How Cutting Date Affects Yield, Quality and Profitability of a Hay Crop

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Nutritional quality of first-cutting hay tends to decline as the harvest date is delayed. The physical quantity of the crop increases over some range of dates, however. The quantity increase and quality decline present the grower with a tradeoff which we will analyze in this article. The accompanying Haycutdate.xls Excel spreadsheet template can be downloaded at http://www.apec.umn.edu/faculty/wlazarus/machinery.html.

Suppose that the earliest feasible harvest date is May 20, at which point the crop is expected to yield one ton per acre. The yield is expected to increase by 100 pounds per acre over the next three weeks. On June 9, the yield is up to two tons per acre.

The relative feed value (RFV) on May 20 is estimated to be 200 when evaluated in scissors-cut samples, or 170 after the harvesting operations. Suppose we expect this 170 RFV value to decline by five points each day that harvest is delayed past the May 20 date. By June 9, then, the RFV value is down to 70.

One way to put an economic value on this change in quality is to look at data from our quality-tested hay auctions. Jim Linn, University of Minnesota nutritionist, did a regression analysis of 2002-3 data from the Sauk Centre, Minnesota hay auction. He found that 150 RFV hay sold for around $90/ton. He found that the selling price increased by around $0.58/ton for each one-point change in the RFV value above or below 150.

We estimate that it costs around $30/acre to mow, merge windrows, and bale a first-cutting haylage crop of 1.5 tons/acre. A more important but more difficult number to arrive at, is how much the harvesting cost/acre will vary if the harvest date is delayed and the yield increases. Suppose the harvesting cost increases by $5/ton/acre for each additional ton of yield.

So, four factors are expected to change as the harvest date is delayed: 1) the physical yield, 2) the RFV, 3) the value/ton, and 4) the harvest cost/A. These four factors are fairly easy to compare and graph in a simple spreadsheet. We find that in this example, the profit-maximizing harvest date is May 27. On that date, the yield has increased to 1.35 tons/A, while the RFV has declined to 135. We estimate that hay of that quality would be worth $81/ton or $109/acre on that date. The 1.35 ton yield costs $28/acre to harvest, so our net returns come out at $82/acre.

The vertical axis on the right side of the graph below shows how yield increases as the harvest date is delayed. The vertical axis on the left side shows how RFV declines. The combined effect of those two changes, along with the slight increase in harvesting cost as yield increases, causes net return/A to increase until around May 27, and then decline.

Change in Hay Crop Quantity, Nutritional Quality, and Net Return Per Acre as Harvest Date is Delayed