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First Research Trial of a Draper Pickup on a Round Baler

New technologies come from great ideas. PAMI had the idea to adapt a draper pickup to a round baler. The project looked at two issues; could a draper pickup be adapted to a baler, and would the draper reduce leaf loss? About 70 % of alfalfa's protein is in its leaves, and reducing leaf loss is an important way to improve its nutritional quality. A draper pickup's uniform and gentle method of picking up the crop could possibly reduce leaf loss and improve feed quality. The first research trials to test that assumption under field conditions were carried out.



Draper header on a New Holland 855 round baler.

Funding for this project was provided by Saskatchewan Agriculture, Food, and Rural Revitalization (through the Agriculture Development Fund) and by the Canadian Adaptation and Rural Development (CARD) Fund (through the Manitoba Rural Adaptation Council). Wheatheart Mfg. of

Saskatoon, Saskatchewan, also participated in this project by supplying prototype components and providing advice based on their experience with draper pickups. These contributions are gratefully acknowledged.

At a Glance

The primary goal in making alfalfa bales is to keep the leaves in the bale. Reducing leaf loss is important because about 70 % of an alfalfa plant's protein is in the leaves. PAMI's project sought to deliver an easy method of adapting a draper pickup to a baler, and reducing the amount of leaves lost during baling. The project results proved that adapting the draper header to a round baler was possible and that under some field conditions there was a 5% advantage in feed value by using the draper. ***The advantages are significant enough to warrant more work on this concept.***

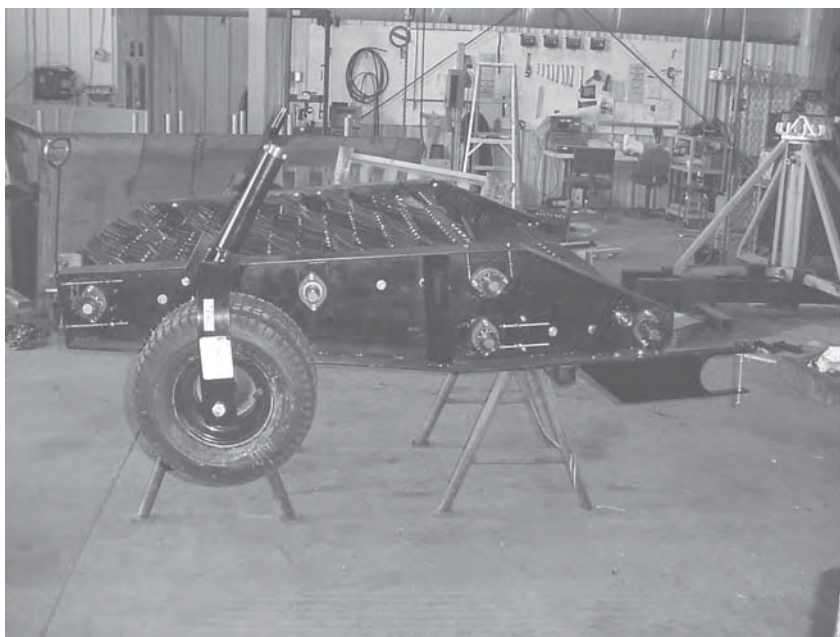
Prototyping

PAMI chose a New Holland 855 baler for the project. PAMI had previously tested this model (see PAMI Report 555), and found it to be a good, dependable fixed-chamber baler, which produced hard-core bales. Leaf losses from the chamber were fairly low at normal moisture contents. The large diameter drum pickup was considered a good choice for producing a noticeable contrast with a draper pickup.

Draper pickups are normally used on combine harvesters and are designed to feed the crop into the harvester uniformly over a wide range of crops and harvesting conditions. The draper pickup chosen for this project consisted of two sets of belts, an upper and lower set with only the lower set having pickup teeth. The upper set of belts had slats that helped move the crop into the harvesting machine.

PAMI personnel designed and carried out modifications to adapt the draper pickup to the baler. The modifications were:

- fabricate pickup sidewalls to fit inside the baler, and leave maximum working width
- develop side shields to prevent forage from hanging up or wrapping
- develop a quick exchange system for the two different pickup systems on the same baler



Draper pickup adaptation to a round baler.

Field Tests

Field tests were conducted on a hay crop that consisted of 70% alfalfa and 30% brome grass. To achieve a good set of observations over varying crop conditions, each pickup was used to make two or three bales and then the pickups were switched. This process was repeated continuously throughout the test period.

PAMI staff continually observed the baling process to determine the effectiveness of swath pickup from the field, and the effectiveness and smoothness of swath feeding into the baler chamber. In an effort to determine the loss levels from each type of pickup, several methods were used:

- PAMI staff conducted close visual inspections of the two swathed areas
- material left on the field surface was vacuumed up and weighed
- bales were weighed and the swath length required to make each bale was measured, and this data was used to create a Bale Development Rate (kg/m)
- the feed value of selected bales was analyzed

Poor harvest conditions, which included heavy rains and growth through the swaths created testing difficulties. Only the data on feed value was reliably gathered over the entire season. In hot and drier

conditions, PAMI is of the opinion that the draper would have reduced leaf loss considerably.

Project Results

Visually, the draper pickup appeared to be gentler than the drum pickup in lifting and conveying the swath. There appeared to be some leaf loss toward the rear of the draper, either between the lower and upper conveyors, or between the upper conveyor and the baler intake roll. There was also some material restriction and plugging because the draper pickup reduced the intake area of the baler.

Feed analysis data collected throughout the test season is shown in the graphs below. Crude Protein (CP) and Relative Feed Value (RFV) were considered the two most important criteria. CP is a good indicator of the amount of leaves in the bales because 70% of alfalfa protein is in the leaves. RFV is the most important overall feed value criteria to livestock producers so it was also considered an important indicator of bale quality in this study.

Figure 1 shows the comparison of CP, while Figure 2 shows the comparison of the RFV. The first two sets of bars in each graph show results of the first-cut harvest, while the next three show the second cut.

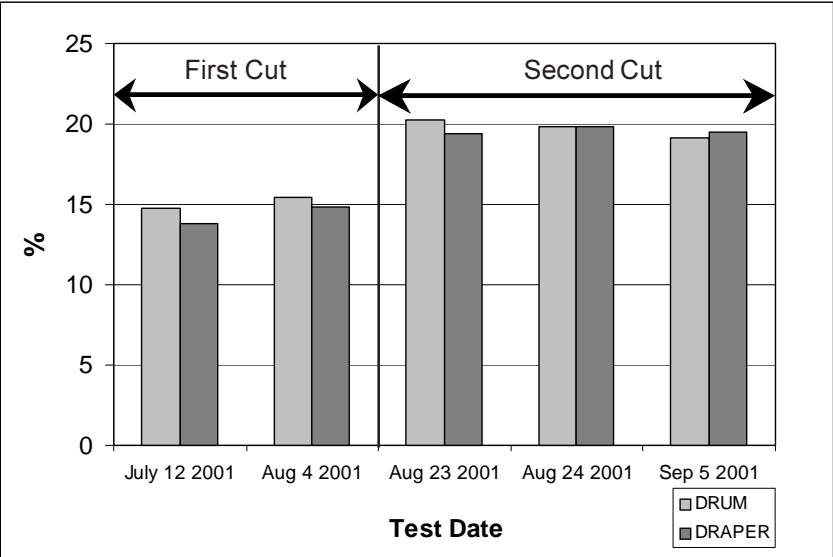


Figure 1: Crude Protein Graph

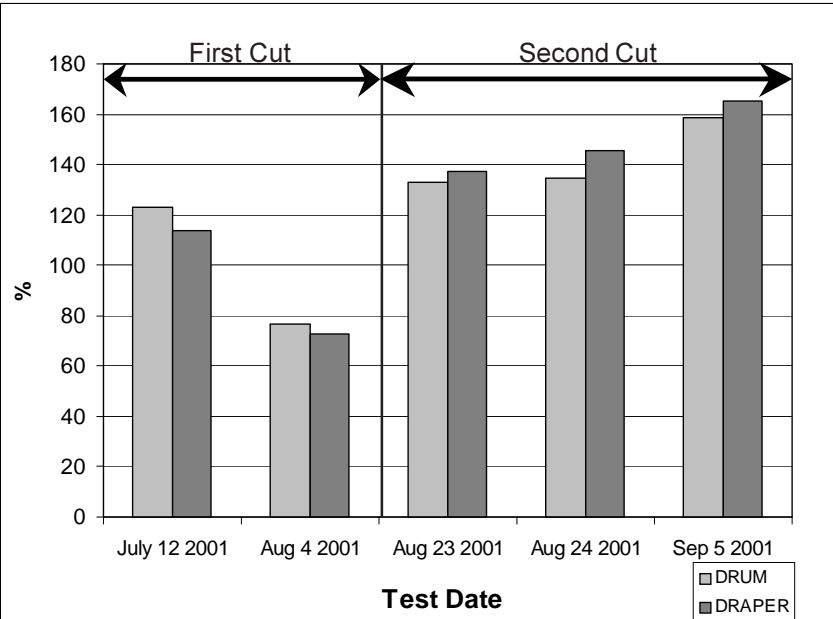


Figure 2: Relative Feed Value

Figure 1 shows that there appeared to be a slight reduction in CP when using the draper compared to the drum under the poor harvest conditions of the first cut, and little to no difference between drum and draper under the more favourable conditions of second cut.

Figure 2 shows RFV also appeared to be slightly reduced by the draper under poor conditions. The superior performance of the drum in these conditions may indicate better overall crop recovery under adverse conditions. Under the favourable conditions of the second cut, the draper produced on average 5% higher RFV.

Although this data is not conclusive, it appears that the draper pickup could give an advantage under some haying conditions. More work needs to be done to quantify this, and to determine the ability of each type in picking up all material under the wide variety of harvest conditions.

Further Work

The potential benefits of reducing leaf loss are significant enough to merit further investigation into this idea. Further design work needs to go into the draper pickup to ensure unrestricted crop feeding into the baler. Initial indications are that the use of a single conveyor belt system may be needed in order to open up the baler's crop intake area and to remove potential areas for leaf loss.

Further field investigation is also required. Field conditions during this project were extreme and interfered with data gathering. The accuracy in measuring the efficiency of the drum versus the draper pickup must also be enhanced by finding a more effective means of quantifying leaf loss.

Need more detail? A detailed PAMI technical report (28001R) on this topic is available. The 25-page report entitled Utilization of a Draper Pickup on a Round Baler is available. A shipping and handling charge will apply.

Acknowledgements

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A Properly Made Round Bale...

- is well packed
- has square corners
- has uniform size across its width

A properly made round bale captures and holds the feed, is easy to handle, and will store well with little spoilage.

Moisture content at baling is important for forming a firm, well-shaped bale, minimizing spoilage during storage, and for limiting leaf loss during baling and handling.

See Research Update #717, Forage Growers Guide to Round Baling, April 1995, for further information.