Evaluation of Pasture Forage and Harvested Forage Types during the Third Trimester Production Period

Results

The third trimester production period was 90 days during winter from mid December to mid March. The third trimester production period has increased nutrient requirements. Although the cow has no calf at her side and is not producing milk, the developing fetus is growing at an increasing rate. The weight gain from the fetus and related fluid and tissue is about one pound per day during the last 2 or 2.5 months when the fetus is growing very rapidly (BCRC 1999). It is important that higher-quality forage that meets the nutritional requirements be provided during this period to maintain the weight of cows in moderate or good body condition and to ensure a strong, healthy calf. Feeding forages containing insufficient nutrients during this period causes a reduction in cow body condition and results in delayed estrual activity and a delay in rebreeding.
Pasture forage and harvested forage costs and returns after feed costs were determined for a 1200-pound range cow during the 90-day third trimester production period. The cow requires a daily intake of 24 lbs dry matter (DM) at 7.8% crude protein (CP) (1.87 lbs CP/day).

Pasture Forage Types

Reserved native rangeland managed as a repeated seasonal pasture was evaluated during the third trimester production period for 90 days between mid December and mid March (tables 21 and 25). Native rangeland forage during the fall and winter dormancy period has a crude protein content of around 4.8%. Late-season native rangeland forage has pasture rent value or production costs of $8.76 per acre, forage dry matter costs of $120.83 per ton, and crude protein costs of $1.26 per pound. A cow grazing during the third trimester would require 18.62 acres (6.31 acres per month) at a forage cost of $163.12 per production period. The crude protein content of mature native rangeland forage is below the requirements of a cow in the third trimester, and crude protein would need to be supplemented at 0.43 lbs per cow per day at a cost of $11.61 period. Total feed costs would be $174.73 per period, or $1.94 per day (table 26). Calf fetus weight gain was assumed to be 0.78 lbs per day; accumulated weight gain was 70.08 lbs. When calf accumulated weight was assumed to have a value of $0.70 per pound, the gross return was $49.06 per calf, and the net returns after pasture costs were a loss of $125.61 per cow-calf pair and a loss of $6.75 per acre. The cost of calf fetus weight gain was $2.49 per pound (table 27).

Standing corn managed as a seasonal pasture was evaluated during the third trimester production period for 90 days between mid December and mid March (tables 21 and 25). Standing corn forage had production costs of $126.67 per acre (Nelson et al. 2002) and forage dry matter costs of $65.97 per ton. A cow grazing during the third trimester period was allotted 0.70 acres. Daily forage utilization averaged 77.7 lbs/cow with 61% to 65% of the forage wasted. Intake and wasted forage would cost $89.07 per production period. An additional 0.54 lbs of crude protein per day would need to be provided at a cost of $21.67 per period (Nelson et al. 2002). Total forage and supplement costs would be $110.74 per period, or $1.23 per day (Nelson et al. 2002) (table 26). Cow weight gain was 0.86 lbs per day and 110.57 lbs per acre; accumulated weight gain was 77.40 lbs. Calf fetus weight gain was assumed to be 0.78 lbs per day; accumulated weight gain was 70.08 lbs. When calf accumulated weight was assumed to have a value of $0.70 per pound, the gross return was $49.06 per calf, and the net returns after pasture costs were a loss of $61.68 per cow-calf pair and a loss of $87.76 per acre. The cost of calf fetus weight gain was $1.58 per pound (table 27).

Harvested Forage Types

Crested wheatgrass hay cut late, at a mature plant stage, has a crude protein content of around 6.4%. This crested wheatgrass hay has production costs of $28.11 per acre, forage dry matter costs of $34.80 per ton, and crude protein costs of $0.28 per pound. Mature crested wheatgrass hay would be fed at 24.0 lbs DM/day to provide 1.5 lbs CP/day. The nutrient content of mature crested wheatgrass hay is below the dietary requirements of a cow in the third trimester. An additional 0.33 lbs of crude protein per day would need to be provided, at a cost of $9.02 per period. Production of mature crested wheatgrass hay to feed during the third trimester (tables 22 and 25) would require 1.35 acres, and the forage would cost $38.02 per production period. Total forage and supplement costs would be $47.04 per period, or $0.52 per day (table 26). Calf fetus weight gain was assumed to be 0.78 lbs per day; accumulated weight gain was 70.08 lbs. When calf accumulated weight was assumed to have a value of $0.70 per pound, the gross return was

$49.06 per calf, and the net returns after feed costs were $2.02 per cow-calf pair and $1.50 per acre. The cost of calf fetus weight gain was $0.67 per pound (table 27).

Crested wheatgrass hay cut early, at the boot stage, has a crude protein content of around 14.5%. This crested wheatgrass hay has production costs of $26.50 per acre, forage dry matter costs of $40.80 per ton, and crude protein costs of $0.14 per pound. Early cut crested wheatgrass hay would be fed at 12.9 lbs DM/day to provide 1.9 lbs CP/day. An additional 11.1 lbs of roughage per day would need to be provided, at a cost of $17.48 per period. Production of early cut crested wheatgrass hay to feed during the third trimester (tables 22 and 25) would require 0.89 acres, and the forage would cost $23.40 per production period. Total forage and supplement costs would be $40.88 per period, or $0.45 per day (table 26). Calf fetus weight gain was assumed to be 0.78 lbs per day; accumulated weight gain was 70.08 lbs. When calf accumulated weight was assumed to have a value of $0.70 per pound, the gross return was $49.06 per calf, and the net returns after feed costs were $8.18 per cow-calf pair and $9.19 per acre. The cost of calf fetus weight gain was $0.58 per pound (table 27).

Forage barley hay cut early, at the milk stage, has a crude protein content of 13.0%. This forage barley hay has production costs of $68.21 per acre, forage dry matter costs of $28.80 per ton, and crude protein costs of $0.11 per pound. Early cut forage barley hay would be fed at 14.4 lbs DM/day to provide 1.9 lbs CP/day. An additional 9.6 lbs of roughage per day would need to be provided, at a cost of $14.96 per period. Production of early cut forage barley hay to feed during the third trimester (tables 23 and 25) would require 0.27 acres, and the forage would cost $18.90 per production period. Total forage and supplement costs would be $33.86 per period, or $0.38 per day (table 26). Calf fetus weight gain was assumed to be 0.78 lbs per day; accumulated weight gain was 70.08 lbs. When calf accumulated weight was assumed to have a value of $0.70 per pound, the gross return was $49.06 per calf, and the net returns after feed costs were $15.20 per cow-calf pair and $56.30 per acre. The cost of calf fetus weight gain was $0.48 per pound (table 27).

Forage barley hay cut late, at the hard dough stage, has a crude protein content of 9.2%. This forage barley hay has production costs of $70.35 per acre, forage dry matter costs of $27.40 per ton, and crude protein costs of $0.15 per pound. Late-cut forage barley hay would be fed at 20.3 lbs DM/day to provide 1.9 lbs CP/day. An additional 3.7 lbs of roughage per day would need to be provided, at a cost of $5.83 per period. Production of late-cut forage barley hay to feed during the third trimester (tables 23 and 25) would require 0.36 acres, and the forage would cost $26.10 per production period. Total forage and supplement costs would be $31.93 per period, or $0.35 per day (table 26). Calf fetus weight gain was assumed to be 0.78 lbs per day; accumulated weight gain was 70.08 lbs. When calf accumulated weight was assumed to have a value of $0.70 per pound, the gross return was $49.06 per calf, and the net returns after feed costs were $17.13 per cow-calf pair and $47.58 per acre. The cost of calf fetus weight gain was $0.46 per pound (table 27).

Oat forage hay cut early, at the milk stage, has a crude protein content of 11.5%. This oat forage hay has production costs of $69.17 per acre, forage dry matter costs of $29.60 per ton, and crude protein costs of $0.13 per pound. Early cut oat hay would be fed at 16.3 lbs DM/day to provide 1.9 lbs CP/day. An additional 7.7 lbs of roughage per day would need to be provided, at a cost of $12.13 per period. Production of early cut oat hay to feed during the third trimester (tables 23 and 25) would require 0.31 acres, and the forage would cost $21.60 per production period. Total forage and supplement costs would be $33.73 per period, or $0.37 per day (table 26). Calf fetus weight gain was assumed to be 0.78 lbs per day; accumulated weight gain was 70.08 lbs. When calf accumulated weight was assumed to have a value of $0.70 per pound, the gross return was $49.06 per calf, and the net returns after feed costs were $15.33 per cow-calf pair and $49.45 per acre. The cost of calf fetus weight gain was $0.48 per pound (table 27).

Oat forage hay cut late, at the hard dough stage, has a crude protein content of 7.8%. This oat forage hay has production costs of $74.53 per acre, forage dry matter costs of $26.40 per ton, and crude protein costs of $0.17 per pound. Late-cut oat hay would be fed at 24.0 lbs DM/day to provide 1.9 lbs CP/day. Production of late-cut oat hay to feed during the third trimester (tables 23 and 25) would require 0.38 acres, and the forage would cost $28.80 per production period. Total forage feed costs would be $28.80 per period, or $0.32 per day (table 26). Calf fetus weight gain was assumed to be 0.78 lbs per day; accumulated weight gain was 70.08 lbs. When calf accumulated weight was assumed to have a value of $0.70 per pound, the gross return was $49.06 per calf, and the net returns after feed costs were $20.26 per cow-calf pair and $53.32 per acre. The cost of calf fetus weight gain was $0.41 per pound (table 27).

Pea forage hay cut at an early plant stage has a crude protein content of 18.9%. This pea forage hay

has production costs of $79.96 per acre, forage dry matter costs of $55.00 per ton, and crude protein costs of $0.15 per pound. Early cut pea forage hay would be fed at 9.9 lbs DM/day to provide 1.9 lbs CP/day. An additional 14.1 lbs of roughage per day would need to be provided, at a cost of $22.21 per period. Production of early-cut pea forage hay to feed during the third trimester (tables 24 and 25) would require 0.32 acres, and the forage would cost $25.20 per production period. Total forage and supplement costs would be $47.41 per period, or $0.53 per day (table 26). Calf fetus weight gain was assumed to be 0.78 lbs per day; accumulated weight gain was 70.08 lbs. When calf accumulated weight was assumed to have a value of $0.70 per pound, the gross return was $49.06 per calf, and the net returns after feed costs were $1.65 per cow-calf pair and $5.16 per acre. The cost of calf fetus weight gain was $0.68 per pound (table 27).

Pea forage hay cut at a late plant stage has a crude protein content of 14.4%. This pea forage hay has production costs of $86.87 per acre, forage dry matter costs of $37.40 per ton, and crude protein costs of $0.13 per pound. Late-cut pea forage hay would be fed at 13.0 lbs DM/day to provide 1.9 lbs CP/day. An additional 11.0 lbs of roughage per day would need to be provided, at a cost of $17.33 per period. Production of late-cut pea forage hay to feed during the third trimester (tables 24 and 25) would require 0.25 acres, and the forage would cost $21.60 per production period. Total forage and supplement costs would be $38.93 per period, or $0.43 per day (table 26). Calf fetus weight gain was assumed to be 0.78 lbs per day; accumulated weight gain was 70.08 lbs. When calf accumulated weight was assumed to have a value of $0.70 per pound, the gross return was $49.06 per calf, and the net returns after feed costs were $10.13 per cow-calf pair and $40.52 per acre. The cost of calf fetus weight gain was $0.56 per pound (table 27).

Forage lentil hay cut at an early plant stage has a crude protein content of 21.8%. This forage lentil hay has production costs of $59.69 per acre, forage dry matter costs of $71.60 per ton, and crude protein costs of $0.17 per pound. Early cut forage lentil hay would be fed at 8.6 lbs DM/day to provide 1.9 lbs CP/day. An additional 15.4 lbs of roughage per day would need to be provided, at a cost of $24.26 per period. Production of early cut forage lentil hay to feed during the third trimester (tables 24 and 25) would require 0.46 acres, and the forage would cost $28.80 per production period. Total forage and supplement costs would be $53.06 per period, or $0.59 per day (table 26). Calf fetus weight gain was assumed to be 0.78 lbs per day; accumulated weight gain was 70.08 lbs. When calf accumulated weight was assumed to have a value of $0.70 per pound, the gross return was $49.06 per calf, and the net returns after feed costs were a loss of $4.00 per cow-calf pair and a loss of $8.70 per acre. The cost of calf fetus weight gain was $0.76 per pound (table 27).

Forage lentil hay cut at a late plant stage has a crude protein content of 14.7%. This forage lentil hay has production costs of $71.48 per acre, forage dry matter costs of $37.00 per ton, and crude protein costs of $0.13 per pound. Late-cut forage lentil hay would be fed at 12.7 lbs DM/day to provide 1.9 lbs CP/day. An additional 11.3 lbs of roughage per day would need to be provided, at a cost of $17.80 per period. Production of late-cut forage lentil hay to feed during the third trimester (tables 24 and 25) would require 0.30 acres, and the forage would cost $21.60 per production period. Total forage and supplement costs would be $39.40 per period, or $0.44 per day (table 26). Calf fetus weight gain was assumed to be 0.78 lbs per day; accumulated weight gain was 70.08 lbs. When calf accumulated weight was assumed to have a value of $0.70 per pound, the gross return was $49.06 per calf, and the net returns after feed costs were $9.66 per cow-calf pair and $32.20 per acre. The cost of calf fetus weight gain was $0.56 per pound (table 27).

Oat-pea forage hay has a crude protein content of 12.5%. This oat-pea forage hay has production costs of $95.52 per acre, forage dry matter costs of $37.20 per ton, and crude protein costs of $0.16 per pound. Oat-pea forage hay would be fed at 15.0 lbs DM/day to provide 1.9 lbs CP/day. An additional 9.0 lbs of roughage per day would need to be provided, at a cost of $14.18 per period. Production of oat-pea forage hay to feed during the third trimester (tables 24 and 25) would require 0.26 acres, and the forage would cost $25.20 per production period. Total forage and supplement costs would be $39.38 per period, or $0.44 per day (table 26). Calf fetus weight gain was assumed to be 0.78 lbs per day; accumulated weight gain was 70.08 lbs. When calf accumulated weight was assumed to have a value of $0.70 per pound, the gross return was $49.06 per calf, and the net returns after feed costs were $9.68 per cow-calf pair and $37.23 per acre. The cost of calf fetus weight gain was $0.56 per pound (table 27).

Discussion

Pasture Forage Types

Reserved native rangeland forage grazed as a repeated seasonal pasture during the third trimester production period was high-cost forage because the quantities of crude protein captured per acre were low and the quantity of forage dry matter available per acre was low. Total forage costs for reserved native rangeland pastures was high, even though the equipment costs, labor costs, land rent per acre, and forage production costs per acre were low, because the input costs do not directly regulate livestock forage feed costs. The cost per pound of crude protein ($1.26/lb CP) was extremely high because the quantity of crude protein captured per acre was extremely low. The crude protein content of the forage was below the requirements of a gestating cow making it necessary to provide purchased supplemental crude protein. The forage dry matter cost ($120.83/ton) was extremely high because the quantity of forage weight per acre was low. The low forage weight per acre made it necessary to use 2.5 times the land area that would have been needed during the summer period to provide a cow with adequate forage dry matter for a month in the same pasture. The large land area (18.62 acres) per cow caused the forage costs per period to be high. The total daily forage and supplemental crude protein costs ($1.94/day) were extremely high. The total feed costs were greater than the low market value of the accumulated calf fetus weight causing an extremely high loss in returns after feed costs ($-125.67) per cow and a moderate loss in returns after feed costs of ($-6.75) per acre. The cost per pound of calf fetus weight gain ($2.49/lb) was extremely high because of the very low crude protein and very low forage dry matter yields per acre, the large land area per cow, and growth in weight of the fetus was relatively slow.

Standing corn grazed as a seasonal pasture during the third trimester production period was high-cost forage because of the extremely high production costs per acre and the extremely high quantity of unutilized wasted forage. The forage dry matter cost ($65.97/ton) was high because of the low percentage (38%) of herbage consumed as forage. The land area (0.70 acres) per cow was small because of the high herbage biomass produced during exceptionally good growing season conditions with low water deficiency. Corn herbage biomass production would be expected to be low during growing season conditions with normal water deficiency. The crude protein content of the forage was below the requirements of a gestating cow making it necessary to provide purchased supplemental crude protein. The weight gained by the cows was less than a pound per day. The total daily forage and supplemental crude protein costs ($1.23/day) were very high because of the low crude protein content in the forage, the high cost of supplemental crude protein, and the low percent of herbage consumed as forage. The total feed costs were greater than the low market value of the accumulated calf fetus weight causing a very high loss in returns after feed costs ($-61.68) per cow and an extremely high loss in returns after feed costs ($-87.74) per acre. The cost per pound of calf fetus weigh gain ($1.58/lb) was extremely high because of the high production costs per acre, the high percent of wasted herbage, and growth in weight of the fetus was relatively slow.

Harvested Forage Types

Crested wheatgrass hay cut at a mature growth stage and fed during the third trimester production period was moderate-cost forage. The forage dry matter cost ($34.80/ton) was moderate for mature crested wheatgrass hay and lower than the forage dry matter cost per ton for early cut crested wheatgrass hay because greater dry matter weight of the mature crested wheatgrass hay was harvested per acre. The cost per pound of crude protein ($0.28/lb CP) was high for mature crested wheatgrass hay and double the cost per pound of crude protein for early cut crested wheatgrass hay because of the lower crude protein weight in the mature crested wheatgrass hay harvested per acre. The land area (1.35 acres) per cow for mature crested wheatgrass hay was small but greater than the land area required per cow for early cut crested wheatgrass hay because of the greater crude protein weight per acre in the early cut crested wheatgrass hay. The crude protein content of the mature crested wheatgrass forage was below the requirements of a gestating cow making it necessary to provide purchased supplemental crude protein. The total daily forage and supplemental crude protein costs ($0.52/day) were moderate because the total supplemental crude protein costs were moderate. The total feed costs were slightly lower than the low market value of the accumulated calf fetus weight resulting in very low returns after feed costs ($2.02) per cow and ($1.50) per acre. The cost per pound of calf fetus weight gain ($0.67/lb) was high because of the additional supplemental crude protein costs needed because mature crested wheatgrass hay did not meet the nutrient requirements of gestating range cows and growth in weight of the fetus was relatively slow.

Crested wheatgrass hay cut at the boot growth stage and fed during the third trimester production period was moderate-cost forage. The forage dry matter cost

($40.80/ton) was moderate for early cut crested wheatgrass hay and was greater than the forage dry matter cost per ton for mature crested wheatgrass hay because crested wheatgrass hay cut at the boot stage harvested lower forage dry matter weight per acre than crested wheatgrass hay cut at a mature growth stage. The cost per pound of crude protein ($0.14/lb CP) was low for early cut crested wheatgrass hay and lower than the cost per pound of crude protein for mature crested wheatgrass hay because of the greater crude protein weight in the early cut crested wheatgrass hay harvested per acre. The land area (0.89 acres) per cow for early cut crested wheatgrass hay was small and less than the land area required per cow for mature crested wheatgrass hay because of the greater crude protein weight harvested per acre in the early cut crested wheatgrass hay. The forage cost of early cut crested wheatgrass hay was low but the total daily forage feed cost ($0.45/day) was moderate because slightly under half of the ration forage was supplemental roughage which added substantially to the total forage costs. The total feed costs were lower than the low market value of the accumulated calf fetus weight resulting in moderate returns after feed costs ($8.18) per cow and ($9.19) per acre. The cost per pound of calf fetus weight gain ($0.58/lb) was moderate mainly because of the additional supplemental roughage costs.

Forage barley hay cut at the milk growth stage and fed during the third trimester production period was low-cost forage. The production costs per acre were high for early cut forage barley hay because the equipment costs, labor costs, and land rent per acre were high. The forage dry matter cost ($28.80/ton) was low because of the high forage dry matter production. The cost per pound of crude protein ($0.11/lb CP) was low because of the high crude protein weight contained in the forage. The land area (0.27 acres) per cow was small because of the high crude protein and high forage dry matter yields per acre. The total daily forage and supplemental roughage costs ($0.38/day) were low because of the low cost of crude protein per pound and the high forage dry matter production. The total forage feed costs for early cut forage barley hay was slightly greater than the total forage feed costs for late cut forage barley hay because of the greater quantity of supplemental roughage in the forage ration for early cut forage barley hay. The total feed costs were lower than the low market value of the accumulated calf fetus weight resulting in moderate returns after feed costs ($15.20) per cow and in high returns after feed costs ($56.30) per acre. The cost per pound of calf fetus weight gain ($0.48/lb) was moderate because growth in weight of the fetus was relatively slow.

Forage barley hay cut at the hard doughgrowth stage and fed during the third trimesterproduction period was low-cost forage. The production costs per acre were high for late cut forage barley hay because the equipment costs, labor costs, and land rent per acre were high. The forage dry matter cost ($27.40/ton) was low because of the high forage dry matter production. The cost per pound of crude protein ($0.15/lb CP) was low because of the high crude protein weight contained in the forage. The cost per pound of crude protein for late cut forage barley hay was greater than the cost per pound of crude protein for early cut forage barley hay because of the lower crude protein weight harvested per acre in the late cut forage barley hay. The land area (0.36 acres) per cow was small because of the high crude protein and high forage dry matter yields per acre. The total daily forage and supplemental roughage costs ($0.35/day) were low because of the high crude protein content and the high forage dry matter production. The total feed costs were lower than the low market value of the accumulated calf fetus weight resulting in moderate returns after feed costs ($17.13) per cow and in high returns after feed costs ($47.58) per acre. The returns after feed costs per acre were lower for late cut forage barley hay than for early cut forage barley hay because late cut forage barley hay had slightly higher crude protein cost per pound and slightly larger land area per cow than early cut forage barley hay. The cost per pound of calf fetus weight gain ($0.46/lb) was moderate because growth in weight of the fetus was relatively slow.

Oat forage hay cut at the milk growth stage and fed during the third trimester production period was low-cost forage. The production costs per acre were high for early cut oat forage hay because the equipment costs, labor costs, and land rent per acre were high. The forage dry matter cost ($29.60/ton) was low because of the high forage dry matter production. The cost per pound of crude protein ($0.13/lb CP) was low because of the high crude protein weight contained in the forage. The land area (0.31 acres) per cow was small because of the high crude protein and high forage dry matter yields per acre. The total daily forage and supplemental roughage costs ($0.37/day) were low because of the low cost of crude protein per pound and the high forage dry matter production. The total feed costs were lower than the low market value of the accumulated calf fetus weight resulting in moderate returns after feed costs ($15.33) per cow and in high returns after feed costs ($49.45) per acre. The cost per pound of calf fetus weight gain ($0.48/lb) was moderate because growth in weight of the fetus was relatively slow.

Oat forage hay cut at the hard dough growth stage and fed during the third trimester production period was low-cost forage. The production costs per acre were high for late cut oat forage hay because the equipment costs, labor costs, and land rent per acre were high. The forage dry matter cost ($26.40/ton) was low because of the high forage dry matter production. The cost per pound of crude protein ($0.17/lb CP) was low because of the high crude protein weight contained in the forage. The cost per pound of crude protein for late cut oat forage hay was greater than the cost per pound of crude protein for early cut oat forage hay because of the lower crude protein weight harvested per acre in the late cut oat forage hay. The land area (0.38 acres) per cow was small because of the high crude protein and high forage dry matter yields per acre. The total daily forage feed costs ($0.32/day) were low because of the low cost of crude protein per pound and the high forage dry matter production. The total forage feed costs for late cut oat forage hay were lower than the total forage feed costs for early cut oat forage hay because of the greater quantity of supplemental roughage in the forage ration for early cut oat forage hay. The total feed costs were lower than the low market value of the accumulated calf fetus weight resulting in moderate returns after feed costs ($20.26) per cow and in high returns after feed costs ($53.32) per acre. The cost per pound of calf fetus weight gain ($0.41/lb) was moderate because growth in weight of the fetus was relatively slow.

Pea forage hay cut at an early growth stage and fed during the third trimester production period was low-cost forage. However, pea forage hay cut at a late growth stage has lower forage feed costs and greater revenue returns after feed costs than early cut pea forage hay. The production costs per acre were high for early cut pea forage hay because the equipment costs, labor costs, seed costs, and land rent per acre were high. The forage dry matter cost ($55.00/ton) was high because of the modest forage dry matter production. The cost per pound of crude protein ($0.15/lb CP) was low because of the high crude protein weight contained in the forage. The land area (0.32 acres) per cow was small because of the high crude protein yield per acre. The total daily forage and supplemental roughage costs ($0.53/day) were low because of the low cost of crude protein per pound and the small land area per cow. The total feed costs were slightly lower than the low market value of the accumulated calf fetus weight resulting in very low returns after feed costs ($1.65) per cow and in low returns after feed costs ($5.16) per acre. The cost per pound of calf fetus weight gain ($0.68/lb) was high because of the modest forage dry matter production per acre and the high supplemental roughage costs.

Pea forage hay cut at a late growth stage and fed during the third trimester production period was low-cost forage. Late cut pea forage hay has lower forage feed costs and greater revenue returns after feed costs than early cut pea forage hay. The production costs per acre were high for late cut pea forage hay because the equipment costs, labor costs, seed costs, and land rent per acre were high. The forage dry matter cost ($37.40/ton) was moderate because of the high forage dry matter production. The cost per pound of crude protein ($0.13/lb CP) was low because of the high crude protein weight contained in the forage. The land area (0.25 acres) per cow was small because of the high crude protein and high forage dry matter yields per acre. The total daily forage and supplemental roughage costs ($0.43/day) were low because of the low cost of crude protein per pound, the high forage dry matter production per acre, and the small land area per cow. The total feed costs were lower than the low market value of the accumulated calf fetus weight resulting in moderate returns after feed costs ($10.13) per cow and in high returns after feed costs ($40.52) per acre. The cost per pound of calf fetus weight gain ($0.56/lb) was moderate because growth in weight of the fetus was relatively slow.

Forage lentil hay cut at an early growth stage and fed during the third trimester production period was low-cost forage. However, forage lentil hay cut at a late growth stage has lower forage feed costs and greater revenue returns after feed costs than early cut forage lentil hay. The production costs per acre were high for early cut forage lentil hay because the equipment costs, labor costs, and land rent per acre were high. The forage dry matter cost ($71.60/ton) was high because of the modest forage dry matter yield per acre. The cost per pound of crude protein ($0.17/lb CP) was low because of the high crude protein weight contained in the forage. The land area (0.46 acres) per cow was small because of the high crude protein yield per acre. The total daily forage and supplemental roughage costs ($0.59/day) were low because of the low cost of crude protein per pound and the small land area per cow. The total feed costs were greater than the low market value of the accumulated calf fetus weight causing moderate losses in returns after feed costs ($-4.00) per cow and ($-8.70) per acre. The cost per pound of calf fetus weight gain ($0.76/lb) was high because of the modest forage dry matter production per acre and the high supplemental roughage costs.

Forage lentil hay cut at a late growth stage and fed during the third trimester production period was low-cost forage. Late cut forage lentil hay has lower forage feed costs and greater revenue returns after feed costs

than early cut forage lentil hay. The production costs per acre were high for late cut forage lentil hay because the equipment costs, labor costs, and land rent per acre were high. The forage dry matter cost ($37.00/ton) was moderate because of the high forage dry matter production. The cost per pound of crude protein ($0.13/lb CP) was low because of the high crude protein weight contained in the forage. The land area (0.30 acres) per cow was small because of the high crude protein and high forage dry matter yields per acre. The total daily forage and supplemental roughage costs ($0.44/day) were low because of the low cost of crude protein per pound, the high forage dry matter production per acre, and the small land area per cow. The total feed costs were lower than the low market value of the accumulated calf fetus weight resulting in moderate returns after feed costs ($9.66) per cow and in moderate returns after feed costs ($32.20) per acre. The cost per pound of calf fetus weight gain ($0.56/lb) was moderate because growth in weight of the fetus was relatively slow.

Oat-pea hay cut at compromised plant growth stages and fed during the third trimester production period was low-cost forage. However, seeding oat forage separately on half of the field and cutting it at an early growth stage and seeding pea forage separately on half of the field and cutting it at a late growth stage will result in lower production costs per acre, lower forage dry matter costs per ton, lower costs per pound of crude protein, lower total forage feed costs per day, lower costs per pound of calf weight gain, greater net returns after feed costs per cow, and greater net returns after feed costs per acre than oat-pea forage seeded together and cut at compromised growth stages. The production costs per acre were very high for oat-pea hay because the equipment costs, labor costs, seed costs, and land rent per acre were high. The forage dry matter cost ($37.20/ton) was moderate because of the high forage dry matter production per acre. The cost per pound of crude protein ($0.16/lb CP) was low because of the high crude protein weight contained in the forage. The land area (0.26 acres) per cow was small because of the high crude protein and high forage dry matter yields per acre. The total daily forage and supplemental roughage costs ($0.44/day) were low because of the low cost of crude protein per pound, the high forage dry matter production per acre, and the small land area per cow. The total feed costs were lower than the low market value of the accumulated calf fetus weight resulting in moderate returns after feed costs ($9.68) per cow and in high returns after feed costs ($37.23) per acre. The cost per pound of calf fetus weight gain ($0.56/lb) was moderate because growth in weight of the fetus was relatively slow.

Table 21. Costs and returns for pasture forage types grazed by range cows during the 90-day third trimester production period.

		Native Rangeland Repeated Seasonal	Standing Corn Seasonal Pasture
Days		90	90
Growth Stage		Dormant	Mature
Herbage Weight	lb/ac	580	9940*
Forage DM Weight	lb/ac	145	3840
Costs/Acre			
Land Rent	$	8.76	
Custom Work	$		
Seed Cost	$		
Baling Costs	$		
Production Costs	$/ac	8.76	126.67*
Forage DM Costs	$/ton	120.83	65.97
Crude Protein	%	4.8	
Crude Protein Yield	lb/ac	6.96	
Crude Protein Cost	$/lb	1.26	
Forage Allocation	lb/d	30.0	30.0
Land Area/Period	ac	18.62	0.70
Forage Costs/Period	$/pp	163.12	89.07
Supplementation			
Roughage/Day	lb/d		
Crude Protein/Day	lb/d	0.43	0.54*
Sup. Cost/Period	$/pp	11.61	21.67
Total Feed Cost	$/pp	174.73	110.74
Cost/Day	$/d	1.94	1.23*
Accumulated Calf Wt.	lbs	70.08	70.08
Weight Value @$0.70/lb	$	49.06	49.06
Net Return/c-c pr	$	-125.67	-61.68
Net Return/acre	$	-6.75	-87.74
Cost/lb of Calf Gain	$	2.49	1.58

*Data from Nelson et al. 2002

Table 22. Costs and returns for perennial grass harvested forage types to be fed to range cows during the 90-day third trimester production period.

		Crested Wheatgrass Hay	Crested Wheatgrass Hay
Days		90	90
Growth Stage		Mature	Boot Stage
Herbage Weight	lb/ac	-	-
Forage DM Weight	lb/ac	1600	1300
Costs/Acre			
Land Rent	$	14.22	14.22
Custom Work	$	5.31	5.31
Seed Cost	$	-	-
Baling Costs	$	8.58	6.97
Production Costs	$/ac	28.11	26.50
Forage DM Costs	$/ton	34.80	40.80
Crude Protein	%	6.4	14.5
Crude Protein Yield	lb/ac	102	189
Crude Protein Cost	$/lb	0.28	0.14
Forage Allocation	lb/d	24.0	12.9
Land Area/Period	ac	1.35	0.89
Forage Costs/Period	$/pp	38.02	23.40
Supplementation			
Roughage/Day	lb/d		11.1
Crude Protein/Day	lb/d	0.33	
Sup. Cost/Period	$/pp	9.02	17.48
Total Feed Cost	$/pp	47.04	40.88
Cost/Day	$/d	0.52	0.45
Accumulated Calf Wt.	lbs	70.08	70.08
Weight Value @$0.70/lb	$	49.06	49.06
Net Return/c-c pr	$	2.02	8.18
Net Return/acre	$	1.50	9.19
Cost/lb of Calf Gain	$	0.67	0.58

Table 23. Costs and returns for annual cereal harvested forage types to be fed to range cows during the 90-day third trimester production period.

		Forage Barley Hay	Forage Barley Hay	Oat Forage Hay	Oat Forage Hay
Days		90	90	90	90
Growth Stage		Milk	Hard Dough	Milk	Hard Dough
Herbage Weight	lb/ac				
Forage DM Weight	lb/ac	4733	5133	4667	5667
Costs/Acre					
Land Rent	$	22.07	22.07	22.07	22.07
Custom Work	$	16.08	16.08	16.08	16.08
Seed Cost	$	4.69	4.69	6.00	6.00
Baling Costs	$	25.37	27.51	25.02	30.38
Production Costs	$/ac	68.21	70.35	69.17	74.53
Forage DM Costs	$/ton	28.80	27.40	29.60	26.40
Crude Protein	%	13.0	9.2	11.5	7.8
Crude Protein Yield	lb/ac	606	468	535	435
Crude Protein Cost	$/lb	0.11	0.15	0.13	0.17
Forage Allocation	lb/d	14.4	20.3	16.3	24.0
Land Area/Period	ac	0.27	0.36	0.31	0.38
Forage Costs/Period	$/pp	18.90	26.10	21.60	28.80
Supplementation					
Roughage/Day	lb/d	9.6	3.7	7.7	
Crude Protein/Day	lb/d				0.0
Sup. Cost/Period	$/pp	14.96	5.83	12.13	0.0
Total Feed Cost	$/pp	33.86	31.93	33.73	28.80
Cost/Day	$/d	0.38	0.35	0.37	0.32
Accumulated Calf Wt.	lbs	70.08	70.08	70.08	70.08
Weight Value @$0.70/lb	$	49.06	49.06	49.06	49.06
Net Return/c-c pr	$	15.20	17.13	15.33	20.26
Net Return/acre	$	56.30	47.58	49.45	53.32
Cost/lb of Calf Gain	$	0.48	0.46	0.48	0.41

Table 24. Costs and returns for annual legume harvested forage types to be fed to range cows during the 90-day third trimester production period.

		Pea Forage Hay	Pea Forage Hay	Forage Lentil Hay	Forage Lentil Hay	Oat-Pea Hay
Days		90	90	90	90	90
Growth Stage		Early	Late	Early	Late	
Herbage Weight	lb/ac					
Forage DM Weight	lb/ac	2800	4650	1667	3867	5143
Costs/Acre						
Land Rent	$	22.07	22.07	22.07	22.07	22.07
Custom Work	$	16.08	16.08	16.08	16.08	16.08
Seed Cost	$	23.80	23.80	12.60	12.60	29.80
Baling Costs	$	15.01	24.92	8.94	20.73	27.57
Production Costs	$/ac	79.96	86.87	59.69	71.48	95.52
Forage DM Costs	$/ton	55.00	37.40	71.60	37.00	37.20
Crude Protein	%	18.9	14.4	21.8	14.7	12.5
Crude Protein Yield	lb/ac	526	685	361	567	611
Crude Protein Cost	$/lb	0.15	0.13	0.17	0.13	0.16
Forage Allocation	lb/d	9.9	13.0	8.6	12.7	15.0
Land Area/Period	ac	0.32	0.25	0.46	0.30	0.26
Forage Costs/Period	$/pp	25.20	21.60	28.80	21.60	25.20
Supplementation						
Roughage/Day	lb/d	14.1	11.0	15.4	11.3	9.0
Crude Protein/Day	lb/d					
Sup. Cost/Period	$/pp	22.21	17.33	24.26	17.80	14.18
Total Feed Cost	$/pp	47.41	38.93	53.06	39.40	39.38
Cost/Day	$/d	0.53	0.43	0.59	0.44	0.44
Accumulated Calf Wt.	lbs	70.08	70.08	70.08	70.08	70.08
Weight Value @$0.70/lb	$	49.06	49.06	49.06	49.06	49.06
Net Return/c-c pr	$	1.65	10.13	-4.00	9.66	9.68
Net Return/acre	$	5.16	40.52	-8.70	32.20	37.23
Cost/lb of Calf Gain	$	0.68	0.56	0.76	0.56	0.56

Table 25. Feed quantity and land area for forage types used during the 90-day third trimester production period.

Forage Types	Daily Feed per Cow			Third Trimester Period Feed one Cow for 90 days			
	Forage lb/d	Roughage lb/d	Crude Protein lb/d	Forage lb/pp	Roughage lb/pp	Crude Protein lb/pp	Land Area ac/pp
Pasture Forage Types							
Native Rangeland Repeated Seasonal	30.0		0.43	2700.0		38.7	18.62
Standing Corn	30.0		0.54	2700.0		48.6	0.70
Harvested Forage Types							
Crested Wheat, mature	24.0		0.33	2160.0		30.1	1.35
Crested Wheat, early	12.9	11.1		1161.0	999.0		0.89
Forage Barley, early	14.4	9.6		1296.0	864.0		0.27
Forage Barley, late	20.3	3.7		1827.0	333.0		0.36
Oat Forage, early	16.3	7.7		1467.0	693.0		0.31
Oat Forage, late	24.0			2160.0			0.38
Pea Forage, early	9.9	14.1		891.0	1269.0		0.32
Pea Forage, late	13.0	11.0		1170.0	990.0		0.25
Forage Lentil, early	8.6	15.4		774.0	1386.0		0.46
Forage Lentil, late	12.7	11.3		1143.0	1017.0		0.30
Oat-Pea Forage	15.0	9.0		1350.0	810.0		0.26

Table 26. Summary of feed costs for forage types used during the 90-day third trimester production period.

Forage Types	Forage Costs $/pp	Roughage Costs $/pp	Crude Protein Costs $/pp	Total Feed Costs $/pp	Daily Feed Costs $/d
Pasture Forage Types					
Native Rangeland Repeated Seasonal	163.12		11.61	174.73	1.94
Standing Corn	89.07		21.67	110.74	1.23
Harvested Forage Types					
Crested Wheat, mature	38.02		9.02	47.04	0.52
Crested Wheat, early	23.40	17.48		40.88	0.45
Forage Barley, early	18.90	14.96		33.86	0.38
Forage Barley, late	26.10	5.83		31.93	0.35
Oat Forage, early	21.60	12.13		33.73	0.37
Oat Forage, late	28.80			28.80	0.32
Pea Forage, early	25.20	22.21		47.41	0.53
Pea Forage, late	21.60	17.33		38.93	0.43
Forage Lentil, early	28.80	24.26		53.06	0.59
Forage Lentil, late	21.60	17.80		39.40	0.44
Oat-Pea Forage	25.20	14.18		39.38	0.44

Table 27. Summary of returns after feed costs for forage types used during the 90-day third trimester production period.

Forage Types	Gross Return @$0.70/lb $/calf	Net Return per C-C pr $/pr	Net Return per acre $/ac	Calf Gain Cost $/lb
Pasture Forage Types				
Native Rangeland Repeated Seasonal	49.06	-125.67	-6.75	2.49
Standing Corn	49.06	-61.68	-87.74	1.58
Harvested Forage Types				
Crested Wheat, mature	49.06	2.02	1.50	0.67
Crested Wheat, early	49.06	8.18	9.19	0.58
Forage Barley, early	49.06	15.20	56.30	0.48
Forage Barley, late	49.06	17.13	47.58	0.46
Oat Forage, early	49.06	15.33	49.45	0.48
Oat Forage, late	49.06	20.26	53.32	0.41
Pea Forage, early	49.06	1.65	5.16	0.68
Pea Forage, late	49.06	10.13	40.52	0.56
Forage Lentil, early	49.06	-4.00	-8.70	0.76
Forage Lentil, late	49.06	9.66	32.20	0.56
Oat-Pea Forage	49.06	9.68	37.23	0.56