

DETERMINING THE PROFITABILITY OF MULTIPLE SPECIES
LIVESTOCK ENTERPRISE BUDGETS WITHIN WEST TEXAS

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Abstract

For several decades, multiple species stocking has been accepted as an effective and efficient practice in the ranching industry of west Texas. Benefits include exploitation of multiple markets, flexibility to adjust to those markets, maximum utilization of forage diversity, and sustained productive health of the improved pasture. This investigation was designed to assess the potential profit represented in different combinations, while accounting for extensive variability through the analysis of a series of enterprise budgets. Results indicate that a multiple species cow-calf and commercial range sheep combination enterprise generates the highest profitability. Sensitivity analysis was also conducted to show how volatile an enterprise can be to market fluctuations both low and high.

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Introduction

Due to the downward turn in the economy, the need to understand different ways to improve a firm's profitability within its current operation has become increasingly important. The firm's operation could be raising livestock, producing crops, generating wind energy, or a combination of these enterprises. It is necessary to continually evaluate possible changes that need to be made in order to maximize profits. For instance, will a livestock enterprise that utilizes various combinations of cattle, sheep, and goats maximize profitability? Research has shown that this question can be most effectively answered by utilizing enterprise budgets (Doye, 2009) and operating profit margin ratios (Kay, et al., 2012).

Doye (2009) discusses that budgeting is a tool used worldwide as a marketing technique, and can provide answers to a vast number of questions if interpreted correctly. Subsequently, a producer must also be prepared to accept the risks involved with decisions made based on the budgets (Doye, 2009). Kay et al. (2012) states that an enterprise budget allows one to see potential revenue, expenses, and profits for a single enterprise; and are normally used to obtain a concise view of what to expect from a given enterprise (Kay, et al., 2012).

Of the nine states that account for 50 percent of agricultural production in the United States, Texas ranks second overall (McCorkle, 2009). Texas is a leader in in all areas of livestock production (U.S. Department of Agriculture, 2009). This study

focused on an area of the Edwards Plateau, a region of Texas, that consists of 28 counties and is located in west Texas. This area includes 8 of the 10 leading counties in overall sheep production, ewe brood stock, and wool production. Tom Green County, found within the Edwards Plateau, ranks second in the state for wool production (U.S. Department of Agriculture, 2009).

This study evaluated different stocking combinations of cattle, sheep and/or goats with respect to improving profitability and land use. The region chosen for the study included Coke, Concho, Irion, Schleicher, Sterling, and Tom Green counties; because of the importance of cattle, sheep, and goats to the ranching operations in this area. Specifically, this study determined the differences in profitability of single and multiple species livestock operations by evaluating enterprise budgets, and determined how sensitive the net margins were to price changes.

Objectives

Main Objective

To determine the differences in profitability of single and multiple species livestock operations by analyzing enterprise budgets.

Supporting Objective

To determine if stocking rate can be increased with a multiple species operation.

Literature Review

Background

The land in west central Texas is diverse with varying concentrations of grasses, browse, and forbs. Given that forbs and browse make up a large percent of the species composition on most ranches, relying on cattle production alone can limit overall stocking rates. Proper stocking rate is only one of the many risks associated with livestock operations. A few others are drought, market fluctuations, predator problems, and health management. These are all important factors to consider when determining what enterprise or combination of enterprises is the best to utilize. There are also some benefits that can come from utilizing multiple species operations, which will alleviate some of those risks.

Animal Science

Producers face multiple problems each day, including predation. Predation often limits the profitability of sheep and goat operations. Hulet et al. (1987) discusses that animal producers have always experienced ongoing problems with predation. They conducted this study to investigate whether or not cattle can offer any true protection to sheep. The study concluded that significant reduction in death loss of sheep can be obtained when the sheep are bonded to cattle (Hulet et al., 1987).

Sheep and goats are both highly susceptible to parasites, external and internal. These species differ in consumption levels of different forages, which is a key source of most parasite distribution. Williams et al. (2001) discussed that

extermination of parasites is almost impossible, but maintaining a healthy herd can be facilitated by proper grazing management which in turn relates to using a proper stocking rate. Hale (2006) discussed the same concept regarding sheep and goats, and supports the principle that grazing cattle along with sheep and goats can actually reduce the number of parasites on a pasture. Cattle do not share the same parasite problems as sheep and goats, and can improve the pasture quality for small ruminants with regard to parasites. The resistance to sheep and goat parasites in cattle allows the cattle to consume those parasite larvae, which then helps to rid the pasture of the parasites for the smaller ruminants (Hale, 2006). Along with reducing parasite loads, utilizing multiple species allows for more even grazing of a pasture. For example, cattle will graze some grasses that sheep will not, and sheep will graze near cattle manure deposits which cattle will avoid (Coffey, 2001).

Another common problem faced by livestock producers is drought. Briskey (2001) states that cattle nutrition and grazing are factors heavily influenced by drought. Drought causes additional stress in cattle due to low forage availability, and limited nutritional quality (Briskey, 2001). Extended dry seasons and droughts can heavily influence weight losses and even deaths in sheep and goats (Pfister and Malechek, 1986).

Range

In order to utilize the land more efficiently it is encouraged to run more than one species of animals, if those animals have varying prehensile skills and diet compositions. Cattle and sheep are both grass roughage eaters and consume

mainly grass and other fibrous plant material, goats on the other hand are an intermediate type and prefer forage with cells high in nutrients and have a limited ability to digest cellulose. Another difference between these animals is their ability, through prehensile skills, to consume different forage types (Hofmann, 1988).

Farmers and ranchers use sustainable agriculture to improve the efficiency of the land and increase profitability. Earles (2005) defined sustainable agriculture as the ability to produce plentiful food without exhausting resources or contaminating the environment. Although this will certainly pertain to future concerns, he believes that it is currently relevant, and soon to be a necessity (Earles, 2005). Rook et al. (2003) discussed how properly matching types of livestock to a particular rangeland will create biodiversity and can theoretically increase economic benefits (Rook et al., 2003). Earles (2005) and Rook et al. (2003) both claim that sustainability relies on more producers increasing biodiversity within their operations. One way to do this is through multispecies grazing.

Animut and Goetsch (2008) stated that producers throughout the world have long since employed co-grazing of sheep and goats. Many advantages of co-grazing sheep and goats rise from the variation in forages they can and will consume. Animut et al. (2005) found that total stocking rates can be increased for multi-species systems, including cattle, sheep, and goats, over single-species grazing because different livestock species consume different types of forages. Therefore, evaluation of stocking rates is viewed as a highly important factor to consider when making decisions about co-grazing (Animut et al., 2005, and Animut

and Goetsch, 2008). The calculations of accurate and efficient stocking rates are an essential component of effective management (Ash and Smith, 1996). Holecheck et al. (2011) found there are certain factors such as, the precipitation dependent total available forage profile, and species diet composition that affect the calculation of stocking rate which can vary from year to year. Thus, there is no way to set a permanent stocking rate for a specific area over an extended period of time (Stoddart, 1960, Torell et al., 1991, Batabyal et al., 2001, and Holechek et al., 2011).

Enterprise Budgets

Enterprise budgets aid producers in decision making, by illustrating profits and losses (Doye and Sahs, 2009, and Kay et al., 2012). Literature on single and multiple enterprises is relatively vast, but research analyzing the profitability of their individual enterprise budgets and any combination thereof, is lacking. Few articles have been found analyzing different livestock species enterprise budgets; however, several articles have analyzed pieces of an enterprise budget separately. Young et al. (2008) discussed the need for appropriate stocking rates to maintain forage and brush conditions for wildlife. They also mentioned the idea of utilizing a mix of more than one enterprise, cow-calf and stockers, but stated that it is not common practice for ranchers in South Texas. Falconere et al. (1999) assessed the cost of production for the cow-calf industry and, Glimp (1995) considered rising prices of meat goats in North America. While pricing and cost of production are both pieces that are found in an enterprise budget, both researchers analyzed the pieces separately but their research did not use a multispecies strategy as a basis for

profitability. A reason for assessing this information is that, in west central Texas, the amount of land required to sustain a single animal is significantly larger than in regions such as East Texas.

Materials and Methods

In this study, the research sample was comprised of individual enterprise budgets based on animal units (AU). In order to make livestock of different sizes comparable, they must be converted to a general unit of measurement called animal unit (AU). Equation (1) shows the equivalencies of animal units between cow-calf, sheep, and goats (Machen and Lyons, 2000; Redfearn and Bidwell, 2003).

$$(1) \quad 1 \text{ AU} = 1 \text{ cow with calf (1000lb)} = 4 \text{ sheep} = 5 \text{ goats}$$

The individual operations analyzed in this study were cow-calf, range commercial sheep, range commercial goats, and all combinations thereof. Because the enterprise budgets were based on AU, the profitability of each enterprise budget was comparable.

Input Parameters

Enterprise budgets were created on a basis that the available forage was assumed and that each species consumes a specific type of forage.

Assumptions used in creating the enterprise budgets:

- Ample water supply
- 3200 acres improved pasture
 - Forage composition on the improved pasture of 50% grass, 37.5% browse, and 12.5% forbs
- Moderate stocking rate
 - Stocking rates were based on general accepted principles for the area relative to a sustainable carrying capacity and required forage demand

for each animal.

- Stocking rates were set also to allow for optimum consumption per species diet composition.
- 1 sire for 25 dams
- Death loss for sheep and goats were assumed to be higher than cattle, due to predation.
 - 10% Sheep and Goats
 - 3% Cattle
- 10% female replacement (retained in all operations)
- 120 day protein supplementation
- Minerals available year round
- Weaned animals
 - 85% calf crop, 130% lamb crop, and 150% kid crop
- Cattle Breed – Angus
- Sheep Breed – Rambouillet
- Goat Breed – Spanish Boer Cross

Calculating Stocking Rate

All stocking rates for combination budgets were split evenly between the species to reduce biasness. The required variables to calculate stocking rates were acreage (3,200), the percentage of each animals diet composition from the three main forage categories (grass, browse and forbs), and how much forage can be produced on a given acreage. Table 1 shows the average annual diet composition

by percent of grass, browse and forbs for cattle, sheep and goats on rangeland in the Edwards Plateau (Lyons et al., 1996). When calculating usable forage it is often best to use what range scientists call the take half – leave half theory, ultimately this means that only a quarter of the total forage will be utilized, because the rest is left for ground cover, and/or will be trampled and defecated on. This method was used to keep stocking rates at a moderate level. Equation (2) was used to determine total usable forage.

$$(2) \quad TUF_j = 0.25 * TAF_j * Acres$$

Where TUF_j is the total usable forage for each forage type j in pounds per year, 0.25 comes from the take half – leave half assumption, and TAF_j is the total available forage for each forage type j in pound per year. In west central Texas, an average 1,000 pounds of grass; 750 pounds of browse; and 250 pounds of forbs can be grown per acre per year. Using equation (2), the TUF for grass, browse and forbs would be 800,000 lbs/yr, 600,000 lbs/yr and 200,000 lbs/yr, respectively. Equation (3) shows forage demand.

$$(3) \quad FD = DMI * days\ on\ pasture$$

Where FD is the forage demand per AU; DMI is the dry matter intake per day based on a 1,000 lb. animal (1AU) that consumes 2% of its body weight. For this research the animals were left on pasture year around, so the forage demand was 7,300 lbs. per animal unit for the entire year.

Table 1. Average Annual Diet Composition by Percent Grass, Browse, and Forbs for Cattle, Sheep, and Goats on Rangeland in the Edward Plateau, by Lyons et al., (1996)

Species	Grass	Browse	Forbes
Cattle	80%	8%	12%
Sheep	60%	22%	18%
Goats	45%	40%	15%

The number of animal units selected for each enterprise budget was based on the average annual diet composition by Lyons et al. (1996), forage demand per animal unit and the total amount of usable forage for each forage type. To determine a moderate stocking rate in animal units the following constraints must hold.

$$(4) \quad AU_{c,s,g} * FD * (DC_{cj} + DC_{sj} + DC_{gj}) \leq TUF_j$$

Where *c* is for cattle, *s* is for sheep, and *g* is for goats; *FD* is the forage demand determined in equation (3); *DC_j* is the average annual diet composition in percent of forage type *j* with respect to species *c*, *s* and/or *g* from table 1; and *TUF_j* is the total usable forage for forage type *j* determined from equation (2). Equation (4) can be modified to determine the AUs by finding the floor of the minimum value:

$$(5) \quad AU_{c,s,g} = \left\lceil \text{Min} \left[\frac{TUF_j}{FD * (DC_{cj} + DC_{sj} + DC_{gj})} \right] \right\rceil$$

Where for each species *c*, *s*, and *g* there are *j* forage types. To find the maximum number of animal units for cattle, equation (5) was modified as follows:

$$AU_c = \left\lceil \text{Min} \left[\frac{TUF_j}{FD * (DC_{cj})} \right] \right\rceil$$

Yielding a 1 x 3 matrix, where $AU_c = [\text{Min} [136.98, 1027.40, 228.31]]$. Therefore, the

minimum floor of animal units for cattle was 136. This modification was also completed for the single species operations for sheep and goats with resulting animal units of 152 and 182, respectively. A similar modification was completed for dual species operations. The number of animal units for cattle and sheep; cattle and goat; and sheep and goat operations was 78, 87, and 83 per species, respectively. For an operation with cattle, sheep and goats, the number of animal units that can be sustained on 3,200 acres at a moderate stocking rate was 59 per species for a total of 177 animal units.

Determining the number of cows for a cow-calf operation based on AU

Equation (5) shows how to determine total number of AUs for a cattle operation. To convert AUs to the number of cows, the animal units of bulls, cows with calves, and open cows must be considered.

$$(6) \quad AU_c = AU \text{ Bulls} + AU \text{ Cows with Calves} + AU \text{ Open Cows}$$

For the cow-calf operation the calving rate was set at 85 percent. The average open cow weight was set at 700 lbs. and was considered 0.80 of an animal unit and the average bull weight was set at 1600 lbs. and was considered 1.5 of an AU following Redfearn and Bidwell's (2003) calculation of animal weight to animal units (Machen and Lyons, 2000). It was assumed that one bull can service 25 cows and one AU was set equal to a 1000 lb. cow-calf pair. By modifying equation (6), the number of cows for a cattle operation can be determined as follows:

$$(7) \quad AU = 1.5 \frac{1}{25} C + 0.85C + 0.8(C - 0.85C)$$

$$(8) \quad C = \left[\frac{1}{1.03} * AU \right]$$

Where C is for cows. From equation (5) the number of AUs determined for a single cattle operation was 136; therefore from equation (8) the number of cows needed for the operation was 132, with approximately 5 bulls. The number of cows for a multiple species operation was also determined by using equation (8). Therefore, the number of cows for a cattle and sheep; cattle and goat; and cattle, sheep, and goat operations was determined to be 76, 84, and 57, respectively.

Determining the number of ewes for a commercial range sheep operation based on AU

Equation (5) shows how to determine total number of AUs for a sheep operation. The assumptions for a commercial range sheep operation were one ram can service approximately 25 ewes, and 4 ewes or 4 rams equal an animal unit. The total number of sheep S was calculated as follow:

$$(9) \quad S = AU * 4$$

Equation (10) states the number of ewes needed in a commercial range sheep operation.

$$(10) \quad Ewes = S - \left(\frac{S - \left(\frac{S}{25} \right)}{25} \right)$$

From equation (5) the number of animal units determined for a single commercial range sheep operation was 152; therefore, from equation (10) the number of ewes needed for the operation was approximately 584 with 23 rams. The number of ewes for a multiple species operation was also determined by equation (10). Therefore, the number of ewes for a cattle and sheep; sheep and goat; and cattle, sheep, and goat operations was determined to be approximately 300, 319, and 227,

respectively.

Determining the number of does for a commercial range goat operation based on AU

Equation (5) shows how to determine total number of AUs for a goat operation. The assumptions for a commercial range goat operation were one buck can service approximately 25 does, and 5 does or 5 bucks equal an animal unit. The total number of goats G was calculated as follow:

$$(11) \quad G = AU * 5$$

Equation (12) states the number of does needed in a commercial range goat operation.

$$(12) \quad Does = G - \left(\frac{G - \left(\frac{G}{25} \right)}{25} \right)$$

From equation (5) the number of animal units determined for a single commercial range goat operation was 182; therefore, from equation (12) the number of does needed for the operation was approximately 875 with 35 bucks. The number of does for a multiple species operation was also determined by equation (12).

Therefore, the number of does for a cattle and goat; sheep and goat; and cattle, sheep, and goat operations was determined to be approximately 418, 399, and 284, respectively.

Pricing Information

Revenue prices were obtained from the USDA Market News reports (U.S. Department of Agriculture, 2011). These prices were reported to the USDA by one of the largest livestock auctions in the area of this study, Producers Livestock

Auction in San Angelo, TX. The livestock prices were averaged from 2007-2011 to account for fluctuations in the market. Wool and shearing prices on all sheep budgets were averages obtained from a local source. Operating input prices were based on 2012 prices and obtained from a local feed store. Fixed costs were obtained from a local bank and insurance company. Depreciation was calculated using the equation (13):

$$(13) \quad \textit{Depreciation} = \left(\frac{\textit{cost}}{\textit{life}} \right) * \textit{Quantity}$$

Equation (13) was used for all adult male livestock, buildings, equipment, and machinery. Females were not depreciated because cost of maintaining the herd was captured through retained replacements and cull female sales. Another portion of fixed costs is the interest rate on all loans for an operation. All livestock, buildings, and equipment were calculated on a 5% interest rate. Machinery, however, was calculated on a 3.5% interest rate. Insurance for all livestock was set at \$500.00 for a 1 million dollar policy, and is divided equally among all enterprise budgets if more than one budget exists for the operation. Buildings, equipment, and machinery were insured at a rate of \$0.42 per \$100.00 of value.

Net Margins

An enterprise budget can only be created for a single enterprise, therefore when looking at a multispecies operation this means that there are multiple enterprises being run simultaneously. In order to find the total net margin for multiple enterprises, it requires an individual enterprise budget for each enterprise in the operation. Simply take the net margin from one enterprise budget and add it to

the net margin of the next enterprise budget. Equation (14) shows the calculation for finding total net margin TNM .

$$(14) \quad TNM = \sum_{i=1}^n NM_i$$

Where NM is the net margin of the enterprise budget i ; and where i goes from 1 to the total number of enterprises.

Results

Single Species

Table 2 shows the single species cow-calf enterprise budget. This particular budget was based on 136 animal units, which consisted of 132 cows and 5 bulls, totaling 137 cattle. The total net margin for this budget was \$15,946.23, the per animal unit net margin was \$117.25, and this enterprise was ranked third in profitability.

Table 3 shows the single species commercial range sheep enterprise budget. This particular budget was based on 152 animal units, which consisted of 585 ewes and 23 rams, for a total of 608 sheep. The total net margin for this budget was \$16,947.04, the per animal unit net margin was \$111.49, and this enterprise was ranked second in profitability.

Table 4 shows the single species commercial range goat enterprise budget. This particular budget was based on 182 animal units, which consisted of 875 does and 35 bucks, for a total of 910 goats. The total net margin for this budget was \$4,784.28, the per animal unit net margin was \$26.29, and this enterprise was ranked seventh in profitability.

Table 2. Cow-Calf Enterprise Budget for the Single Species Cow-Calf Operation

Production	Weight	Unit	Price/Cwt.	Quantity	Total	\$/AU
Steer Calves	560	Lbs.	\$120.69	54.42	\$36,791.55	\$270.53
Heifer Calves	551	Lbs.	\$104.31	41.22	\$23,689.17	\$174.19
Cull Cows	1166	Lbs.	\$50.82	13.20	\$7,821.56	\$57.51
Cull Bulls	1625	Lbs.	\$63.44	0.00	\$0.00	\$0.00
TOTAL RECEIPTS					\$68,302.29	\$502.22
Operating Inputs		Unit	Price	Quantity		
Pasture		Acre	\$5.28	3200.00	\$16,896.00	\$124.24
Protein Supplement		Head	\$68.10	1.00	\$9,329.70	\$68.60
Minerals		Head	\$22.58	1.00	\$3,093.46	\$22.75
Vet Supplies		Head	\$2.00	1.00	\$274.00	\$2.01
Medicine, Vet Service		Head	\$6.00	1.00	\$822.00	\$6.04
Mach., Equip., Fuel, Oil, Repairs		Head	\$28.01	1.00	\$3,837.37	\$28.22
Mach., Equip. Labor		Hrs.	\$10.00	2.65	\$3,630.50	\$26.69
Other Labor		Hrs.	\$10.00	3.00	\$4,110.00	\$30.22
Marketing		Head	\$5.00	1.00	\$685.00	\$5.04
Total Operating Cost					\$42,678.03	\$313.81
Returns Above Total Operating Costs					\$25,624.26	\$188.41
Fixed Costs			Rate			
Machinery						
Interest at			3.50%		\$1,120.00	\$8.24
Insurance and taxes			\$0.42		\$134.40	\$0.99
Depreciation					\$1,700.00	\$12.50
Buildings and Equip.						
Interest at			5.00%		\$1,750.00	\$12.87
Insurance and taxes			\$0.42		\$147.00	\$1.08
Depreciation					\$1,241.10	\$9.13
Livestock						
Interest at			5.00%		\$1,002.20	\$7.37
Insurance and taxes					\$500.00	\$3.68
Depreciation					\$2,083.33	\$15.32
Total Fixed Costs					\$9,678.03	\$71.16
Total Costs(Operating+Fixed)					\$52,356.06	\$384.97
Net Margin					\$15,946.23	\$117.25

Table 3. Commercial Range Sheep Enterprise Budget for the Single Species Sheep Operation

Production	Weight	Unit	Price/Cwt.	Quantity	Total	\$/AU
Lambs	87	Lbs.	\$121.94	625.58	\$66,272.66	\$436.00
Cull Ewes	143	Lbs.	\$43.99	58.47	\$3,670.49	\$24.15
Wool	8	Lbs.	\$237.50	608.00	\$11,552.00	\$76.00
TOTAL RECEIPTS					\$81,495.15	\$536.15
Operating Inputs		Unit	Price	Quantity		
Pasture		Acre	\$5.28	3200.00	\$16,896.00	\$111.16
Protein Supplement		Head	\$13.62	1.00	\$8,280.96	\$54.48
Minerals		Head	\$5.91	1.00	\$3,593.28	\$23.64
Vet Supplies		Head	\$2.00	1.00	\$1,216.00	\$8.00
Medicine, Vet Service		Head	\$2.09	1.00	\$1,270.72	\$8.36
Shearing		Head	\$3.50	1.00	\$2,128.00	\$14.00
Mach., Equip., Fuel, Oil, Repairs		Head	\$7.51	1.00	\$4,566.08	\$30.04
Mach., Equip. Labor		Hrs.	\$10.00	0.90	\$5,472.00	\$36.00
Other Labor		Hrs.	\$10.00	2.00	\$12,160.00	\$80.00
Marketing		Head	\$2.00	1.00	\$1,216.00	\$8.00
Total Operating Cost					\$56,799.04	\$373.68
Returns Above Total Operating Costs					\$24,696.11	\$162.47
Fixed Costs			Rate			
Machinery						
Interest at			3.50%		\$234.50	\$1.54
Insurance and taxes			\$0.42		\$28.14	\$0.19
Depreciation					\$353.33	\$2.32
Buildings and Equip.						
Interest at			5.00%		\$1,250.00	\$8.22
Insurance and taxes			\$0.42		\$105.00	\$0.69
Depreciation					\$1,041.60	\$6.85
Livestock						
Interest at			5.00%		\$3,069.14	\$20.19
Insurance and taxes					\$500.00	\$3.29
Depreciation					\$1,167.36	\$7.68
Total Fixed Costs					\$7,749.07	\$50.98
Total Costs(Operating+Fixed)					\$64,548.11	\$424.66
Net Margin					\$16,947.04	\$111.49

Table 4. Commercial Range Goat Enterprise Budget for the Single Species Goat Operation

Production	Weight	Unit	Price/Cwt.	Quantity	Total	\$/AU
Kids	59	Lbs.	\$124.83	1093.82	\$81,165.20	\$445.96
Cull Does	105	Lbs.	\$49.91	87.51	\$4,565.38	\$25.08
Cull Bucks	137	Lbs.	\$91.57	0.00	\$0.00	\$0.00
TOTAL RECEIPTS					\$85,730.58	\$471.05
Operating Inputs						
		Unit	Price	Quantity		
Pasture		Acre	\$5.28	3200.00	\$16,896.00	\$92.84
Protein Supplement		Head	\$13.62	1.00	\$12,394.20	\$68.10
Minerals		Head	\$8.86	1.00	\$8,062.60	\$44.30
Vet Supplies		Head	\$2.00	1.00	\$1,820.00	\$10.00
Medicine, Vet Service		Head	\$2.09	1.00	\$1,901.90	\$10.45
Mach., Equip., Fuel, Oil, Repairs		Head	\$7.51	1.00	\$6,834.10	\$37.55
Mach., Equip. Labor		Hrs.	\$10.00	0.90	\$8,190.00	\$45.00
Other Labor		Hrs.	\$10.00	1.50	\$13,650.00	\$75.00
Marketing		Head	\$2.00	1.00	\$1,820.00	\$10.00
Total Operating Cost					\$71,568.80	\$393.24
Returns Above Total Operating Costs					\$14,161.78	\$77.81
Fixed Costs						
			Rate			
Machinery						
Interest at			3.50%		\$234.50	\$1.29
Insurance and taxes			\$0.42		\$28.14	\$0.15
Depreciation					\$353.33	\$1.94
Buildings and Equip.						
Interest at			5.00%		\$1,250.00	\$6.87
Insurance and taxes			\$0.42		\$105.00	\$0.58
Depreciation					\$1,102.00	\$6.05
Livestock						
Interest at			5.00%		\$4,732.91	\$26.01
Insurance and taxes					\$500.00	\$2.75
Depreciation					\$1,071.62	\$5.89
Total Fixed Costs					\$9,377.50	\$51.52
Total Costs(Operating+Fixed)					\$80,946.30	\$444.76
Net Margin					\$4,784.28	\$26.29

Double Species

An enterprise budget can only be created for one enterprise at a time. Therefore two enterprise budgets were created for an operation with multiple avenues for revenue, those being cow-calf and commercial range sheep. Table 5 shows the cow-calf enterprise budget and Table 6 shows the commercial range sheep enterprise budget.

Table 5 was based on 78 animal units, which consisted of 75 cows and 3 bulls, for a total of 78 cattle. The total net margin for this budget was \$8,449.54, the per animal unit net margin was \$108.33.

Table 6 was based on 78 animal units, which consisted of 300 ewes and 12 rams, for a total of 312 sheep. The total net margin for this budget was \$8,534.54, the per animal unit net margin was \$109.42.

By adding the individual total net margins from Tables 5 and 6, the combined total net margin was \$16,984.08 for the multiple species cow-calf and commercial range sheep operation; which ranked it first in profitability.

Table 5. Cow-Calf Enterprise Budget for the Multiple Species Cow-Calf and Commercial Range Sheep Operation

Production	Weight	Unit	Price/Cwt.	Quantity	Total	\$/AU
Steer Calves	560	Lbs.	\$120.69	30.92	\$20,904.88	\$268.01
Heifer Calves	551	Lbs.	\$104.31	23.42	\$13,460.20	\$172.57
Cull Cows	1166	Lbs.	\$50.82	7.50	\$4,444.21	\$56.98
Cull Bulls	1625	Lbs.	\$63.44	0.00	\$0.00	\$0.00
TOTAL RECEIPTS					\$38,809.29	\$497.55
Operating Inputs		Unit	Price	Quantity		
Pasture		Acre	\$5.28	1600.00	\$8,448.00	\$108.31
Protein Supplement		Head	\$68.10	1.00	\$5,311.80	\$68.10
Minerals		Head	\$22.58	1.00	\$1,761.24	\$22.58
Vet Supplies		Head	\$2.00	1.00	\$156.00	\$2.00
Medicine, Vet Service		Head	\$6.00	1.00	\$468.00	\$6.00
Mach., Equip., Fuel, Oil, Repairs		Head	\$28.01	1.00	\$2,184.78	\$28.01
Mach., Equip. Labor		Hrs.	\$10.00	2.65	\$2,067.00	\$26.50
Other Labor		Hrs.	\$10.00	3.00	\$2,340.00	\$30.00
Marketing		Head	\$5.00	1.00	\$390.00	\$5.00
Total Operating Cost					\$23,126.82	\$296.50
Returns Above Total Operating Costs					\$15,682.47	\$201.06
Fixed Costs			Rate			
Machinery						
Interest at			3.50%		\$1,023.75	\$13.13
Insurance and taxes			\$0.42		\$134.40	\$1.72
Depreciation					\$1,550.00	\$19.87
Buildings and Equip.						
Interest at			5.00%		\$1,375.00	\$17.63
Insurance and taxes			\$0.42		\$147.00	\$1.88
Depreciation					\$923.40	\$11.84
Livestock						
Interest at			5.00%		\$579.38	\$7.43
Insurance and taxes					\$250.00	\$3.21
Depreciation					\$1,250.00	\$16.03
Total Fixed Costs					\$7,232.93	\$92.73
Total Costs(Operating+Fixed)					\$30,359.75	\$389.23
Net Margin					\$8,449.54	\$108.33

Table 6. Commercial Range Sheep Enterprise Budget for the Multiple Species Cow-Calf and Commercial Range Sheep Operation

Production	Weight	Unit	Price/Cwt.	Quantity	Total	\$/AU
Lambs	87	Lbs.	\$121.94	321.02	\$34,008.34	\$436.00
Cull Ewes	143	Lbs.	\$43.99	30.00	\$1,883.54	\$24.15
Wool	8	Lbs.	\$237.50	312.00	\$5,928.00	\$76.00
TOTAL RECEIPTS					\$41,819.88	\$536.15
Operating Inputs		Unit	Price	Quantity		
Pasture		Acre	\$5.28	1600.00	\$8,448.00	\$108.31
Protein Supplement		Head	\$13.62	1.00	\$4,249.44	\$54.48
Minerals		Head	\$5.91	1.00	\$1,843.92	\$23.64
Vet Supplies		Head	\$2.00	1.00	\$624.00	\$8.00
Medicine, Vet Service		Head	\$2.09	1.00	\$652.08	\$8.36
Shearing		Head	\$3.50	1.00	\$1,092.00	\$14.00
Mach., Equip., Fuel, Oil, Repairs		Head	\$7.51	1.00	\$2,343.12	\$30.04
Mach., Equip. Labor		Hrs.	\$10.00	0.90	\$2,808.00	\$36.00
Other Labor		Hrs.	\$10.00	2.00	\$6,240.00	\$80.00
Marketing		Head	\$2.00	1.00	\$624.00	\$8.00
Total Operating Cost					\$28,924.56	\$370.83
Returns Above Total Operating Costs					\$12,895.32	\$165.32
Fixed Costs			Rate			
Machinery						
Interest at			3.50%		\$96.25	\$1.23
Insurance and taxes			\$0.42		\$28.14	\$0.36
Depreciation					\$150.00	\$1.92
Buildings and Equip.						
Interest at			5.00%		\$875.00	\$11.22
Insurance and taxes			\$0.42		\$105.00	\$1.35
Depreciation					\$682.40	\$8.75
Livestock						
Interest at			5.00%		\$1,574.95	\$20.19
Insurance and taxes					\$250.00	\$3.21
Depreciation					\$599.04	\$7.68
Total Fixed Costs					\$4,360.78	\$55.91
Total Costs(Operating+Fixed)					\$33,285.34	\$426.74
Net Margin					\$8,534.54	\$109.42

Tables 7 and 8 show the enterprise budgets for a multiple species cow-calf and commercial range goat operation, respectively.

Table 7 was based on 87 animal units. This budget consisted of 84 cows and 3 bulls, for a total of 87 cattle. The total net margin for this budget was \$11,363.22, the per animal unit net margin was \$130.61.

Table 8 was based on 87 animal units. This budget consisted of 418 does and 17 bucks, for a total of 435 goats. The total net margin for this budget was \$1,413.26, the per animal unit net margin was \$16.24.

By adding the individual total net margins from Tables 7 and 8, the combined total net margin was \$12,776.48 for the multiple species cow-calf and commercial range goat operation; which ranked it fifth in profitability.

Table 7. Cow-Calf Enterprise Budget for the Multiple Species Cow-Calf and Commercial Range Goat Operation

Production	Weight	Unit	Price/Cwt.	Quantity	Total	\$/AU
Steer Calves	560	Lbs.	\$120.69	34.63	\$23,413.46	\$269.12
Heifer Calves	551	Lbs.	\$104.31	26.23	\$15,075.43	\$173.28
Cull Cows	1166	Lbs.	\$50.82	8.40	\$4,977.51	\$57.21
Cull Bulls	1625	Lbs.	\$63.44	0.00	\$0.00	\$0.00
TOTAL RECEIPTS					\$43,466.40	\$499.61
Operating Inputs		Unit	Price	Quantity		
Pasture		Acre	\$5.28	1600.00	\$8,448.00	\$97.10
Protein Supplement		Head	\$68.10	1.00	\$5,924.70	\$68.10
Minerals		Head	\$22.58	1.00	\$1,964.46	\$22.58
Vet Supplies		Head	\$2.00	1.00	\$174.00	\$2.00
Medicine, Vet Service		Head	\$6.00	1.00	\$522.00	\$6.00
Mach., Equip., Fuel, Oil, Repairs		Head	\$28.01	1.00	\$2,436.87	\$28.01
Mach., Equip. Labor		Hrs.	\$10.00	2.65	\$2,305.50	\$26.50
Other Labor		Hrs.	\$10.00	3.00	\$2,610.00	\$30.00
Marketing		Head	\$5.00	1.00	\$435.00	\$5.00
Total Operating Cost					\$24,820.53	\$285.29
Returns Above Total Operating Costs					\$18,645.87	\$214.32
Fixed Costs			Rate			
Machinery						
Interest at			3.50%		\$1,023.75	\$11.77
Insurance and taxes			\$0.42		\$134.40	\$1.54
Depreciation					\$1,550.00	\$17.82
Buildings and Equip.						
Interest at			5.00%		\$1,375.00	\$15.80
Insurance and taxes			\$0.42		\$147.00	\$1.69
Depreciation					\$926.10	\$10.64
Livestock						
Interest at			5.00%		\$626.40	\$7.20
Insurance and taxes					\$250.00	\$2.87
Depreciation					\$1,250.00	\$14.37
Total Fixed Costs					\$7,282.65	\$83.71
Total Costs(Operating+Fixed)					\$32,103.18	\$369.00
Net Margin					\$11,363.22	\$130.61

Table 8. Commercial Range Goat Enterprise Budget for the Multiple Species Cow-Calf and Commercial Range Goat Operation

Production	Weight	Unit	Price/Cwt.	Quantity	Total	\$/AU
Kids	59	Lbs.	\$124.83	522.87	\$38,799.78	\$445.97
Cull Does	105	Lbs.	\$49.91	41.83	\$2,182.36	\$25.08
Cull Bucks	137	Lbs.	\$91.57	0.00	\$0.00	\$0.00
TOTAL RECEIPTS					\$40,982.14	\$471.06
Operating Inputs		Unit	Price	Quantity		
Pasture		Acre	\$5.28	1600.00	\$8,448.00	\$97.10
Protein Supplement		Head	\$13.62	1.00	\$5,924.70	\$68.10
Minerals		Head	\$8.86	1.00	\$3,854.10	\$44.30
Vet Supplies		Head	\$2.00	1.00	\$870.00	\$10.00
Medicine, Vet Service		Head	\$2.09	1.00	\$909.15	\$10.45
Mach., Equip., Fuel, Oil, Repairs		Head	\$7.51	1.00	\$3,266.85	\$37.55
Mach., Equip. Labor		Hrs.	\$10.00	0.90	\$3,915.00	\$45.00
Other Labor		Hrs.	\$10.00	1.50	\$6,525.00	\$75.00
Marketing		Head	\$2.00	1.00	\$870.00	\$10.00
Total Operating Cost					\$34,582.80	\$397.50
Returns Above Total Operating Costs					\$6,399.34	\$73.56
Fixed Costs			Rate			
Machinery						
Interest at			3.50%		\$96.25	\$1.11
Insurance and taxes			\$0.42		\$28.14	\$0.32
Depreciation					\$150.00	\$1.72
Buildings and Equip.						
Interest at			5.00%		\$875.00	\$10.06
Insurance and taxes			\$0.42		\$105.00	\$1.21
Depreciation					\$707.00	\$8.13
Livestock						
Interest at			5.00%		\$2,262.44	\$26.01
Insurance and taxes					\$250.00	\$2.87
Depreciation					\$512.26	\$5.89
Total Fixed Costs					\$4,986.08	\$57.31
Total Costs(Operating+Fixed)					\$39,568.88	\$454.81
Net Margin					\$1,413.26	\$16.24

Tables 9 and 10 show the enterprise budgets for a multiple species commercial range sheep and commercial range goat operation, respectively.

Table 9 was based on 83 animal units, which consisted of 319 ewes and 13 rams, for a total head count of 332. The total net margin for this budget was \$10,121.68, the per animal unit net margin was \$121.95.

Table 10 was based on 83 animal units, which consisted of 399 does and 16 bucks, for a total head count of 415. The total net margin for this budget was \$1,224.53, the per animal unit net margin was \$14.75.

By adding the individual total net margins from Tables 9 and 10, the combined total net margin was \$11,346.20 for the multiple species commercial range sheep and commercial range goat operation; which ranked it sixth in profitability.

Table 9. Commercial Range Sheep Enterprise Budget for the Multiple Species
Commercial Range Sheep and Commercial Range Goat Operation

Production	Weight	Unit	Price/Cwt.	Quantity	Total	\$/AU
Lambs	87	Lbs.	\$121.94	341.60	\$36,188.36	\$436.00
Cull Ewes	143	Lbs.	\$43.99	31.93	\$2,004.28	\$24.15
Wool	8	Lbs.	\$237.50	332.00	\$6,308.00	\$76.00
TOTAL RECEIPTS					\$44,500.64	\$536.15
Operating Inputs		Unit	Price	Quantity		
Pasture		Acre	\$5.28	1600.00	\$8,448.00	\$101.78
Protein Supplement		Head	\$13.62	1.00	\$4,521.84	\$54.48
Minerals		Head	\$5.91	1.00	\$1,962.12	\$23.64
Vet Supplies		Head	\$2.00	1.00	\$664.00	\$8.00
Medicine, Vet Service		Head	\$2.09	1.00	\$693.88	\$8.36
Shearing		Head	\$3.50	1.00	\$1,162.00	\$14.00
Mach., Equip., Fuel, Oil, Repairs		Head	\$7.51	1.00	\$2,493.32	\$30.04
Mach., Equip. Labor		Hrs.	\$10.00	0.90	\$2,988.00	\$36.00
Other Labor		Hrs.	\$10.00	2.00	\$6,640.00	\$80.00
Marketing		Head	\$2.00	1.00	\$664.00	\$8.00
Total Operating Cost					\$30,237.16	\$364.30
Returns Above Total Operating Costs					\$14,263.48	\$171.85
Fixed Costs			Rate			
Machinery						
Interest at			3.50%		\$117.25	\$1.41
Insurance and taxes			\$0.42		\$28.14	\$0.34
Depreciation					\$176.67	\$2.13
Buildings and Equip.						
Interest at			5.00%		\$625.00	\$7.53
Insurance and taxes			\$0.42		\$105.00	\$1.27
Depreciation					\$526.40	\$6.34
Livestock						
Interest at			5.00%		\$1,675.91	\$20.19
Insurance and taxes					\$250.00	\$3.01
Depreciation					\$637.44	\$7.68
Total Fixed Costs					\$4,141.81	\$49.90
Total Costs(Operating+Fixed)					\$34,378.97	\$414.20
Net Margin					\$10,121.68	\$121.95

Table 10. Commercial Range Goat Enterprise Budget for the Multiple Species
Commercial Range Sheep and Commercial Range Goat Operation

Production	Weight	Unit	Price/Cwt.	Quantity	Total	\$/AU
Kids	59	Lbs.	\$124.83	498.83	\$37,015.88	\$445.97
Cull Does	105	Lbs.	\$49.91	39.91	\$2,082.02	\$25.08
Cull Bucks	137	Lbs.	\$91.57	0.00	\$0.00	\$0.00
TOTAL RECEIPTS					\$39,097.90	\$471.06
Operating Inputs		Unit	Price	Quantity		
Pasture		Acre	\$5.28	1600.00	\$8,448.00	\$101.78
Protein Supplement		Head	\$13.62	1.00	\$5,652.30	\$68.10
Minerals		Head	\$8.86	1.00	\$3,676.90	\$44.30
Vet Supplies		Head	\$2.00	1.00	\$830.00	\$10.00
Medicine, Vet Service		Head	\$2.09	1.00	\$867.35	\$10.45
Mach., Equip., Fuel, Oil, Repairs		Head	\$7.51	1.00	\$3,116.65	\$37.55
Mach., Equip. Labor		Hrs.	\$10.00	0.90	\$3,735.00	\$45.00
Other Labor		Hrs.	\$10.00	1.50	\$6,225.00	\$75.00
Marketing		Head	\$2.00	1.00	\$830.00	\$10.00
Total Operating Cost					\$33,381.20	\$402.18
Returns Above Total Operating Costs					\$5,716.70	\$68.88
Fixed Costs			Rate			
Machinery						
Interest at			3.50%		\$117.25	\$1.41
Insurance and taxes			\$0.42		\$28.14	\$0.34
Depreciation					\$176.67	\$2.13
Buildings and Equip.						
Interest at			5.00%		\$625.00	\$7.53
Insurance and taxes			\$0.42		\$105.00	\$1.27
Depreciation					\$543.00	\$6.54
Livestock						
Interest at			5.00%		\$2,158.42	\$26.01
Insurance and taxes					\$250.00	\$3.01
Depreciation					\$488.70	\$5.89
Total Fixed Costs					\$4,492.18	\$54.12
Total Costs(Operating+Fixed)					\$37,873.38	\$456.31
Net Margin					\$1,224.53	\$14.75

Triple Species

Tables 11, 12, and 13 show the enterprise budgets for a multiple species cow-calf, commercial range sheep, and commercial range goat operation, respectively.

Table 11 was based on 59 animal units. The total number of cattle for this budget was 59, with 57 cows and 2 bulls. The total net margin for this budget was \$6,502.40, the per animal unit net margin was \$110.21.

Table 12 was based on 59 animal units. The total number of sheep for this budget was 336, with 227 ewes and 9 rams. The total net margin for this budget was \$7,502.85, the per animal unit net margin was \$127.17.

Table 13 was based on 59 animal units. The total number of goats for this budget was 295, with 284 does and 11 bucks. The total net margin for this budget was \$1,178.37, the per animal unit net margin was \$19.97.

By adding the individual total net margins from Tables 11, 12, and 13, the combined total net margin was \$15,183.61 for the multiple species cow-calf, commercial range sheep, and commercial range goat operation; which ranked it fourth in profitability.

Table 11. Cow-Calf Enterprise Budget for the Multiple Species Cow-Calf, Commercial Range Sheep, and Commercial Range Goat Operation

Production	Weight	Unit	Price/Cwt.	Quantity	Total	\$/AU
Steer Calves	560	Lbs.	\$120.69	23.50	\$15,887.71	\$269.28
Heifer Calves	551	Lbs.	\$104.31	17.80	\$10,229.75	\$173.39
Cull Cows	1166	Lbs.	\$50.82	5.70	\$3,377.60	\$57.25
Cull Bulls	1625	Lbs.	\$63.44	0.00	\$0.00	\$0.00
TOTAL RECEIPTS					\$29,495.06	\$499.92
Operating Inputs						
		Unit	Price	Quantity		
Pasture		Acre	\$5.28	1066.67	\$5,632.00	\$95.46
Protein Supplement		Head	\$68.10	1.00	\$4,017.90	\$68.10
Minerals		Head	\$22.58	1.00	\$1,332.22	\$22.58
Vet Supplies		Head	\$2.00	1.00	\$118.00	\$2.00
Medicine, Vet Service		Head	\$6.00	1.00	\$354.00	\$6.00
Mach., Equip., Fuel, Oil, Repairs		Head	\$28.01	1.00	\$1,652.59	\$28.01
Mach., Equip. Labor		Hrs.	\$10.00	2.65	\$1,563.50	\$26.50
Other Labor		Hrs.	\$10.00	3.00	\$1,770.00	\$30.00
Marketing		Head	\$5.00	1.00	\$295.00	\$5.00
Total Operating Cost					\$16,735.21	\$283.65
Returns Above Total Operating Costs					\$12,759.85	\$216.27
Fixed Costs						
			Rate			
Machinery						
Interest at			3.50%		\$991.03	\$16.80
Insurance and taxes			\$0.42		\$134.40	\$2.28
Depreciation					\$1,499.00	\$25.41
Buildings and Equip.						
Interest at			5.00%		\$1,247.50	\$21.14
Insurance and taxes			\$0.42		\$147.00	\$2.49
Depreciation					\$815.70	\$13.83
Livestock						
Interest at			5.00%		\$422.83	\$7.17
Insurance and taxes					\$166.67	\$2.82
Depreciation					\$833.33	\$14.12
Total Fixed Costs					\$6,257.45	\$106.06
Total Costs(Operating+Fixed)					\$22,992.66	\$389.71
Net Margin					\$6,502.40	\$110.21

Table 12. Commercial Range Sheep Enterprise Budget for the Multiple Species Cow-Calf, Commercial Range Sheep, and Commercial Range Goat Operation

Production	Weight	Unit	Price/Cwt.	Quantity	Total	\$/AU
Lambs	87	Lbs.	\$121.94	242.82	\$25,724.26	\$436.00
Cull Ewes	143	Lbs.	\$43.99	22.69	\$1,424.73	\$24.15
Wool*	8	Lbs.	\$237.50	236.00	\$4,484.00	\$76.00
TOTAL RECEIPTS					\$31,632.99	\$536.15
Operating Inputs		Unit	Price	Quantity		
Pasture		Acre	\$5.28	1066.67	\$5,632.00	\$95.46
Protein Supplement		Head	\$13.62	1.00	\$3,214.32	\$54.48
Minerals		Head	\$5.91	1.00	\$1,394.76	\$23.64
Vet Supplies		Head	\$2.00	1.00	\$472.00	\$8.00
Medicine, Vet Service		Head	\$2.09	1.00	\$493.24	\$8.36
Shearing		Head	\$3.50	1.00	\$826.00	\$14.00
Mach., Equip., Fuel, Oil, Repairs		Head	\$7.51	1.00	\$1,772.36	\$30.04
Mach., Equip. Labor		Hrs.	\$10.00	0.90	\$2,124.00	\$36.00
Other Labor		Hrs.	\$10.00	2.00	\$4,720.00	\$80.00
Marketing		Head	\$2.00	1.00	\$472.00	\$8.00
Total Operating Cost					\$21,120.68	\$357.98
Returns Above Total Operating Costs					\$10,512.31	\$178.17
Fixed Costs			Rate			
Machinery						
Interest at			3.50%		\$63.53	\$1.08
Insurance and taxes			\$0.42		\$28.14	\$0.48
Depreciation					\$99.00	\$1.68
Buildings and Equip.						
Interest at			5.00%		\$497.50	\$8.43
Insurance and taxes			\$0.42		\$105.00	\$1.78
Depreciation					\$405.20	\$6.87
Livestock						
Interest at			5.00%		\$1,191.31	\$20.19
Insurance and taxes					\$166.67	\$2.82
Depreciation					\$453.12	\$7.68
Total Fixed Costs					\$3,009.46	\$51.01
Total Costs(Operating+Fixed)					\$24,130.14	\$408.99
Net Margin					\$7,502.85	\$127.17

Table 13. Commercial Range Goat Enterprise Budget for the Multiple Species Cow-Calf, Commercial Range Sheep, and Commercial Range Goat Operation

Production	Weight	Unit	Price/Cwt.	Quantity	Total	\$/AU
Kids	59	Lbs.	\$124.83	354.59	\$26,312.50	\$445.97
Cull Does	105	Lbs.	\$49.91	28.37	\$1,479.99	\$25.08
Cull Bucks	137	Lbs.	\$91.57	0.00	\$0.00	\$0.00
TOTAL RECEIPTS					\$27,792.49	\$471.06
Operating Inputs		Unit	Price	Quantity		
Pasture		Acre	\$5.28	1066.67	\$5,632.00	\$95.46
Protein Supplement		Head	\$13.62	1.00	\$4,017.90	\$68.10
Minerals		Head	\$8.86	1.00	\$2,613.70	\$44.30
Vet Supplies		Head	\$2.00	1.00	\$590.00	\$10.00
Medicine, Vet Service		Head	\$2.09	1.00	\$616.55	\$10.45
Mach., Equip., Fuel, Oil, Repairs		Head	\$7.51	1.00	\$2,215.45	\$37.55
Mach., Equip. Labor		Hrs.	\$10.00	0.90	\$2,655.00	\$45.00
Other Labor		Hrs.	\$10.00	1.50	\$4,425.00	\$75.00
Marketing		Head	\$2.00	1.00	\$590.00	\$10.00
Total Operating Cost					\$23,355.60	\$395.86
Returns Above Total Operating Costs					\$4,436.89	\$75.20
Fixed Costs			Rate			
Machinery						
Interest at			3.50%		\$63.53	\$1.08
Insurance and taxes			\$0.42		\$28.14	\$0.48
Depreciation					\$99.00	\$1.68
Buildings and Equip.						
Interest at			5.00%		\$497.50	\$8.43
Insurance and taxes			\$0.42		\$105.00	\$1.78
Depreciation					\$417.00	\$7.07
Livestock						
Interest at			5.00%		\$1,534.30	\$26.01
Insurance and taxes					\$166.67	\$2.82
Depreciation					\$347.39	\$5.89
Total Fixed Costs					\$3,258.52	\$55.23
Total Costs(Operating+Fixed)					\$26,614.12	\$451.09
Net Margin					\$1,178.37	\$19.97

Table 14 represents the total net margins, from the enterprise budgets that utilized average prices, of all single and multiple species operations ranking them from the highest to lowest net margins. This research determined that the multiple species cow-calf and commercial range sheep operation, showed to be the most profitable enterprise from this study with a net margin of \$16,984.08. The next enterprise to follow was the single species sheep enterprise with a net margin of \$16,947.04. This operation was followed by the single species cow-calf enterprise with a net margin of \$15,946.23. These enterprises were followed up by the triple species cow-calf, commercial range sheep, and commercial range goat operation which had a net margin of \$15,183.61. However, these results are only valid for the given input parameters.

Table 14. Net Margins for the Average Priced Enterprise Budgets

Combination	AU	Total AU	Net Margin	Change in Net Margins
Cattle and Sheep	78/78	156	\$16,984.08	
Sheep	152	152	\$16,947.04	\$37.04
Cattle	136	136	\$15,946.23	\$1,000.82
Cattle, Sheep, and Goats	59/59/59	177	\$15,183.61	\$762.62
Cattle and Goats	87/87	174	\$12,776.48	\$2,407.13
Sheep and Goats	83/83	166	\$11,346.20	\$1,430.28
Goats	182	182	\$4,784.28	\$6,561.92

The changes in net margins in Table 14 indicate little difference in profitability between the top 4 enterprises. The producer should keep in mind that by diversifying the operation with multiple species, the producer has ultimately reduced

risk associated with predation, disease, birthing time, market fluctuation, and increased forage utilization within the entire operation.

Sensitivity Analyses

To illustrate how sensitive the enterprises can be to high and low prices due to market fluctuations, two additional net margin tables, Tables 15 and 16, were created. Tables 17, 18, and 19 show the low, average, and high prices obtained for each species revenues, which were utilized to acquire the new net margins in each individual enterprise budget. Tables 15 and 16 show the new ranking of the enterprises based on the new net margins.

Another example of sensitivity for the individual enterprise budgets was how they were affected by the volatile market fluctuations, multiple sensitivity analyses were conducted to display the upward and downward movement in the revenue and costs of the operations which would be reflected in the net margin, for each single species. These analyses were done by percentage and based on the original net margins.

Table 15. Low Price Net Margins

Combination	AU	Total AU	Net Margin	Change in Net Margins
Cattle	136	136	-\$6,179.10	
Cattle and Sheep	78/78	156	-\$9,830.33	\$3,651.23
Sheep	152	152	-\$11,075.30	\$1,244.97
Cattle, Sheep, and Goats	59/59/59	177	-\$16,586.74	\$5,511.44
Cattle and Goats	87/87	174	-\$18,003.31	\$1,416.57
Sheep and Goats	83/83	166	-\$19,920.47	\$1,917.16
Goats	182	182	-\$30,221.13	\$10,300.66

Table 16. High Price Net Margins

Combination	AU	Total AU	Net Margin	Change in Net Margins
Cattle, Sheep, and Goats	59/59/59	177	\$68,707.33	
Cattle and Goats	87/87	174	\$65,121.37	\$3,585.96
Goats	182	182	\$64,087.57	\$1,033.80
Sheep and Goats	83/83	166	\$63,775.76	\$311.81
Sheep	152	152	\$63,436.41	\$339.35
Cattle and Sheep	78/78	156	\$62,514.85	\$921.56
Cattle	136	136	\$53,287.53	\$9,227.32

Table 17. Cattle Low, Average, and High Prices

	Low Price	Average Price	High Price
Steer	\$82.12	\$120.69	\$184.50
Heifer	\$72.25	\$104.31	\$168.32
Cull Cow	\$31.06	\$50.82	\$72.77
Cull Bulls	\$47.56	\$63.44	\$83.20

Table 18. Sheep Low, Average, and High Prices

	Low Price	Average Price	High Price
Lambs	\$79.32	\$121.94	\$196.15
Ewes	\$22.19	\$43.99	\$81.35
Wool	\$175.00	\$237.50	\$300.00

Table 19. Goat Low, Average, and High Prices

	Low Price	Average Price	High Price
Kids	\$75.00	\$124.83	\$211.31
Cull Does	\$21.41	\$49.91	\$83.47
Cull Bucks	\$62.31	\$91.57	\$138.46

Table 20 shows the sensitivity in percent change to the net margins in revenue and cost for a single species cow-calf enterprise.

Table 20. Price Sensitivity Analysis for Single Species Cow-Calf Enterprise

		Percent Change in Total Gross Receipts				
		-32.32%	-23.50%	0.00%	23.50%	54.71%
Percent Change in	-40.00%	\$10,939.05	\$16,966.40	\$33,017.44	\$49,068.48	\$70,388.25
Total	-37.40%	\$9,829.42	\$15,856.77	\$31,907.81	\$47,958.85	\$69,278.62
Variable	0.00%	(\$6,132.16)	(\$104.81)	\$15,946.23	\$31,997.27	\$53,317.04
Costs	37.40%	(\$22,093.74)	(\$16,066.39)	(\$15.36)	\$16,035.68	\$37,355.46
	40.00%	(\$23,203.37)	(\$17,176.02)	(\$1,124.98)	\$14,926.05	\$36,245.83

If there was a zero percent change in cost, the market would have to incur a 23.5% loss to exhibit a non-profitable enterprise for a single species cow-calf operation. The same principle applies if there was a zero percent change in revenue; operating costs would have to increase by 37.25% to cause a non-profitable enterprise in regards to the single species cow-calf operation. If the cattle market fell to its lowest price, the operation would experience a 32.32% loss in profit from the average prices. If the cattle market increased to its highest price, the operation would experience a 54.71% gain in profit from the average prices.

Table 21 shows the sensitivity in percent change to the net margins in revenue and cost for a single species commercial range sheep enterprise.

Table 21. Price Sensitivity Analysis for Single Species Commercial Range Sheep Enterprise

		Percent Change in Total Gross Receipts				
		-34.38%	-23.75%	0.00%	23.75%	57.05%
Percent Change in Total	-40.00%	\$11,644.78	\$20,311.56	\$39,666.66	\$59,021.76	\$86,157.15
	-35.25%	\$8,946.83	\$17,613.61	\$36,968.70	\$56,323.80	\$83,459.19
	0.00%	(\$11,074.83)	(\$2,408.06)	\$16,947.04	\$36,302.14	\$63,437.53
Variable Costs	35.25%	(\$31,096.49)	(\$22,429.72)	(\$3,074.62)	\$16,280.48	\$43,415.87
	40.00%	(\$33,794.45)	(\$25,127.67)	(\$5,772.57)	\$13,582.53	\$40,717.91

If there was a zero percent change in cost, the market would have to incur a 23.75% loss to exhibit a non-profitable enterprise for a single species commercial range sheep operation. The same principle applies if there was a zero percent change in revenue; operating costs would have to increase by 35.25% to cause a non-profitable enterprise in regards to the single species commercial range sheep operation. If the sheep market fell to its lowest price, the operation would experience a 34.38% loss in profit from the average prices. If the sheep market increased to its highest price, the operation would experience a 57.05% gain in profit from the average prices.

Table 22 shows the sensitivity in percent change to the net margins in revenue and cost for a single species commercial range goat enterprise.

Table 22. Price Sensitivity Analysis for Single Species Commercial Range Goat Enterprise

		Percent Change in Total Gross Receipts				
		-40.83%	-5.75%	0.00%	5.75%	69.17%
Percent Change in Total Variable Costs	-10.00%	(\$23,064.25)	\$7,011.65	\$11,941.16	\$16,870.67	\$71,244.45
	-6.75%	(\$25,390.24)	\$4,685.67	\$9,615.17	\$14,544.68	\$68,918.46
	0.00%	(\$30,221.13)	(\$145.23)	\$4,784.28	\$9,713.79	\$64,087.57
	6.75%	(\$35,052.02)	(\$4,976.12)	(\$46.61)	\$4,882.89	\$59,256.68
	10.00%	(\$37,378.01)	(\$7,302.11)	(\$2,372.60)	\$2,556.91	\$56,930.69

-If there was a zero percent change in cost, the market would have to incur a 5.75% loss to exhibit a non-profitable enterprise for a single species commercial range goat operation. The same principle applies if there was a zero percent change in revenue; operating costs would have to increase by 6.75% to cause a non-profitable enterprise in regards to the single species commercial range goat operation. If the goat market fell to its lowest price, the operation would experience a 40.83% loss in profit from the average prices. If the goat market increased to its highest price, the operation would experience a 69.17% gain in profit from the average prices.

Discussion

The intent of this study was to identify the ideal enterprise which maximizes profitability, while increasing stocking rates and making a better use of the land, through the analysis of enterprise budgets. Due to the variability in forage composition, even pastures adjacent to each other may represent different forage profiles. As such, with any rangeland evaluation, the data contained within this study will not directly apply to another rangeland unless it exhibits the same qualities as stated in the input parameters. Due to the variability of rangelands, it is almost impossible to obtain complete forage composition profiles and production levels. Therefore, further research is required to obtain actual accurate forage production including grasses, browse, and forbs during each season of the year. This will allow for more accurate stocking rates, and will affect the enterprise budgets and their corresponding net margins. This study accounted for some of the risks, but could not account for all of the risk associated with livestock operations.

When drought occurs, often the first thing utilized to overcome it is to destock the land. This is completed in hopes that the lands forage production for the year will sustain the animals owned without excessive supplementation. One way to help protect against this problem is to maintain a lower stocking rate. Stocking at 60% of the maximum rate would be the ideal stocking rate. This would help to maintain pasture quality and sustainability and would set stocking rate moderately enough, that in times of drought or hardship destocking would not have such a detrimental effect on the operation. Ultimately reducing risk associated with all livestock

operations.

Market fluctuations can cause great economic losses to a producer if the market prices decrease at the wrong time. Market fluctuations can be minimized by operating in more than one market, which is achieved by running a multispecies operation.

Predation can have a large negative economic impact on producers. Predator problems will always be a difficulty faced by producers but a reduction in death loss can potentially occur when cattle and sheep are bonded together, thus adding a benefit to the list of reasons to run a multiple species operation.

The last risk to consider is health management. Cattle do not share all of the same health problems that sheep and goats do; therefore it can be advantageous to have an operation that utilizes both or all three of these species to prevent incurring a loss of animals and profits that can occur when only utilizing one species. The risks discussed above are only a few that can affect the producer's profits; however, these risks are the ones seen as the most harmful and volatile to the producer.

Conclusion

The main purpose of this study was to determine the difference in profitability of single and multiple species livestock operations by evaluating enterprise budgets. This was accomplished by creating enterprise budgets for each of the three livestock species, based on average prices for each species, and then comparing the profitability of each budget or combination of budgets to determine the ranking of profitability. Results indicate that a multiple species cow-calf and commercial range sheep operation was the most profitable. Another purpose of this study was to determine if stocking rate could be increased by utilizing multiple species of livestock in an operation. This was accomplished by analyzing what different species consume and how much of what they consume was available, and then utilizes what was available to the fullest capability. With determining what each species consumes and how much was available, it was possible to discover the optimal amount and combinations of animals to utilize on the given land and was increased with utilizing multiple species of livestock. Results indicate that the stocking rate range from 136 AU to 182 AU by utilizing different species of animals.

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