

UNIVERSITY OF CALIFORNIA AGRICULTURE AND NATURAL RESOURCES
COOPERATIVE EXTENSION
AGRICULTURAL ISSUES CENTER
UC DAVIS DEPARTMENT OF AGRICULTURAL AND RESOURCE ECONOMICS

SAMPLE COSTS TO ESTABLISH AND PRODUCE
ORCHARDGRASS HAY



INTERMOUNTAIN REGION - 2016
Shasta, Lassen and Siskiyou Counties

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INTRODUCTION

Sample costs to establish and produce orchardgrass hay are presented in this study. This study is intended as a guide only. It can be used to guide production decisions, estimate potential returns, prepare budgets and evaluate production loans. Sample costs given for labor, materials, equipment and contract services are based on April 2016 figures. Practices described are based on production practices considered typical for the crop and area, but will not apply to every situation. A blank column titled Your Costs is provided in Tables 1 and 2 to enter your estimated costs.

For an explanation of calculations used in the study refer to the section titled Assumptions. For more information contact Christine Gutierrez; University of California Agriculture and Natural Resources, Agricultural Issues Center, at 530-752-1520 or cagut@ucdavis.edu.

Sample Cost of Production studies for many commodities are available and can be down loaded from the website at <http://coststudies.ucdavis.edu>. Archived studies are also available on the website.

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ASSUMPTIONS

The following assumptions refer to tables 1 to 10 and pertain to sample costs to establish and produce orchardgrass hay in the Intermountain region (Shasta, Lassen, and Siskiyou Counties). Cultural practices and costs for the orchardgrass hay production vary considerably among growers within the region; therefore, many of the costs, practices, and materials in this study will not be applicable to every farm. The practices and inputs used in this cost study serve as a guide only. **The use of trade names and cultural practices in this report does not constitute an endorsement or recommendation by the University of California nor is any criticism implied by omission of other similar products or cultural practices.**

Farm. The study is based on a 305 acre field crop farm, of which 300 contiguous acres are dedicated to growing orchardgrass. The remaining 5 acres are occupied by a road, a farmstead, three hay barns and a shop building. The 305 acre farm is owned and operated by the grower. Note that non-contiguous parcels may have additional costs for travel time and equipment calibration. Larger farms will have increased efficiencies and thus lower per acre costs. Orchardgrass is often rotated with alfalfa or alfalfa is grown in other fields at the same time. These crops share the same equipment, so some of the equipment costs could be allocated to the alfalfa operation.

This study focuses on orchardgrass for hay production to be sold in small bales to the horse feed industry. The expected stand life for orchardgrass is a minimum of 5 years, if planted for hay production, which is the expected stand life used in this study.

Stand Establishment Operating Costs

Tables 1 to 3 show the costs associated with land preparation, fertilizer, planting, weed control, equipment, labor, and establishing an orchardgrass stand. Land preparation for planting starts in the fall. The establishment year ends after the winter herbicide application in the fall of that same year.

Land Preparation. Seedbed preparation begins in August. The field is ripped using a chisel to a depth of 12-14 inches by the grower. The chisel fractures the soil, which improves root penetration and water infiltration. The grower then discs the field two times, followed by three passes with a tri-plane to level the field.

Planting. Orchardgrass can be seeded in the spring (April-May) or fall (mid-August – September), depending on cultural practices and crop rotation practices. In this study, planting occurs in early September. Orchardgrass seed is planted at a rate of 15 pounds per acre. The seed is planted using a conventional grain drill. Alternative seeding practices such as a Brillion type seeder/roller or air seeding can also be used.

Fertilizer. A soil test (two samples per 100 acres) for nitrogen, phosphorus and potassium is included in this study. At planting, a custom operator will apply 200 pounds of ammonium sulfate using a fertilizer spreader. Ammonium sulfate (21-0-0-24) provides 42 pounds of nitrogen (N) per acre.

Irrigation. During the establishment year, irrigation water for seed germination is applied immediately after planting at a rate of 3.00 acre-inches. The actual amount of water applied can vary depending on the year and fall precipitation. Water is supplied by a well, and pumping costs vary based on well depth, pumping level and type of irrigation system. This study applies a pumping cost of \$75 per acre foot (\$6.25 per acre inch) using center pivot irrigation systems. Alternate methods of irrigation can include wheel-line or border flood. Irrigation labor is provided as a separate line item.

Pest Management. Pest management consists of herbicide treatments only. Although control for insect damage is not common and not used in this study, some scouting for insects should be done by the manager in late

winter (grain mites) and in the summer (armyworms). For information on other pesticides available, pest identification, monitoring, and management, visit the UC IPM website at www.ipm.ucdavis.edu. **The herbicides mentioned in this study are not recommendations, but those commonly used in the region. Pest control costs can vary considerably each year, depending upon local conditions and pest populations in any given year.** For information regarding pesticide use permits contact the county Agricultural Commissioner Office.

Application. Pesticide and fertilizer applications are made by either chemigation (pesticides and/or fertilizers applied through the irrigation water), by a tractor-pulled fertilizer spreader or broadcast via airplane. Pesticides with different active ingredients, mode of action, and sites of action should be rotated as needed to combat species shift and resistance. Check individual pesticide labels for compatibility, mixing requirements and usage. Some pesticides are applied to a portion of the acreage. See tables 2 & 5 for a list of chemicals used in this study for the applications. Adjuvants are recommended for many pesticides for effective control and are an added cost. Adjuvants are not included as a cost in this study.

Pest Control Adviser (PCA). The PCA monitors the field for insects, diseases, beneficial insects, and production needs to determine the necessary management practices. Written recommendations are required for many pesticides and are written by licensed pest control advisors. Growers may hire a private PCA or receive the service as part of a service agreement with an agricultural chemical and fertilizer company. This study assumes that the PCA services are provided free of charge by the chemical/fertilizer company.

Weeds. The land preparation practices outlined above will not only serve to create a suitable seedbed, but should also control most currently established weeds. In this study, planting occurs directly after land preparation, and no further weed control is needed prior to planting. However, if planting is delayed and weeds germinate before planting, an additional weed control measure should be taken to control emerged weeds prior to seeding (such as an application of glyphosate at 22oz/acre). In October, an application of 1.5 pints of 2, 4-D will be applied by a custom operator for control of most broadleaf winter annual weeds. Depending on weed species present, other herbicides may be more effective.

Production Operating Costs

Tables 4 to 10 show the costs associated with ongoing production of orchardgrass, following the establishment year. The orchardgrass stand in this study is kept for five years, however, only one year of production costs is shown for point of comparison.

Fertilizer. Urea (46-0-0) is applied three times in the growing season, providing 120 pounds of N in April, 90 pounds after first cutting in early June and 90 pounds after second cutting in late July for a total of 300 pounds of N per acre. The Pest Control Advisor (PCA) takes soil samples (two per 100 acres) from the field in March to determine if the nitrogen, phosphorus and potassium levels are adequate. Subsequent fertilizer applications are applied as needed based on the tissue analysis and PCA recommendations.

Irrigation. As stored soil moisture from winter rainfall provides sufficient water through March, the irrigation during the production year begins in April. From April to September, 30 acre-inches of water are applied to the field in accordance with the California Irrigation Management Information System (CIMIS) evapotranspiration (ET_o). Applied water values are greater than the actual water requirement due to an estimated application efficiency of 80 percent. CIMIS data can be found on the internet at <http://www.cimis.water.ca.gov/cimis/welcome.jsp>. After the last harvest operation, some growers may irrigate the field with three acre-inches of water, depending on the soil profile. This post-harvest irrigation is not included in this study. Total water use will vary depending upon factors such as irrigation method, soil type, weather, and the time of the year the crop is planted.

Pest Management. See section in establishment costs.

Weeds. Proper fertilization and irrigation help create a competitive orchardgrass crop to reduce weed populations, however additional weed control measures are needed for complete weed control. In the production years, 2 pints of 2, 4-D /acre are applied by a custom operator in April to control broadleaf winter annual weeds. Herbicide and rate selection should always be based on weed species present, orchardgrass growth stage and label recommendations. If necessary, field borders may be kept clean with a spot spray in April and June using a post-emergent herbicide (i.e. Roundup Power Max). This application is not included in this study.

Harvest. In this study, the orchardgrass is cut three times during the growing season on an approximate 50 day schedule (early June, late July and mid to late September). A swather with a 16 foot header is used by the grower to cut the orchardgrass and lay it into windrows. In this study, all windrows are raked once with windrows merged in the second and third cuttings, so that two windrows become one.

This study focuses on hay production to be sold in small bales to the horse feed industry. Due to slower speeds when making small-size bales, two balers and tractors are used. The balers are “chambered” for small bales, allowing bottom bales to stand on edge for easier squeeze handling during loading and reduce weights to less than 100 pounds each.

A bale wagon picks up, stacks, and transports the bales to the hay barn. A forklift with a hay squeeze attachment is used to place the bales on plastic sheets or tarps inside the hay barns for storage. Loading hay is negotiated and may be by either the buyer or seller. In this study, the grower pays a custom operator for the loading and weighing of the hay at a cost of \$11 per ton.

Custom Harvest: Some growers choose to have the harvest performed by a custom operator. In that case, the custom operator would swath, rake, bale and roadside (pickup bales and stack bales in the barn) for a fee based on a ton per acre yield. Typical charges for custom harvesting are swathing/raking/baling for \$40/ton with a roadside charge of \$11/ton, which includes the bale wagon, weighing and hauling.

If growers have their hay custom harvested, then the equipment for the required operations should be deleted in the investments in the various tables. Moreover, labor, fuel, repairs, depreciation and interest on investment would need to be removed from the harvest operations and replaced with custom charges.

Yield. The crop yield used in this study are 7 tons per acre annually with 3.2 tons the first cutting, 1.8 tons the second cutting and 2.0 tons the third cutting. Orchardgrass, a cool season perennial grass, often yields as much or more in the final late summer cutting as in the 2nd cutting, which is exposed to mid-summer heat. Therefore, the yield and fertilization rate for the two cuttings are similar in this study. Actual yield per acre depends on many variables, such as production location and growing conditions.

Return. Orchardgrass hay in this study is sold in small bales to the horse market. Returns will vary significantly according to quality and market conditions and time of year. This study applies a price of \$205/ton for the first cutting and \$245/ton for the second and third cuttings. Quality can be affected by grassy weeds and rain damage. Rain damage may significantly reduce the price, by \$20-40/T, depending on the degree of rain damage. A ranging analysis of varying prices (\$160-\$310/ton) and yields (2-8 tons/acre) is provided in the tables below as a point of reference. Market pricing data can be found at <http://www.ams.usda.gov/market-news/hay-reports>.

Pickup/ATV: The pickup is used for farm and business purposes as needed. The ATV is used for irrigation, monitoring pests and herbicide applications. Associated costs are included in this study.

Labor, Interest and Equipment

Labor: The labor rates of \$23.73 per hour for equipment operators and \$16.79 for irrigation labor include overhead of 46 percent. The basic hourly wages are \$16.25 for equipment operators and \$11.50 for irrigation labor. The overhead includes the employers' share of federal and California state payroll taxes, workers' compensation insurance for field crops (code 0171), and a percentage for other possible benefits. Workers' compensation insurance costs will vary among growers, but for this study the cost is based upon the average industry rate as of April 2016. Labor costs for operations involving machinery are 20 percent higher than the operation time for the equipment to account for the extra labor involved with the equipment set up, moving, maintenance, work breaks and field repair.

Management. The grower produces the orchardgrass; therefore, no salaries are included for management. Returns above costs are considered a return to management.

Interest on Operating Capital. Interest on operating capital is based on cash operating costs and is calculated monthly until harvest at a nominal rate of 4.25 percent per year. Interest charge is the cost of your money that is tied up in the production of a crop. It reflects the amount of money you pay on borrowed money (Line of Credit) or that amount you could have earned had you invested your own resources in alternative uses. The interest cost of post-harvest operations is discounted back to the last harvest month using a negative interest charge. The interest rate will vary depending upon various factors. The rate in this study is considered a typical lending rate by a farm lending agency as of April 2016.

Equipment Operating Costs. Repair costs are based on purchase price, annual hours of use, total hours of life, and repair coefficients formulated by American Society of Agricultural and Biological Engineers (ASABE). Fuel and lubrication costs are also determined by ASABE equations based on maximum power takeoff (PTO) horsepower, and fuel type.

Average prices for on-farm delivery of diesel and gasoline based on April 2016 data from the Energy Information Administration are \$2.43 and \$2.70 per gallon, respectively. The cost includes a 9.25 percent sales tax and a \$0.13/gal excise tax on diesel fuel and an 8 percent sales tax and a \$0.30/gal excise tax on gasoline. It is noted that federal and state excise taxes are refundable for on-farm use when filing the farm income tax return.

Equipment. Both new and used farm equipment is purchased. This study shows the current purchase price for new equipment, which is then adjusted to 60 percent to reflect a mix of new and used equipment. Sixty percent indicates a relatively high percentage of new equipment because of machinery upgrades that are currently necessary to meet air quality requirements.

The fuel, lube, and repair cost per acre for each operation is determined by multiplying the total hourly operating cost for each piece of equipment used for the selected operation by the hours per acre. Tractor time is 10 percent higher than implement time for a given operation to account for setup, travel and down time.

Risk. The risks associated with crop production should not be minimized. While this study makes every effort to model a production system based on typical, real world practices, it cannot fully represent financial, agronomic and market risks, which affect profitability and economic viability of agricultural production. Because of so many potential risk factors, effective risk management must combine specific tactics in a detailed manner, in various combinations for a sustainable operation. Moreover, Table 7 of this study reflects a ranging analysis of returns based on various assumptions which is therefore hypothetical in nature. It is important to realize that actual results may differ from the returns contained in this study.

Cash Overhead Costs

Cash overhead consists of various cash expenses paid out during the year that are assigned to the whole farm and not to a particular operation. Employee benefits, payroll taxes and workers' compensation insurance are included in labor costs and not under cash overhead. Because overhead costs are farm and ranch specific, costs will vary among growers. In most cases costs are apportioned based on the number of crops produced per acre per year.

Property Taxes. Counties charge a base property tax rate of 1 percent on the assessed value of the property. In some counties special assessment districts exist and charge additional taxes on property including equipment, buildings, and improvements. For this study, county taxes are calculated as 1 percent of the average value of the property.

Insurance. Insurance for farm investments varies depending on the assets included and the amount of coverage. Property insurance provides coverage for property loss and is charged at 0.843 percent of the average value of the assets over their useful life. Liability insurance covers accidents on the farm and costs \$1,010 for the entire farm.

Crop Insurance. Federally supported crop insurance is available to hay growers for any unavoidable loss of production, damage or poor quality resulting from adverse weather conditions such as cool wet weather, freeze, frost, hail, heat, rain, wind and damage from birds, drought, earthquakes and fire. The hay crop insurance program is administered by the [USDA Risk Management Agency \(RMA\)](#). Coverage levels are from 50-85 percent of the approved average yield as established by verifiable production records from the farm. Insurance coverage is for the unit, not by acre. A significant number of growers purchase crop insurance in this region. However, due to wide variability in coverages, we assume no insurance purchase for the operation in this study.

Office Expense. Office expenses are estimated at \$20 per acre to account for office supplies, utilities, telephones, bookkeeping, accounting, and other miscellaneous expenses.

Investment Repair. Annual repairs on investments or capital recovery items that require maintenance are calculated as two percent of the purchase price. Repairs are not calculated for land and establishment costs.

Non-Cash Overhead Costs

Non-cash overhead is calculated as the capital recovery cost for equipment and other farm investments.

Capital Recovery Costs. Capital recovery cost is the annual depreciation and interest costs for a capital investment. It is the amount of money required each year to recover the difference between the purchase price and salvage value (unrecovered capital). It is equivalent to the annual payment on a loan for the investment with the down payment equal to the discounted salvage value. This is a more complex method of calculating ownership costs than straight-line depreciation and opportunity costs, but more accurately represents the annual costs of ownership because it takes the time value of money into account (Boehlje and Eidman). The formula for the calculation of the annual capital recovery costs is $(\text{Purchase Price} - \text{Salvage Value}) \times \text{Capital Recovery Factor} + (\text{Salvage Value} \times \text{Interest Rate})$.

Salvage Value. Salvage value is an estimate of the remaining value of an investment at the end of its useful life. For farm machinery (tractors and implements) the remaining value is a percentage of the new cost of the investment (Boehlje and Eidman). The percent remaining value is calculated from equations developed by ASABE based on equipment type and years of life. The life in years is estimated by dividing the wear out life, as given by ASABE by the annual hours of use in this operation. For other investments including irrigation

systems, buildings, and miscellaneous equipment, the value at the end of its useful life is zero. The salvage value for land is the purchase price because land does not depreciate. The purchase price and salvage value for equipment and investments are shown in the tables.

Capital Recovery Factor. Capital recovery factor is the amortization factor or annual payment whose present value at compound interest is 1. The amortization factor is a table value that corresponds to the interest rate used and the life of the machine.

Interest Rate. The interest rate of 3.75 percent used to calculate capital recovery cost is the effective long term interest rate effective April 2016. The interest rate is provided by a local farm lending agency and will vary according to risk and amount of loan.

Establishment Costs. The establishment cost is the sum of cash costs for land preparation, planting, production expenses, and cash overhead for growing orchardgrass through the first year. The Total Cash Cost in the first year as shown in Table 2 represents the establishment cost per acre. For this study, the cost is \$294 per acre or \$88,200 for the 300 acre field. The establishment cost is amortized over the remaining 4 years of the stand life.

Land. Irrigated cropland suitable for orchardgrass production ranges from \$2,000-\$6,000/acre. Land in this study is owned by the grower and valued at \$4,000 per acre. Land rents for irrigated cropland ranges between \$100 - 300 per acre, depending on the quality of the land, water quality and the value/type of crop planted.

Buildings. The shop building is on a cement slab and totals approximately 1,500 square feet. Three 5,000 sq. ft. open hay barns are supported by 20 ft. tall poles on concrete piers with a natural floor (ground). Each barn holds 500 tons of hay. All of the buildings are located on the grower owned land.

Irrigation System: The water is pumped from an existing well using a 100 HP electric pump with a 150-foot lift owned by the grower. This study uses two center pivot systems to irrigate the two quarter sections, at a cost of \$50,000 each.

Shop Tools. This includes shop tools and equipment and miscellaneous hand tools. The cost is assumed and not based on any collected data.

Fuel Tanks/Wagon. Diesel is stored in a 5,000 gallon above ground storage tank with a spill containment pad and uses an electric pump to fill equipment. Gasoline is also stored above ground in a 100 gallon tank on a riser in a spill containment pad, but uses gravity flow to fill equipment. A 500 gallon diesel fuel wagon is used during planting and harvest operations.

Table Values. Due to rounding, the totals may be slightly different from the sum of the components.

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UC COOPERATIVE EXTENSION – AGRICULTURAL ISSUES CENTER
TABLE 1. COSTS PER ACRE to ESTABLISH ORCHARDGRASS
INTERMOUNTAIN REGION (2016)

Operation	Equipment Time (Hrs./Acre)	Cash and Labor Costs per Acre					Total Cost	Your Cost
		Labor Cost	Fuel	Lube & Repairs	Material Cost	Custom/ Rent		
Pre- Plant:								
Chisel Field (12-14in. depth)	0.09	3	1	1	0	0	5	
Disc Field (2x)	0.33	9	5	5	0	0	19	
Level Field (Tri-Plane 3x)	0.46	13	7	5	0	0	25	
Fertilize: Soil Test	0.00	0	0	0	0	1	1	
TOTAL PREPLANT COSTS	0.88	25	14	11	0	1	50	
Cultural:								
Plant Seed	0.16	4	2	2	53	0	61	
Fertilize (21-0-0-24)	0.00	0	0	0	29	8	37	
Irrigate	0.00	4	0	0	19	0	23	
Weed Control: Winter Herbicide	0.00	0	0	0	3	8	11	
TOTAL CULTURAL COSTS	0.16	9	2	2	104	16	132	
Interest on Operating Capital at 4.25%							1	
TOTAL OPERATING COSTS/ACRE	1.04	34	16	12	104	17	183	
CASH OVERHEAD:								
Liability Insurance (305 Acres)							3	
Office Expense							20	
GPS Fee							12	
Property Taxes							48	
Property Insurance							4	
Investment Repairs							24	
TOTAL CASH OVERHEAD COSTS/ACRE							111	
TOTAL CASH COSTS/ACRE							294	
NON-CASH OVERHEAD:								
		<u>Per Producing Acre</u>		<u>Annual Cost Capital Recovery</u>				
Fuel Tanks & Pumps		49		4			4	
Fuel Wagon		29		2			2	
Hay Barns - 500T each (3)		590		33			33	
Hay Land		4,000		150			150	
Shop Building		148		8			8	
Shop Tools		33		4			4	
Center Pivot w/out Corners (2)		333		18			18	
GPS Receivers (3)		18		2			2	
Equipment		220		18			18	
TOTAL NON-CASH OVERHEAD COSTS		5,420		240			240	
TOTAL COSTS/ACRE							533	

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TABLE 2. MATERIAL and INPUT COSTS to ESTABLISH ORCHARDGRASS
 INTERMOUNTAIN REGION (2016)

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
OPERATING COSTS					
Fertilizer:					29
21-0-0-24	42.00	Lb N	0.70		29
Herbicide:					3
2,4-D	1.50	Pint	2.05		3
Seed:					53
Orchardgrass Seed	15.00	Lb	3.50		53
Custom:					17
Soil Analysis (N,P,K)	0.02	Each	25.90		1
Ground Application Fertilizer	1.00	Acre	8.00		8
Ground Application Herbicide	1.00	Acre	8.00		8
Irrigation:					19
Water - Pumped	3.00	AcIn	6.25		19
Labor					38
Equipment Operator Labor	1.24	hrs	23.73		29
Irrigation Labor	0.25	hrs	16.79		4
Machinery					28
Fuel-Gas	0.00	gal	2.70		0
Fuel-Diesel	6.59	gal	2.43		16
Lube					2
Machinery Repair					10
Interest on Operating Capital @ 4.25%					1
TOTAL OPERATING COSTS/ACRE					183

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TABLE 3. HOURLY EQUIPMENT COSTS - ESTABLISHMENT YEAR
 INTERMOUNTAIN REGION (2016)

Yr.	Description	Orchardgrass Hours Used	Total Hours Used	COSTS PER HOUR						Total Costs/Hr.
				Cash Overhead			Operating			
				Capital Recovery	Insurance	Taxes	Lube & Repairs	Fuel	Total Operating Cost	
16	Tractor #1 - 130 HP4wd	341	1000	5.35	0.04	0.42	5.17	14.10	19.27	25.07
16	Grain drill	47	150	7.39	0.03	0.41	4.85	0.00	4.85	12.68
16	Chisel plow	28	100	8.42	0.05	0.63	4.16	0.00	4.16	13.26
16	Tri-Plane	137	150	10.67	0.07	0.80	5.73	0.00	5.73	17.26
16	Offset Disc 14'	98	200	16.11	0.07	0.89	8.40	0.00	8.40	25.47
16	ATV	1	285	2.05	0.01	0.12	0.89	1.80	2.69	4.87

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TABLE 4. COSTS PER ACRE to PRODUCE ORCHARDGRASS
 INTERMOUNTAIN REGION (2016)

Operation	Equipment Time (Hrs./A)	Cash & Labor Costs per Acre					Total Cost	Your Cost
		Labor Cost	Fuel	Lube & Repairs	Material Cost	Custom Rent		
Cultural:								
Weed Control - In-Field Application	0.00	0	0	0	4	8	12	
Fertilize	0.00	0	0	0	150	24	174	
Irrigate	0.00	32	0	0	188	0	219	
Pickup Truck Use	1.00	28	4	3	0	0	36	
ATV Use	0.50	14	1	0	0	0	16	
Soil Analysis	0.00	0	0	0	0	1	1	
TOTAL CULTURAL COSTS	1.50	74	5	4	342	33	457	
Harvest:								
Cut Hay	0.39	11	9	7	0	0	27	
Rake Hay	0.31	9	5	2	0	0	16	
Bale Hay	1.09	31	17	68	7	0	122	
Roadside, Store & Load Hay	0.00	0	0	0	0	77	77	
TOTAL HARVEST COSTS	1.78	51	31	77	7	77	242	
Interest on Operating Capital at 4.25%							0	
TOTAL OPERATING COSTS/ACRE	3.28	125	36	81	348	110	699	
CASH OVERHEAD:								
Liability Insurance (305 Acres)							3	
Office Expense							20	
GPS Fee							12	
Property Taxes							51	
Property Insurance							4	
Investment Repairs							24	
TOTAL CASH OVERHEAD COSTS/ACRE							114	
TOTAL CASH COSTS/ACRE							814	
NON-CASH OVERHEAD:								
		Per Producing Acre		Annual Cost Capital Recovery				
Fuel Tanks & Pumps		49		4			4	
Fuel Wagon		29		2			2	
Hay Barns - 500T each (3)		590		33			33	
Shop Building		148		8			8	
Shop Tools		33		4			4	
GPS Receivers (3)		18		2			2	
Hay Land		4,000		150			150	
Center Pivot w/out Corners (2)		333		18			18	
Hay Stand Establishment Cost		294		81			81	
Equipment		478		45			45	
TOTAL NON-CASH OVERHEAD COSTS		5,972		347			347	
TOTAL COSTS/ACRE							1,160	

UC COOPERATIVE EXTENSION – AGRICULTURAL ISSUES CENTER
TABLE 5. COSTS and RETURNS PER ACRE to PRODUCE ORCHARDGRASS
 INTERMOUNTAIN REGION (2016)

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS					
Orchardgrass Hay – 1 st Cutting	3.2	Ton	205.00	656	
Orchardgrass Hay – 2 nd Cutting	1.8	Ton	245.00	441	
Orchardgrass Hay – 3 rd Cutting	2.0	Ton	245.00	490	
TOTAL GROSS RETURNS	7.0	Ton		1,587	
OPERATING COSTS					
Fertilizer:					
Urea 46-0-0	300.00	Lb N	0.50	150	150
Herbicide:					
2,4-D	2.00	Pint	2.05	4	4
Custom:					
Ground Application - Herbicide	1.00	Acre	8.00	8	8
Ground Application - Fertilizer	3.00	Acre	8.00	24	24
Bale Weighing & Hauling	7.00	Ton	11.00	77	77
Soil Analysis (N,P,K)	0.02	Each	25.90	1	1
Harvest Aid:					
Bale Twine- 20,000'	0.33	Box	19.99	7	7
Irrigation:					
Water – Pumped	30.00	AcIn	6.25	188	188
Labor					
Equipment Operator Labor	3.94	hrs	23.73	94	94
Irrigation Labor	1.88	hrs	16.79	32	32
Machinery					
Fuel-Gas	1.83	gal	2.70	5	5
Fuel-Diesel	12.62	gal	2.43	31	31
Lube				5	5
Machinery Repair				76	76
Interest on Operating Capital @ 4.25%					0
TOTAL OPERATING COSTS/ACRE				699	
TOTAL OPERATING COSTS/TON				100	
NET RETURNS ABOVE OPERATING COSTS				888	
CASH OVERHEAD COSTS					
Liability Insurance (305 Acres)				3	3
Office Expense				20	20
GPS Auto-Trac Fee				12	12
Property Taxes				51	51
Property Insurance				4	4
Investment Repairs				24	24
TOTAL CASH OVERHEAD COSTS/ACRE				114	
TOTAL CASH COSTS/ACRE				814	
TOTAL CASH COSTS/TON				116	
NET RETURNS ABOVE CASH COSTS				773	
NON-CASH OVERHEAD COSTS (Capital)					
Fuel Tanks & Pumps				4	4
Fuel Wagon				2	2
Hay Barns - 500T each (3)				33	33
Shop Building				8	8
Shop Tools				4	4
GPS Receivers (3)				2	2
Hay Land				150	150
Center Pivot w/out Corners (2)				18	18
Hay Stand Establishment Cost				81	81
Equipment				45	45
TOTAL NON-CASH OVERHEAD COSTS/ACRE				347	
TOTAL NON-CASH OVERHEAD COSTS/TON				50	
TOTAL COST/ACRE				1,160	
TOTAL COST/TON				166	
NET RETURNS ABOVE TOTAL COST				427	

UC COOPERATIVE EXTENSION – AGRICULTURAL ISSUES CENTER
TABLE 6. MONTHLY CASH COSTS PER ACRE to PRODUCE ORCHARDGRASS
 INTERMOUNTAIN REGION (2016)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Cultural													
Weed Control - In Field Application				12									12
Fertilize				68		53	53						174
Irrigate				29	29	36	51	51	22				219
Pickup Truck Use			5	5	5	5	5	5	5				36
ATV Use			2	2	2	2	2	2	2				16
Soil Analysis			1			1							1
TOTAL CULTURAL COSTS			8	117	37	97	112	59	29				457
Harvest:													
Cut Hay						9	9		9				27
Rake Hay						5	5		5				16
Bale Hay						42	40		40				122
Roadside, Store & Load Hay						35	20		22				77
TOTAL HARVEST COSTS				0	0	91	74	0	77				242
Interest on Operating Capital @ 4.25%				0	1	1	-1	-1	0				0
TOTAL OPERATING COSTS/ACRE			8	117	37	189	185	58	105				699
Cash Overhead:													
Liability Insurance (305 Acres)			3										3
Office Expense			20										20
GPS Fee			12										12
Property Taxes			25						25				51
Property Insurance			2						2				4
Investment Repairs			3	3	3	3	3	3	3				24
TOTAL CASH OVERHEAD COSTS			66	3	3	3	3	3	31				114
TOTAL CASH COSTS/ACRE			74	121	41	193	188	61	136				814

UC COOPERATIVE EXTENSION – AGRICULTURAL ISSUES CENTER
TABLE 7. RANGING ANALYSIS
 INTERMOUNTAIN REGION (2016)

COSTS PER ACRE AND PER TON AT VARYING YIELDS TO PRODUCE ORCHARDGRASS

	YIELD(TON)						
	2.00	3.00	4.00	5.00	6.00	7.00	8.00
OPERATING COSTS/ACRE:							
Cultural	457	457	457	457	457	457	457
Harvest	192	208	225	242	259	275	292
Interest on Operating Capital @ 4.25%	0.19	0.16	0.12	0.08	0.04	0.00	-0.04
TOTAL OPERATING COSTS/ACRE	650	666	683	699	716	733	749
TOTAL OPERATING COSTS/TON	324.75	221.95	170.66	139.88	119.36	104.67	93.68
CASH OVERHEAD COSTS/ACRE							
CASH OVERHEAD COSTS/ACRE	114	114	114	114	114	114	114
TOTAL CASH COSTS/ACRE	764	780	797	814	830	847	864
TOTAL CASH COSTS/TON	381.83	260.01	199.19	162.71	138.38	120.98	107.95
NON-CASH OVERHEAD COSTS/ACRE							
NON-CASH OVERHEAD COSTS/ACRE	347	347	347	347	347	347	347
TOTAL COSTS/ACRE	1,110	1,127	1,144	1,160	1,177	1,194	1,210
TOTAL COSTS/TON	555.24	375.61	285.90	232.70	196.19	170.53	151.30

Net Return per Acre above Operating Costs for Orchardgrass

PRICE (\$/ton)	YIELD (ton /acre)						
Orchardgrass Hay	2.00	3.00	4.00	5.00	6.00	7.00	8.00
160.00	-330	-186	-43	101	244	387	531
185.00	-280	-111	57	226	394	562	731
210.00	-230	-36	157	351	544	737	931
235.00	-180	39	257	476	694	912	1,131
260.00	-130	114	357	601	844	1,087	1,331
285.00	-80	189	457	726	994	1,262	1,531
310.00	-30	264	557	851	1,144	1,437	1,731

Net Return per Acre above Cash Costs for Orchardgrass Hay

PRICE (\$/ton)	YIELD (ton /acre)						
Orchardgrass Hay	2.00	3.00	4.00	5.00	6.00	7.00	8.00
160.00	-444	-300	-157	-14	130	273	416
185.00	-394	-225	-57	111	280	448	616
210.00	-344	-150	43	236	430	623	816
235.00	-294	-75	143	361	580	798	1,016
260.00	-244	0	243	486	730	973	1,216
285.00	-194	75	343	611	880	1,148	1,416
310.00	-144	150	443	736	1,030	1,323	1,616

Net Return per Acre above Total Costs for Orchardgrass Hay

PRICE (\$/ton)	YIELD (ton /acre)						
Orchardgrass Hay	2.00	3.00	4.00	5.00	6.00	7.00	8.00
160.00	<u>-790</u>	<u>-647</u>	<u>-504</u>	<u>-360</u>	<u>-217</u>	<u>-74</u>	70
185.00	<u>-740</u>	<u>-572</u>	<u>-404</u>	<u>-235</u>	<u>-67</u>	101	270
210.00	<u>-690</u>	<u>-497</u>	<u>-304</u>	<u>-110</u>	83	276	470
235.00	<u>-640</u>	<u>-422</u>	<u>-204</u>	15	233	451	670
260.00	<u>-590</u>	<u>-347</u>	<u>-104</u>	140	383	626	870
285.00	<u>-540</u>	<u>-272</u>	<u>-4</u>	265	533	801	1,070
310.00	<u>-490</u>	<u>-197</u>	96	390	683	976	1,270

UC COOPERATIVE EXTENSION – AGRICULTURAL ISSUES CENTER
TABLE 8. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT and BUSINESS OVERHEAD COSTS
 INTERMOUNTAIN REGION (2016)

ANNUAL EQUIPMENT COSTS								
Yr.	Description	Price	Years Life	Salvage Value	Capital Recovery	Cash Overhead		Total
						Insurance	Taxes	
16	ATV	8,350	7	3,167	974	5	58	1,037
16	Rake - 20' Ctr Del	14,394	10	2,545	1,538	7	85	1,630
16	Pickup 1/2 Ton 2WD	30,000	6	12,370	3,800	18	212	4,029
16	Baler - #1 - small bales	36,557	10	6,896	3,870	18	217	4,106
16	Baler - #2 - small bales	36,557	10	6,896	3,870	18	217	4,106
16	Tractor #1 - 130 HP 4wd	117,421	16	21,031	8,909	58	692	9,660
16	Tractor #2 - 130 HP 4wd	117,421	16	21,031	8,909	58	692	9,660
16	Windrower/Swather 16'	133,764	15	12,842	11,168	62	733	11,963
	TOTAL	494,464	-	86,778	43,039	245	2,906	46,190
	60% of New Cost*	296,678	-	52,067	25,823	147	1,744	27,714

*Used to reflect a mix of new and used equipment

ANNUAL INVESTMENT COSTS								
Description	Price	Years Life	Salvage Value	Capital Recovery	Cash Overhead			Total
					Insurance	Taxes	Repairs	
INVESTMENT								
Fuel Tanks & Pumps	15,000	15	1,500	1,249	7	83	300	1,639
Fuel Wagon	8,950	15	627	759	4	48	179	990
Hay Barns - 500T each (3)	180,000	30	1,800	10,062	77	909	3,600	14,648
Shop Building	45,000	30	4,500	2,440	21	248	900	3,609
Shop Tools	10,000	10	700	1,159	5	54	200	1,417
GPS Receivers (3)	5,385	10	539	610	3	30	108	750
Hay Land	1,200,000	40	1,200,000	45,000	1,012	12,000	0	58,012
Center Pivot w/out Corners (2)	100,000	30	10,000	5,423	46	550	2,000	8,019
Hay Stand Establishment Cost	88,200	4	0	24,155	37	441	0	24,633
TOTAL INVESTMENT	1,652,535	-	1,219,666	90,858	1,211	14,361	7,287	113,717

ANNUAL BUSINESS OVERHEAD COSTS				
Description	Units/Farm	Unit	Price/Unit	Total Cost
Liability Insurance	305	Acre	3.31	1,010
Office Expense	305	Acre	20	6,100
GPS Fee	305	Acre	12	3,660

UC COOPERATIVE EXTENSION – AGRICULTURAL ISSUES CENTER
TABLE 9. HOURLY EQUIPMENT COSTS
 INTERMOUNTAIN REGION (2016)

COSTS PER HOUR										
Yr.	Description	Orchardgrass Hours Used	Total Hours Used	Cash Overhead			Operating			Total Costs/Hr.
				Capital Recovery	Insurance	Taxes	Lube & Repairs	Fuel	Total Operating Cost	
16	ATV	151	285	2.05	0.01	0.12	0.89	1.80	2.69	4.87
16	Rake - 20' Ctr Del	93	250	3.69	0.02	0.20	2.05	0.00	2.05	5.97
16	Pickup 1/2 Ton 2WD	300	300	7.60	0.04	0.42	3.45	4.05	7.50	15.56
16	Baler - #1 - small bales	163	200	11.61	0.05	0.65	113.13	0.00	113.13	125.45
16	Baler - #2 - small bales	163	200	11.61	0.05	0.65	0.00	0.00	0.00	12.32
16	Tractor #1 - 130 HP 4wd	281	1000	5.35	0.04	0.42	5.17	14.10	19.27	25.07
16	Tractor #2 - 130 HP 4wd	179	1000	5.35	0.04	0.42	5.17	14.10	19.27	25.07
16	Windrower/Swather 16'	128	200	33.50	0.19	2.20	16.30	21.15	37.46	73.35

UC COOPERATIVE EXTENSION – AGRICULTURAL ISSUES CENTER
TABLE 10. OPERATIONS WITH EQUIPMENT & MATERIALS (PRODUCTION ONLY)
 INTERMOUNTAIN REGION (2016)

Operation	Operation Month	Tractor	Implement	Labor Type/ Material	Rate/ acre	Unit
Weed Control - In-Field	Apr			2,4-D	2.00	Pint
				Ground Application - Herbicide	1.00	Acre
Fertilize	Apr			Urea 46-0-0	120.00	Lb. N
				Ground Application- Fertilizer	1.00	Acre
	June			Urea 46-0-0	90.00	Lb. N
				Ground Application- Fertilizer	1.00	Acre
	July			Urea 46-0-0	90.00	Lb. N
				Ground Application- Fertilizer	1.00	Acre
Irrigate	Apr			Irrigation Labor	0.25	hour
				Water - Pumped	4.00	AcIn
	May			Irrigation Labor	0.25	hour
				Water - Pumped	4.00	AcIn
	June			Irrigation Labor	0.31	hour
				Water - Pumped	5.00	AcIn
	July			Irrigation Labor	0.44	hour
				Water - Pumped	7.00	AcIn
	Aug			Irrigation Labor	0.44	hour
				Water - Pumped	7.00	AcIn
	Sept			Irrigation Labor	0.19	hour
				Water - Pumped	3.00	AcIn
Pickup Truck Use	Sept		Pickup 1/2 Ton 2WD	Equipment Operator Labor	1.20	hours
ATV Use	Sept		ATV	Equipment Operator Labor	0.60	hour
Soil Analysis	March		ATV	Equipment Operator Labor	0.00	hour
				Soil Analysis (N,P,K)	0.02	Each
Cut Hay	June		Windrower/Swather 16'	Equipment Operator Labor	0.15	hour
	July		Windrower/Swather 16'	Equipment Operator Labor	0.15	hour
	Sept		Windrower/Swather 16'	Equipment Operator Labor	0.15	hour
Rake Hay	June	Tractor #1 - 130 HP 4wd	Rake - 20' Ctr Del	Equipment Operator Labor	0.12	hour
	July	Tractor #1 - 130 HP 4wd	Rake - 20' Ctr Del	Equipment Operator Labor	0.12	hour
	Sept	Tractor #1 - 130 HP 4wd	Rake - 20' Ctr Del	Equipment Operator Labor	0.12	hour
Bale Hay	June	Tractor #1 - 130 HP 4wd	Baler - #1 - small bales	Equipment Operator Labor	0.22	hour
	July	Tractor #1 - 130 HP 4wd	Baler - #1 - small bales	Equipment Operator Labor	0.22	hour
	Sept	Tractor #1 - 130 HP 4wd	Baler - #1 - small bales	Equipment Operator Labor	0.22	hour
	June	Tractor #2 - 130 HP 4wd	Baler - #2 - small bales	Equipment Operator Labor	0.22	hour
				Bale Twine- 20,000'	0.15	Box
	July	Tractor #2 - 130 HP 4wd	Baler - #2 - small bales	Equipment Operator Labor	0.22	hour
				Bale Twine- 20,000'	0.09	Box
	Sept	Tractor #2 - 130 HP 4wd	Baler - #2 - small bales	Equipment Operator Labor	0.22	hour
				Bale Twine- 20,000'	0.09	Box
Roadside, Store & Load	June			Bale Weighing & Hauling	3.20	Ton
	July			Bale Weighing & Hauling	1.80	Ton
	Sept			Bale Weighing & Hauling	2.00	Ton