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# Using Goals and Profitability to Determine What to Plant in Pastures

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Landowners replant a pasture for many reasons such as invasive plants, drought impacts, wildlife concerns, or changes in the ranch operation. Choosing the right pasture plants involves important considerations.

## What are your goals?

Always begin management decisions by establishing goals for the property. A written plan helps you optimize the time, effort, and money spent on ranch operations. Goals define where you ultimately want to be; objectives serve as guidelines to achieve those goals.

Objectives should be measurable and revisited at the end of every year or season. For example, you may want to increase calving rates by 5 percent or to harvest deer to meet a predetermined sex ratio. Before planting a pasture, determine if the land will be managed solely for livestock production or does wildlife contribute to your profit or recreational interests?

**Figure 1.** Cattle grazing Tifton 85 bermudagrass. *Source: Larry Redmon*

Many landowners now manage for both livestock and wildlife on the same piece of property. Cattle may thrive on pastures of thick, introduced forage grasses (Fig. 1). Wildlife do best where a diversity of native plants, including broadleaf forbs (herbaceous plants other than grass) and brush, provide not only food for various wildlife species, but also diverse cover for protection from predators or shade from the sun (Fig. 2).

**Figure 2.** Wildlife species, such as white-tailed deer benefit from a diversity of plants in the pasture. *Source: David Hewitt*

On most Texas properties, landowners base management decisions such as planting or brush management on a combination of livestock and wildlife priorities. However, there is a difference between maximizing a livestock operation (maintaining the highest carrying capacity possible for the most profit) and using cattle as a tool to manage habitat for a particular wildlife species. Your goals may even vary by pasture or section of the ranch.

## What are you willing to sacrifice?

While there are pros and cons to every management decision, it helps to recognize what you are willing to tolerate. Introduced grasses, such as buffelgrass and Tifton 85 bermudagrass, often establish quicker, may be less expensive to

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**Figure 3.** Buffelgrass is a common South Texas forage planted solely for cattle grazing. *Source: Pete Flores*

**Figure 5.** Stages of a bermudagrass planting from early June through late August. *Source: Larry Redmon*

establish, and have the potential to grow more forage per acre than most native plant species (Fig. 3). Planting these grasses could translate into grazing more livestock on the acreage with less delay after planting. However, these introduced species need more inputs, such as fertilizer, irrigation, or weed control to do well. Also, they typically grow as a monoculture, or pasture with one dominant grass species, which is far less desirable for wildlife management.

Planting native grasses in a mix, even with some forbs, increases the success of establishing the stand and provides the diverse plant species necessary for wildlife habitat. For instance, Northern bobwhites need pastures that are open enough at ground level for the birds to forage for the seeds the native plants produce or the insects they harbor (Fig. 4).

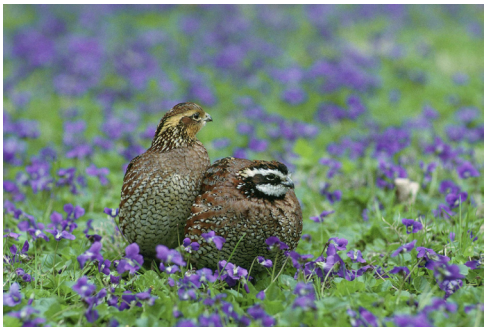

**Figure 4.** Northern bobwhites. *Source: Pixabay*

Northern bobwhites also need bunchgrasses to use as nesting sites as well as some portion of brush for loafing and escape cover. Pastures with sod-forming, introduced grasses, such as bermudagrass or bahiagrass, lack almost all the habitat needs Northern bobwhites require.

Choose seeds adapted for your area and plant them according to recommendations. Often, native seed cost is considerably higher than introduced species because of a limited supply of native seed, but once established, there are fewer, if any, input costs associated with fertilizer and herbicide.

The diversity of plants that grow in a native seeding can provide both livestock grazing and wildlife habitat, although you must delay livestock grazing for a couple of years to establish the native plants. Also, to balance both wildlife and livestock needs and to maintain stands of native plants, stocking rates are more conservative and managed more carefully in response to rainfall.

When brush or weeds (forbs and legumes) are allowed to grow in a pasture, profits for cattle enterprises may suffer because of the need for a lower stocking rate. Many managers consider planting either native or introduced forages with the mind-set that maximum financial return on livestock is only possible with an introduced forage grass.

But is that the case? Let's look at a hypothetical 250-acre pasture in Live Oak County, Texas. Assume this pasture has been overgrazed or farmed and the owner would like to manage it for livestock or round-bale hay production. We'll consider three different enterprises: 1) owner grazing the land with their cattle, 2) leasing the grazing rights to another producer, or 3) haying the field. Also, consider three different plant covers: 1) a mix of native grasses and forbs, 2) buffelgrass, or 3) Tifton 85 bermudagrass.

Assume the field preparation for planting is the same—spray with glyphosate, disk the land multiple times, and follow up with another round of glyphosate application to remove any volunteer plants. Estimate preparation costs at $63.40 per acre (Table 1). Good field preparation is crucial for

getting successful plant establishment (Fig. 5).

To make a cost comparison of our plant cover types for establishment, assume some average prices for a 22-seed mix of native plants broadcasted and packed, buffelgrass at 4 pounds of pure live seed per acre broadcasted and packed, and Tifton 85 bermudagrass sprigs planted with a recommended 30-day post-planting weed spray (Table 1). Packing the seed may be done with equipment such as a culti-packer, seed drill, harrows, or tire after planting.

## What can you maintain?

After the initial planting, what maintenance can you expect for these different plant cover types? A newly planted grass stand in South Texas will eventually have brush seedlings pop up. Aggressively spot spraying these new recruits each year with a simple stem spray method reduces their cover in the pasture and decreases control cost later (Table 1). Broadleaf weeds are not typically sprayed in native fields because the herbicides are not selective enough to leave valuable forbs for wildlife.

Native fields are not fertilized because the low potential increase in grass growth does not justify the expense (Fig. 6). Also, fertilization can favor certain plants species and limit long-term plant diversity. As a result, we estimated establishment costs for natives higher than introduced grass species, but the maintenance cost ($33.78/acre/10 years) is less than a third of any other two scenarios (Table 1).

Buffelgrass pastures will have similar brush control costs but typically produce higher yields when you also control weeds. Weed spraying may not be necessary every year, as thick stands of buffelgrass can shade out weed seedlings; however, herbicide application will likely be necessary every few years (Table 1).

Buffelgrass is well adapted to South Texas, rarely requires fertilization, and may be a cheaper introduced grass option to maintain (Table 1— $97.78/acre/10 years). However, a dense stand of buffelgrass is not good habitat for most wildlife species, so it may not be suitable for ranch goals, especially if there is profit resulting from wildlife leases (Fig. 7).

Tifton 85 bermudagrass requires more maintenance because it performs best with reduced weed competition and fertilizer application (Fig. 8). Spraying weeds every year on grazed Tifton 85 pastures is typical, but hay fields need herbicide treatments twice a year to maintain good production (Table 1). They also need fertilizer—250 pounds of nitrogen (N), 125 pounds of phosphorus (P), and 60 pounds of potassium (K) per acre per year—for establishment and to maximize yield. For the grazing scenario, we assume only 50 pounds of N per acre per year since cattle return a portion of the nutrients back into the soil, cutting fertilizer costs in half (Table 1).

Finally, insects can consume a lot of forage very quickly, and of the forage options presented here, bermudagrass is most susceptible to insects such as fall armyworm or bermudagrass stem maggot (Fig. 9). Assume the need to spray Tifton 85 bermudagrass for insects every 3 years (Table 1), estimating that Tifton 85 bermudagrass maintained for livestock grazing will cost about $516.54 per acre, and Tifton 85 for hay production will cost about $978 per acre over a 10-year period.

**Table 1.** Comparison of costs for field preparation, establishment, and maintenance of different plant cover types

| | Field preparation (per acre) | Establishment costs (per acre) | Maintenance costs (for 10 years per acre) |
|---|---|---|---|
| Native plants | $63.40[1] | $107[2] | $33.78[5] |
| Buffelgrass | $63.40[1] | $88.70[3] | $97.78[6] |
| Tifton 85 bermudagrass for grazing | $63.40[1] | $151[4] | $516.54[7] |
| Tifton 85 bermudagrass for haying | $63.40[1] | $151[4] | $978[8] |

[1]$27.40/acre for two glyphosate applications + $36/acre for disking three times
[2]$82/acre for a 22-seed mix of natives + $25/acre to broadcast and pack the seed
[3]$63.70/acre for 4 pounds of pure live buffelgrass seed + $25/acre to broadcast and pack the seed
[4]$135/acre for sprigged Tifton 85 bermudagrass + $16/acre for 2,4-D weed spray at 30 days post-planting
[5]$7.5/acre for brush control (including $12/hour labor charge) for first 2 years, $3.75/acre for the next 2 years, $1.88/acre for the remaining 6 years
[6]$16/acre for weed spraying (including a $7/acre application fee) with 2,4-D every 3 years + $7.5/acre for brush control (including $12/hour labor charge) for first 2 years, $3.75/acre for next 2 years, $1.88/acre for remaining 6 years
[7]$16/acre for weed spraying (including a $7/acre application fee) with 2,4-D annually + $3.75/acre for brush control (including $12/hour labor charge) for first 2 years, $1.88/acre for remaining eight years + $62 for fertilizer for first year, $26/acre for remaining 9 years + $9.50/acre for insect spraying every 3 years
[8]$32/acre for weed spraying (including a $14/acre application fee) with 2,4-D + $62/acre for fertilizer + $9.50/acre for insect spraying every 3 years

**Figure 6.** A diverse native plant pasture. *Source: South Texas Natives Project*

## What can you expect for production?

It is probably not surprising that grasses introduced for livestock forages can typically produce more forage (dry forage per acre) than a native plant mix. How would you estimate the potential increase in livestock stocking rate with the added cost of cattle ownership and depreciation? Annual cow variable cost is usually around $550 to $600 per cow, including costs such as vaccinations, supplementation when needed, pregnancy testing, and some labor costs for those intense cattle working days (Table 2). Table 2 reflects typical practices and associated costs for a South Texas cattle operation, assuming full ownership of the land.

When restoring the pasture, plants typically establish best when deferred from grazing or haying for some time. Allowing the plants to seed out fully adds valuable seed back into the soil for germination later. Native plants cannot withstand the grazing intensity that introduced species can, nor can they be grazed as soon after establishment as introduced forages. So, deferring grazing for 2 years is recommended for natives, whereas buffelgrass or Tifton 85 can be grazed or hayed a year after planting (Table 3).

**Figure 8.** Bermudagrass field. *Source: Pete Flores*

Use only 25 percent of the total forage produced on a native pasture for livestock, accounting for insects, trampling, and stubble, which should be left standing. This stubble maintains healthy plant root systems, provides cover for wildlife, helps water infiltrate into the soil instead of running off, prevents soil erosion, and provides many other important ecosystem benefits. In our example, the native field yielded 3,000 pounds of forage per acre. Introduced grasses can safely be grazed more intensely than natives, so we estimate a 50-percent use of buffelgrass (of 4,500 total pounds per acre) and 65-percent use of Tifton 85 (of 5,000 total pounds per acre).

**Figure 7.** Cattle grazing buffelgrass. *Source: Pete Flores*

**Figure 9.** Fall armyworm. *Source: Clemson University-USDA Cooperative Extension Slide Series, Bugwood.org*

Table 2: 2016 General assumptions of 250-acre example pasture in Live Oak County, Texas

| Selected parameter | Assumptions | Selected parameter | Assumptions |
|---|---|---|---|
| Off-farm income | Not included | Heifer weaning weights | 475 lbs |
| Family living expense | Not included | Steer prices | $1.74 lb |
| Land | 250 acres | Heifer prices | $1.62/lb |
| Ownership tenure | 100% | Cull cow prices | $.85/lb |
| Royalty income | Not included | Cull bull prices | $1.02/lb |
| Hunting income (natives only) | $15/acre | Bred cow prices | $1,550/head |
| Assets and debts | Not included | Replacement bull price/head | $3,000 |
| Land tillage, planting, and spraying | Custom rates | Hay prices | $100/ton |
| Grazing lease rate | $150/a.u./year | Bulk range cube prices | $.15/lb |
| Cow herd replacement | Bred cows | Pregnancy testing | $7.50/cow |
| Veterinary medicine and supplies | $34.34/cow | BSE testing | $42.50/bull |
| Salt/mineral blocks/year | $23.60/cow | Clostridial vaccination | $1.16/calf |
| Hay fed/cow/year | 1.5 tons | Castration and growth implants | $1.97/calf |
| Protein cubes fed/cow/year | 200 lbs | Deworming injection (calf/cow) | $1.81/$3.96 |
| Calving rate | 90% | Reproductive vaccines | $3.12/cow |
| Cow culling rate/year | 10% | Extra day labor/calf practice | $2/calf |
| Steer weaning weights | 525 lbs | | |

The production value for grazing is based on a 90-percent calf crop and, in the grazing-lease scenarios, a rate of $150 per head per year (Table 4). In the hayed Tifton 85 scenario, assume yields of 9,000 pounds per acre per year and hay valued at $100 per ton.

## Will I ever make back my investment?

Smaller-acreage cattle producers often find it difficult to make a profit unless they have a specialty or niche market item or few enterprise costs. This situation is reflected in our hypothetical ranch when using the Farm Assistance Risk Management Model for analysis. Assuming 100-percent land ownership and several other standard variables (Table 2), the producer will not realize a profit during the 10-year period following the pasture scenarios for livestock grazing or leases (Fig. 10). The annual net farm income over 10 years reflects usual operating in- and out-flows as well as adjustments for variables such as cattle depreciation over time, livestock markets, and weather fluctuations.

How can the scenarios in Figure 10 show such negative results? For one, plant establishment costs are too expensive such that net returns from cattle, either owned or by leasing

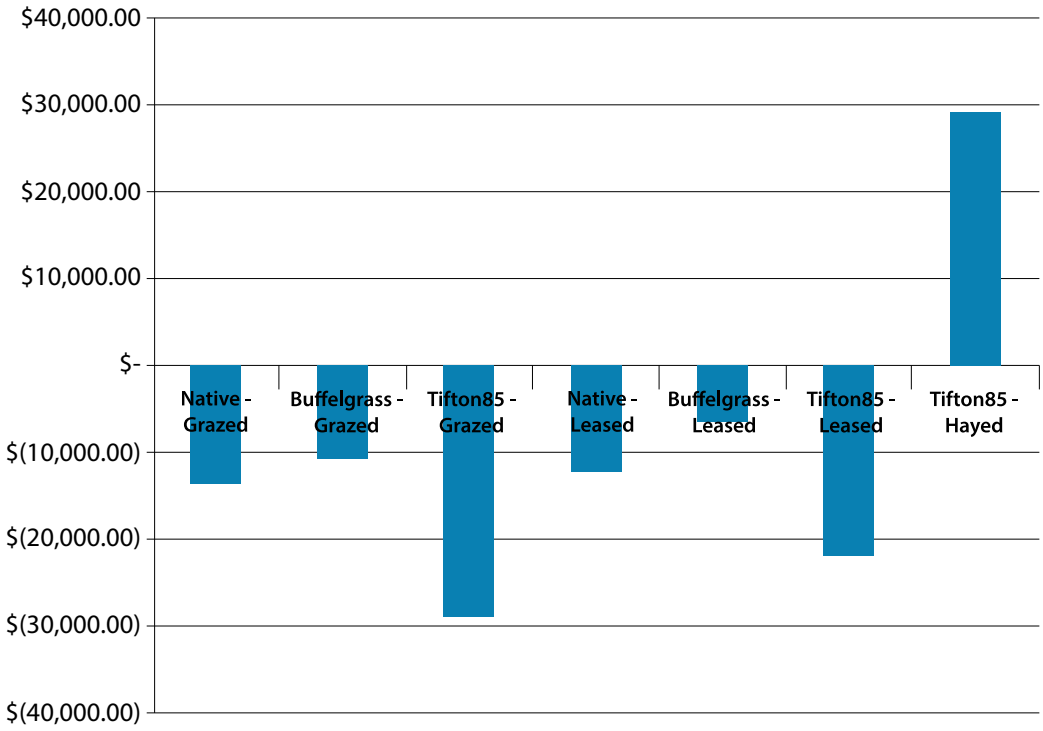


**Figure 10.** Annual net farm income (10-year average) by plant cover type and practice for a 250-acre example pasture in Live Oak County, Texas

**Table 3:** Specific year-end cattle stocking rate (# of head) on a 250-acre example pasture in Live Oak County, Texas

| Plant cover | Practice | Start | Year | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Native | Owner-grazed | 12 | 0 | | 8 | | 12 | | | | | |
| Native | Leased for grazing | 12 | 0 | | 8 | | 12 | | | | | |
| Buffelgrass | Owner-grazed | 12 | 0 | 50 | | | | | | | | |
| Buffelgrass | Leased for grazing | 12 | 0 | 50 | | | | | | | | |
| Tifton 85 | Owner-grazed | 12 | 0 | 72 | | | | | | | | |
| Tifton 85 | Leased for grazing | 12 | 0 | 72 | | | | | | | | |
| Tifton 85 | Owner-hayed | 12 | 0 | | | | | | | | | |

the land, cannot recoup the costs expended in a 10-year horizon. Native land included a yearly $15-per-acre profit for a hunting lease, a typical amount paid for hunting rights in the region used for our model. Even this added income stream, often thought to offset necessary stocking rate reductions and high establishment costs for natives, does not offer a profitable scenario.

Livestock carrying capacity limits the 250 acres from providing profit within the first 10 years, no matter the choice of forage base. While introduced pastures can support much higher carrying capacities for cattle, the annual expenses incurred for maintaining forage and cattle are simply too high.

At a first glance of the scenario results, the hay business appears to be a great solution! Based on our calculations, haying your property is a potentially profitable enterprise. However, there is a saying, "When you have hay, everyone has hay," meaning that unless you have a place to store hay during high production years to sell during drought years, you will likely be competing with many other producers who also had a good year, effectively driving down hay prices. Thus, other cost factors we did not include that could affect hay profitability may not be fully detailed in our analysis.

More often than not, hay is a boom-or-bust enterprise, yielding a nice profit one year, but potentially losing money the next. Unfortunately, there is no easy option to ensure profitability, especially on smaller acreages. Figuring in a large investment such as replanting is difficult when the profit margin is already quite small.

Although the negative net farm income (which includes changes due to depreciation and cattle purchases) for grazing practices in this analysis looks less than optimistic (Table 4), it is an important example of why you must consider the goals for the property to make a sound management decision. It also sheds light on the fallacy of many widely held perceptions in agriculture. In the past, introduced grasses often did increase profitability, a reason ranchers overwhelmingly selected and planted them. However, in those periods, input, establishment, and maintenance costs were much lower. Today, that is not the case; yet, in many circles, the mind-set that introduced forages are more profitable than natives prevails.

## What is the future use of the land?

Although we base many decisions on what benefits our operation now, choosing the plant type warrants some consideration of what will happen to the land in the future. If you plan to pass the family ranch down to your children or grandchildren, will their land-use goals be the same as yours?

**Table 4:** 10-year average financial indicators for a 250-acre example pasture in south Texas

| Plant Cover | Practice | 10-Year Averages | | | |
|---|---|---|---|---|---|
| | | Total cash receipts ($1000) | Total cash costs ($1000) | Net farm income ($1000) | Net farm income/acre |
| Native | Owner-grazed | 9.56 | 18.01 | -8.15 | -32.6 |
| Native | Leased for grazing | 5.07 | 12.11 | -7.04 | -28.16 |
| Buffelgrass | Owner-grazed | 30.48 | 42.78 | -10.73 | -42.92 |
| Buffelgrass | Leased for grazing | 6.75 | 13.00 | -6.25 | -25.00 |
| Tifton 85 | Owner-grazed | 43.75 | 74.72 | -28.75 | -115 |
| Tifton 85 | Leased for grazing | 9.73 | 31.59 | -21.86 | -87.44 |
| Tifton 85 | Owner-hayed | 116.55 | 87.04 | 29.50 | 118.00 |

If you intend to improve and then sell your land, what would be more desirable to a buyer?

Currently, people purchasing land usually place more emphasis on wildlife habitat and recreational hunting than on cattle production. Once you have established many of the introduced grasses, they may be hard to eradicate. If you later choose to plant natives for their additional wildlife benefit, you may find that the introduced species continue to out-compete the natives. Remember, there are agriculture property tax valuations available for both agricultural practices and wildlife management. Check with your local tax appraiser for information specific to your county.

This analysis shows that the expense of pasture planting of any kind, either native or introduced, is a negative income generator with livestock production, and risky for hay production. Even with lower maintenance costs, native pastures with sustainable stocking rates have no particular advantage from a profitability standpoint with livestock grazing as the main source of income. Introduced grass pastures, with today's input and livestock costs, fare no better.

Although this appears to be dismal news for those in the agriculture business looking to improve their land holdings, knowledge is power. Understanding the risks will help you make informed decisions before making a financial and time commitment.

Before deciding to replant:

1. Identify clearly your goals for the property. Write down your goals and objectives. Periodically evaluate your progress, or lack of, based on measuring the objectives and keeping good records.
2. Determine what the land should look like to meet your goals. What type of plants will do best?
3. Gain knowledge on what management practices may be available for improving the existing forage base, other than starting from scratch with a replanting. Options may include grazing deferment, chemical, mechanical, or prescribed fire techniques.
4. If reseeding is still the best option to maintain the integrity of the land and the operation, increase recreational opportunities, or to increase the real estate value if sold, consult professionals for assistance with seed selection specific to your ecoregion and soil type to increase the chance of success.
5. Contact local USDA offices to seek potential assistance programs that may reduce landowner investment. With available cost-share programs, many of the practices discussed here may yield a more profitable scenario.

## For more information

The following resources are available at the Texas A&M AgriLife Extension Service Bookstore:


Clayton, M. K., F. S. Smith, K. A. Pawelek, and A. D. Falk. 2014. *Reseeding Natives in South Texas: Top 10 Mistakes to Avoid.* Texas A&M AgriLife Extension Publication ERM-003.

Clayton, M. K., F. S. Smith, K. A. Pawelek, and A. D. Falk. 2014. *Reseeding Natives in South Texas: Site Preparation.* Texas A&M AgriLife Extension Publication ERM-004.

Clayton, M. K., F. S. Smith, K. A. Pawelek, and A. D. Falk. 2014. *Reseeding Natives in South Texas: Planting Techniques and Equipment.* Texas A&M AgriLife Extension Publication ERM-005.

Clayton, M. K., F. S. Smith, K. A. Pawelek, and A. D. Falk. 2014. *Reseeding Natives in South Texas: Selecting the Seed Mix.* Texas A&M AgriLife Extension Publication ERM-006.

Clayton, M. K., F. S. Smith, K. A. Pawelek, and A. D. Falk. 2014. *Reseeding Natives in South Texas: Post-Planting Management.* Texas A&M AgriLife Extension Publication ERM-007.

Clayton, M. K., F. S. Smith, K. A. Pawelek, and A. D. Falk. 2014. *Reseeding Natives in South Texas: Targeting Noxious Plant Species.* Texas A&M AgriLife Extension Publication ERM-008.

Clayton, M., M. Young, R. Lyons, and S. Klose. 2013. *Controlling Brush with Herbicides to Increase Ranch Profits.* Texas A&M AgriLife Extension Publication E-629.

McGinty, A., C. W. Hanselka. *How Much Forage Do You Have?* Texas A&M AgriLife Extension Publication EB-1646.

Klose, S. L. and Outlaw, J. L. August 2005. "Financial and Risk Management Assistance: Decision Support for Agriculture." *Journal of Agricultural and Applied Economics*, 37 (2), 415–423.



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