1997-1998 "CRUSHER" EVALUATION TRIAL

Effect Of Harvest Technique On Alfalfa Drying Time

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Study Objective:
Comparison of the drying rates of alfalfa harvested with a "Crusher" super conditioner harvester with that harvested by conventional conditioner rollers under late-season conditions in the Lower Columbia Basin (LCB).

Background:

Circle C Equipment, of Hermiston, Oregon, has developed a harvester for alfalfa that cuts and crushes the stem, leaving the leaves intact and attached to the stem. Preliminary tests with this unit, which we will here-in refer to as "Crusher", indicated that this unit could reduce pre-bailing drying time for alfalfa harvested in the LCB 1/3 to 1/2 of that needed for alfalfa harvested by conventional conditioning rollers. If confirmed, this method of harvesting could reduce post cut field time by 2-4 days, reducing the risk of down hay being rained on. The shorter removal time could also reduce the likelihood of harvest damage to fast recovering varieties and perhaps allow for an additional cutting in some seasons.

Materials and Methods:

Comparisons of the drying rates of the two harvesters were made on alfalfa at the Hermiston Agricultural Research and Extension Center and in 2 commercial fields near Hermiston, Oregon. Five trials were conducted on the final seasonal harvest, with cutting dates ranging from October 6th to October 20th, 1997 (see **Table 1**). All fields were irrigated by center pivot, with the comparative sampling areas consisting of alfalfa on either side of various wheel tracks of the field (i.e., at HAREC the area between the second and third wheel track were harvested with the crusher, with the rest of the field being harvested by conventional means). Three samples per field were taken for each harvest method. Individual samples consisted of at least 4 handfuls of material taken at 20 paces apart as one walked around the pivot wheel tracks. Only the three wind-rows nearest the wheel track were sampled, with every effort being made to take a representative sample from each wind-row. Depending on the size track used, from 1/4 to 1/2 of the field was sampled by this method.

Samples were taken daily and immediately placed in a 1-gallon plastic zip-lock bag, and stored at 40°F until processed. The moisture content of each sample was determined by comparison of fresh weight with the weight after drying at 60°F for 2 days using the formula: (fresh weight - dry weight) / (fresh weight). Data obtained was statically analyzed by using SAS.

The weather during the trial period is presented on **Table 2**. It varied from cool and cloudy during the beginning of the trial to relatively warm and dry at the end, with one evening of ½" rainfall at midpoint of the first three fields. This cutting period was chosen because the cool nights, and sometime wet weather, offers less than ideal conditions for hay drying.

Results:

Samples ran through the "Crusher" had stems that were flattened but not otherwise mutilated. There did not appear to be any more leaf loss on the material ran through the "Crusher" than that on material handled the conventional manner. Alfalfa ran through the "Crusher" felt softer (i.e., offered less resistance to bending) and had comparable feed values (**Table 3**). Protein % was statically the same at the 5% level (n=10), with numerical protein value of hay ran through the Crusher harvester of 21.6% compared to 20.9% for the standard harvester (LSD of 0.90%). The swath rows of the crusher unit were slightly wider and more uniform than the standard unit, which may account for some of the differential drying rates.

The daily change in moisture content of samples taken from each part of the fields is presented in **Table 4**. For the purposes of comparison, values below 20% were considered "bailable." In all cases the drying rate for material ran through the "Crusher" harvester was significantly faster than material conventionally harvested. This advantage was manifested despite the occurrence of ½" rain on the 3rd night for the first three fields.

On field one (Sherrel), material ran though the "Crusher" harvester could have been bailed about day 5, four days earlier than the conventionally harvested hay. Results were less dramatic on Field 2 (HAREC) probably due to the low tonnage on this field, with a two day advantage, and on Field 3 (Circle 4-1) there was a 2-3 day advantage. The occurrence of the cloudy weather and rain during the drying period of fields 1-3 certainly delayed the dry-down period of both types of harvested material, but exemplify the value of reducing the drying time even by a few days during this period of the year. In Field 1 bailing of the conventionally harvested hay was delayed for several days wind-blown hay had formed clumps what were difficult to dry out, and necessitated additional raking, further deteriorating the quality of the hay. No such clumping occurred on the "Crusher" harvested material.

Trials on Fields 4 & 5 were carried out on what is considered more ideal haying weather for such a late-season cutting. No rain, sunny weather, with light breezes. The differential drying rates of Field 4 is shown in Figure 1. On day 5 the "Crusher" harvested hay was ready to be bailed, where as the conventionally harvested material was still at 40% moisture, and could not be bailed for 4 more days. There was only a 2-day difference in Field 5, with the "Crusher" harvested material being ready for harvest on day 5, and the conventionally harvested material would have been ready by day 7, however, on day 6 there was rain, delaying the removal on the conventionally harvested material and deteriorating it quality.

Conclusions:

The alfalfa hay harvested with the "Crusher" harvester dried faster, and was ready to bail 2-4 days earlier than the conventionally harvested material. At harvest and while drying, its quality was equal or better than the conventional material. It was "softer," had similar or slightly better leaf retention, and required less raking. The ability to remove hay from fields 2 to 3 days earlier during this late-season period of unpredictable weather patterns, offers definite advantages worth considering.

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TABLE 3 FEED ANALYSIS REPORT - Dry Weight Basis

	Crude Protein %	ADF %	Tri-State TDN %	RFV
Crusher	21.468	31.679	60.901	142.16
Standard	20.856	30.871	60.737	139.07
LSD	*0.899*	*1.287*	*0.846*	*4.702*

Sample size of 10 cores each

Due to rapid drying, the Super Conditioner increases leaf retention, thus increasing nutrients in the hay.

TABLE 4. SUMMARY OF RESULTS *1

MOISTURE LEVEL (BY DATE)

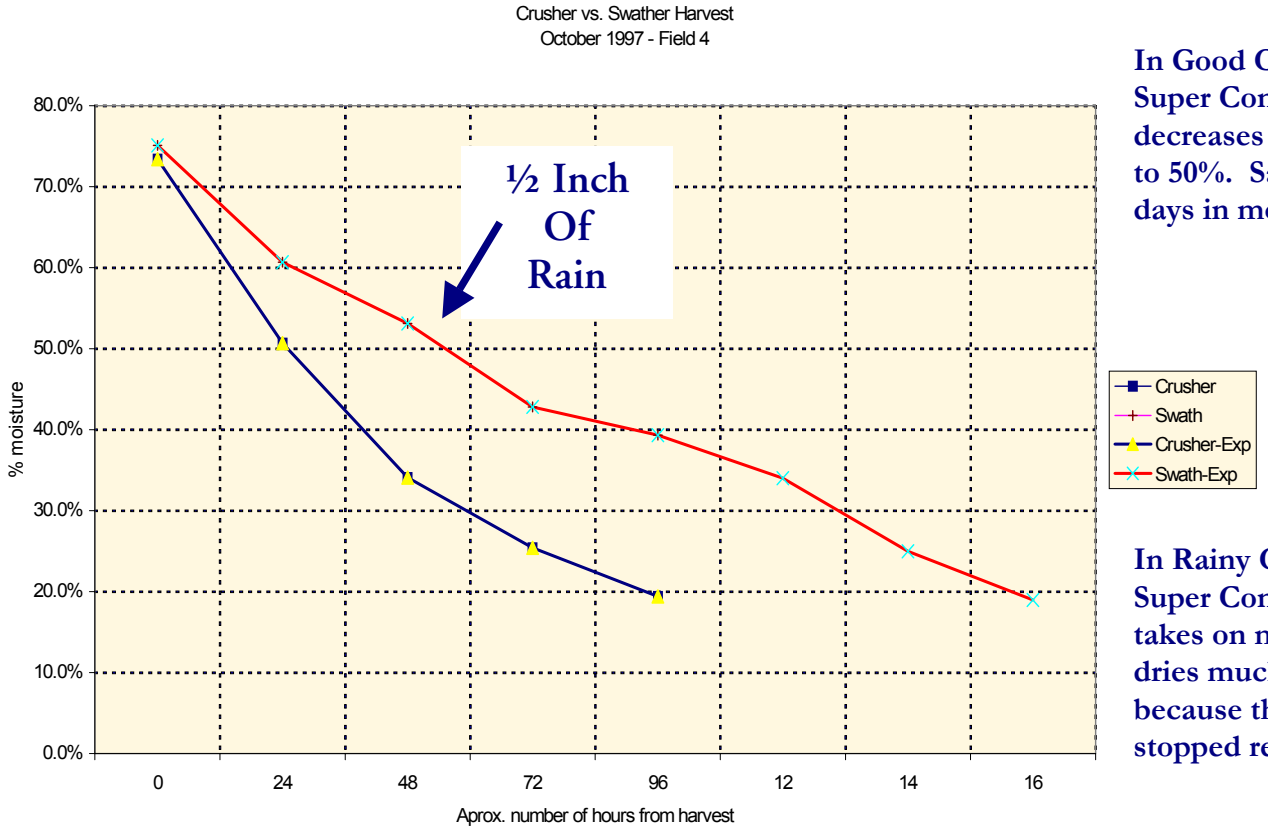
Hours from harvest:		0 24	48	72	96	120	144	168	
Field - Treatment		10/06/97	10/7/97	10/8/97	10/09/97	10/10/97	10/11/97	10/12/97	10/13/97
1-A	Crusher	76.8%	74.1%	38.5%	57.0%	21.0%	16.7%	20.0%	
1-B	Swather	76.8%*2	76.6%*2	61.2%	62.0%	50.3%	39.6%	39.8%	
2-C&D	Crusher	74.8%	60.6%	25.5%	46.4%	18.1%	16.1%	20.8%	
2-E&F	Swather	74.8%*2	58.9%	37.9%	44.8%*2	31.6%	23.0%	25.9%	
3-G	Crusher		78.7%	63.6%	65.5%	41.6%	34.2%	28.6%	19.4%
3-H	Swather		78.7%*2	74.1%	70.0%	55.8%	44.9%	42.3%	27.3%

	Date:	10/13/97	10/14/97	10/15/97	10/16/97	10/17/97
4-I	Crusher	73.4%	50.7%	34.1%	25.4%	19.4%
4-J	Swather	75.1%*2	60.7%	53.1%	42.8%	39.3%

	Date:	10/20/97	10/21/97	10/22/97	10/23/97	10/24/97
5-K	Crusher	69.30%	46.80%	26.20%	22.05%	15.21%
5-L	Swather	69.60%*2	63.60%	46.80%	33.28%	22.70%

*1 - differences on all but initial sampling dates (and where marked *2) significant at P=0.05% level

In all fields and conditions the Super Conditioned hay was ready to bale days before traditionally crimped hay.



In Good Conditions the Super Conditioner decreases drying time up to 50%. Saving you a few days in most cases.

In Rainy Conditions Super Conditioned Hay takes on moisture, but dries much faster because the plants have stopped respiring.