U.S. Baseline Lamb Cost of Production Model

LMIC WORKING GROUP:

Coordinator: Bridger Feuz, University of Wyoming
Member Cooperators: Tim Petry, North Dakota State University; David Anderson, Texas A&M University; Lee Meyer, University of Kentucky
Non-Member Cooperator: Kenneth Andries, Kentucky State University
LMIC Staff: Jessica Sampson (Lead Project Analyst) and James Robb

OBJECTIVE:

Provide American Sheep Industry Association (ASI) with baseline estimates regarding the on-farm/ranch costs of producing lambs. Best-estimate industry parameters will be used to generate regionally representative budgets. Those budgets will be constructed to facilitate a national aggregation and annual updating.

SCOPE OF PROJECT:

Background:

Lamb production occurs across the U.S. and in a variety of ecological zones; economic costs of production reflect that diversity. Farm level production costs and risk have increased in the last decade and needs to be described and evaluated including feedstuff costs, management practices, labor costs, predator losses, etc. The lamb industry includes several sectors, but this sector is the foundation and economic aspects require careful documentation and estimation.

Many universities have budgets to assist producers, but they are not standardized and most are updated irregularly. Existing budgets and expertise will be evaluated and adapted. As part of their lamb producer educational programs, all of the participants in this Livestock Marketing Information Center (LMIC) project have participated in developing farm/ranch level budgets in their respective regions.

The results of this project will be useful in educational programs, policy analysis, and applied research for the U.S. lamb industry. Input and output data will be easy to depict graphically and summarize trends.

Methodology and Output Summary:

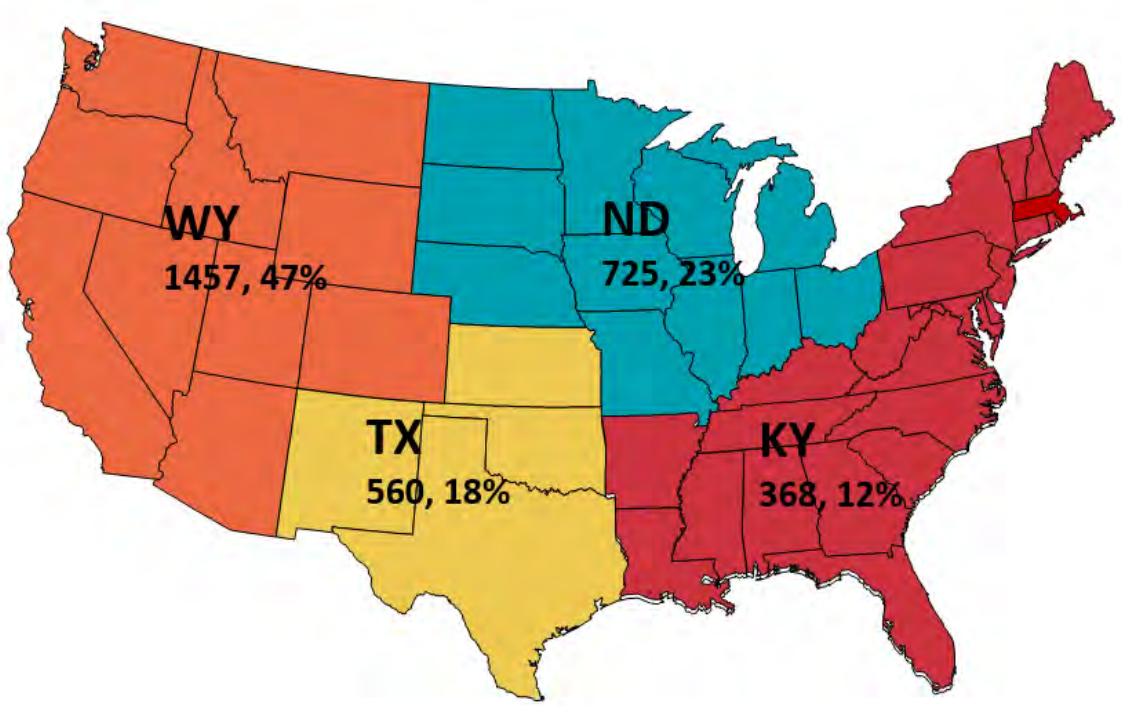
Regional budgets were developed in a common spreadsheet format (Microsoft Excel). Major economic parameters required to produce a lamb were incorporated along with performance assumptions (e.g. death loss). Regional models were aggregated by constructing a national baseline spreadsheet.

This effort included four major phases: 1) review of existing budgets by region; 2) construction of consensus master budget format; 3) development, review, and some standardization of regional budgets; and 4) aggregation and weighting or regional budgets to national baseline with some additional sensitivity analysis for key budget parameters.

Outputs are: 1) a brief summary of available university-based cost of production budgets for lamb; 2) final spreadsheets; and 3) brief summary report describing the spreadsheets and the cost considerations included; and comments on how to annual update (data sources, etc.). This model was specifically designed to facilitate stochastic analysis.

MODEL INPUTS AND DETAILS:

Defined Regions:



Numbers denoted below state abbreviations are:

- Region's total mature ewe population (1000 head), percent of national mature ewe population

Spreadsheet Layout:

The spreadsheet file, "ASI Budget.xls" contains all calculations, inputs, and assumptions. The tabs in the spreadsheet, in order, are: Budget-full, WY, ND, TX, KY, National, Inputs. The WY, ND, TX, KY tabs are the regional budgets, each region (see map above) denoted by the state the project cooperator was from. The National tab is a weighted average of the regional budgets. The Budget-full puts all the regional budgets and the national budget together in one sheet. The Input tab has all the data used in

the budget calculations. All budgets have calculations from 2010 through 2015 and have been developed to be updated annually.

The second spreadsheet file, "ASI Budget Stochastic.xls" has all of the same input data and calculations as the original "ASI Budget.xls" and in addition shows the sensitivity analysis done on the key budget variables of feeder lamb price and regional average lambing percentage.

Data Inputs:

Regional Budgets

The regional budgets were developed by the member cooperators and non-member cooperators of the working group. These regional budgets can be found in in their corresponding tabs of the "ASI Budget.xls" file. Within this file, each region is named by the project cooperators' state. For example, WY = region including WA, OR, CA, NV, ID, MT, WY, CO, UT, AZ. Each region's budget is formatted in a consistent form, with units in $/mature ewe. All calculations are done in each budget sheet (WY, ND, TX, KY). The regional budgets are then aggregated together to create a weighted average National budget. Each budget line is weighted by mature ewe flock in the region to calculate the weighted national average. Those aggregate calculations are done in the "National" sheet.

Budget Inputs

The inputs for all budget calculations are located in the "Inputs" sheet. This sheet is organized by region. Each region has a designated/representative average flock size, ram flock, cull ram rate, cull ewe rate, mature ewe death loss rate, regional total mature ewe flock inventory, regional average lambing percent, cull ewe price, and cull ram price. The flock size is an average representation of each region. To clarify this average regional flock size is not the same number as the regional total mature ewe flock (discussed below). Ram flock was based on an average breeding rate of 31 ewes per ram, for all regions (KY region has a slightly lower breeding rate). Cull ram rate and cull ewe rate are set regionally, based on flock size/type production practices. Mature ewe death loss rate was calculated from the USDA-NASS sheep death loss report, series maintained by LMIC. The regional total mature ewe flock is a summed total of by state (for the states in each respective region) mature ewe flock inventory from the January Sheep and Goats report published by USDA-NASS. Regional average lambing percent is a simple average of each states' (in each respective region) lambing percent. By state lambing percent is calculated by the state's lamb crop divided by the state's mature ewe flock (lamb crop and mature ewe flock numbers from the UDSA-NASS Sheep and Goat January report).

The cull ewe price for the WY region is a simple average of annual prices (calculated by LMIC) of slaughter ewes Good 2-4 from Fort Collins, CO Auction (weekly AMS report from Greeley, CO, LS 214 mailed in) and from Billings, MT Auction (weekly AMS report from Torrington, WY, LS 214 mailed in). Cull ewe prices for the ND region are a simple average of annual prices (calculated by LMIC) of slaughter ewes Good 2-3, 160-199 pounds, from Sioux Falls Regional Sheep and Goat Auction (weekly AMS report SF_LS 333). Cull ewe prices for the KY region are a simple average of annual prices (calculated by LMIC) of slaughter ewes Good 1-3, 160-200 pounds, from New Holland, PA Sales Stables (weekly AMS report LN_LS 322). All weekly auction prices are reported by USDA-AMS and historical price series are maintained by LMIC.

Cull ram prices are only reported for the Sioux Falls Regional Sheep and Goat Auction and for the New Holland, PA Auction. Cull ram price for WY, ND and TX regions come from the weekly Sioux Falls Regional Sheep and Goat Auction report and are a simple annual average (calculated by LMIC) of slaughter bucks, Medium Flesh, average weight of 245 pounds. Cull ram price for the KY region is a simple annual average of New Holland, PA weekly auction prices for slaughter bucks, 160-200 pounds.

There were several inputs used, that had the same value for all regions. These inputs included: feeder lamb weight, cull ewe weight, cull ram weight, wool weight per ewe, feeder lamb price, and wool price. For the project, it was decided to use the same value across regions for these key input prices due to data availability, quality, and consistency.

Values used for feeder lamb weight, cull ewe weight, cull ram weight, and wool weight per ewe are all found in rows 74-78 of the "Input" sheet in the "ASI Budget.xls" file.

Feeder lamb price is an annual average of the 3 Market Average feeder lamb price. The 3 Market Average price combines feeder lamb prices from South Dakota, Colorado, and Texas. Individual weekly auction prices are reported by AMS and weekly and annual averages are calculated by LMIC.

Wool price comes from the US Wool report, LS 214 mailed in from Greeley, CO, Fleece States, 30-34 micron, US grade 46-50's. The weekly price is reported by AMS and the annual average is calculated by LMIC.

Calculations:

Each budget item is calculated in an individual regional tab.

Under gross receipts, revenue generated from sales of lambs is calculated and includes: the region's representative ewe flock (i.e. WY=1000 head, ND=250 head, etc.), average regional lambing percent, mature ewe cull rate and death loss (i.e. female lambs held back for flock replacement), feeder lamb weight, and feeder lamb price. It is assumed the majority of lamb death loss is captured in the average lambing percentage (although it is realized that states report this percentage differently). This calculated revenue is then divided by the region's representative ewe flock size (i.e. WY region has a 1000 head ewe flock), to put the revenue on a $/ewe basis.

Cull ewe revenue is calculated using each region's cull ewe rate, cull ewe price, and the cull ewe weight. Cull ram revenue is calculated similarly. Revenue from wool is calculated using the wool weight per ewe and the representative ewe flock and ram flock for the region. It is recognized that wool volume produced from ewes and rams will be different, however the difference is not enough to significantly affect the bottom line revenue for the budget, so the same wool weight is used for both ewes and rams.

Variable and fixed costs were determined by each cooperating member and non-member, for their respective region, for 2015. One note, in the Wyoming region, the hired labor variable cost includes the new wage rate of $1500 per month as determined by the Department of Labor. There are additional employee expenses associated with recruiting, transporting, etc. H2A employees that raise the annual salary expense to $22,000 per year. It is assumed, due to lack of federal land grazing and smaller average flock sizes in the rest of the U.S., this increased hired labor rate only applies to the Wyoming region.

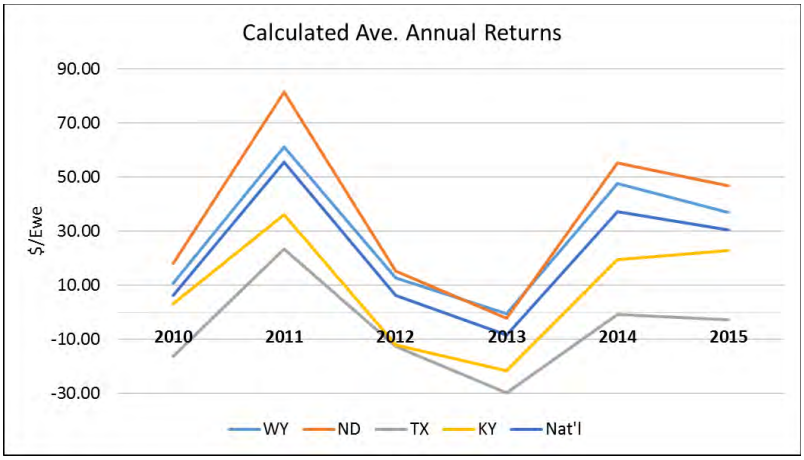
The national budget is then calculated using a weighted average of each regions budget items. The budget items are weighted by the regions total reported mature ewe flock inventory. This is done in attempt to give appropriate revenue and cost weights to areas in the U.S. where the majority of sheep are raised.

Each regional budget, and the national budget, have been calculated to show historical values from 2010 through 2015. On the revenue side, historical values are calculated using the data sources described above, for each respective year. On the variable and fixed cost side, the original budgets were developed with 2015 costs in mind. Then, the reported Prices Paid by Farmers Index (reported by USDA-NASS in Monthly Agricultural Prices) was applied to the 2015 base cost numbers to calculate each year back to 2010. The percent change year-to-year, in the prices paid index was used, and can be found in the "input" tab in row 5, column D through I.

MODEL RESULTS, OUTCOMES, AND RECOMENDATIONS

Analyzing the past five years of budget calculations, with the estimated and assumed budget inputs, at the national level sheep producers made money three out of the six years. Returns per mature ewe were positive in 2011, 2014, and 2015 and returns per mature ewe were negative in 2010 and 2014. The years with negative returns correspond with the lowest 3 Market Average feeder lamb annual average price during the 2010-2015 time frame.

At the regional level, the Wyoming region's estimated returns per mature ewe closely followed the direction of the National budget results. This is not surprising as the Wyoming region carries about 47% of the total national mature ewe flock, the majority by far. Wyoming region's budget results showed calculated positive returns in 2010, 2011, 2012, 2014, and 2015 with negative returns in 2013. The North Dakota region performed the best out of all regions, with estimated positive returns per mature ewe for 2010, 2011, 2012, 2014, and 2015. North Dakota's region had the highest simple average for lambing percent, which is the main factor influencing the increased number of positive returns. The Texas region showed estimated positive returns per mature ewe only in 2011. The 3 Market Average feeder lamb price was highest in 2011 (out of the 2010-2015 series) and the Texas region's average lambing percentage is significantly below other regions'. The Kentucky region showed positive estimated returns for 2010, 2011, 2014, and 2015. This region shows the highest total costs (a combination of higher production costs and small average flock size) but also reports a fairly high lambing percentage and relatively higher cull ewe prices than other regions.



All historical calculated average annual returns are shown in the

graph here.

The two budget inputs that showed the most variability and had the largest effect on estimated returns were the 3 Market Average feeder lamb price and regional lambing percentage. Within the regional budgets, the magnitude and directional changes of estimated returns are highly correlated with magnitude and directional changes of the 3 Market Average feeder lamb price. The regional lambing percent influenced the region's overall breakeven level, and ability to weather lower feeder lamb prices (and hence the outcome of the estimated return).

Sensitivity Analysis Results -- Lambing Percentage and Feeder Lamb Price:

All simulations and sensitivity analysis were done using Simetar©.

Due to the importance of the regional lambing percentage, on the overall budget outcomes, a sensitivity analysis was performed on this variable and a stochastic value incorporated into a simulated 2016 budget. The historical series of annual average lambing percent by region, from 1990 to 2015, was used to calculate a stochastic lambing percentage variable. These variables were estimated using a normal distribution for WY and TX and an empirical distribution for ND and KY. The different types of distributions were chosen based on tests for normality. Then the variables were simulated 500 times to provide a probability curve and validate that the simulated variable did not have a statistically different mean and standard deviation compared to the original historical data series (for the normally distributed variables). WY and TX were simulated using a normal distribution on a forecasted value based on the intercept and slope calculated from the historical series, and on the standard deviation calculated from the historical data series. ND and KY were simulated using an empirical distribution on the mean of the historical data, and percent deviations from the mean with corresponding probabilities.

	Simulation Results, 2016 Lambing % by Region			
	WY	**ND**	**TX**	**KY**
Mean	121.6	133.6	94.9	115.7
StDev	5.0	6.0	5.4	10.4
CV	4.2	4.5	5.6	9.0
Min	107.0	114.4	78.9	79.7
Max	136.4	151.1	110.9	148.1

The results in the table above are based on the sensitivity analysis. For each region, the results show the mean (average) lambing percentage, the standard deviation (StDev), the coefficient of variation (CV), and the minimum and maximum simulated number. What this can immediately tell us, is that the model fits the variables fairly well (there is a low CV). Additionally, there is not a relatively large amount of deviation from the average percentage (small standard deviation) as one would expect for a regional production variable. Additionally the Texas region, historically and simulated, shows the lowest lambing percentage by far.

Next, the 3 Market feeder lamb annual average price was simulated. The historical data of annual average prices from 1990 to 2015 was used. The stochastic variable was calculated using an empirical distribution on a forecasted value (forecasted using the calculated intercept and slope from the historical data), and percent deviations from trend with corresponding probabilities.

The results of this analysis are in the table below. Compared to lambing percent, feeder lamb price shows relatively more variation and a less desirable model fit, but it does allow risk to be built into budget calculations for 2016.

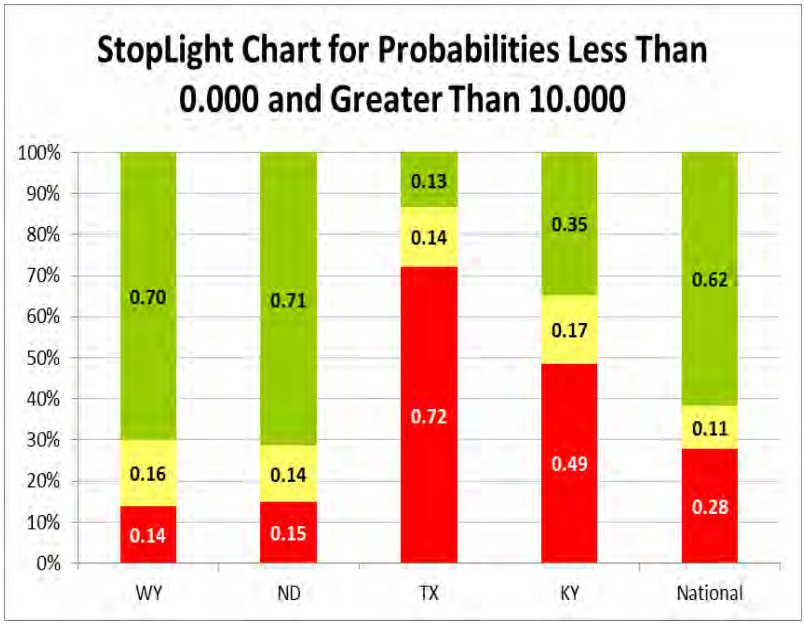
	Simulation Results, 2016 Ave. Feeder Lamb Price ($/cwt)
Mean	176.91
StDev	29.50
CV	16.68
Min	131.54
Max	247.89

The stochastic variables for lambing percentage and annual average feeder lamb price were both included in the 2016 regional budget calculations and national budget aggregation. The results of the 2016 average return simulation, in $ per mature ewe, are in the below table.

Simulation Results, 2016 Average Returns					
Return	**WY**	**ND**	**TX**	**KY**	**National**
($/ewe)	25.99	29.64	-10.76	3.78	17.60

More Stochastic Results:

The values in the chart to the right show average estimated returns by region for 2016, and incorporates the probability and risk into this analysis. The Stoplight chart shows the probability, by region, of sheep producers showing negative returns per ewe in 2016 (red), the probability of returns between $0 and $10 per ewe (yellow), and the probability of returns over $10 per ewe (green). This includes the stochastic values for lambing percentage and annual average feeder lamb price, and shows the simulated risk involved in 2016 lamb production returns.



In the Stoplight chart, the probability that sheep producers, nationally, make more than $10 per mature ewe in 2016 is 62%, the probability that sheep producers make between $10 and $0 per mature ewe is

11%, and the probability that they lose money is 28%. This is an aggregated average and it is key to remember that all values in this budget are estimates. Moving on to the different regions, both the WY and ND regions have a high (70% and 71%) chance of making more than $10 per mature ewe, in net returns. The Texas region shows a 13% chance of making more than $10 per mature ewe, a 14% chance of returns between $0 and $10, and a 72% chance that producers record a net loss in 2016. The KY region shows estimated returns have a 35% probability of being greater than $10 per mature ewe, a 17% chance of recording between $10 and $0 per ewe, and a 49% chance of falling below $0 per ewe.

The differences between regions largely result from differences in assumed average mature ewe flock size, cost structure, and lambing percent.

Recommendation for Updating Methods:

This budget was developed with the idea to allow annul updating. Keeping this budget up to date will provide a barometer for the industry, and allow analysts and industry to gauge change over time.

How to Use the Budget:

This budget can be manipulated to show the effect of different revenue and cost inputs. Due to how the budgets and calculations are organized, for the revenue calculations, changes can only be made in the "Inputs" tab. All calculations are linked to the cells of the Inputs tab. For the variable and fixed costs, changes can only be made to 2015 numbers in each regional budget tab. Of course, this recommended method of making changes is only required to avoid changing any formulas.

Appendix (see following pages)

WY Regional Budget, page 9
ND Regional Budget, page 10
TX Regional Budget, page 11
KY Regional Budget, page 12
National Budget, page 13
Budget Inputs, page 14

		$/Ewe					
		2010	2011	2012	2013	2014	2015
		WY	WY	WY	WY	WY	WY
	GROSS RECEIPTS						
	Lambs	94.23	142.64	96.03	90.67	136.32	120.76
	Cull ewes	13.65	16.77	13.72	10.25	15.10	17.90
	Cull rams	0.55	0.57	0.54	0.41	0.48	0.62
	Wool	7.60	12.23	15.95	12.64	13.22	13.47
	TOTAL RECIEPTS	116.04	172.21	126.24	113.98	165.13	152.76
	VARIABLE COSTS						
	Pasture	13.68	13.68	13.68	13.68	13.68	13.50
	Federal Range	2.57	2.57	2.57	2.57	2.57	2.54
	Hay	7.32	7.32	7.32	7.32	7.32	7.22
	PRF Rainfall Insurance	0.00	0.00	0.00	0.00	0.00	0.00
	Feed Grain	1.53	1.53	1.53	1.53	1.53	1.51
	Salt & Mineral	0.61	0.61	0.61	0.61	0.61	0.60
	Vet & Medicine	0.64	0.64	0.64	0.64	0.64	0.63
	Breeding (ram cost per ewe)	5.57	5.57	5.57	5.57	5.57	5.50
	Marketing & Hauling	4.26	4.26	4.26	4.26	4.26	4.20
	Fuel, lube, repairs, utilities	10.46	10.46	10.46	10.46	10.46	10.32
	Shearing ewes	3.85	3.85	3.85	3.85	3.85	3.80
	Shearing rams	0.23	0.23	0.23	0.23	0.23	0.23
	Predator Control	1.01	1.01	1.01	1.01	1.01	1.00
	Dog Food	2.03	2.03	2.03	2.03	2.03	2.00
	ALB Checkoff	0.55	0.55	0.55	0.55	0.55	0.55
	Operator/Family Labor	11.05	12.28	12.79	13.05	13.68	13.50
	Hired Labor	16.37	18.19	18.95	19.33	20.27	20.00
	Camp Supplies	4.09	4.55	4.74	4.83	5.07	5.00
	Housing Improvement & Repair	0.59	0.65	0.68	0.70	0.73	0.72
	Interest on Operating Capital	0.86	0.96	0.99	1.01	1.06	1.05
	TOTAL VARIABLE COSTS	87.29	90.95	92.48	93.24	95.14	93.87
	FIXED COSTS						
	Capital Recovery						
	Housing & Improvement	0.82	0.91	0.95	0.97	1.01	1.00
	Machinery, Equipment, Vehicles	4.75	5.28	5.50	5.61	5.88	5.80
	Interest on retained livestock	5.12	5.69	5.92	6.04	6.33	6.25
	Taxes & Insurance	0.65	0.73	0.76	0.77	0.81	0.80
	Overhead	6.71	7.46	7.77	7.93	8.31	8.20
	TOTAL FIXED COSTS	18.05	20.06	20.89	21.31	22.35	22.05
	TOTAL COSTS	105.34	111.01	113.37	114.56	117.49	115.92
	RETURNS	10.70	61.20	12.86	-0.57	47.64	36.84

		$/Ewe					
		2010	2011	2012	2013	2014	2015
		ND	ND	ND	ND	ND	ND
	GROSS RECEIPTS						
	Lambs	122.49	193.17	130.87	123.16	184.43	170.83
	Cull ewes	9.65	11.27	9.54	6.04	8.48	11.14
	Cull rams	0.55	0.57	0.54	0.41	0.48	0.62
	Wool	7.60	12.22	15.93	12.63	13.21	13.46
	TOTAL RECIEPTS	140.28	217.23	156.89	142.24	206.60	196.05
	VARIABLE COSTS						
	Pasture	16.04	17.83	18.57	18.94	19.87	19.6
	Federal Range	0.00	0.00	0.00	0.00	0.00	0.00
	Hay	24.56	27.29	28.43	29.00	30.41	30
	PRF Rainfall Insurance	0.00	0.00	0.00	0.00	0.00	0.0
	Feed Grain	14.73	16.37	17.06	17.40	18.24	18
	Salt & Mineral	5.57	6.19	6.44	6.57	6.89	6.8
	Vet & Medicine	5.73	6.37	6.63	6.77	7.10	7
	Breeding (ram cost per ewe)	4.91	5.46	5.69	5.80	6.08	6
	Marketing & Hauling	4.50	5.00	5.21	5.32	5.57	5.5
	Fuel, lube, repairs, utilities	7.37	8.19	8.53	8.70	9.12	9
	Shearing ewes	4.09	4.55	4.74	4.83	5.07	5
	Shearing rams	0.33	0.36	0.38	0.39	0.41	0.4
	Predator Control	1.64	1.82	1.90	1.93	2.03	2
	Dog Food	0.82	0.91	0.95	0.97	1.01	1
	ALB Checkoff	0.55	0.55	0.55	0.55	0.55	0.55
	Operator/Family Labor	14.73	16.37	17.06	17.40	18.24	18
	Hired Labor	0.61	0.68	0.71	0.72	0.76	0.75
	Camp Supplies	0.00	0.00	0.00	0.00	0.00	0.00
	Housing Improvement & Repair	0.00	0.00	0.00	0.00	0.00	0.00
	Interest on Operating Capital	4.44	4.93	5.14	5.24	5.49	5.42
	TOTAL VARIABLE COSTS	110.63	122.87	127.97	130.52	136.85	135.02
	FIXED COSTS						
	Capital Recovery						
	Housing & Improvement	0.00	0.00	0.00	0.00	0.00	0.00
	Machinery, Equipment, Vehicles	4.09	4.55	4.74	4.83	5.07	5.00
	Interest on retained livestock	2.46	2.73	2.84	2.90	3.04	3.00
	Taxes & Insurance	1.87	2.07	2.16	2.20	2.31	2.28
	Overhead	3.27	3.64	3.79	3.87	4.05	4.00
	TOTAL FIXED COSTS	11.69	12.99	13.53	13.80	14.47	14.28
	TOTAL COSTS	122.32	135.86	141.50	144.32	151.32	149.30
	RETURNS	17.96	81.37	15.39	-2.08	55.28	46.75

		$/Ewe					
		2010	2011	2012	2013	2014	2015
		TX	TX	TX	TX	TX	TX
	GROSS RECEIPTS						
	Lambs	79.94	126.33	92.01	83.80	115.58	109.08
	Cull ewes	10.12	11.33	11.19	8.45	11.54	13.71
	Cull rams	0.27	0.28	0.27	0.21	0.24	0.31
	Wool	7.60	12.22	15.93	12.63	13.21	13.46
	TOTAL RECIEPTS	97.92	150.16	119.40	105.08	140.57	136.55
	VARIABLE COSTS						
	Pasture	8.19	9.10	9.48	9.67	10.14	10.00
	Federal Range	0.00	0.00	0.00	0.00	0.00	0.00
	Hay	2.87	3.18	3.32	3.38	3.55	3.50
	PRF Rainfall Insurance	0.70	0.77	0.81	0.82	0.86	0.85
	Feed Grain	35.25	39.17	40.80	41.62	43.64	43.06
	Salt & Mineral	6.88	7.64	7.96	8.12	8.51	8.40
	Vet & Medicine	6.21	6.90	7.19	7.34	7.69	7.59
	Breeding (ram cost per ewe)	6.39	7.10	7.39	7.54	7.91	7.80
	Marketing & Hauling	3.41	3.78	3.94	4.02	4.22	4.16
	Fuel, lube, repairs, utilities	6.55	7.28	7.58	7.73	8.11	8.00
	Shearing ewes	4.09	4.55	4.74	4.83	5.07	5.00
	Shearing rams	0.37	0.41	0.43	0.43	0.46	0.45
	Predator Control	8.60	9.55	9.95	10.15	10.64	10.50
	Dog Food	0.82	0.91	0.95	0.97	1.01	1.00
	ALB Checkoff	0.55	0.55	0.55	0.55	0.55	0.55
	Operator/Family Labor	7.37	8.19	8.53	8.70	9.12	9.00
	Hired Labor	0.00	0.00	0.00	0.00	0.00	0.00
	Camp Supplies	0.00	0.00	0.00	0.00	0.00	0.00
	Housing Improvement & Repair	0.00	0.00	0.00	0.00	0.00	0.00
	Interest on Operating Capital	4.91	5.46	5.69	5.80	6.08	6.00
	TOTAL VARIABLE COSTS	103.13	114.54	119.29	121.67	127.56	125.86
	FIXED COSTS						
	Capital Recovery						
	Housing & Improvement	0.00	0.00	0.00	0.00	0.00	0.00
	Machinery, Equipment, Vehicles	5.16	5.73	5.97	6.09	6.39	6.30
	Interest on retained livestock	2.46	2.73	2.84	2.90	3.04	3.00
	Taxes & Insurance	0.98	1.09	1.14	1.16	1.22	1.20
	Overhead	2.46	2.73	2.84	2.90	3.04	3.00
	TOTAL FIXED COSTS	11.05	12.28	12.79	13.05	13.68	13.50
	TOTAL COSTS	114.18	126.82	132.08	134.72	141.25	139.36
	RETURNS	-16.26	23.34	-12.68	-29.64	-0.68	-2.81

		$/Ewe					
		2010	2011	2012	2013	2014	2015
		KY	KY	KY	KY	KY	KY
	GROSS RECEIPTS						
	Lambs	109.59	150.31	107.20	105.80	150.62	150.05
	Cull ewes	11.59	13.47	11.45	9.74	12.22	12.84
	Cull rams	4.07	4.17	3.24	3.25	3.86	4.64
	Wool	7.65	12.31	16.06	12.73	13.31	13.56
	TOTAL RECIEPTS	132.90	180.27	137.95	131.52	180.01	181.09
	VARIABLE COSTS						
	Pasture	16.37	18.19	18.95	19.33	20.27	20.00
	Federal Range	0.00	0.00	0.00	0.00	0.00	0.00
	Hay	16.04	17.83	18.57	18.94	19.87	19.60
	PRF Rainfall Insurance	0.00	0.00	0.00	0.00	0.00	0.00
	Feed Grain	29.88	33.20	34.59	35.28	37.00	36.50
	Salt & Mineral	2.95	3.27	3.41	3.48	3.65	3.60
	Vet & Medicine	4.91	5.46	5.69	5.80	6.08	6.00
	Breeding (ram cost per ewe)	5.73	6.37	6.63	6.77	7.10	7.00
	Marketing & Hauling	5.06	5.62	5.86	5.97	6.26	6.18
	Fuel, lube, repairs, utilities	9.82	10.92	11.37	11.60	12.16	12.00
	Shearing ewes	4.09	4.55	4.74	4.83	5.07	5.00
	Shearing rams	0.37	0.41	0.43	0.43	0.46	0.45
	Predator Control	1.64	1.82	1.90	1.93	2.03	2.00
	Dog Food	0.82	0.91	0.95	0.97	1.01	1.00
	ALB Checkoff	0.55	0.55	0.55	0.55	0.55	0.55
	Operator/Family Labor	18.42	20.47	21.32	21.75	22.81	22.50
	Hired Labor	0.00	0.00	0.00	0.00	0.00	0.00
	Camp Supplies	0.00	0.00	0.00	0.00	0.00	0.00
	Housing Improvement & Repair	0.00	0.00	0.00	0.00	0.00	0.00
	Interest on Operating Capital	4.86	5.40	5.63	5.74	6.02	5.94
	TOTAL VARIABLE COSTS	121.51	134.97	140.57	143.38	150.33	148.32
	FIXED COSTS						
	Capital Recovery						
	Housing & Improvement	0.00	0.00	0.00	0.00	0.00	0.00
	Machinery, Equipment, Vehicles	1.96	2.18	2.27	2.32	2.43	2.40
	Interest on retained livestock	2.13	2.37	2.46	2.51	2.64	2.60
	Taxes & Insurance	1.64	1.82	1.90	1.93	2.03	2.00
	Overhead	2.46	2.73	2.84	2.90	3.04	3.00
	TOTAL FIXED COSTS	8.19	9.10	9.48	9.67	10.14	10.00
	TOTAL COSTS	129.70	144.06	150.05	153.04	160.46	158.32
	RETURNS	3.20	36.20	-12.10	-21.52	19.55	22.77

Inputs:

General		2010	2011	2012	2013	2014	2015
	Feeder Lamb - 3 mkt ave ($/lb)	1.43	2.13	1.49	1.41	2.05	1.92
	Wool Price ($/lb)	0.92	1.48	1.93	1.53	1.6	1.63
	Prices Paid Index % chng from 2015	0.82	0.91	0.95	0.97	1.01	1.00
	US Mature Ewe Inventory (1000 hd)	3335	3215	3165	3135	3090	3110
REGION		2010	2011	2012	2013	2014	2015
WY	Flock Size	1000	1000	1000	1000	1000	1000
	Ram flock	33	33	33	33	33	33
	Cull Ram Rate	0.15	0.15	0.15	0.15	0.15	0.15
	Cull Ewe Rate	0.15	0.15	0.15	0.15	0.15	0.15
	Mature ewe death loss rate	0.06	0.07	0.07	0.06	0.06	0.06
	Region total mature ewe flock	1486	1442	1469	1459	1423	1457
	Region avg. lambing percent	1.09	1.11	1.08	1.07	1.10	1.04
	Cull Ewe Price ($/lb)	0.54	0.66	0.54	0.40	0.59	0.70
	Cull Ram Price ($/lb)	0.61	0.63	0.60	0.46	0.53	0.69
		2010	2011	2012	2013	2014	2015
ND	Flock Size	250	250	250	250	250	250
	Ram flock	8	8	8	8	8	8
	Cull Ram Rate	0.15	0.15	0.15	0.15	0.15	0.15
	Cull Ewe Rate	0.1	0.1	0.1	0.1	0.1	0.1
	Mature ewe death loss rate	0.07	0.08	0.07	0.08	0.08	0.08
	Region total mature ewe flock	824.5	761	787	758	730	725
	Region avg. lambing percent	1.31	1.39	1.34	1.34	1.38	1.36
	Cull Ewe Price ($/lb)	0.57	0.66	0.56	0.36	0.50	0.66
	Cull Ram Price ($/lb)	0.61	0.63	0.60	0.46	0.53	0.69
		2010	2011	2012	2013	2014	2015
TX	Flock Size	500	500	500	500	500	500
	Ram flock	16	16	16	16	16	16
	Cull Ram Rate	0.1	0.1	0.1	0.1	0.1	0.1
	Cull Ewe Rate	0.1	0.1	0.1	0.1	0.1	0.1
	Mature ewe death loss rate	0.08	0.08	0.09	0.10	0.09	0.09
	Region total mature ewe flock	678	657	556	542	568	560
	Region avg. lambing percent	0.92	0.97	1.01	0.99	0.94	0.94
	Cull Ewe Price ($/lb)	0.60	0.67	0.66	0.50	0.68	0.81
	Cull Ram Price ($/lb)	0.61	0.63	0.60	0.46	0.53	0.69
		2010	2011	2012	2013	2014	2015
KY	Flock Size	50	50	50	50	50	50
	Ram flock	2	2	2	2	2	2
	Cull Ram Rate	0.5	0.5	0.5	0.5	0.5	0.5
	Cull Ewe Rate	0.08	0.08	0.08	0.08	0.08	0.08
	Mature ewe death loss rate	0.09	0.09	0.08	0.08	0.09	0.09
	Region total mature ewe flock	346.5	355	353	376	369	368
	Region avg. lambing percent	1.20	1.12	1.13	1.14	1.16	1.21
	Cull Ewe Price ($/lb)	0.85	0.99	0.84	0.72	0.90	0.94
	Cull Ram Price ($/lb)	0.90	0.93	0.72	0.72	0.86	1.03

	Sheep death loss by region, Sheep and Lamb PDI						
Death loss		2010	2011	2012	2013	2014	2015
	WY	86.5	95	95.5	85	83	83
	ND	57.7	59.4	55	57	56.3	56.3
	TX	55	55	50	53	48.5	48.5
	KY	30.8	30.6	28.5	30	32.2	32.2
Region mature ewe inventory							
	WY	1486	1442	1469	1459	1423	1457
	ND	824.5	761	787	758	730	725
	TX	678	657	556	542	568	560
	KY	346.5	355	353	376	369	368
% Death Loss							
	WY	0.06	0.07	0.07	0.06	0.06	0.06
	ND	0.07	0.08	0.07	0.08	0.08	0.08
	TX	0.08	0.08	0.09	0.10	0.09	0.09
	KY	0.09	0.09	0.08	0.08	0.09	0.09
	*do not have 2015 death loss numbers, used 2014 death loss numbers						

General		
Feeder lamb wt	75	lbs
Cull ewe wt	170	
Cull ram wt	225	
Wool weight	8	