CHALLENGES WITH DRYING ALFALFA AND OTHER FORAGES

Edward J Shaw[1]

Since the beginning of modern-day agriculture, farmers have had the challenge of getting the right moisture to achieve optimum yields and best quality without spoilage.

A. Wet weather problems.

1. All too often, farmers cut their forage crops, have it almost ready to bale; yet the moisture is still too high for it to keep, and a heavy rain comes in. The results are additional loss of color and quality.
2. In many places in North America and around the world, high yield forages can be grown but due to humidity, dews, etc., it is impossible to get the last 5 to 10% moisture out to reach an acceptable preservation level to be baled. Processing the crop as haylage or silage is the solution, however operation costs rise, reduces the potential market to local area, restricting distance transport and eliminates export opportunities.

B. Extreme dry conditions

1. Every farmer has experienced the disappointment of loss of income when there is leaf loss due to baling hay when it is at the moisture level required for it to keep. Often, by the time the stems are cured, the potentially over dried leaves can break from the stems and/or disintegrate during the baling process. The results are stemmy skeleton hay with low RFV and reduced yields.

   A solution to this challenge is a steamer, that potentially will maintain color, increases quality and yield.

Moisture problems affect Hay Growers around the world and each area has its own harvesting challenges. The art and science of drying hay can become complex very quickly with so many variables, however it can be simplified into two categories: either the hay is too high moisture to be baled and appropriately preserved or the moisture is too low and quality, yield and profit decrease.

History of the Agri Green's development of the AG Maximizer Hay Dryer

Emil Gulbranson and Sons of Vanderhoof, British Columbia Canada, a farmer, logger, and world hay exporter experienced ongoing difficulties drying hay in 2016. The challenges faced due to extreme wet harvesting conditions initiated a search of alternative hay drying methods.

Emil researched hay dryers around the world; travelling to access and evaluate bed dryers, barn dryers and spike dryers, some of which were successful in Europe. The dryer that he was most satisfied with, as far as drying efficiency, was stationary, costly and did not meet his needs as it would only dry two 3X4 bales at a time.

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He researched lumber dryers and over time designed a unique compressor/fan combination to give the volume and pressure required to create heat and be large enough to dry at least twenty (3X4X8) bales/hour. A prototype was created, and testing began. When he ran out of fresh baled hay to dry in Vanderhoof, he contacted me to see if there was hay to dry in Southern Alberta. We arranged for him to come to the Lethbridge area and dry wet bales at the Hay Exporter facilities, Green Prairie.

We were drying 3rd and 4th cut and some of the samples had an RFV of 212 and increased protein to 21 % I took a pressed sample to a trade show in the Middle East, and the USA alfalfa exporters could not believe 1) it came from Canada and 2) after pressing the leaves were attached to the stem.

We have sold units in 5 countries, including South Africa, Poland, two into the UK, six in various states and eight across Canada.

How it works

The technically designed fan/compressor in combination with a Tier 4 or Stage 5 400 HP diesel engine captures all the radiant heat from the engine (approx. 50 degrees F) in addition to the friction of the air in the compressor (another 50-degree F). This combined heat increase of 100 degrees F over ambient is available at no added cost. For example, if ambient air temperature is 80 degrees F, the heat produced by the unit will increase the temperature of the air blown through the spikes into the bale to 180 degrees F. The AG Maximizer dries hay from inside out. This process can reduce moisture levels from 25% to 15%. The bales are then stored on edge, three high with a space between the bales and over the next 24 to 96 hours the bales will lose another 3 to 5%. As the heat comes out of the bales, it also takes out this moisture.

What this means to a farmer.

1. A farmer can bale in the 25% moisture range and retain a greater crop yield and quality (minimum leaf loss), then dry the bales to the desired moisture level. This approach widens the window that enables farmers to produce consistent moisture levels and retain leaf, adding value to their product.
2. A farmer in wetter climates can bale earlier and dodge the storms and retain color, quality, and quantity.
3. The AG Maximizer enables a farmer to start baling earlier in the day and later in the evening when moisture levels are above 15% (better for leaf retention). Baling can continue through mid-day, processing fully sun-cured hay that does not require drying. The AG Maximizer extends baling hours considerably and as a result can lessen the need of an additional tractor and baler.

Cost of operating

1. Fuel used is approximately fifteen gallons/hour. Averages .83 gallons/bale.
2. One operator.
3. One telehandler, skid steer or loader unit.

Since the prototype was developed in 2017, Agri Green has sold eighteen units (including one round bale unit) worldwide to dry areas, high humidity locations and regions in which rain conditions are challenging.

Some of the findings.

1. Alfalfa can be baled at 25% and we have had increases in RFV, protein and even yield increase by two hundred pounds per acre.
2. Round Bermuda bales (baled after second day after cutting) had 111 pounds of weight (water) removed by AG Maximizer Hay Dryer from a 1300-pound bale.
3. Grass and or mixed hay dries the best, higher density bales talk more time to dry.
4. Some producers have been able to reduce one tractor and baler by starting earlier, going later, and having the balers bale dry hay in the middle of the day.
5. One customer had a section pivot of timothy and he baled ½ the field with high moisture in the morning and processed through the dryer and waited for the rest to dry naturally and then bale. When a major pet food company looked at the hay, they bought all the hay processed through the dryer and not the sun-dried hay, as the hay through the dryer was softer and not shattered and dusty.
6. On two tests, one in Alberta and one in Arizona, forty% moisture hay was dried down to 25%. Several weeks later the hay still had the same color, no smell, and had kept. We are continuing research to verify and conclude what occurred.
7. Our first client has his 17-year-old daughter load, dry, unload and reload the dryer and in a 10-hour day will do more than two hundred bales.
8. Fuel used is less than one gallon per bale.

Background to support the anecdotal findings in the development of the Agrigreen Maximizer Hay Drier

1. Loss at baling, pick up and chamber Source Pitt. R.E 1990 Silage and hay preservation Ithaca NY
    a. Yield and leaf loss at 25% is 4% yield loss and 4% leaf loss
    b. Yield and leaf loss at 20 is 6 % yield loss and 4% leaf loss
    c. Yield and leaf loss at 12 % moisture is 6% yield loss and 8% leaf loss

Yield and leaf loss	Moisture %	Yield loss in %	Leaf in %
	25	4	4
	20	6	4
	12	8	8

    Both yield loss and leaf loss doubles when going from 25% to 12 %

2. Hay loss barn dried to Field cured Source Michael Collins - Forage and Research Department of Agronomy University of Kentucky, Lexington
    a. Barn dried % of barn dried harvest losses is 10% to 18%
    b. Field cured hay is harvest losses is 18 to 24%

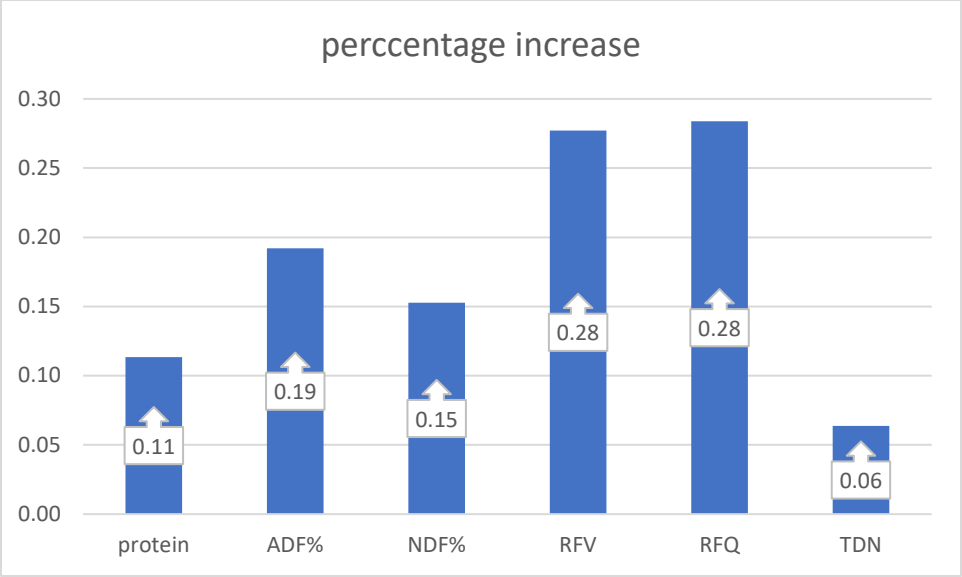
Barn dried to field Suncured losses	
Barn dried	Suncured losses
10 to 18%	10 to 24%

3. Leaf retention loss source Doug Rich High Plains Journal updated 6/21/21 and Jeff Roberts Farm Tec Inc. Hudson, Wisc.
    a. Baled alfalfa at 20% moisture has 20% leaf loss
    b. Baled alfalfa at 10% moisture had up to 50% leaf loss

Leaf loss from 10% to 20% moisture	Leaf loss
20 %	20%
10%	50%

4. Potential value from leaf loss Dr. Dan Undersander
    a. Consider hay at $210 per ton, and $1 per point of RFV (relative feed value) for a two ton per acre yield for every one percent leaf loss equals $14 per acre
5. Quick test and trial done in Tonapah in 2020
   Agrigreen sent a test unit to Tonapah in 2020. The field was had both bales were both dried at over 20% and then the bales from the same field and cutting were allowed to dry down and be baled with out drying. The table is an average of both types of bales evaluated* Note This test was for twenty-one bales of both Suncured and dried. Lab tests were sent out to a lab. We did not weigh the bales

	moisture	protein	ADF	NDF	RFV	RFQ	TDN	
Average Suncured	9.43	20.7%	27.35	33.08	190	182	61.83	
After drying with dryer	14.23	23.05	22.10	28.03	242.67	233.67	65.77	
% change		11.35%	19.19%	15.26%	27.72%	33.33%	6.37%	



From the above research and tests, it is obvious that the higher moisture you can bale, the higher the yield and the higher the quality

With the Agrigreen Maximizer Hay drier, farmers can bale earlier,

1. Reduce weather risk
2. Bale to keep more yield and more quality. This increases more dollars per ton and dollars per acre
3. Use this in high humidity area
4. Use this in dry desert conditions to reduce leaf loss

Advantages of Agrigreen Maximizer hay Drier

1. Only portable stand alone drier in the market
2. Can be made fully portable or stationary. In portable model can be driven to field/shed and be fully operational in 10 minutes
3. Only requires one person to operate
4. Is stand alone, does not need hook up to power, gas, biogas, or external heat supply
5. Has been sold and proven into UK, Europe, South America, USA, and Canada