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The Debate of Hay Production Systems: Cost and Long-term Benefits

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Not too long ago, I was at one of our regional producer's advisory meetings and several producers made the comment that alfalfa is not a feasible hay crop in Mississippi because of the fertilization requirement and the cost of seed. That is the reason why I have decided to write this newsletter, to remind producers that unless you have implemented hay production strategies and have managed it properly (no matter what crop you choose), it will not reach its production potential. I often hear ***"I'm going to get out of the cattle business because feeds are too expensive. I cannot afford to do it." Instead of taking that approach, have you taken the time to consider what you might be able to improve in your forage program? What management practices do you need to consider to be more efficient with your forage grazing and hay production system?*** If you are still stuck in the mode that ***"this is what my ancestors did,"*** then you need to consider that forage production practices have moved on. That means that in hay production, there is a need for producers to put quality over quantity and consider the long-term sustainability. For example, when you buy a new vehicle, you expect to have it for at least five years or more. The same with your forage system. It requires that initial economic investment and maintenance like any other commodity to have the long-term benefit. Things do not fall from the sky!

Table 1. Fertilizer recommendations for hay production systems for a period of three years in the same field based on MSU soil testing recommendations. Soil pH was 5.7 with medium P and very low K soil nutrient levels.

	Year			
Nutrient	**1**	**2**	**3**	**Total**
Lime (ton/ac)				
Hybrid Bermudagrass	2.5	-	-	2.5
Alfalfa	2.5	-	-	2.5
Alfalfa/Bermudagrass	2.5	-	-	2.5
Nitrogen (N) (lb N/ac)				
Hybrid Bermudagrass[1]	200	200	200	600
Alfalfa	-	-	-	0
Alfalfa/Bermudagrass	-	-	-	0
Phosphorous (P) (lb P/ac)[2]				
Hybrid Bermudagrass	50	50	50	150
Alfalfa	60	60	60	180
Alfalfa/Bermudagrass	60	60	60	180
Potassium (K) (lb K/ac)[3]				
Hybrid Bermudagrass	100	200	200	500
Alfalfa	180	200	200	580
Alfalfa/Bermudagrass	180	200	200	580

[1]It assumes four hay cuts with an application of 50 lb N per acre per cut.
[2]Phosphrous applications will occur at the beginning of the growing season.
[3]Potassium application with be split through the growing season.

I do not expect that every producer will integrate alfalfa into their forage system, because it requires management. For those that might want to consider it, start small (few acres) until you learn the management practices that work in your farm, because there is not a one size fits all. I would like to start my analysis by using a soil sample from a producer's hybrid bermudagrass hay field. The producer in question said that alfalfa requires too much nutrients. Based upon soil test results, we developed nutrient recommendations for hybrid bermudagrass hay production, alfalfa, and alfalfa/bermudagrass mix. Keep in mind that when MSU Soil Testing Laboratory provides nutrient recommendations, those recommendations are for a 3-year nutrient management plan. ***Table 1*** illustrates the nutrient recommendations from the MSU Soil testing laboratory for this particular soil sample. You can observe that all three hay production systems will require 2.5 tons of lime per acre application in year one. All systems will require the same amount of lime applied in year 1. The hay pro-

duction systems containing alfalfa do not require nitrogen since rhizobia bacteria in the alfalfa roots will fix nitrogen to increase alfalfa yield and forage quality. During the growing season, nitrogen fixed in the alfalfa plant will be used by the plant to maintain metabolic functions and growth instead of being transferred to the grass. Over the three-year period, the hybrid bermudagrass will need 600 lb N per acre (assuming four cuts with an application of 50 lb N per acre per cut of hay). The hay systems containing alfalfa will only require 30 more units of P and 80 units of K over the three-year period when compared to bermudagrass. Producers might indicate that the cost of fertilizer might be too high for large-acre hay fields. Then the questions to consider are: ***(1) Do you need large acres in hay production? (2) Have you determined how much hay you need for the season? (3) Can you produce the same amount of hay in less acreage with better nutrient management and harvest production practices? The answer is always use a hay inventory to determine hay needs.***

Table 2. Cost of production per acre in Mississippi for various hay production systems (hybrid bermudagrass, alfalfa, and alfalfa/bermudagrass mix). Production costs were calculated using estimated research yields, nutritive value, and estimated production cost values from the MSU forage budgets.

	Hay Production System		
Variable	***Bermudagrass***	***Alfalfa***	***Alfalfa/Bermudagrass***
		Year 1	
Fertilizer	$303.00	$223.30	$223.30
Alfalfa Seed	-	$80.00	$80.00
Pesticide	$36.74	$60.27	$60.27
Labor	$66.28	$66.28	$66.28
Fuel	$28.57	$26.83	$26.83
Repair & Maintenance	$35.99	$36.35	$36.35
Fixed Expenses	$43.08	$66.52	$66.52
Total Expenses per Acre	***$513.66***	***$559.55***	***$559.55***
Yield Production (ton/ac)	4.5	4.2	4.4
Cost ($/ton of hay)	***$114.15***	***$133.23***	***$127.17***
		Year 2	
Fertilizer	$201.50	$93.00	$93.00
Alfalfa Seed	-	-	-
Pesticide	$36.74	$60.27	$60.27
Labor	$66.28	$66.28	$66.28
Fuel	$28.57	$26.83	$26.83
Repair & Maintenance	$35.99	$36.35	$36.35
Fixed Expenses	$43.08	$66.52	$66.52
Total Expenses per Acre	***$412.16***	***$349.25***	***$349.25***
Yield Production (ton/ac)	4.6	4.0	3.5
Cost ($/ton of hay)	***$89.60***	***$87.31***	***$99.79***
		Year 3	
Fertilizer	$201.50	$85.80	$85.80
Alfalfa Seed	-	-	-
Pesticide	$36.74	$60.27	$60.27
Labor	$66.28	$66.28	$66.28
Fuel	$28.57	$26.83	$26.83
Repair & Maintenance	$35.99	$36.35	$36.35
Fixed Expenses	$43.08	$66.52	$66.52
Total Expenses per Acre	***$412.16***	***$342.05***	***$342.05***
Yield Production (ton/ac)	5.8	4.2	3.4
Cost ($/ton of hay)	***$71.06***	***$81.44***	***$100.60***
Three-year Average	***$91.60***	***$100.66***	***$109.19***

Budget does not include storage cost, storage losses and feeding losses.

Now that we have indicated that that the fertilizer requirements are very similar between hybrid bermudagrass and alfalfa, let us talk about the yearly production cost. Using local fertilizer prices, MSU forage budgets information for bermudagrass and alfalfa production, we can develop an estimated cost of production and the cost per ton of hay produced. ***Table 2*** provides a three-year production cost budget. The costs of fertilizers are from a local coop and forage yields used in each scenario are from our research studies at Mississippi State. The cost per ton of hay produced was lower in the alfalfa/bermudagrass hay system, except in the third year when alfalfa production started to decline. The three-average cost per ton of hay produced was very similar between all three systems with the alfalfa/bermudagrass hay system being lower than the other two systems. ***A producer might ask, then why I want to plant alfalfa?*** The answer to an efficient hay production system is not complete until you take into account the nutritive value of the hay produced and how it might reduce the need for supplementation. If we take the nutritive value [crude protein (CP) and total digestible nutrients (TDN)] of hybrid bermudagrass (CP = 9.5% and TDN = 54.3%), alfalfa (CP = 22.7% and TDN = 61.9%), and alfalfa/bermudagrass (CP = 18.7% and TDN = 59.3%) we can put an economic value to the hay produced. Remember that hay can smell good or look green, but that does not tell you much about the nutritive value. You need to get your hay tested. Figure 1 indicates that the alfalfa and the alfalfa/bermudagrass hay systems have a higher protein content than the hybrid bermudagrass. Hybrid bermudagrass has 55.8 and 50.0% lower protein content when compared to the other hay systems (Fig. 1). The three-year overall TDN content per ton of hay was lower with the bermudagrass compared to the other hay systems, which will ultimately end in supplementing TDN. The economic value of the hay based in crude protein over the three-year period increased

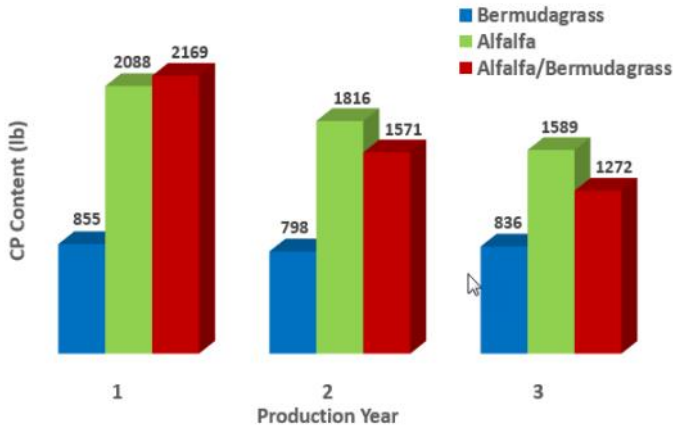

Figure 1. Seasonal crude protein content over a three-year period for hay production systems in Mississippi.

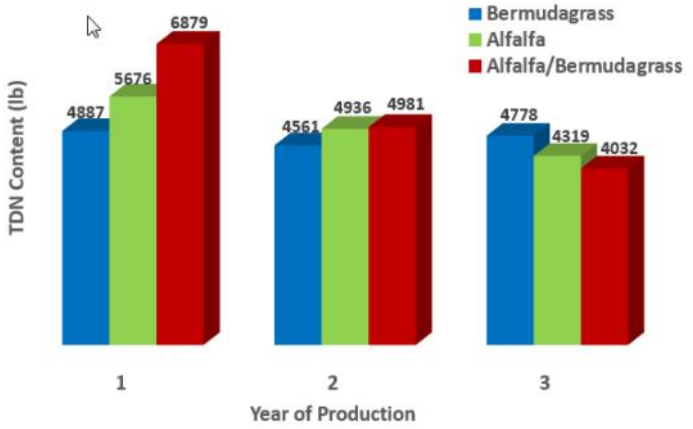

Figure 2. Seasonal total digestible nutrients content over a three-year period for hay production systems in Mississippi.

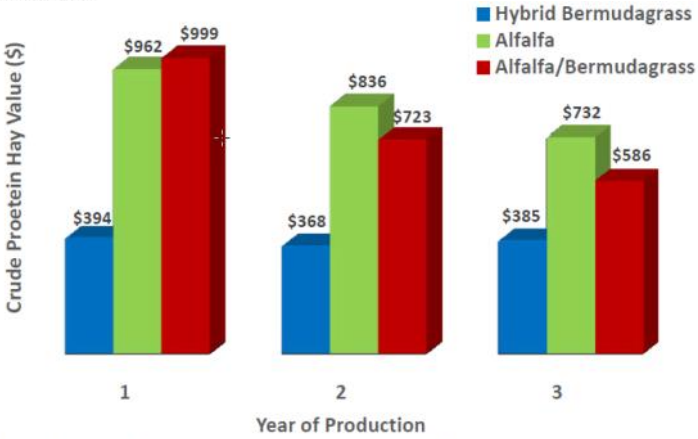

Figure 3. Seasonal hay value based on protein content. Values were calculated using corn gluten with 19% crude protein (CP) at a cost of $0.46/lb of protein in a dry matter basis.

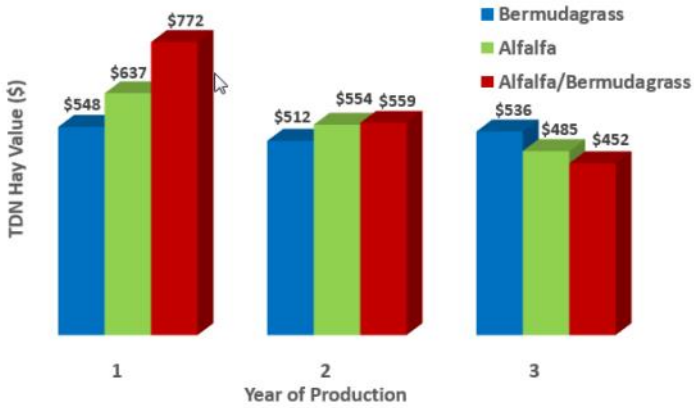

Figure 4. Seasonal hay value based on total digestible nutrients content. Values were calculated using corn gluten with 78% total digestible nutrients (TDN) at a cost of $0.11/lb of protein in a dry matter basis.

120.7% when alfalfa was harvested as monoculture and 101.4% when alfalfa was interseeded with hybrid bermudagrass (Fig. 3). On the other hand, the increased seasonal value in TDN was only 5% for alfalfa and 11.7% for the alfalfa/ bermudagrass hay system (Fig. 4).

Based on this comparison analysis for hay production, alfalfa is still a viable crop in Mississippi even if the stand only persist for three years or even if you treat it as annual crop. The economics of hay production has changed considerably in the last decade and as result many producers need to consider a long-overdue look at their cost of production compared to the nutritive value of the hay being produced. It is important to know how much it costs to produce one ton of hay. If your costs of production are higher than the cost of nutrients in the hay, then you should strongly consider an overhaul of your hay management program from species selection, nutrient management, harvest, storage, and feeding methods. You need to take an honest look at the true cost of hay production before you assume that a specific hay production might not fit in your farm. As we start the hay season, think first, analyzed second, analyze again, and then act on your hay production budget. For more information related to hay production practices, contact your MSU County Extension Service office.

Upcoming Events

May 11, 2019—Small Ruminant Workshop, Hattiesburg, MS
June 6, 2019—Hay Production Field Day, Newton, MS
July 24—25, 2019—Grazing and Forage Production Workshop, Starkville, MS
July 16-17, 2019—Southern Cover Crop Conference, Auburn, AL

For upcoming forage related events visit: ***http://forages.pss.msstate.edu/events.html***

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