in the spring. For every five days in late May alfalfa yield increases by 0.25 tons/A and RFQ decreases by 20 to 25 points (these are averages and actual values will vary with weather conditions). If the alfalfa is somewhere north of 200 RFQ (as it was in some of these project fields) then waiting for a bump in yield is probably a good tradeoff. Conversely, if the alfalfa is at 160 RFQ, then the tradeoff doesn't look nearly as good.

Summary:

The Wisconsin Alfalfa Yield and Persistence Program is designed to provide forage growers and agricultural professionals a unique look at what is happening at the farm level. As more fields are entered and years pass, the reliability of information will increase. It's important to keep in mind that only two years of data have been collected. Nevertheless, the 2007 and 2008 growing seasons can be contrasted and there certainly is enough information to begin to formulate possible trends and topics for discussion. Overall, both yield and quality were lower in 2007 compared to 2008. However, this might be more of a reflection of the extremely high quality forage harvested in 2007 rather than low quality in 2008.

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