Eastern Idaho: Alfalfa Hay Production

Ben Eborn, Joseph Sagers and Reed Findlay

Introduction to Costs & Returns Estimates

The University of Idaho Extension produces crop costs and returns estimates every other year. The overall goal of this project is to provide the Idaho agricultural industry with an unbiased and consistently calculated estimate of the cost of producing various crops and to track the change in production costs per acre and per unit over time.

The University of Idaho's costs and returns estimates are based on economic costs, not just accounting costs. All resources are valued at a market rate or "opportunity cost". Input prices are taken from the U of I's annual survey of agricultural supply companies. The selling price is a historical average, not a current year's price. Production practices are based on data from growers, crop consultants, and extension personnel throughout Idaho. Although production practices may be similar for individual farms, each farm has a unique set of resources with different levels of productivity, different production problems, and therefore different costs. Farm size, crop rotation, age and type of equipment, and the quality and intensity of management are all crucial factors that influence costs. The cost of production estimates show the typical or representative production costs by region based on documented production practices. These production costs are not area averages, rather they are based on model farms for four areas of the state.

University of Idaho costs and returns estimates can be used as a management tool to help producers in three ways:

1. **Templates.** Excel spreadsheets have been created by the University of Idaho to make enterprise budgeting and record keeping an easy task. You can start by substituting our costs and returns estimates with your own numbers. You can also enter them in the "Your Cost" column.
2. **Marketing.** Estimating production costs on a per acre or per unit basis can help you calculate your farm's break-even prices. Knowing your break-even price to cover operating costs and total costs can help with contract negotiations and selling on the open market.
3. **Benchmarks.** The University of Idaho costs and returns estimates are based on a typical or model farm and are calculated annually using consistent methodology. You can use these estimates as benchmarks by comparing your own total costs or specific cost categories to our estimates. This is a good way to find strengths and weaknesses in your production practices.

It's important to remember, just because your production costs are similar to our estimates, that isn't necessarily a good thing. Our model farms are also typically unprofitable! Average producers usually don't make an economic profit (which includes opportunity costs and non-cash costs such as depreciation). Being profitable requires fine-tuned management and a competitive advantage that the average producer doesn't have. (Being average is not okay in farming)

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Background and Assumptions

The University of Idaho's costs and returns estimates are based on economic costs, not accounting costs. All resources are valued at a market rate or "opportunity cost". Input prices are based on the data collected annually by the University of Idaho from agricultural supply companies. The selling price for the commodity is typically an historical average, not a current year's price. The cost estimate shown here is typical for growing irrigated alfalfa hay. Production practices are based on data from farmers, crop consultants, and extension personnel in eastern Idaho. These aren't University of Idaho recommendations. Production practices most closely resemble those in Bonneville, Clark, Jefferson and Madison counties. Although production practices may be similar for individual farms, each farm has a unique set of resources with different levels of productivity, different production problems, and therefore different costs. Farm size, crop rotation, age and type of equipment, and the quality and intensity of management are all crucial factors that influence production costs.

The Model Farm

The model farm for this costs and returns estimate is a 1,250-acre farm with 1,000 acres in alfalfa hay and 250 acres in grain. Corn may substitute for grain. The alfalfa stand is kept in production four years, including the establishment year. Approximately 250 acres of alfalfa are established every year.

The farm uses a center pivot irrigation system and surface water delivered to the farm from an irrigation district. The irrigation district charges a flat fee per acre for water. Irrigation power use is based only on pressurization (no lift). Power costs per acre-inch of water applied are calculated using 2017 Idaho Power Schedule 24 Agricultural Irrigation Service rates.

Production Practices

There are no tillage costs or seeding costs during the full production years of the alfalfa stand. However, a prorated share of the cost of establishing the alfalfa stand is included as a non-cost ownership cost. This cost would range between $55 and $85 per acre, assuming establishment costs between $200 and $300 per acre, a four-year stand life, and an interest rate of 6.0%.

Alfalfa is harvested three times: June, August, and September. The cost of all harvest operations are based on rates charged by a custom operator who swaths, rakes, bales, and stacks the hay in one-ton bales. Fertilizer, impregnated with herbicide, is custom applied each spring, and an insecticide is applied by air in July. More than one insecticide application may be necessary in some years, however. Alfalfa receives 28 inches of water during the growing season, 3 inches in May, 7 inches in June, 7 inches in July, 7 inches in August, and 4 inches in September.

Machinery

Equipment used to produce irrigated alfalfa hay is shown in Tables 4 and 5. Table 4 lists the equipment and their hourly operating and ownership costs, while Table 5 lists the equipment and their annual ownership costs. Machinery ownership cost (capital recovery) is based on 75% of the replacement cost of a new piece of equipment, except for trucks. Capital recovery combines depreciation and interest into a single value. Equipment capital recovery (depreciation and interest) is calculated as a cost per acre. This non-cash overhead is shown in the lower part of Table 1. It comes from the Budget Planner program and is automatically calculated using the information from Table 4, taking into account the

hours used and the number of acres for each piece of machinery. To keep machinery prices current between years in which a comprehensive survey is conducted, machinery prices are adjusted using USDA's Farm Machinery Prices Paid Index. Equipment prices are collected approximately every five years.

The University of Idaho uses the budget generator program *Budget Planner* from the University of California-Davis to produce the various tables shown in this publication. Machinery operating and ownership costs are calculated based on engineering equations in this program. Machinery operating costs include fuel, lubricants and repairs.

Labor and Management

The cost of labor used in this study includes a base wage, plus a percentage to account for various payroll taxes (FICA, SUTA & FUTA), and workman's compensation, as well as benefits such as paid vacation/personal leave days, health insurance and bonuses. Labor is classified by the type of work performed. Labor classifications, labor rates and payroll overhead are shown below.

Labor Values

Labor Class	Base Rate	Payroll Overhead	Effective Rate
General Farm Labor	$14.00	15%	$17.55
Truck Drivers	$14.00	15%	$17.55
Equipment Operators	$18.00	25%	$22.50
Irrigation Labor			
Set Move: HL & WL	$14.00	30%	$17.55
Continuous Move: CP & L	$18.00	25%	$22.50

Set Move includes: handlines and wheellines
Continuous Move includes: center pivots and linear move
Payroll overhead for set move systems includes housing

Based on the speed, width and overall field efficiency, *Budget Planner* calculates equipment operator labor hours for all field operations except those performed on a custom basis. Custom operations are listed separately. General farm labor accounts for extra field labor used during planting or harvest.

A management fee based on approximately 5% of the total production costs is included. Prior to 2013, the basis of the 5% charge was expected revenue.

Capital, Land and Overhead Costs

Interest on operating capital is charged from the time an input is applied until harvest and is calculated at a nominal rate of 7.00 percent. Interest on intermediate term capital, primarily equipment, is calculated using a nominal rate of 6.75 percent. A general overhead charge, calculated at approximately 2.5 percent of operating expenses, is included to cover unallocated whole-farm costs such as office expenses, legal and accounting fees, cell phones, internet service and utilities. Irrigation power is not included as part of general farm utilities.

Land rent is based on a one-year cash lease for grain and covers the ownership costs (depreciation, interest, and insurance) of the irrigation system. Because the charge for water, irrigation system repairs and irrigation power costs are listed separately, the land rent may appear low because the landowner in many circumstances pays some or even all these expenses.

Budget Format

In addition to the Background and Assumption pages, this publication has six tables presenting a variety of cost and returns information.

Table 1 shows both expected revenue, based on a specified yield and price, and expenses. Expenses are broken into two main categories: operating and ownership. Operating expenses are those that typically vary with the level of production and involve inputs that are used in a single production cycle. Ownership expenses include a systematic cost recovery over the useful life for inputs used in the production process that have a useful life of more than one year. Machinery and land fall into

this category. Operating inputs are organized by category. In addition to the cost per unit and cost per acre for each input, a total cost is given for each category. Table 1 also gives a total of all operating, ownership and total costs per acre, as well as these same categories on a yield basis (per bushel, cwt, ton, etc.).

Table 2 has most of the same cost information presented in Table 1 but the data is organized by operation for both pre-harvest and harvest costs. Operations can define a single activity, such as seed hauling, or multiple activities as in the case of tillage. The quantity of labor is shown for each operation. The cash costs per acre for labor, machinery costs, materials and custom are also specified. Cash overhead expenses are listed separately as are the non-cash overhead.

Table 3 is a monthly cash flow of expenses based on when the operation occurs and when inputs are applied. Field operations are classified as pre-harvest, harvest and post-harvest.

Table 4 lists the equipment used to produce this crop and the costs per hour to operate this equipment. Total annual hours of use for the current crop and for all crops on the farm is also shown.

Table 5 lists the purchase price and salvage value of equipment used to produce this crop, as well annual capital recovery and cash overhead expenses.

Table 6 provides a ranging analysis, sometime referred to as a sensitivity analysis. Table 6 shows how the costs and returns per acre will vary as the yield and/or price ranges above and below the base values from Table 1.

Authors

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TABLE 1. COSTS AND RETURNS PER ACRE TO PRODUCE ALFALFA HAY

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS					
Alfalfa	6.00	ton	160.00	960.00	
TOTAL GROSS RETURNS	6.00	ton		960.00	
OPERATING COSTS					
Fertilizer:				**73.78**	
Dry P2O5	104.00	lb	0.41	42.64	
K2O	60.00	lb	0.31	18.60	
Dry Nitrogen - Pre-plant	22.00	lb	0.42	9.24	
Sulfur	15.00	lb	0.22	3.30	
Pesticides/Chemicals:				**17.25**	
Metribuzin 75DF	0.75	lb	16.00	12.00	
Warrior II w/Zeon Technology	3.00	fl oz	1.75	5.25	
Custom:				**212.35**	
Custom Fertilize: 400 - 800 lbs	1.00	acre	7.85	7.85	
Custom Swath Hay	3.00	acre	19.00	57.00	
Custom Rake Hay	3.00	acre	6.50	19.50	
Custom Bale Hay: 4x4	6.00	ton	15.50	93.00	
Custom Haul/Stack Hay	6.00	ton	4.50	27.00	
Custom Air Spray - 3 gal. rate	1.00	acre	8.00	8.00	
Irrigation:				**88.44**	
Irrigation Water Assessment - Al	1.00	acre	19.00	19.00	
Irrigation Repairs - CP	28.00	ac-in	0.55	15.40	
Irrigation Power - Center Pivot	28.00	ac-in	1.93	54.04	
Labor				**43.54**	
Equipment Operator Labor	0.82	hrs	22.50	18.34	
Irrigation Labor - CP	1.12	hrs	22.50	25.20	
Machinery				**9.12**	
Fuel-Gas	2.08	gal	3.15	6.54	
Fuel-Diesel	0.00	gal	2.90	0.00	
Fuel-Road Diesel	0.06	gal	3.40	0.21	
Lube				1.01	
Machinery Repair				1.35	
Interest on Operating Capital @ 7.00%				11.81	
TOTAL OPERATING COSTS/ACRE				456.28	
TOTAL OPERATING COSTS/TON				76.05	
NET RETURNS ABOVE OPERATING COSTS				503.72	

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TABLE 1. CONTINUED

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
CASH OVERHEAD COSTS					
General Overhead				11.00	
Land Rent				210.00	
Management Fee				38.00	
Property Taxes				0.00	
Property Insurance				0.78	
Investment Repairs				0.00	
TOTAL CASH OVERHEAD COSTS/ACRE				259.78	
TOTAL CASH OVERHEAD COSTS/TON				43.30	
TOTAL CASH COSTS/ACRE				716.06	
TOTAL CASH COSTS/TON				119.34	
NET RETURNS ABOVE CASH COSTS				243.94	
NON-CASH OVERHEAD COSTS (Capital Recovery)					
Amort. Establishment Cost				73.39	
Equipment				7.19	
TOTAL NON-CASH OVERHEAD COSTS/ACRE				80.58	
TOTAL NON-CASH OVERHEAD COSTS/TON				13.43	
TOTAL COST/ACRE				796.63	
TOTAL COST/TON				132.77	
NET RETURNS ABOVE TOTAL COST				163.37	

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TABLE 2. COSTS PER ACRE TO PRODUCE ALFALFA HAY

Operation	Operation Time (Hrs/A)	Cash and Labor Costs per Acre						
		Labor Cost	Fuel	Lube &Repairs	Material Cost	Custom/ Rent	Total Cost	Your Cost
Preharvest:								
Fertilize	0.00	0.00	0.00	0.00	85.78	7.85	93.63	
Irrigation Water Assessment	0.00	0.00	0.00	0.00	19.00	0.00	19.00	
Irrigation Repairs	0.00	0.00	0.00	0.00	15.40	0.00	15.40	
Irrigate	0.00	25.20	0.00	0.00	54.04	0.00	79.24	
Aerial Application	0.00	0.00	0.00	0.00	5.25	8.00	13.25	
General Pickup Use	0.62	16.76	6.51	2.27	0.00	0.00	25.54	
Service Truck Use	0.03	0.68	0.21	0.08	0.00	0.00	0.97	
General 4-Wheeler Use	0.03	0.90	0.03	0.02	0.00	0.00	0.95	
TOTAL PREHARVEST COSTS	0.68	43.54	6.75	2.37	179.47	15.85	247.97	
Harvest:								
Swath	0.00	0.00	0.00	0.00	0.00	57.00	57.00	
Rake	0.00	0.00	0.00	0.00	0.00	19.50	19.50	
Bale	0.00	0.00	0.00	0.00	0.00	93.00	93.00	
Custom Haul & Stack	0.00	0.00	0.00	0.00	0.00	27.00	27.00	
TOTAL HARVEST COSTS	0.00	0.00	0.00	0.00	0.00	196.50	196.50	
Interest on Operating Capital at 7.00%							11.81	
TOTAL OPERATING COSTS/ACRE	0.68	43.54	6.75	2.37	179.47	212.35	456.28	

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TABLE 2. CONTINUED

Operation	Operation Time (Hrs/A)	Cash and Labor Costs per Acre						
		Labor Cost	Fuel	Lube &Repairs	Material Cost	Custom/ Rent	Total Cost	Your Cost
CASH OVERHEAD:								
General Overhead							11.00	
Land Rent							210.00	
Management Fee							38.00	
Property Taxes							0.00	
Property Insurance							0.78	
Investment Repairs							0.00	
TOTAL CASH OVERHEAD COSTS/ACRE							259.78	
TOTAL CASH COSTS/ACRE							716.06	
NON-CASH OVERHEAD:		Per Producing Acre		Annual Cost Capital Recovery				
Amort. Establishment Cost		250.00		73.39			73.39	
Equipment		49.34		7.19			7.19	
TOTAL NON-CASH OVERHEAD COSTS		299.34		80.58			80.58	
TOTAL COSTS/ACRE							796.63	

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TABLE 3. MONTHLY COSTS PER ACRE TO PRODUCE ALFALFA HAY

	APR 15	MAY 15	JUN 15	JUL 15	AUG 15	SEP 15	OCT 15	Total
Preharvest:								
Fertilize	93.63							93.63
Irrigation Water Assessment	19.00							19.00
Irrigation Repairs	15.40							15.40
Irrigate		8.49	19.81	19.81	19.81		11.32	79.24
Aerial Application				13.25				13.25
General Pickup Use	3.65	3.65	3.65	3.65	3.65	3.65	3.65	25.54
Service Truck Use	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.97
General 4-Wheeler Use	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.95
TOTAL PREHARVEST COSTS	131.95	12.41	23.73	36.98	23.73	3.92	15.24	247.97
Harvest:								
Swath			19.00		19.00	19.00		57.00
Rake			6.50		6.50	6.50		19.50
Bale			31.00		38.75	23.25		93.00
Custom Haul & Stack			9.00		11.25	6.75		27.00
TOTAL HARVEST COSTS	0.00	0.00	65.50	0.00	75.50	55.50	0.00	196.50
Interest on Operating Capital @7.00%	0.77	0.84	1.36	1.58	2.16	2.50	2.59	11.81
TOTAL OPERATING COSTS/ACRE	132.72	13.25	90.59	38.56	101.39	61.93	17.83	456.28
CASH OVERHEAD								
General Overhead	1.57	1.57	1.57	1.57	1.57	1.57	1.57	11.00
Land Rent								210.00
Management Fee	5.43	5.43	5.43	5.43	5.43	5.43	5.43	38.00
Property Taxes								0.00
Property Insurance	0.78							0.78
Investment Repairs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL CASH OVERHEAD COSTS	7.78	7.00	7.00	7.00	7.00	7.00	7.00	259.78
TOTAL CASH COSTS/ACRE	140.50	20.25	97.59	45.56	108.39	68.93	24.83	716.06

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TABLE 4. HOURLY EQUIPMENT COSTS

Yr	Description	ALFALFA HAY Hours Used	Total Hours Used	Capital Recovery	Cash Overhead Insur-ance	Cash Overhead Taxes	Operating Lube& Repairs	Operating Fuel	Total Oper.	Total Costs/Hr.
15	4-wheeler	33	90	7.35	0.19	0.00	0.59	0.79	1.38	8.91
15	Pickup 1 - 3/4 ton	250	800	8.74	0.16	0.00	3.65	10.49	14.14	23.04
15	Pickup 2 - 3/4 ton	250	800	8.74	0.16	0.00	3.65	10.49	14.14	23.04
15	Pickup 3 - 3/4ton	121	375	12.60	0.31	0.00	3.65	10.49	14.14	27.05
15	Service Truck	25	80	41.85	1.24	0.00	3.12	8.50	11.62	54.71

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TABLE 5. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT, AND BUSINESS OVERHEAD COSTS

ANNUAL EQUIPMENT COSTS

						Cash Overhead		
Yr	Description	Price	Yrs Life	Salvage Value	Capital Recovery	Insur-ance	Taxes	Total
15	4-wheeler	6,000.00	10	1,500.00	734.56	18.75	0.00	753.31
15	Pickup 1 - 3/4 ton	42,000.00	5	13,750.00	7,771.98	139.38	0.00	7,911.36
15	Pickup 2 - 3/4 ton	42,000.00	5	13,750.00	7,771.98	139.38	0.00	7,911.36
15	Pickup 3 - 3/4ton	42,000.00	10	9,000.00	5,251.81	127.50	0.00	5,379.31
15	Service Truck	41,000.00	20	3,000.00	3,720.03	110.00	0.00	3,830.03
	TOTAL	173,000.00	-	41,000.00	25,250.37	535.00	0.00	25,785.37
	90% of New Cost*	155,700.00	-	36,900.00	22,725.33	481.50	0.00	23,206.83

*Used to reflect a mix of new and used equipment

ANNUAL INVESTMENT COSTS

					Cash Overhead			
Description	Price	Yrs Life	Salvage Value	Capital Recovery	Insur-ance	Taxes	Repairs	Total
INVESTMENT								
Amort. Establishment Cost	250,000.00	4	0.00	73,390.92	625.00	0.00	0.00	74,015.92
TOTAL INVESTMENT	250,000.00	-	0.00	73,390.92	625.00	0.00	0.00	74,015.92

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/ Farm	Unit	Price/ Unit	Total Cost
General Overhead	1000	acre	11.00	11,000.00
Land Rent	1000	acre	210.00	210,000.00
Management Fee	1000	acre	38.00	38,000.00

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TABLE 6. RANGING ANALYSIS - ALFALFA HAY

COSTS PER ACRE AND PER TON AT VARYING YIELDS TO PRODUCE ALFALFA HAY

	YIELD(TON)						
	4.50	5.00	5.50	6.00	6.50	7.00	7.50
OPERATING COSTS/ACRE:							
Preharvest	247.97	247.97	247.97	247.97	247.97	247.97	247.97
Harvest	196.50	196.50	196.50	196.50	196.50	196.50	196.50
Interest on Operating Capital @ 7.00%	11.81	11.81	11.81	11.81	11.81	11.81	11.81
TOTAL OPERATING COSTS/ACRE	456.28	456.28	456.28	456.28	456.28	456.28	456.28
TOTAL OPERATING COSTS/TON	101.40	91.26	82.96	76.05	70.20	65.18	60.84
CASH OVERHEAD COSTS/ACRE	259.78	259.78	259.78	259.78	259.78	259.78	259.78
TOTAL CASH COSTS/ACRE	716.06	716.06	716.06	716.06	716.06	716.06	716.06
TOTAL CASH COSTS/TON	159.12	143.21	130.19	119.34	110.16	102.29	95.47
NON-CASH OVERHEAD COSTS/ACRE	80.58	80.58	80.58	80.58	80.58	80.58	80.58
TOTAL COSTS/ACRE	796.63	796.63	796.63	796.63	796.63	796.63	796.63
TOTAL COSTS/TON	177.03	159.33	144.84	132.77	122.56	113.80	106.22

Net Return Per Acre Above Operating Costs For Alfalfa Hay

PRICE ($/ton)	YIELD (ton/acre)						
Alfalfa	4.50	5.00	5.50	6.00	6.50	7.00	7.50
120.00	83.72	143.72	203.72	263.72	323.72	383.72	443.72
125.00	106.22	168.72	231.22	293.72	356.22	418.72	481.22
130.00	128.72	193.72	258.72	323.72	388.72	453.72	518.72
135.00	151.22	218.72	286.22	353.72	421.22	488.72	556.22
140.00	173.72	243.72	313.72	383.72	453.72	523.72	593.72
145.00	196.22	268.72	341.22	413.72	486.22	558.72	631.22
150.00	218.72	293.72	368.72	443.72	518.72	593.72	668.72

Net Return Per Acre Above Cash Costs For Alfalfa Hay

PRICE ($/ton)	YIELD (ton/acre)						
Alfalfa	4.50	5.00	5.50	6.00	6.50	7.00	7.50
120.00	-176.06	-116.06	-56.06	3.94	63.94	123.94	183.94
125.00	-153.56	-91.06	-28.56	33.94	96.44	158.94	221.44
130.00	-131.06	-66.06	-1.06	63.94	128.94	193.94	258.94
135.00	-108.56	-41.06	26.44	93.94	161.44	228.94	296.44
140.00	-86.06	-16.06	53.94	123.94	193.94	263.94	333.94
145.00	-63.56	8.94	81.44	153.94	226.44	298.94	371.44
150.00	-41.06	33.94	108.94	183.94	258.94	333.94	408.94

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TABLE 6. RANGING ANALYSIS CONTINUED

Net Return Per Acre Above Total Costs For Alfalfa Hay

PRICE ($/ton)	YIELD (ton/acre)						
Alfalfa	4.50	5.00	5.50	6.00	6.50	7.00	7.50
120.00	-256.63	-196.63	-136.63	-76.63	-16.63	43.37	103.37
125.00	-234.13	-171.63	-109.13	-46.63	15.87	78.37	140.87
130.00	-211.63	-146.63	-81.63	-16.63	48.37	113.37	178.37
135.00	-189.13	-121.63	-54.13	13.37	80.87	148.37	215.87
140.00	-166.63	-96.63	-26.63	43.37	113.37	183.37	253.37
145.00	-144.13	-71.63	0.87	73.37	145.87	218.37	290.87
150.00	-121.63	-46.63	28.37	103.37	178.37	253.37	328.37