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Calculating Hay Yields

Danny Greene, Stephen Hawkins, and Keith Johnson
Department of Agronomy
David Petritz
Department of Agricultural Economics
David Trotter
Clark County Agricultural Agent
Purdue University

Knowing the forage dry matter yield of a given acreage is important in determining the productivity of the crop, estimating yields for lease arrangements, buying or selling hay, making fertility recommendations and feeding recommendations. The most overlooked areas often have the greatest potential for increased profitability. Reporting yields to land owners is necessary in many land rent agreements. Examining profit margins per field can be easily figured when hay yield and price per ton are recorded. Producers need to know yields and selling prices in order to estimate potential profitability - or calculate actual net returns after the hay is marketed. A greater awareness of your hay yields could direct you to making changes that will bring about greater profitability.

Why Calculate Hay Yields?

Selling Hay. Hay networks and auctions commonly market hay by the ton. Weight estimates will be needed to appraise transportation options. For those producers who are contemplating the marketing of their hay, it would seem beneficial for them to show to potential buyers that they really can produce and deliver the quality of hay being promised. Since hay yields and qualities are so variable, a good sales tool would be for them to be able to demonstrate their historical achievements.

Fertility. Plant nutrient management requires dry matter forage yields along with soil tests to accurately assess fertility needs. Due to variations in moisture content among forages, plant nutrient recommendations are based on dry matter forage yields. By knowing the production level of a field over time, problems can be identified and management options selected to optimize production. An example: A field believed to be producing 4 tons per acre of dry forage per year is fertilized to achieve a 4 ton production level. The crop, however, is actually producing 5 tons per acre. Over time the nutrients removed by the crop exceed that which the soil can supply. By determining actual yield, production problems related to crop nutrition can be identified before yields are severely reduced.

Feeding Hay. Balancing rations require knowing how much hay you have of a certain quality. Computer programs that balance rations require knowledge of dry

matter as well as nutrient composition. Not providing the correct amount of an appropriate feed will result in decreased animal production or in wasted feed. For more information on forage quality, obtain a copy of Purdue Extension publication AY-260, "Forage Testing - Why, How, and Where", available at Cooperative Extension Service offices.

How to Calculate Hay Yields

Hay yields in dry tons per acre can be calculated for a given field if you know:

1) Acreage of the field
2) Number of bales per harvest
3) Average weight of the bales in each harvest

Each component of the equation can be determined for each harvest or cutting. Representative small bales can be individually weighed on a farm feed scale or a household scale. All package types (i.e. large round, large square, small square) could be transported to a truck scale to determine average bale weight. Bales from each cutting should be weighed to give a more accurate estimation of yield.

4) Dry matter percentage.

A portion of all forages will be water and the moisture content will vary between different lots of forages from the same area or cuttings from the same field. Moisture testers are available to determine hay moisture content. A microwave method of moisture determination is outlined in Purdue Extension publication ID-172, "Use of Microwave Drying to Determine Moisture Content in Forage", available at Cooperative Extension Service offices.

Field-cured hay is generally harvested at approx. 15-20 % moisture. The moisture content will gradually decrease until an equilibrium is reached, generally between 10 and 14%. Hay treated with preservatives may be harvested at 20-30+ % moisture. This hay may reach an equilibrium at a higher moisture level dependent upon the rate of preservative applied and storage conditions. As an example of hay dryness, an "as is" yield of 4.0 tons per acre is equal to 3.4 "dry" tons per acre when the moisture is 15%. [4.0 tons x (100% - 15% moisture)] = 3.4 tons of dry forage].

The importance in adjusting for moisture content can be seen in the example below. You harvested a 4.5 acre alfalfa field as follows:

	A	B	Wt		DM
Cutting	Acres Harvested	Number of Bales	Average Weight*	% Moisture	% Dry Matter (100-% Moisture)
1st	4.5	33 large round bales	880 lb.	18	82
2nd	4.5	196 small square bales	60 lb.	22	78
3rd	4.5	162 small square bales	50 lb.	20	80
4th	4.5	136 small bales	50 lb	18	82
*Average bale weight and moisture should be determined on the same date for each cutting.					

If harvests are taken as silage, then "bale" can be replaced with "wagon". To calculate hay yields in dry tons per acre, place the correct values in the blanks

$$\left(\frac{Field}{\_\_ Acres}\right)\left(\frac{\_\_ Bales}{Field}\right)\left(\frac{\_\_ lb.}{Bale}\right)\left(\frac{Ton}{2000\ lb.}\right)\left(\frac{\_\_ \%\ Dry\ Mat}{100\%}\right) = \frac{\_\_ Tons}{Acre}$$

or more simply as:

$$\left(\frac{B \times Wt \times DM}{A \times 2000}\right) = \frac{\_\_ Tons}{Acre}$$

1st cutting yield:

$$\left(\frac{Field}{4.5\ Acres}\right)\left(\frac{33\ Bales}{Field}\right)\left(\frac{880\ lb.}{Bale}\right)\left(\frac{Ton}{2000\ lb.}\right)\left(\frac{82\%\ Dry\ Mat}{100\%}\right) = \frac{2.65\ Tons}{Acre}$$

$$\left(\frac{33 \times 880 \times 0.82}{4.5 \times 2000}\right) = \frac{2.65\ Tons}{Acre}$$

2nd cutting yield:

$$\left(\frac{196 \times 60 \times 0.78}{4.5 \times 2000}\right) = \frac{1.02\ Tons}{Acre}$$

3rd cutting yield:

$$\left(\frac{162 \times 50 \times 0.80}{4.5 \times 2000}\right) = \frac{0.72\ Tons}{Acre}$$

4th cutting yield:

$$\left(\frac{136 \times 50 \times 0.82}{4.5 \times 2000}\right) = \frac{0.62\ Tons}{Acre}$$

The yields from each cutting are added together to obtain total yield.

1st + 2nd + 3rd + 4th = Total Yield

$$\left(\frac{2.65\ Tons + 1.02\ Tons + 0.74\ Tons + 0.62\ Tons}{Acre}\right) = \frac{5.01\ Tons}{Acre}$$