Palo Pinto County Agriculture and Natural Resources Newsletter

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Bermudagrass Hay Production and Fertilization

By Justin Benavidez

Hay production is an important and profitable activity for many farmers. These latest rains have benefited several areas of the Rolling Plains and made us reconsider the expected yield and how much to invest. Below we will look at our District budgets, breakeven prices to help us price our hay, and how much to fertilize depending on our yield projections.

Even after these late rains, we are still in a drought scenario. Drought and high fertilizer costs will be the two key variables defining production potential and fertilizing amount for a profitable bermudagrass hay production. Estimating our potential yield and investment level will be critical for our business success.

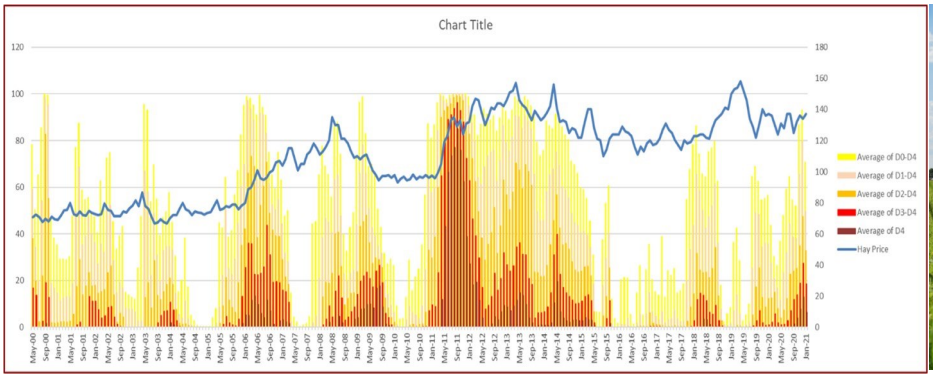
A productive bermudagrass pasture requires water and fertilization. According to Vanessa Corriher-Olson in Overton (Quality is What Counts in Hay Production. March 27, 2017. Texas AgriLife Today), a ton of Bermudagrass hay contains 50 pounds of nitrogen, 14 pounds of phosphorus, and 42 pounds of Potassium (Table 1).

Table 1. Amount of Nutrients in 1 Ton per Acre.

1 Ton Hay	Lb/acre
Phosphorus	14
Nitrogen	50
Potassium	42

A good and honest estimation of how many round bales per acre we produce this year will define how much to fertilize. Round bale production costs can easily exceed market values if our yield is lower than expected. On the other hand, we should consider that a prolonged drought lasting through the summer and fall will undoubtedly lead to higher hay market prices. It is usual for hay values to be higher during a drought (Graph 1).

Graph 1. Texas Historical Hay Prices and Drought Index



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Hay production District budgets consider high fertilization costs and a rate similar to the extraction rate per ton of hay per acre. This year it is essential to conduct a soil test analysis to determine the correct amount of fertilizer to apply. The cost of soil tests is around 12-15 dollars per sample. The cost per acre is much lower, less than $1/acre, considering each test represents several acres. Our budgets also assumed contracted custom cut and bale services. These budgets describe an average production system in our area. To better use this tool, you need to use your data reflecting your production system, costs, and estimated yields (Table 2).

Table 2. Bermudagrass Hay Production Budget

REVENUE	Quantity	Units	$/Unit	Total
Bermudagrass Round Bale	9.00	Round Bale	$85.00	$765.00
Total Revenue				$765.00
VARIABLE COSTS	Quantity	Units	$/Unit	Total
Production Costs				
Custom				
Fertilizer Application	3	Acre	$4.50	$13.50
Herbicide Application	2	Acre	$5.50	$11.00
Insecticide Application	1	Acre	$5.50	$5.50
Cut and Bale	9	Roll	$15.00	$135.00
Fertilizer				
Fertilizer (N)	225	Pound	$1.03	$231.75
Fertilizer (P)	65	Pound	$0.67	$43.55
Potash (K)	190	Pound	$0.69	$131.42
Herbicide				
Hay Pre and Post Herbicide	2	Acre	$12.00	$24.00
Insecticide				
Insecticide - Alfalfa 1	1	Pint	$4.12	$4.12
Gasoline				
Pickup/General Use Equipment	1	Acre	$4.50	$4.50
Repairs & Maintenance				
Pickup/General Use Equipment	1	Acre	$30.00	$30.00
Interest on Credit Line			6.50%	$22.00
Total Variable Costs				$656.34
Planned Returns Above Variable Costs:				$108.66
Breakeven Price to Cover Variable Costs			$72.93	Round Bale
FIXED COSTS	Quantity	Units	$/Unit	Total
Machinery Depreciation				
Pickup/General Use Equipment	1	Acre	$45.83	$45.83
Equipment Investment				
Pickup/General Use Equipment	$395.88	Dollars	5.50%	$21.77
Allocated Establishment Cost	1	Acre	$55.00	$55.00
Total Fixed Costs				$122.60
Total Specified Costs				$778.94
Returns Above Specified Costs				($13.94)

Returns per acre above variable costs were positive at $108/acre, considering a yield of 9 round bales per acre. Returns above all costs (variable and fixed costs) were marginally negative at $85/bale price. Fixed costs included pasture establishment amortization at today's value, machinery investment, and other depreciation costs. Results can be positive from the financial point of view (cash-flow). Still, they might be negative from the economic point of view (including amortization and investment costs).

Breakeven Prices.

The breakeven prices show us the significant variability that we can have if the production decreases significantly. It gives us the lowest price we must take to cover variable and total costs at different yield scenarios. Overestimating our potential yield can result in breakeven prices above-market prices (Table 3). It is crucial to have an honest and accurate estimate of how many round bales we might produce if we want to be profitable in a year like this. (Table 3)

Table 3. Bermudagrass Production Breakeven Prices
Estimated Yield and Fertilization

		Example Breakeven Prices	
Example Yield Percent	Example Yield Round Bale	To Cover Variable Costs	To Cover Total Costs
75%	6.75	$97.24	$115.40
90%	8.10	$81.03	$96.16
100%	9.00	$72.93	$86.55
110%	9.90	$66.30	$78.68
125%	11.25	$58.34	$69.24

The following tables help us calculate the fertilization level we need according to our expected yield. Fertilizer cost per ton produced is $90/acre, below the value of hay per ton of $189/acre (Table 4).

There are two key variables we have to consider this year. First, a soil test can generate significant savings and ensure that we use the indicated amount of nutrients to maximize our production.

Second, we are assuming a linear response to fertilization. Therefore, if the Marginal Revenue (MR) is higher than the Marginal Cost (MC), as in this case, it would be convenient to continue fertilizing (Table 4).

Table 4. Bermudagrass Fertilization Tables with No Yield Limitations

Ton/acre	Nitrogen Lb/acre	Phosphorus Lb/acre	Potassium Lb/acre	Revenue ($/acre)	Fertilizer Costs	Other Var. Costs	Returns Above VC	Returns Above FC
1	50	14	42	$ 189	90	148	$ (48.92)	$ (170.92)
2	100	28	84	$ 378	180	181	$ 16.77	$ (105.23)
3	150	42	126	$ 567	270	215	$ 82.47	$ (39.53)
4	200	56	168	$ 756	359	248	$ 148.16	$ 26.16
5	250	70	210	$ 944	449	281	$ 213.86	$ 91.86
6	300	84	252	$ 1,133	539	315	$ 279.55	$ 157.55
7	350	98	294	$ 1,322	629	348	$ 345.25	$ 223.25
8	400	112	336	$ 1,511	719	381	$ 410.94	$ 288.94
9	450	126	378	$ 1,700	809	415	$ 476.64	$ 354.64

On the other hand, lack of rainfall will be our main limitation in production. Considering the high costs of fertilizers, any fertilization above our production potential would result in negative returns. Each field is different; each pasture has its production potential. There might be significant production variability within each field that requires variable fertilization to maximize profits. An accurate yield estimation will be essential in a year like this. Table 5 below shows the results above variable costs and total costs if our production is limited to 3 tons/acre. Any fertilization above those levels will result in negative profits.

Table 5. Bermuda Grass Fertilization Tables (3 Ton/acre Yield)

Ton/acre	Nitrogen Lb/acre	Phosphorus Lb/acre	Potassium Lb/acre	Revenue ($/acre)	Fertilizer Costs	Other Var. Costs	Returns Above VC	Returns Above FC
1	50	14	42	$ 189	90	148	$ (48.92)	$ (170.92)
2	100	28	84	$ 378	180	181	$ 16.77	$ (105.23)
3	150	42	126	$ 567	270	215	$ 82.47	$ (39.53)
3	200	56	168	$ 567	359	215	$ (7.39)	$ (129.39)
3	250	70	210	$ 567	449	215	$ (97.25)	$ (219.25)
3	300	84	252	$ 567	539	215	$ (187.11)	$ (309.11)
3	350	98	294	$ 567	629	215	$ (276.97)	$ (398.97)
3	400	112	336	$ 567	719	215	$ (366.83)	$ (488.83)
3	450	126	378	$ 567	809	215	$ (456.69)	$ (578.69)

Other Production Management Variables to Consider

As we can see from the budget, concentrating on saving herbicides or insecticides this year may not be the best decision. First, there are other more significant variables where we can achieve savings, as in the case of a good soil test. Second, poor pasture management this year can deteriorate the pasture and affect future production. As in most of our productive decisions in agriculture, today's decisions have their effects in the coming years.