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## **Dollars Lost with Use of "Dirty" Fescue Pastures: An Economic Comparison between Endophyte- Infected Fescue and other Alternative Forages**

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Having grown up on a beef farm, I am aware of the importance of pasture forage production on the profitability of beef cow-calf enterprises. Feed costs typically represent 40-50% of yearly cash costs of production for beef cow-calf operations. Livestock producers are especially challenged these days by the lowest beef livestock prices in five years. As a result, pasture forages that can increase cattle productivity are more important now than ever.

It is generally recognized that endophyte infected fescue pastures produce weaning weights about 50 pounds less and cow conception rates about 20% less compared to cows grazing non-infected pastures. In the U.S. alone, the annual, economic impact of the fescue problem has been estimated to be over \$600 million.

Research at the Southern Indiana Purdue Agricultural Center (SIPAC), Dubois, Indiana, has shown that interseeding a legume into existing fescue or reestablishing a low-endophyte fescue or orchardgrass forage (both seeded with legumes) can improve cattle performance. However, some of the long-term economic implications of using improved forages are still uncertain. My research addresses two issues:

1. What are the average, expected profits that I can expect from improved forages? How much better are low-endophyte fescue and orchardgrass forages?
2. How long will it take for a producer to recover the costs to reestablish a pasture with an improved low endophyte fescue or orchardgrass forage?

Four forage alternatives were evaluated in this study:

1. Kentucky-31 infected fescue (>60%) and red/ladino clovers.
2. Forager low-endophyte fescue and red/ladino clovers.
3. Martin low-endophyte fescue and red/ladino clovers.

#### 4. Orchardgrass and birdsfoot trefoil.

### Profitability Calculations

The research used cattle and forage data from SIPAC as the basis for its analysis. SIPAC is used to conduct research in many agronomic and livestock areas -- the focus in the past ten years has been alternatives to endophyte-infected fescue.

The following is general information about the SIPAC data:

- Each forage alternative consisted of 4-8 years of data.
- 70-100 cows grazed each forage alternative (or about 9-15 cows/pasture/year).
- SIPAC cattle breeds include Angus x Hereford or Hereford x Angus, with some cows carrying one-fourth or one-half Simmental
- SIPAC pastures and livestock are well-managed with fertilization and legume reseeding.

Stocking rate, average weaning weight, average daily gain (ADG), and culling rate were computed for each forage using the SIPAC cow and calf data ([Table 1](#)). The Martin fescue-clovers forage had the most efficient stocking rate with 1.2 acres per cow units. The orchardgrass-trefoil forage had the least efficient stocking rate with 1.6 acres per cow unit. Both Kentucky 31-clovers and Forager-clovers had intermediate stocking rates of 1.5 acres per cow unit.

Average calf weaning weight and ADG were highest for the Orchardgrass-trefoil (550 pounds and 2.28 lbs/day, respectively) followed closely by the two low-endophyte fescues, Martin and Forager with clovers. In comparison, the Kentucky-31 fescue-clovers generated a significantly lower calf weaning weight and ADG of 468 pounds and 1.80 lbs per day, respectively. **The average culling rate for cows was 6%, 15%, 16% and 26% for Forager-fescue clovers, Martin fescue-clovers, orchardgrass-trefoil, and Kentucky-31 fescue-clovers, respectively.**

**A budget for 1995 was constructed for each forage for each year to estimate returns to labor, management, and overhead. Revenues in the budgets consisted of actual feeder calf, cull cow, and harvested hay revenue. Costs in the budgets consisted of direct costs (feed, veterinary, marketing, bull, and hay production costs and indirect costs (retained heifer feeding costs, breeding stock investment, production inventory investment, pasture fertilization and legume renovation costs).**

The following are four important assumptions used in the budgets:

1. The average feeder calf price was \$78.00 per cwt for 500-600 lb calves

2. The average cull cow price was \$44.51 per cwt for 1,100 lb cows.
3. 1.3 heifers were retained for every culled cow to maintain a constant herd size.
4. The actual stocking rates at SIPAC were used in this analysis ([Table 1](#)).

Returns calculated on per acre basis are shown in [Table 2](#). Forager fescue-clovers and Martin fescue-clovers generated the highest returns of \$48.26 and \$39.92 per acre, respectively followed by orchardgrass-trefoil with \$11.44 per acre. However, the Kentucky-31 fescue-clover's generated a negative return of -\$46.41 per acre.

Two notes about the results: Martin, Forager and Orchardgrass have all experienced some reinfestation of the endophyte-infected fescue which has resulted erratic in animal performance (ADG has stabilized in recent years). Furthermore, there is some concern about the longevity of orchardgrass. Continuing studies will determine if the stand life of orchardgrass is equivalent to that of tall fescue.

An average budget for 1995 was constructed for each forage to estimate average returns to labor, management, and overhead. Average stocking rates, weaning weights were used. In addition, the average culling rates for Kentucky-31, Martin, and Orchardgrass were 26%, 15%, and 16%, respectively.

## **Payback Period for New Forage System Establishment**

A key question of livestock producers is whether it is more profitable to reestablish a pasture with improved forages or to renovate the pasture maintaining an existing but lower quality forage. Pasture reestablishment is defined as destroying the existing and replacing it with an improved forage. Herbicides and/or tillage are generally used to kill the existing pasture. At SIPAC, a combination of Roundup was sprayed on the pasture in the fall and spring to kill the forage. 2,4-D was also applied in the spring and the new forage was then seeded.

Pasture renovation does *not* destroy the existing pasture the existing pasture. Rather, the existing grass is maintained and a legume is seeded into the grass. At SIPAC, either birdsfoot trefoil or the combination of red and ladino clover were seeded into existing pastures.

Pasture reestablishment and renovation requires the periodic reseeding of the legume. In this analysis, we assumed the two clovers were reseeded every other year, while birdsfoot trefoil was reseeded every third year.

Net present value (NPV) analysis, which looks at the discounted cash inflows and expenses over a period of time, is useful for this analysis. NPV analysis

determined the payback period required to recover the investment costs of forage reestablishment.

One renovated forage and two reestablished forage systems were evaluated in this study:

**Renovated Forage:**

1. Kentucky-31 high endophyte fescue and the combination of red and ladino clover

**Reestablished Forages:**

1. Martin low endophyte fescue and the combination of red and ladino clover
2. Orchardgrass and birdsfoot trefoil

Average, annual renovation costs were estimated at about \$8.00 per acre per year. Net costs to reestablish the Martin fescue-clovers and Orchardgrass-trefoil were estimated to be \$99.07 and \$100.26 per acre, respectively. (See [Table 3](#) for the reestablishment budget for Martin fescue-clovers).

Payback periods for the Martin fescue-clovers and Orchardgrass-trefoil were calculated next. The payback period is the time period required to recover the investment costs of forage reestablishment. For example, the payback period for the reestablishment of the Martin fescue-clovers was calculated to be 2.4 years using a 7% interest rate, the average calf price (\$78.00), the average weaning weight (540 pounds) and the average culling rate (15%) ([Table 4](#)).

**Payback Periods for the Martin Fescue-Clovers Pasture**

Sensitivity analysis examined the effect of changes in interest rate, feeder calf prices, weaning weights, and cow culling rate ([Tables 4-6](#)). Table 4 evaluates a change in calf prices. The average historical calf price was \$78.00 per cwt. As calf prices increase, the payback period declines. Contrastly, as calf prices decrease, the payback period increases. For example, the payback period for a \$70 calf price was 11.3 years compared to 2.4 years for a \$78 calf price (using a 7% interest rate).

[Table 5](#) examines the effect of changing the weaning weight. The average weaning weight for Martin fescue-clovers was 540 pounds. A 580 lb. weaning weight decreased the payback period to 1.5 years (using a 7% interest rate). However, reducing the weaning weight from 540 pounds to 460 pounds produced a negative return for the Martin forage. Therefore, the payback period does not exist ( $\infty$ ) because it is not profitable to reestablish a pasture with Martin fescue- clovers when weaning weights are only 460 pounds.

[Table 6](#) examines the effect of changing the cow culling rate. The average culling rate for Martin fescue-clovers was 15%. Using a 7% interest rate, the

payback periods for a 20%, 15%, and 10% culling rate were 4.7, 2.4, and 1.4 years, respectively.

### **Payback Periods for the Orchardgrass-Trefoil Pasture**

Payback periods were also calculated for the reestablished Orchardgrass-trefoil ([Tables 7-9](#)). The smaller average return for Orchardgrass-trefoil increased the time required to recover the costs of reestablishing a pasture with Orchardgrass-trefoil. For example, using a 7% interest rate and the average feeder calf price, weaning weight, and culling rate, the expected payback period was 8.0 years for Orchardgrass versus 2.4 years for Martin fescue-clovers.

The average calf price was \$78 per cwt. As calf prices were increased to \$82 and \$86, payback periods declined from 8 years to 2-4 years ([Table 7](#)). On the other hand, decreasing calf prices to \$70 and \$74 per cwt generated negative returns making reestablishment of Orchardgrass-trefoil unprofitable. Thus, the payback period periods were infinity.

Changes in the calf weaning weight also affected the payback period ([Table 8](#)). The average weaning weight was 550 pounds. Increasing the weaning weight to 580 pounds decreased the payback period by >50% to just 3.5 years (using a 7% rate). However, reducing the weaning weight to 500 and 460 pounds resulted in indeterminate payback periods. That is, the sum of the discounted revenues did not exceed the costs of reestablishment. Therefore, it is not profitable to reestablish a pasture with Orchardgrass-trefoil at 460 and 500 lb. weaning weights.

The effect of changing the culling rate can be seen in [Table 9](#). The payback period decreased from 8.0 to 2.3 years when the culling rate was decreased from 16% to 10%. However, when the culling rate was increased to 20%, the average returns to the Orchardgrass-trefoil were negative. It is not profitable to reestablish a pasture with Orchardgrass-trefoil when your culling rate is 20%.

### **Summary**

Average returns to labor, management, and overhead on a per acre basis were calculated for each forage. The Martin forage generated the highest mean return of \$79.92 per acre followed by Forager, Orchardgrass, and Kentucky-31 with returns of \$70.52, \$60.36, and \$23.53 per acre, respectively. In this study, the two low endophyte and legume forage alternatives, Martin and Forager, were the most profitable forages.

Net present value (NPV) analysis looked at the benefit of establishing a new forage versus renovating a dirty fescue pasture with clover. The average payback period for reestablishing Martin and clover is 2.4 years. Reestablishing

a pasture with Orchardgrass and birdsfoot trefoil results in an 8.0 year average payback period.

The payback periods are sensitive to changes in interest rates, calf prices, weaning weights, and culling rates. Therefore, good management of your beef enterprise will substantially affect the time required to recover the investment costs of reestablishing a pasture.

<b>Forage</b>	<b>Stocking Rate (acres / cow unit)</b>	<b>Average Weaning Wt *</b>	<b>Average Daily Gain **</b>	<b>Culling Rate</b>
Kentucky 31 & Clover	1.5	468	1.80	26 %
Forager & Clover	1.5	535	2.14	6 %
Martin & Legume	1.2	540	2.17	15 %
Orchardgrass & Legume	1.6	550	2.28	16 %

*\* Returns to labor, management, and overhead*

<b>Forage</b>	<b>Returns * (dollars / acre)</b>
Kentucky 31 & Clover	- \$ 46.41
Forager & Clover	+ \$ 48.26
Martin & Legume	+ \$ 39.92
Orchardgrass & Legume	+ \$ 11.44

*\* Average returns to labor, management and overhead*

<b>Item / Quantity</b>	<b>Price</b>	<b>Cost (\$/acre)</b>
Roundup, 2 qts / acre (fall), 1 qt / acre (spring)	\$ 23.85	\$ 71.54
2,4-D. 1 pint / acre (spring)	\$ 15.60	\$ 1.95
Herbicide Applications, 2 trips / acre	\$ 4.19	\$ 8.38
Seed - Grass, 10 lbs / acre	\$ 1.00	\$ 10.00
Seed - Red Clover, 8 lbs / acre	\$ 1.24	\$ 9.92
Seed - Ladino Clover, 0.5 lbs / acre	\$ 3.17	\$ 1.59
Seeding Application, \$ / acre	\$ 10.97	\$ 10.97
Opportunity Cost - Lost Grazing Revenue, \$ / acre		\$ 31.25

Gross Establishment Costs	\$ 145.60
-Estimated Hay Revenue, 1 ton / acre	- \$ 46.53
<b>Net Establishment Costs, dollars / acre</b>	<b>\$ 99.07</b>

<b>Table 4 - Martin Payback Period (years) by Feeder Calf Price</b> <i>(Assuming average 540 lb. weaning weight and 15% culling rate)</i>			
Calf Price (\$/CWT)	Nominal Interest Rate		
	7 %	9 %	11%
\$70.00	11.3	13.9	19.3
\$74.00	3.9	4.2	4.5
\$78.00	2.4	2.5	2.6
\$82.00	1.7	1.8	1.9
\$86.00	1.3	1.4	1.4

<b>Table 5 - Martin Payback Period by Calf Weaning Weight, years</b> <i>(Assuming average \$78 per cwt calf price and 15% culling rate)</i>			
Weaning Weight (lbs)	Nominal Interest Rate		
	7 %	9 %	11%
460	∞	∞	∞
500	5.5	6.0	6.7
540	2.4	2.5	2.6
580	1.5	1.6	1.7

<b>Table 6 - Martin Payback Period by Cow Culling Rate, years</b> <i>(Assuming average \$78 per cwt calf price and 540 lb. weaning weight)</i>			
Average Culling Rate	Nominal Interest Rate		
	7 %	9 %	11%
10 %	1.4	1.5	1.5
15 %	2.4	2.5	2.6
20 %	4.7	5.1	5.6

<b>Table 7 - Orchardgrass Payback Period by Calf Price, years  </b> <i>(Assuming average 550 lb. weaning weight and 16% average culling rate)</i>	
Calf Price	Nominal Interest Rate

(\$/CWT)	7 %	9 %	11%
\$70.00	∞	∞	∞
\$74.00	∞	∞	∞
\$78.00	8.0	9.5	11.6
\$82.00	3.6	3.9	4.3
\$86.00	2.3	2.5	2.7

<b>Table 8 - Orchardgrass Payback Period by Calf Weaning Weight, years</b> (Assuming average \$78 per cwt. calf price and 16% average culling rate)			
Weaning Weight (lbs)	Nominal Interest Rate		
	7 %	9 %	11%
460	∞	∞	∞
500	∞	∞	∞
550	8.0	9.5	11.6
580	3.5	3.8	4.1

<b>Table 9 - Orchardgrass Payback Period by Cow Culling Rate, years</b> Note: Assuming a \$78 per cwt calf price and 550 weaning weight			
Average Culling Rate	Nominal Interest Rate		
	7 %	9 %	11%
10 %	2.3	2.5	2.7
16 %	8.0	9.5	11.6
20 %	∞	∞	∞