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AN ECONOMIC ANALYSIS

OF THE

STAR ACCELERATED LAMBING SYSTEM

by

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Introduction

During the recent past the sheep industry in the United States has experienced a steady decline in numbers. The January 1, 1986 inventory of all sheep and lambs was only 77 percent of the 1981 inventory. In the Northeast during the same period, numbers were 92 percent of the 1981 inventory (Crop Reporting Board, Sheep and Goats). Within the Northeast region, Virginia, Maryland, Pennsylvania, and West Virginia have shown an increase during the past year. This appears to be in response to the demand created by the new slaughter facility which began operating in Virginia in 1985.

The declining size of the national sheep flock reflects the relatively poor economic health of the industry. With a stable per capita consumption of lamb and reduced supplies, prices have improved and continue to be strong for the producer. The traditional annual lambing systems, however, have limited the potential for gains in productivity and, therefore, profits for sheep and lamb producers.

Traditionally, lamb production has been based on the natural tendency of ewes to lamb annually. In an effort to improve the productivity of the ewe flock and producer profits, work has been done to accelerate lambing schedules. This has involved breed selection, improved management practices, and various innovations.

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Much of the research on the economics of sheep production has dealt with comparisons of management practices, flock size, and levels of labor and capital intensity (Harrison and Epplin, Doye and Ward). Other research explores not only existing systems but also alternative management systems used for sheep enterprises (Gee and Madsen). These studies generally measure results in terms of return to various factors on a total or per ewe basis. Research done on accelerated lambing systems has generally been limited to the husbandry aspects of the system rather than the economics of the concept.

As early as 1971, Hogue and Hall published a series of sheep budgets including some involving accelerated lambing. In 1980, work was done by Harrison that described some of the techniques used to improve lambing rates. This work also included budgets for different levels of management for a given size ewe flock.

More recently, work at Cornell by Hogue and Magee has produced a combination of management practices they have called the STAR accelerated lambing system. It is a package of practices designed to improve the efficiency and profitability of a sheep enterprise. The program will allow a ewe to lamb a maximum of five times in three years instead of the traditional annual event. This major feature, plus an increase in the incidence of multiple births, can substantially increase the number of lambs produced per ewe per year.

In recent years, the Cornell animal scientists have developed and refined the management practices of the STAR system to the point where some producers are using it in the field. However, the fact that the system works does not establish its economic feasibility compared to other sheep management systems.

This study examines the economics of the STAR lambing program. It is intended that the results will provide guidance to researchers, extension personnel, and producers about the economic merits of the system. It will add an economic dimension to the growing body of literature on accelerated lambing systems.

The STAR System

The STAR system of lamb production is based on the 146 day gestation period of a ewe. One-half pregnancy equals 73 days which is exactly one-fifth of a year. By dividing the calendar into five 73 day periods, the flock can be managed in a way that allows a significant increase in the efficiency of the use of farm resources. Each of the five periods begins with a 30 day lambing and breeding period (Figure 1). While the group of open ewes is exposed to a ram, another group of ewes is lambing. During the last week of the period, lambs born earlier in the period are weaned and moved to the feeder operation. The next group of ewes to lamb is moved to the lambing barn, open ewes are selected for breeding and another management period begins.

These characteristics of the STAR system are described in more detail by Hogue and Magee and Magee. They found that, by emphasizing aseasonal breeding tendencies, the system matches sheep biology to the calendar year in a way that improves production efficiency and resource use.

Since facility and other resource uses are spread throughout the year and used more frequently, more ewes and lambs can be handled in the same space. The resulting increased use of fixed resources should improve production efficiency and reduce costs per unit. It should also introduce more stability and uniformity to the production and marketing of lambs. At the same time, the producer's cash flow throughout the year would be more regular than with traditional annual lambing programs.

STAR

Accelerated Lambing System
Cornell University November 1983

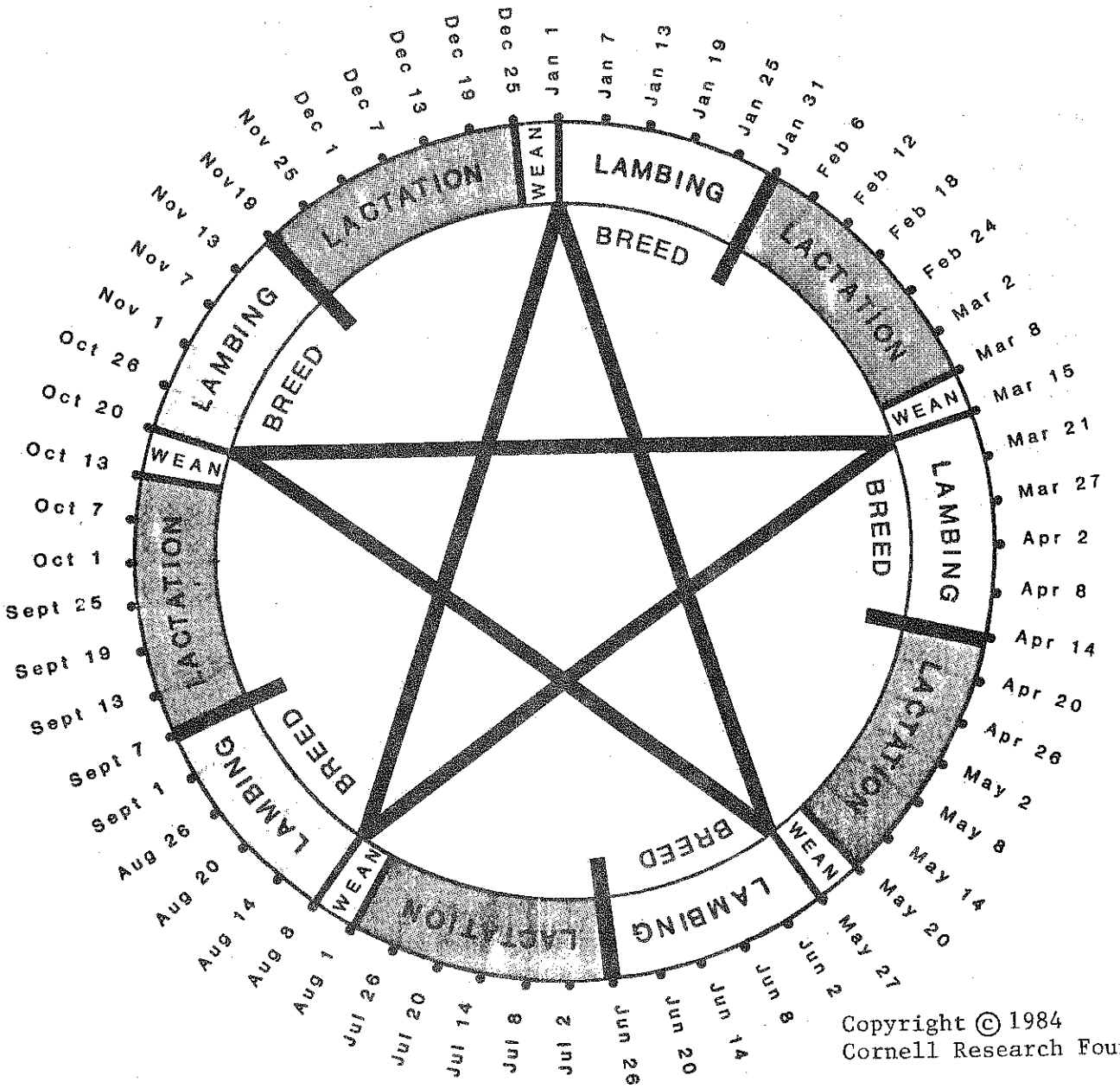

Figure 1.

Procedure

The study develops economic engineering budgets to examine the economics of the STAR system used on a farm representative of those commonly found in many parts of the Northeast. The intent is to utilize modified existing buildings and land more suited to forage than cash crop production. The representative ewe flock and lamb feeding operation requires a part-time operator and is small enough to be combined with other income producing activities and the use of family labor.

The STAR system is budgeted for three production levels expressed in terms of lambs raised per ewe per year. A budget for the Annual lambing system is also constructed, using the same resources, for comparison purposes.

Two situations for each of these budgets are developed. In one case, the operator owns field equipment to harvest his own hay; in the other situation the operator owns no field equipment and uses a share arrangement to harvest his forage and clean the barns.

Results of the budgets for the two situations are compared on the basis of the farm net cash income and various measures of profitability. Since the farm activities are limited to a ewe flock and lamb feeding operation, the "whole farm" method is used to calculate the cost of producing a pound of lamb and compared for each budget. In addition, a sensitivity analysis is made to show the effects of changes in market lamb and feed prices on the study results.

Representative Farm and Lamb Production System

The representative farm has a former two story dairy barn which has been remodeled to provide facilities for the ewe flock and lamb feeding activities. The land resource includes 150 acres with 70 acres of tillable land and 50 acres of fenced permanent pasture. The hay crop averages 2.2 tons of hay per acre and 2.0 tons of hay equivalent is produced per acre of pasture (Crop Reporting Board, New York Agricultural Statistics).

The equipment complement is used, but serviceable for the anticipated hay crop production. Barn equipment includes a grain bin for feed and adequate feeders and waterers for the ewe flock and market lambs. Permanent and portable fence is used in the pasture and grazing program for the ewe flock. Labor and management is provided by the operator and his family with hired help as needed for hay harvest.

These resources are adequate to meet the needs of a 150 ewe flock using the Annual lambing system with a lamb feeding operation. The land resource is more than adequate to raise all forage for the ewe flock. Excess forage is sold as hay. The general practice is to purchase rams for breeding and to raise replacement ewes along with the market lambs. Cull ewes and rams are sold.

Because of the improved efficiency of resource use with the STAR system, the same buildings, with some additional remodeling, houses a 300 ewe flock and the resulting lambs. The operation involves raising all lambs for market, retaining only those ewes needed for replacements. The larger ewe flock consumes most of the hay produced with a small quantity available for sale.

Capital investments were determined by consulting with extension agents and animal scientists for reasonable values (Table 1). The higher investment for the fences and buildings for the STAR system reflects more fencing and more extensive remodeling. Since both systems harvest the same crop acreage,

the field equipment investment is the same. Barn equipment and movable fence requirements are greater for the STAR system because of the larger flock. Ewes for both systems are valued at $100 each. Rams are valued somewhat higher and fewer are needed for the STAR system based on Hogue and Magee.

The table also summarizes the annual costs for each of these assets. Depreciation is based on a 20 year life for the buildings and a 10 year life for the equipment. A real interest rate of five percent reflects capital costs. Repairs, fuel, taxes, and insurance are estimates based on research results from Snyder (1984) and current price series (New York Crop Reporting Service).

Table 1. Capital Investments and Related Annual Costs for the STAR and Annual Lambing Systems, 1986 Estimates

Item	Land	Fences Buildings*	Equipment	Livestock	Total
STAR System - 300 Ewes					
Investment	$42,000	$23,000	$15,000	$30,750	$110,750
Annual Cost**	3,150	3,450	4,550	1,693	12,843
Annual System - 150 Ewes					
Investment	$42,000	$16,500	$13,850	$15,800	$88,150
Annual Cost	3,150	2,475	4,205	869	10,699

*Excludes residence.
**Includes appropriate depreciation, interest, repairs, fuel, taxes, and insurance.

Lambing information is based on the recent experience of Hogue and Magee with the STAR and Annual systems at Cornell (Table 2). Under the STAR system, the flock produces between two and three lambs per ewe per year as shown in the three production levels in the table. The Annual system produces about one and a half lambs per ewe per year.

Lamb losses from birth to weaning average about 10 percent for both systems. Another two percent of the lambs born are lost after weaning. The annual culling rate is 20 percent of the ewes and both systems raise their own replacements.

Table 2. Lambing Information for the STAR and Annual Lambing Systems

Item	STAR System 300 Ewes - 3 Production Levels Low	Medium	High	Annual System 150 Ewes
Lambings/ewe/year	1.4	1.4	1.4	0.95
Lambs/ewe/lambing	1.4	1.8	2.2	1.60
Lambs/ewe/year	1.96	2.52	3.08	1.52
Lambs weaned*:				
Per ewe/year	1.76	2.27	2.77	1.37
Total/year	528	681	831	206
Lambs raised*:				
Per ewe/year	1.72	2.22	2.71	1.34
Total/year	516	666	813	201
Replacement ewes raised/year	60	60	60	30
Lambs sold/year	456	606	753	171

*Ten percent loss prior to weaning; two percent loss after weaning

The suggested flock sizes depend on a part-time operator, family involvement and part-time local hired labor for hay harvest. Labor estimates for the two systems (Table 3) are based on experience with the Cornell flock and from crop enterprise research at Cornell (Snyder, 1984).

Under both systems, the 70 acres of cropland is maintained for hay production. Two cuttings are harvested with aftermath growth used for pasture. Hired labor is used to harvest hay as quickly as possible, while the operator concentrates his labor on the sheep activities.

Table 3. Labor Requirements for Sheep and Crops for the STAR and Annual Lambing Systems

Item	STAR System Low	Medium	High	Annual System
Labor for Sheep	------- 300 ewes -------			150 ewes
Operator, hours/year	600	700	800	310
Family, hours/year	300	350	475	100
Hired, hours/year	0	0	0	0
Hours/ewe/year	3.0	3.5	4.3	2.7
Hours/lamb raised/year	1.7	1.6	1.6	2.0
Labor for Crops	---------- 70 acres hay ----------			
Operator, hours/year	100	100	100	100
Family, hours/year	110	110	110	110
Hired, hours/year	140	140	140	140

Pregnant ewes are fed grain for a 70 day prelambing-through-weaning period to maintain body condition and lactating ability. Ewes in each system and productivity level shown require different amounts of grain because of differing lambing rates and frequencies (Table 4).

Table 4. Annual Grain and Forage Requirements for the Breeding Flock, STAR and Annual Lambing Systems*

Item	STAR System Low	Medium	High	Annual System
Grain -				
Days fed per lambing**	70	70	70	70
Lambings per year	1.4	1.4	1.4	0.95
Days fed per ewe, average	98	98	98	67
Grain per day, pounds	1.4	1.8	2.2	1.6
Total grain per ewe, pounds	137	176	216	107
Ewes, number	300	300	300	150
Total feed, tons	20.6	26.4	32.4	8.0
Total cost @ $180/ton	$3,708	$4,752	$5,832	$1,440
Hay - Total tons	127	127	127	55
Pasture - Average days per ewe	172	172	172	200

*Data are based on experience and judgment of Cornell researchers, see Hogue and Magee. Feed cost of $180 per ton is based on current volume purchases adjusted upward because of current abnormally low ingredient prices.

**Prelambing through weaning.

Pasture and hay produced on the farm are consumed by the breeding flock only. Each ewe in the Annual system utilizes the full 200 day pasture season because lambings occur from winter to early spring. However, because the STAR system involves aseasonal lambings, some ewes lamb and lactate during the pasture season and, therefore, are confined during that period. This reduces the average pasture season for STAR ewes to 172 days.

Market lambs are fed in confinement. Lambs are fed and managed the same for either lambing system. Young lambs are creep fed until weaning at an average of 45 days of age. Weaning weights average about 40 pounds. A complete ration is then fed for 105 days. This feeding program produces a weight gain of 70 pounds for a market weight of 110 pounds per lamb at 150 days of age (Table 5).

Table 5. Feed Requirements for Market Lambs, STAR and Annual Lambing Systems

Item	Both Systems
Creep Feed	
Days on feed	45 days
Total feed	28 lbs. per lamb weaned
Complete Ration	
Days on feed	105 days
Weight gain	70 lb. average
Feed per pound of gain	4 lb. average
Total feed	280 lbs. per lamb raised
Cost of Both Feeds	$180 per ton*
Cost per Lamb	
Creep feed	$2.52 per lamb weaned
Complete ration	$25.20 per lamb raised

*See footnote for Table 4.

During the feeding period, lambs raised under both systems consume 28 pounds of creep feed and 280 pounds of complete ration per lamb. At a cost of $180 per ton for both feeds, total feed costs are $27.72 per lamb (Table 5).

Results

Budgets were developed and analyzed for two situations related to the harvesting of the 70 acres of hay crops. The first analysis assumes the operator owns the field equipment used for hay production, harvests the hay crop, and sells the excess not needed for the ewe flock. The second assumes that no field equipment is owned to harvest hay or spread manure. Manure removal is accomplished by custom hire. Hay is harvested on shares with a neighbor having the necessary equipment.

Own Hay-Making Equipment

As indicated above, land resources are used to produce forage in the form of pasture and hay crops. With an average hay yield of 2.2 tons per acre, the Annual system has a saleable excess of nearly 100 tons. The larger STAR ewe flock consumes all but 27 tons of hay produced. Assuming the pasture on this farm yielded 2.0 tons of hay equivalent per acre, the STAR system requires all pasture available while the Annual system rents out 20 acres of excess pasture for $12 per acre.

The various direct costs for hay and pasture production are in Table 6. Variable costs for repairs and fuel, and fixed costs for taxes and insurance are estimated from Snyder, 1984. The crops are managed the same under each system.

Table 6. Annual Operating Costs for Hay and Pasture When Hay-Making Equipment is Owned*

Item	70 Acres Hay Crop		50 Acres Pasture		Total Crop Expenses
	Average Rate	Both Systems	Average Rate	Both Systems	
	$	$	$	$	$
Labor	4/hour	560		0	560
Seeding	25/acre	1,750	5/acre	250	2,000
Fertilizer	20/acre	1,400	20/acre	1,000	2,400
Lime	10/acre	700	10/acre	500	1,200
Chemicals	3/acre	210		0	210
					6,370

*Adapted from New York Farm Cost Account research (Snyder, 1984). Seeding cost based on four year life. See Snyder and Milligan for details of input rates.

Lamb sales are the most important receipt (Table 7). An average lamb price of $0.70 per pound, live weight, is used in the budgets. Lamb prices averaged $0.67 per pound in New York for 1985 and, generally, reported prices are stronger in 1986 (Crop Reporting Board, New York Agricultural Statistics). Sales of lamb from the Cornell flock have been above $0.70 per pound.

Other sources of income include cull ewes, wool, government wool incentive receipts, and hay crop sales. Receipts are based on animal numbers in Table 2.

The major expense item is purchased feed. Feed costs are based on quantities, prices, and the number of lambs calculated in Tables 2, 4, and 5. Because the crop and pasture acreages are the same for both systems, crop production costs are a larger portion of total costs for the Annual system with fewer ewes and lambs. These extra costs, however, are offset by the income from the sale of excess hay and rented pasture. Marketing charges and miscellaneous costs, as noted in Table 7, are estimated from current experience with the Cornell flock (Magee).

Table 7. Estimated Annual Budgets for Two Lambing Systems When Hay-Making Equipment is Owned

Item	STAR - 300 ewes			Annual - 150 ewes
	Low	Medium	High	
Lambs raised/ewe/year	1.72	2.22	2.71	1.34
	$	$	$	$
Receipts: (Numbers from Table 2)				
Lambs (110 pounds x 0.70)	35,112	46,662	57,981	13,167
Cull ewes ($20 each)	1,200	1,200	1,200	600
Wool & incentive -				
ewes (8 pounds x 1.70)	4,080	4,080	4,080	2,040
lambs (2 pounds x 1.70)	1,754	2,264	2,764	683
Crops - hay ($70/ton)	1,890	1,890	1,890	6,930
Pasture rent	--	--	--	240
Total cash receipts	44,036	56,096	67,915	23,660
Expenses:				
Feed - ewes - grain	3,708	4,752	5,832	1,440
lambs - creep	1,331	1,716	2,094	519
complete feed	13,003	16,783	20,488	5,065
Total feed	18,042	23,251	28,414	7,024
Ram (1 - net of cull)	225	225	225	175
Crop expenses (Table 6)	6,370	6,370	6,370	6,370
Repairs, fuel	2,685	2,685	2,685	2,388
Taxes, insurance, farm share	1,970	1,970	1,970	1,693
Marketing charge @ $2/lamb sold	912	1,212	1,506	362
Misc. expense* @ $4.50/lamb raised	2,322	2,997	3,658	950
Total cash expenses	32,526	38,710	44,828	18,962
Depreciation	2,650	2,650	2,650	2,210
Operator labor & management value	4,900	5,600	6,300	2,870
Unpaid family labor value	1,640	1,840	2,340	840
Interest on average investment @ 5%	5,538	5,538	5,538	4,408
Total expenses	47,254	54,338	61,656	29,290

*Includes utilities, dip, vet, medicine, drench, interest on operating capital, etc.

The net cash income for the farm activities (Table 8) provides an estimate of the effect the various assumptions have on the amount of cash available for purposes other than operating expenses. This income can be combined with non-farm income to meet needs for family living expenses, debt service needs, savings, and capital purchases. It is not a good measure of the profitability of the sheep enterprise. The results show only a modest

net cash income for the Annual system. The STAR lambing system's net cash income is significantly higher and increases markedly as lamb productivity levels increase.

Table 8. Economic Analysis of Two Lambing Systems When Hay-Making Equipment is Owned

Item	STAR - 300 ewes			Annual - 150 ewes
	Low	Medium	High	
Lambs raised/ewe/year	1.72	2.22	2.71	1.34
	$	$	$	$
Farm Net Cash Income:				
Total cash returns	44,036	56,096	67,915	23,660
Total cash costs	32,526	38,710	44,828	18,962
Net Cash Income*	11,510	17,386	23,087	4,698
Returns to Operator:				
Farm Net Cash Income	11,510	17,386	23,087	4,698
less: Depreciation	-2,650	-2,650	-2,650	-2,210
Unpaid family labor	-1,640	-1,840	-2,340	-840
Interest	-5,538	-5,538	-5,538	-4,408
Operator Labor & Mgmt. Return	1,682	7,358	12,559	(2,760)
Operator Labor, hours/year	700	800	900	410
Operator Return per hour	2.40	9.20	13.95	(6.73)
Returns on Investment:				
Farm Net Cash Income	11,510	17,386	23,087	4,698
less: Depreciation	-2,650	-2,650	-2,650	-2,210
Operator value	-4,900	-5,600	-6,300	-2,870
Unpaid family labor	-1,640	-1,840	-2,340	-840
Return on Investment	2,320	7,296	11,797	(1,222)
Average Investment	110,750	110,750	110,750	88,150
Rate of Return	2.1%	6.6%	10.7%	(1.4%)
Cost of Lamb Production:				
Total costs	47,254	54,338	61,656	29,290
less: non-lamb returns	- 7,170	- 7,170	- 7,170	- 9,810
Total Cost of Production	40,084	47,168	54,486	19,480
Lamb sold, pounds	50,160 lb	66,660 lb	82,830 lb	18,810 lb
Total cost/lb. of lamb sold	0.80	0.71	0.66	1.04

*Available for family withdrawals, debt service, capital purchases, and capital retention.

The operator labor and management return is a measure of the financial reward earned by the operator from the enterprise for the year. It is shown in total and on a per hour basis. Returns to the operator are negative for the Annual System. Returns are modest for the lowest productivity level with the STAR system but show a significant increase as productivity improves.

Another measure of success is the returns generated on the total investment. Rates of return range from 2.1 to 10.7 percent for the STAR system and are negative for the Annual system.

In estimating market lamb cost of production, the value of all non-lamb production is subtracted from the total farm costs (Table 8). This assumes the nonlamb items sold were produced at cost. This total cost of production is divided by the total pounds of lamb sold to determine the total cost per pound of lamb sold. This cost includes the opportunity cost of all inputs provided by the operator. Only for the highest level of STAR lamb production was the cost of lamb below the selling price of $0.70 per pound.

Own No Field Equipment

In this analysis, the operator owns no field equipment and has hay harvested on a share arrangement with a neighbor. The operator provides the land and one-half of the cash costs in exchange for half the hay crop to be stored in his barn.

Table 9. Comparison of Profitability for Two Lambing Systems and Two Situations of Field Equipment Ownership

Item	Equipment Ownership	STAR System Low	STAR System Medium	STAR System High	Annual System
		$	$	$	$
Net cash income -	Yes	11,510	17,386	23,087	4,698
	No	10,415	16,291	21,992	3,704
Return to operator labor & management -	Yes	1,682	7,358	12,559	(2,760)
	No	2,827	8,503	13,704	(1,514)
Return on investment -	Yes	2.1%	6.6%	10.7%	(1.4%)
	No	3.6%	8.7%	13.2%	0.2%
Total cost per pound of lamb -	Yes	0.80	0.71	0.66	1.04
	No	0.78	0.69	0.64	0.94
Cash cost per pound of lamb -	Yes	0.51	0.48	0.46	0.48
	No	0.54	0.50	0.48	0.55

The results of both situations are compared in Table 9; details of the second situation are in Snyder and Milligan. At all levels of productivity, the second situation results in higher returns and lower production costs when all costs are included. However, net cash income is lower for Situation 2 because cash receipts are reduced more than cash expenses when the hay is harvested on shares and less hay is sold. When only the cash production costs are considered, the cost per pound of lamb produced falls significantly and is very similar for either method of hay harvest. Production cost differences are greatest for the Annual system because hay income is a more important source of income.

Sensitivity Analysis

An almost infinite number of sensitivity analyses could be imagined. Since the sale of lambs and purchased feeds are the major receipt and expense items, changes in these prices have the quickest and most dramatic effect on

profitability. Also, if the rate of feed conversion to lamb changes, the quantity of feed consumed or the lamb market-weight changes. Either change has a significant effect on the economics of production.

For each five cent change in lamb prices under the STAR system, net cash income and return to the operator changes by $2,508 to $4,141 as lamb production levels increase. For the Annual system, these measures change by $940 for each five cent change in lamb prices (Table 10).

Table 10. Sensitivity Analysis of Two Lambing Systems with Three Lamb Price Levels and Other Factors Constant

Item	STAR System			Annual System
	Low	Expected	High	
Lambs raised/ewe/year	1.72	2.22	2.71	1.34
	$	$	$	$
Own Field Equipment:				
Farm Net Cash Income				
Lamb @ 65¢ per pound	9,002	14,053	18,946	3,918
70¢ per pound	11,510	17,386	23,087	4,858
75¢ per pound	14,018	20,719	27,228	5,798
Operator Labor & Management Return				
Lamb @ 65¢ per pound	(826)	4,025	8,418	(3,540)
70¢ per pound	1,682	7,358	12,559	(2,600)
75¢ per pound	4,190	10,691	16,700	(1,660)
Rate of Return on Investment				
Lamb @ 65¢ per pound	(0.2%)	3.6%	6.9%	(2.3%)
70¢ per pound	2.1%	6.6%	10.7%	(1.2%)
75¢ per pound	4.4%	9.6%	14.4%	(0.1%)

If the price of the complete ration changes by $10 per ton, net cash income and the operator's return changes by $1,002 to $1,579 for the STAR budgets and $390 for the Annual system budget. Total cost of lamb sold changes by two cents per pound for each $10 per ton change in feed price (Table 11).

The effects of changes in lamb or feed prices on enterprise profitability are very similar for both of the equipment ownership situations studied.

Table 11. Sensitivity Analysis of Two Lambing Systems with Three Feed Price Levels and Other Factors Constant

Item	STAR System Low	STAR System Expected	STAR System High	Annual System
Lambs raised/ewe/year	1.72	2.22	2.71	1.34
	$	$	$	$
Own Field Equipment:				
Farm Net Cash Income				
Feed @ $170 per ton	12,512	18,678	24,666	5,088
$180 per ton	11,510	17,386	23,087	4,698
$190 per ton	10,508	16,094	21,508	4,308
Operator Labor & Management Return				
Feed @ $170 per ton	2,684	8,650	14,138	(2,390)
$180 per ton	1,682	7,358	12,559	(2,760)
$190 per ton	680	6,066	10,980	(3,150)
Rate of Return on Investment				
Feed @ $170 per ton	3.0%	7.8%	12.1%	(0.9%)
$180 per ton	2.1%	6.6%	10.7%	(1.4%)
$190 per ton	1.2%	5.4%	9.2%	(1.8%)
Total Cost Per Pound of Lamb Sold				
Feed @ $170 per ton	0.78	0.69	0.64	1.02
$180 per ton	0.80	0.71	0.66	1.04
$190 per ton	0.82	0.73	0.68	1.06

Summary

The study analyzes three productivity levels of market lamb production using the STAR accelerated lambing system and compares the results with the Annual lambing system using the same real estate resources.

The results indicate that all three levels of lambing performance under the STAR system provide a higher profitability than does the Annual system. The STAR system also results in higher profits for the farm operation and lower costs per pound of lamb sold.

The Annual system results in a negative labor and management return for the operator and a modest net cash income. Returns on the investment are negative for the Annual system when the operator harvests his own hay and only slightly positive when the hay is harvested on a share arrangement.

The STAR system appears to be a system of lamb production that provides significantly greater potential for improved cash flow and profits and lower lamb production costs for the good manager. Because of the sensitivity of these objectives to changes in lamb and feed prices, it is important that the lamb producer develop his marketing and production skills equally well. The STAR system of lamb production brings together production techniques that may provide more attractive opportunities for the livestock producer and an alternative use for many rural resources.

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