2009 Cost of Producing Alfalfa Hay Under Center Pivot Irrigation in the Columbia Basin of Washington State

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2009 COST OF PRODUCING ALFALFA HAY UNDER CENTER PIVOT IRRIGATION IN THE COLUMBIA BASIN OF WASHINGTON STATE

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INTRODUCTION

The enterprise budgets presented in this publication are based on alfalfa produced on irrigated land in the Bureau of Reclamation's Columbia Basin Project. The project area is in the Big Bend of the Columbia River in south central Washington. Since rainfall ranges from 6 to 10 inches annually here, crops depend on irrigation water pumped from behind the Grand Coulee Dam. Irrigation water availability coupled with a growing season of 150 to 200 days make it possible to grow numerous crops.

Alfalfa hay is one of the most important agricultural crops grown in the Columbia Basin. The combined irrigated production of Adams, Benton, Franklin, Grant, and Yakima counties in 2006 totaled 1.6 million tons valued at greater than $205 million, 51.5% of Washington State's total production of alfalfa hay.[2]

The goal of this study was to develop enterprise budgets for production of both 1-ton and 80-lb (2-tie) alfalfa bales under two different assumptions: harvesting operations performed by custom operators and harvesting operations performed by owner-operators. The specific objectives include:

1. Describe production practices representative of well-managed alfalfa enterprises grown under center pivot irrigation systems within the Columbia Basin from Stratford south to the Tri-Cities.
2. Provide estimates of capital requirements, production costs, and returns.
3. Present procedures for analyzing the potential profitability of growing alfalfa hay for current and prospective producers.

BUDGET ASSUMPTIONS

The following assumptions were made in developing the alfalfa enterprise budgets:

1. Alfalfa is grown under one or more 125-acre center pivot irrigation systems.
2. The land rental rate is $400/acre. (Rental rates can be changed in the accompanying spreadsheet budget.)
3. The landowner furnishes the center pivot irrigation system while the operator pays an irrigation charge of $45 per acre and annual repairs of $25 per acre per year. The operator also pays an irrigation power charge of approximately $48 per acre for pumping out of the irrigation canal. (Power costs are higher for those producers pumping from deep wells.)
4. Labor for irrigation takes 0.85 hours per acre per year.
5. All labor costs are $20.00/hour. (This value can be changed in the accompanying spreadsheet.)
6. The annual yield is 8 tons per acre and there are four cuttings of hay per year.
7. Hay prices received at the farm are $200/ton for large 1-ton bales and $220/ton for the smaller (2-tie) bales. (These prices can be changed in the accompanying spreadsheet. Breakeven prices at differing yield levels and breakeven yields at differing

[1]Authorship is equally shared among the four authors, all formerly or currently at Washington State University: Herbert Hinman (retired) was an Extension Economist; John Kugler (retired) was an agronomy educator for Grant and Adams counties; Kate Painter was an analyst for the Center for Sustaining Agriculture and Natural Resources; and Phil Petersen is an agronomy educator for Franklin County.

[2]2007 Washington Agricultural Statistics.

price levels are presented at the end of each enterprise budget.)

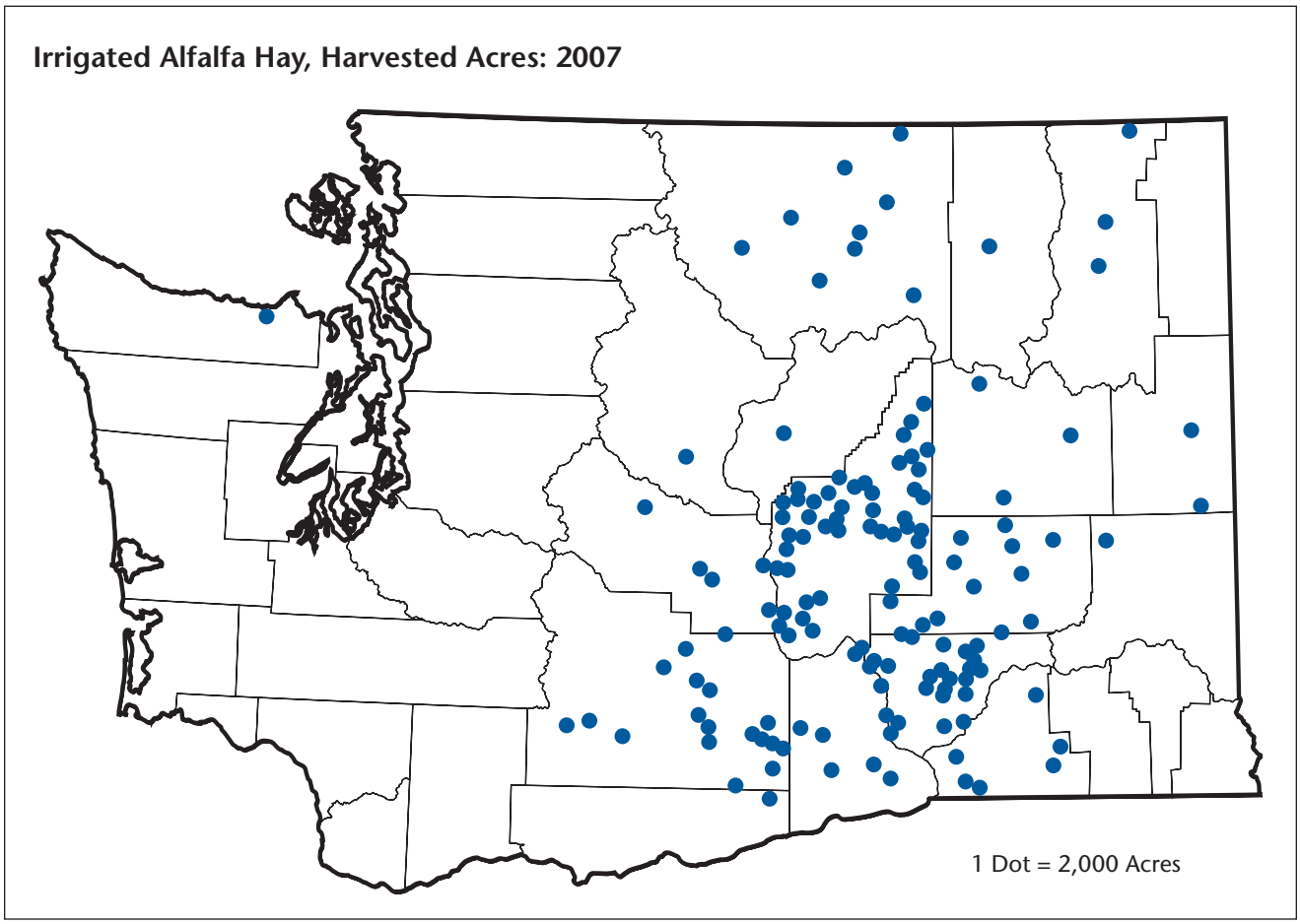
8. The interest rate is 7.5% for operating loans, machinery loans, and the use of equity capital. (The interest rate on operating loans and equity operating capital can be changed in the spreadsheet.)

9. After the establishment year, there are three more years of alfalfa production.

SOURCES OF INFORMATION AND BUDGET RESULTS

Columbia Basin producers considered representative of well-managed farms provided the data for this study. Local farm service agencies and farm suppliers provided service and material costs. Machinery costs for crop establishment and production were based on current purchase prices and current custom rates as of September 2008.

The budgets reported in this study are economic in that all opportunity costs are included. This means that interest is charged for both borrowed and equity-financed capital. In addition, labor and management charges are applied to unpaid operator labor and management. Since much of the land used for production is rented, typical cash rent in this growing region is used to determine the charges for land and use of the center pivot irrigation system. Even if growers were to produce a crop on land they own, the prevailing rental rate represents an opportunity cost or foregone return for not renting out the land and center pivot system.



2007 Census of Agriculture

Alfalfa can be produced by hiring a custom haying operator to cut, rake, swath, bale, and stack the hay. Alternatively, producers may perform all the haying operations themselves using their own equipment. Some producers contract only certain haying operations. These choices depend on the types of labor, management, and machinery available on each farm. The costs of producing alfalfa for the first two types of operations are presented here.

Producers may look at the results of this study and say that they can farm less expensively because they own their land, provide much of the labor, all the management, and pay little or no interest. However, if operators do not take fair compensation into consideration for their investments in the alfalfa production process, they are not getting an accurate assessment of its costs and profitability. Returns over and above the costs reported in an economic budget are considered profit, or compensation for taking the risk of producing alfalfa.

In order for producers to convert these economic budgets to financial budgets that reflect their actual cash costs of producing alfalfa, all opportunity costs need to be removed.

The budget information for alfalfa as described above is reported in the following set of 14 tables, for which summaries are provided directly below.

Table 1: Summary of Returns for Producing 2-Tie and 1-Ton Alfalfa Bales Under Different Management Scenarios ($/acre). Table 1 presents a summary of all the enterprise budgets produced for this report, including the costs of establishment and production for small (2-tie) bales as well as large (1-ton) bales under custom haying and owner-operator management assumptions. Total revenue, variable and total costs, and returns over variable and total costs are listed under the given yield and price assumptions. Figure 1 presents a graphical summary of returns over variable and total costs for small and large bales under both management scenarios. However, it is important to note that the price and yield assumptions can be varied on the accompanying spreadsheet, and this will correspondingly update all of the subsequent calculations.

The results in Table 1 show that alfalfa producers who harvest their own crop(s) can realize a higher return for their production at $469 per acre for 2-tie bales and $308 per acre for 1-ton bales than operators who hire custom harvesters. Growers who hire others to swath, rake, bale, and stack their alfalfa will have lower net returns at $400 per acre for 2-tie bales and $234 per acre for 1-ton bales, a difference of $69 per acre for 2-tie bales and $74 for 1-ton bales.

The relatively large difference in net returns for 2-tie bales compared to 1-ton bales is mainly a result of the assumed price differential of $20 per ton, with 2-tie bales selling at $220 per ton and 1-ton bales selling for $200 per ton. Small bales typically sell for a premium to recreational horse owners and small ranches, but the market is larger for 1-ton bales because of the extensive quantities feedlots and large ranches require. Over four harvests, this price differential sums to $160 per acre.

There are also small differences in harvesting costs, both for custom operators and owner-operators. Under these yield and price assumptions, alfalfa enterprises conducting their own haying operations are covering all cash costs while receiving a 7.5% return on equity capital invested in the enterprise, $20/hour for operator labor, $50/acre for operator management, and $400/acre rent for land and center pivot irrigation. Their per-acre profit values represent returns for the risk of investing in the enterprise.

Table 2: Input Cost Assumptions for Producing Alfalfa Hay in the Columbia Basin in 2008. The input cost table lists prices for fuel, seed, fertilizers, pesticides, labor, land rent, and interest rates. These values can be changed on the accompanying spreadsheet, and all production cost tables and the summary table will reflect the new prices. This feature is especially useful given the recent volatility in the agricultural sector.

Tables 3, 5, 7, 9, and 11: Schedules of Operations for Establishing and Producing Alfalfa Hay Following Wheat or Barley in the Columbia Basin with Center Pivot Irrigation. These five tables outline the farming operations for each of the enterprise budgets in Tables 4, 6, 8, 10, and 12. The timing, type of machinery, and specific materials or services are listed for each operation.

Tables 4, 6, 8, 10, and 12: Costs of Production for Establishing and Producing Alfalfa Hay Following Wheat or Barley in the Columbia Basin with Center Pivot Irrigation. These five tables list all the variable and fixed costs by category for establishing (Table 4) and producing alfalfa for custom operations (Tables 6 and 8) and owner-operator operations (Tables 10 and 12) for both 2-tie (Tables 6 and 10) and 1-ton bales (Tables 8 and 12).

Tables 13 and 14: Machinery Complement Assumptions and Machinery Costs per Acre for Producing Alfalfa Hay in the Columbia Basin in 2008. The machinery complement is based on producer interviews of growers in this region. Machinery costs per acre were derived using the University of Idaho's Machinery Cost Analysis computer program. For further information on this program and details about the underlying calculations, click on "Help" in the program's function bar at http://www.ag.uidaho.edu/aers/r_machcost_inst.htm. Except for the custom hire figures, the machine costs were used to develop the budgets in this report. Custom harvesting costs are based on information obtained from producers and custom operators in the area.

Figure 1. Returns over Variable and Total Costs for Producing 2-tie and 1-ton Alfalfa Bales Under Different Management Scenarios

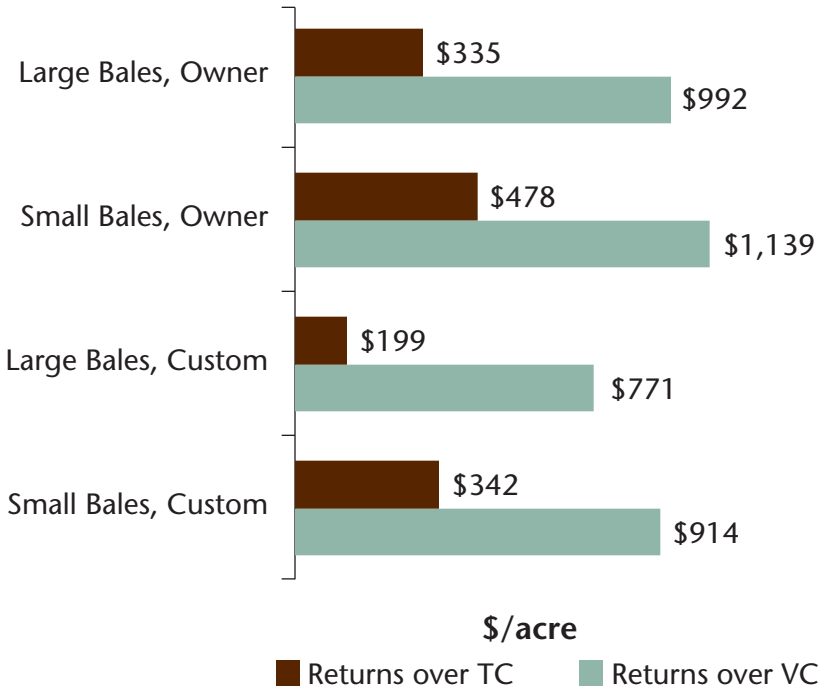


Table 1. Summary of Returns for Producing 2-tie and 1-ton Alfalfa Bales Under Different Management Scenarios

By Crop:	Unit	Yield per acre	Price per unit	Revenue per acre ($/acre)	Total Cost (TC) ($/acre)	Returns over TC ($/acre)	Total Variable Costs (VC) ($/acre)	Returns over VC ($/acre)
Establishment Costs, Custom or Owner-Operator	ton			$0	$415	**-$415**	$235	-$235
Small (2-tie) Bale Production, Custom	ton	8	$220	$1,760	$1,418	**$342**	$846	$914
Large (1-ton) Bale Production, Custom	ton	8	$200	$1,600	$1,401	**$199**	$829	$771
Small (2-tie) Bale Production, Owner-Operator	ton	8	$220	$1,760	$1,282	**$478**	$621	$1,139
Large (1-ton) Bale Production, Owner-Operator	ton	8	$200	$1,600	$1,265	**$335**	$608	$992

Table 2. Input Cost Assumptions for Producing Alfalfa in the Columbia Basin in 2009

	Unit	Price/unit
Fuel:		
Off-Road Diesel[1]	gal	$2.00
Gas	gal	$2.25
Seed:		
Alfalfa seed	lb	$3.00
Fertilizer:		
Dry Nitrogen	lb	$0.49
Dry Phosphate	lb	$1.17
Potash	lb	$0.70
Dry Sulfur	lb	$0.38
Pesticides:		
Eptam 7E	qt	$9.29
Malathion 5EC	qt	$7.95
Sencor 4L	qt	$23.75
Gopher control	acre	$6.00
Labor:		
Hourly machine labor[2]	hour	$20.00
Land Cost:		
Cash rent	hour	$400.00
Interest Rates:		
Operating loan	percent	8.0%
Machinery loan	percent	7.5%

[1]Price is for bulk delivery to farm.
[2]Includes all applicable state and federal taxes.

Table 3. Schedule of Operations for Establishing Alfalfa Hay Following Wheat or Barley in the Columbia Basin with Center Pivot Irrigation

Month	Operation	Tooling	Materials/Service
Fall	Irrigation	Center Pivot Leased with Land	$12 Power, $11.25 Water, $4.25 Labor, $6.25/Acre Repair (25% Annual Cost)
August	Disc & Pack	250HP-WT, 26' Tandem Disk & Pack	
August	Soil Test	Custom	$0.30/Acre
August	Fertilizer	Custom Ground Application	$7.50/Acre, Fertilizer approximately $100/Acre
August	Disc Ripper	250HP-WT, 17.5' Disc Ripper	
August	Seedbed Maker	150HP-WT, 20' Seedbed Maker	
August	Plant	150HP-WT, 20' Double Disc Drill	20 lbs Alfalfa Seed @ $3/lb
August	Herbicide Spray	Custom Ground Application	$7.50/Acre, Herbicide approximately $12/Acre
August	Insecticide Spray	Custom Aerial Application	$7.50/Acre, Insecticide approximately $7/Acre

Table 4. Production Costs for Establishing Alfalfa Hay Following Wheat or Barley in the Columbia Basin with Center Pivot Irrigation

Item	Quantity Per Acre	Unit	Price or Cost	_____ Value or _____ Cost/Acre	
VARIABLE COSTS					
Seed:				**$60.00**	
Alfalfa Seed	20	lb	$3.00		$60.00
Fertilizer:				**$181.75**	
Base your rate on your soil test results.					
A typical recommendation might include the following:					
Dry Nitrogen (N)	25	lb	$0.49		$12.25
Dry Phosphate (P)	100	lb	$1.17		$117.00
Dry Potash (K)	75	lb	$0.70		$52.50
Pesticides:				**$19.00**	
Rates & chemicals will depend on the pests in your crop. *Consult a certified pesticide applicator or the PNW Pest Control Management Guides.*					
The following cost estimates are typical:					
Herbicide	1	acre	$12.00		$12.00
Insecticide	1	acre	$7.00		$7.00

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Table 4. (continued)

Item	Quantity Per Acre	Unit	Price or Cost	Value or Cost/Acre	
Custom & Consultants:				**$22.80**	
Soil Test	1	acre	$0.30		$0.30
Fertilizer Ground Application	1	acre	$7.50		$7.50
Herbicide Ground Application	1	acre	$7.50		$7.50
Insecticide Aerial Application	1	acre	$7.50		$7.50
Irrigation:				**$33.75**	
Irrigation Power-CP	1	acre	$12.00		$12.00
Water Access	1	acre	$11.25		$11.25
Irrigation Repairs	1	acre	$6.25		$6.25
Irrigation Labor-CP	1	acre	$4.25		$4.25
Other:				**$33.70**	
Fuel	6.30	gal	$2.00		$12.59
Lubricants	1	acre	$2.22		$2.22
Machinery Repairs	1	acre	$7.89		$7.89
Storage Facility & Equip. Repairs					$0.00
Machinery Labor	0.55	acre	$20.00		$11.00
Other Labor					$0.00
Overhead					$17.55
Operating Interest					$14.04
Total Variable Costs					**$382.59**
FIXED COSTS					
Machinery depreciation					$17.09
Machinery interest					$10.57
Machinery insurance, taxes housing, licenses					$4.13
Land Cost					$0.00
Total Fixed Costs					**$31.79**
Fixed Costs per Unit					
Total Costs per Acre					**$414.38**
Total Cost per Unit					

Notes: Straw removal costs from the prior grain crop as well as all fixed costs associated with land are allocated to the preceding crop.

Table 5. Schedule of Operations for Producing Small (2-tie) Bales of Alfalfa Hay Following Wheat or Barley in the Columbia Basin with Center Pivot Irrigation and Custom Haying

Calendar	Operation	Tooling	Materials/Service
February	Soil Test	Custom	$0.30/Acre
March	Fertilizer	Custom Ground Application	$7.50/Acre, Fertilizer $100/Acre approximately
March	Weed Control	Custom Ground Application	$7.50/Acre, Herbicide $28/Acre approximately
Seasonal	Irrigation	Center Pivot	$48/Acre Power, $45 Water, .85 hrs of Labor, $25/Acre Repair
4X	Swath Hay	Custom	$18/Acre, 2 Tons/Acre per Swathing
4X	Rake Hay	Custom	$9.50/Acre, 2 Tons/Acre per Raking
4X	Bale Hay	Custom	$17/Ton for Small Bales
4X	Haul and Stack	Custom	$9/Ton for Small Bales
4X	Tarp Hay	Rental	$4/Ton

Table 6. Production Costs for Small (2-tie) Bales of Alfalfa Hay Following Wheat or Barley in the Columbia Basin with Center Pivot Irrigation and Custom Haying

Item	Quantity Per Acre	Unit	Price or Cost	Value or Cost/Acre
GROSS RETURNS				
Alfalfa Hay	8	ton	$220.00	$1,760.00
VARIABLE COSTS				
Fertilizer:				**$183.07**
Base your rate on your soil test results.				
A typical recommendation might include the following:				
Dry Nitrogen (N)	20	lb	$0.49	$9.80
Dry Phosphate (P)	100	lb	$1.17	$117.00
Dry Potash (K)	75	lb	$0.70	$52.50
Dry Sulfur (S)	10	lb	$0.38	$3.77
Pesticides:				**$15.85**
Consult a certified pesticide applicator or the PNW Pest Control Management Guides.				
Common pesticides for alfalfa include the following:				
Malathion 5EC	0.5	qt	$7.95	$3.98
Sencor 4L	0.5	qt	$23.75	$11.88

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Table 6. (continued)

Item	Quantity Per Acre	Unit	Price or Cost	Value or Cost/Acre
Custom & Consultants				**$333.30**
Soil Test	1	acre	$0.30	$0.30
Fertilizer Ground Application	1	acre	$7.50	$7.50
Herbicide Ground Application	1	acre	$7.50	$7.50
Swath	4	acre	$18.00	$72.00
Rake	4	acre	$9.50	$38.00
Bale	8	ton	$17.00	$136.00
Haul and Stack	8	ton	$9.00	$72.00
Tarping (rental)	8	ton	$4.00	$32.00
Irrigation:				**$135.00**
Irrigation Power-CP	1	acre	$48.00	$48.00
Water Access	1	acre	$45.00	$45.00
Irrigation Repairs	1	acre	$25.00	$25.00
Irrigation Labor-CP	0.85	acre	$20.00	$17.00
Other:				**$79.16**
Crop insurance	8	ton	$2.00	$16.00
Gopher control	1	acre	$6.00	$6.00
Management	1	acre	$50.00	$50.00
Fuel	2.28	gal	$2.00	$4.56
Lubricants	1	acre	$0.80	$0.80
Machinery Repairs	1	acre	$1.80	$1.80
Storage Facility & Equip. Repairs				$0.00
Overhead				$37.32
Operating Interest				$29.86
Total Variable Costs				**$845.55**
Variable Costs per Unit				$105.69
Net Returns Above Variable Costs				**$914.45**
FIXED COSTS				
Machinery depreciation				$5.42
Machinery interest				$3.08
Machinery insurance, taxes housing, licenses				$2.79
Establishment Cost				$160.79
Land Cost	1	acre	$400.00	$400.00
Total Fixed Costs				**$572.08**
Fixed Costs per Unit				$71.51
Total Costs per Acre				**$1,417.64**
Total Cost per Unit				$177.20
Returns to Risk				**$342.36**

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Table 6. (continued)

BREAKEVEN ANALYSIS

	– 10%	Base Yield	+ 10%
PRICE	7.2	8	8.4
Operating Cost Breakeven	117	106	101
Ownership Cost Breakeven	79	72	68
Total Cost Breakeven	197	177	169
		Base Price	
YIELD	$198.00	$220.00	$242.00
Operating Cost Breakeven	4.3	3.8	3.5
Ownership Cost Breakeven	2.9	2.6	2.4
Total Cost Breakeven	7.2	6.4	5.9

Table 7. Schedule of Operations for Producing Large (1-ton) Bales of Alfalfa Hay Following Wheat or Barley in the Columbia Basin with Center Pivot Irrigation and Custom Haying

Calendar	Operation	Tooling	Materials/Service
February	Soil Test	Custom	$0.30/Acre
March	Fertilizer	Custom Ground Application	$7.50/Acre, Fertilizer approximately $100/Acre
March	Weed Control	Custom Ground Application	$7.50/Acre, Herbicide approximately $28/Acre
Season	Irrigation	Center Pivot	$48/Acre Power, $45 Water, .85 Hrs. of Labor, $25/Acre Repairs
4X	Swath Hay	Custom	$18/Acre, 2 Tons/Acre per Swathing
4X	Rake Hay	Custom	$9.50/Acre, 2 Tons/Acre per Raking
4X	Bale Hay	Custom	$18/Ton for 1-ton Bales
4X	Haul and Stack	Custom	$4/Ton for 1-ton Bales
4X	Tarp Hay	Rental	$4/Ton for 1-ton Bales

Table 8. Production Costs for Large (1-ton) Bales of Alfalfa Hay Following Wheat or Barley in the Columbia Basin with Center Pivot Irrigation and Custom Haying

Item	Quantity Per Acre	Unit	Price or Cost	Value or Cost/Acre
GROSS RETURNS				
Alfalfa Hay	8	ton	$200.00	$1,600.00
VARIABLE COSTS				
Fertilizer:				**$183.07**
Base your rate on your soil test results.				
A typical recommendation might include the following:				
Dry Nitrogen (N)	20	lb	$0.49	$9.80
Dry Phosphate (P)	100	lb	$1.17	$117.00
Dry Potash (K)	75	lb	$0.70	$52.50
Dry Sulfur (S)	10	lb	$0.38	$3.77
Pesticides:				**$15.85**
Consult a certified pesticide applicator or the PNW Pest Control Management Guides.				
Common pesticides for alfalfa include the following:				
Malathion 5EC	0.5	qt	$7.95	$3.98
Sencor 4L	0.5	qt	$23.75	$11.88
Custom & Consultants:				**$333.30**
Soil Test	1	acre	$0.30	$0.30
Fertilizer Ground Application	1	acre	$7.50	$7.50
Herbicide Ground Application	1	acre	$7.50	$7.50
Swath	4	acre	$18.00	$72.00
Rake	4	acre	$9.50	$38.00
Bale	8	ton	$18.00	$144.00
Haul and Stack	8	ton	$4.00	$32.00
Tarping (rental)	8	ton	$4.00	$32.00
Irrigation:				**$135.00**
Irrigation Power-CP	1	acre	$48.00	$48.00
Water Access	1	acre	$45.00	$45.00
Irrigation Repairs	1	acre	$25.00	$25.00
Irrigation Labor-CP	0.85	acre	$20.00	$17.00
Other:				**$93.16**
Baling Twine	8	ton	$1.75	$14.00
Crop insurance	8	acre	$2.00	$16.00
Gopher control	1	acre	$6.00	$6.00
Management	1	acre	$50.00	$50.00
Fuel	2.28	gal	$2.00	$4.56
Lubricants	1	acre	$0.80	$0.80
Machinery Repairs	1	acre	$1.80	$1.80
Storage Facility & Equip. Repairs				$0.00
Other Labor				$0.00

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Table 8. (continued)

Item	Quantity Per Acre	Unit	Price or Cost	Value or Cost/Acre
Overhead				$38.02
Operating Interest				$30.42
Total Variable Costs				**$828.81**
Variable Costs per Unit				$103.60
Net Returns Above Variable Costs				**$771.19**
FIXED COSTS				
Machinery depreciation				$5.42
Machinery interest				$3.08
Machinery insurance, taxes housing, licenses				$2.79
Establishment Cost				$160.79
Land Cost	1	acre	$400.00	$400.00
Total Fixed Costs				**$572.08**
Fixed Costs per Unit				$71.51
Total Costs per Acre				**$1,400.90**
Total Cost per Unit				$175.11
Returns to Risk				**$199.10**

BREAKEVEN ANALYSIS

	– 10%	Base Yield	+ 10%
PRICE	7.2	8	8.4
Operating Cost Breakeven	115	104	99
Ownership Cost Breakeven	79	72	68
Total Cost Breakeven	195	175	167

		Base Price	
YIELD	$180.00	$200.00	$220.00
Operating Cost Breakeven	4.6	4.1	3.8
Ownership Cost Breakeven	3.2	2.9	2.6
Total Cost Breakeven	7.8	7.0	6.4

Table 9. Schedule of Operations for Producing Small (2-tie) Bales of Alfalfa Hay Following Wheat or Barley in the Columbia Basin with Center Pivot Irrigation and Owner-Operator Management

Calendar	Operation	Tooling	Materials/Service
February	Soil Test	Custom	$0.30/Acre
March	Fertilizer	Custom Ground Application	$7.50/Acre
March	Weed Control	Custom Ground Application	$7.50/Acre
Season	Irrigation	Center Pivot	$48/Acre Power, $45 Water, .85 Hrs. of Labor, $25/Acre Repairs
4X	Swath Hay	Self-Propelled Windrower	
4X	Rake Hay	150HP-WT, 20' Side Delivery Rake	
4X	Bale Hay	150HP-WT, 2-Tie Baler	
4X	Haul and Stack	Self-Propelled Bale Wagon	
4X	Tarp Hay	Rental	$4/Ton

Table 10. Production Costs for Alfalfa Hay Following Wheat or Barley in the Columbia Basin, Center Pivot Irrigation, Small (2-tie) Bales, Owner-Operator Management

Item	Quantity Per Acre	Unit	Price or Cost	_____ Value or _____ Cost/Acre
GROSS RETURNS				
Alfalfa Hay	8	ton	$200.00	$1,760.00
VARIABLE COSTS				
Fertilizer:				**$173.27**
Base your rate on your soil test results.				
A typical recommendation might include the following:				
Dry Nitrogen (N)	20	lb	$0.49	$9.80
Dry Phosphate (P)	100	lb	$1.17	$117.00
Dry Potash (K)	75	lb	$0.70	$52.50
Dry Sulfur (S)	10	lb	$0.38	$3.77
Pesticides:				**$15.85**
Rates & chemicals will depend on the pests in your crop.				
Consult a certified pesticide applicator or the PNW Pest Control Management Guides.				
Common pesticides for alfalfa include the following:				
Malathion 5EC	0.5	qt	$7.95	$3.98
Sencor 4L	0.5	qt	$23.75	$11.88
Custom & Consultants:				**$22.80**
Soil Test	1	acre	$0.30	$0.30
Fertilizer Ground Application	1	acre	$7.50	$7.50
Herbicide Ground Application	1	acre	$7.50	$7.50
Insecticide Ground Application	1	acre	$7.50	$7.50
Irrigation:				**$135.00**
Irrigation Power-CP	1	acre	$48.00	$48.00
Water Access	1	acre	$45.00	$45.00
Irrigation Repairs	1	acre	$25.00	$25.00
Irrigation Labor-CP	0.85	acre	$20.00	$17.00
Other:				**$101.15**
Baling Twine	8	ton	$3.85	$30.80
Crop insurance	8	acre	$2.00	$16.00
Gopher control	1	acre	$6.00	$6.00
Tarping	8	ton	$4.00	$32.00
Management	1	acre	$50.00	$50.00
Fuel	14.59	gal	$2.00	$29.18
Lubricants	1	acre	$5.15	$5.15
Machinery Repairs	1	acre	$22.52	$22.52
Storage Facility & Equip. Repairs				$0.00
Machinery Labor	1.93	acre	$20.00	$38.60
Other Labor				$0.00

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Table 10. (continued)

Item	Quantity Per Acre	Unit	Price or Cost	Value or Cost/Acre
Overhead				$15.65
Operating Interest				$12.52
Total Variable Costs				**$620.85**
Variable Costs per Unit				$77.61
Net Returns Above Variable Costs				**$1,139.15**
FIXED COSTS				
Machinery depreciation				$56.38
Machinery interest				$31.56
Machinery insurance, taxes housing, licenses				$12.75
Establishment Cost*				$160.79
Land Cost	1	acre	$400.00	$400.00
Total Fixed Costs				**$661.48**
Fixed Costs per Unit				$82.69
Total Costs per Acre				**$1,282.33**
Total Cost per Unit				$160.29
Returns to Risk				**$477.67**

BREAKEVEN ANALYSIS

	– 10%	Base Yield	+ 10%
PRICE	7.2	8	8.4
Operating Cost Breakeven	86	78	74
Ownership Cost Breakeven	92	83	79
Total Cost Breakeven	178	160	153
		Base Price	
YIELD	$198.00	$220.00	$242.00
Operating Cost Breakeven	3.1	2.8	2.6
Ownership Cost Breakeven	3.3	3.0	2.7
Total Cost Breakeven	6.5	5.8	5.3

*Establishment costs are amortized over the productive life of the stand, which is assumed to be 3 years at an 8% interest rate.

Table 11. Schedule of Operations for Producing Large (1-ton) Bales of Alfalfa Hay Following Wheat or Barley in the Columbia Basin with Center Pivot Irrigation and Owner-Operator Management

Calendar	Operation	Tooling	Materials/Service
February	Soil Test	Custom	$0.30/Acre
March	Fertilizer	Custom Ground Application	$7.50/Acre, Fertilizer $100/Acre
March	Weed Control	Custom Ground Application	$7.50/Acre, Herbicide $10.75/Acre
Season	Irrigation	Center Pivot	$48/Acre Power, $45 Water, .85 Hrs. of Labor, $25/Acre Repairs
4X	Swath Hay	Self-Propelled Windrower	
4X	Rake Hay	150HP-WT, 20' Side Delivery Rake	
4X	Bale Hay	150HP-WT, 1500-lb Baler	
4X	Haul and Stack	Self-Propelled Bale Wagon	
4X	Tarp Hay	Rental	$4/Ton for 1-ton Bales

Table 12. Production Costs for Large (1-ton) Bales of Alfalfa Hay Following Wheat or Barley in the Columbia Basin with Center Pivot Irrigation and Owner-Operator Management

Item	Quantity Per Acre	Unit	Price or Cost	Value or Cost/Acre
GROSS RETURNS				
Alfalfa Hay	8	ton	$200.00	$1,600.00
Fertilizer:				**$173.27**
Base your rate on your soil test results.				
A typical recommendation might include the following:				
Dry Nitrogen (N)	20	lb	$0.49	$9.80
Dry Phosphate (P)	100	lb	$1.17	$117.00
Dry Potash (K)	75	lb	$0.70	$52.50
Dry Sulfur (S)	10	lb	$0.38	$3.77
Pesticides:				**$15.85**
Rates & chemicals will depend on the pests in your crop.				
Consult a certified pesticide applicator or the PNW Pest Control Management Guides.				
Common pesticides for alfalfa include the following:				
Malathion 5EC	0.5	qt	$7.95	$3.98
Sencor 4L	0.5	qt	$23.75	$11.88
Custom & Consultants:				**$22.80**
Soil Test	1	acre	$0.30	$0.30
Fertilizer Ground Application	1	acre	$7.50	$7.50
Herbicide Ground Application	1	acre	$7.50	$7.50
Insecticide Ground Application	1	acre	$7.50	$7.50
Irrigation:				**$135.00**
Irrigation Power-CP	1	acre	$48.00	$48.00
Water Access	1	acre	$45.00	$45.00
Irrigation Repairs	1	acre	$25.00	$25.00
Irrigation Labor-CP	0.85	acre	$20.00	$17.00
Other:				**$188.62**
Bailing Twine	8	ton	$1.75	$14.00
Crop insurance	8	ton	$2.00	$16.00
Gopher control	1	acre	$6.00	$6.00
Tarping	8	ton	$4.00	$32.00
Management	1	acre	$50.00	$50.00
Fuel	13.49	gal	$2.00	$26.98
Lubricants	1	acre	$4.76	$4.76
Machinery Repairs	1	acre	$19.28	$19.28
Storage Facility & Equip. Repairs				$0.00
Machinery Labor	1.68	acre	$20.00	$33.60
Other Labor				$0.00

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Table 12. (continued)

Item	Quantity Per Acre	Unit	Price or Cost	Value or Cost/Acre
Overhead				$26.78
Operating Interest				$21.42
Total Variable Costs				**$607.54**
Variable Costs per Unit				$75.94
Net Returns Above Variable Costs				**$992.46**
FIXED COSTS				
Machinery depreciation				$54.50
Machinery interest				$30.08
Machinery insurance, taxes housing, licenses				$12.11
Establishment Cost*				$160.79
Land Cost	1	acre	$400.00	$400.00
Total Fixed Costs				**$657.48**
Fixed Costs per Unit				$82.19
Total Costs per Acre				**$1,265.02**
Total Cost per Unit				$158.13
Returns to Risk				**$334.98**

BREAKEVEN ANALYSIS

	– 10%	Base Yield	+ 10%
PRICE	7.2	8	8.4
Operating Cost Breakeven	84	76	72
Ownership Cost Breakeven	91	82	78
Total Cost Breakeven	176	158	151

		Base Price	
YIELD	$180.00	$200.00	$220.00
Operating Cost Breakeven	3.4	3.0	2.8
Ownership Cost Breakeven	3.7	3.3	3.0
Total Cost Breakeven	7.0	6.3	5.8

*Establishment costs are amortized over the productive life of the stand, which is assumed to be 3 years at an 8% interest rate.

Table 13. Machinery Complement for Producing Alfalfa Following Wheat or Barley in the Columbia Basin with Center Pivot Irrigation

Machine	Current Value ($)	Annual Usage in Hours or Miles (pickups)	Current Age (years)	Remaining Life (years)	Labor Multiplier	Taxes, Housing, Insurance, License (% of avg. value)	Annual Repair Cost ($)	Salvage Value ($)	Acres/ Hour	Fuel Type	Fuel Use (gal./hr.)
250HP-WT	100,000	500	5	10		1.20	2,000	26,000		Diesel	11.0
150HP-WT	80,000	500	5	10		1.20	1,530	20,000		Diesel	6.5
26′ Tandem Disk & Pack	31,000	150	new	15	1.10	0.60	1,500	3,000	12.0		
17.5′ Disk Ripper	25,500	150	new	15	1.10	0.60	1,500	3,000	8.0		
20′ Seedbed Maker	17,000	150	new	15	1.10	0.60	800	1,650	9.0		
20′ Double Disk Drill	22,000	120	new	12	1.20	3.00	1,250	3,050	6.0		
20′ Side Delivery Rake	15,900	200	0	15	1.10	0.60	500	1,800	11.6		
1500-lb Rectangular Baler	80,000	150	5	10	1.20	2.50	500	7,500	15.5		
2-tie Baler (PTO)	30,000	150	0	10	1.20	2.50	1,000	4,500	10.9		
14′ Swather	80,000	200	0	10	1.10	3.20	1,920	20,000	6.8	Diesel	4.8
Balewagon, Small Bales	115,000	150	5	10	1.20	3.10	2,000	12,000	16.3	Diesel	4.0
Balewagon, Large Bales	115,000	150	5	10	1.20	3.10	2,000	12,000	27.2	Diesel	4.0
Manager's Pickup	30,000	18,000	0	7		6.80	600	15,000	18.0	Gasoline	12.0
Labor's Pickup	15,000	6,000	7	7		6.80	600	3,500	12.0	Gasoline	12.0

Table 14. Per Acre Machine Costs (Calculated using the MachCost Calculator from the University of Idaho), $/acre

Machine Combination	Depreciation	Interest	THI&L*	Total Fixed Costs	Repairs	Labor	Fuel/Lube	Total Variable Costs	Total Costs
Manager's Pickup	2.14	1.69	1.53	5.36	0.60	0.00	6.04	6.64	12.00
Labor's Pickup	3.28	1.39	1.26	5.93	1.20	0.00	4.02	5.22	11.15
250HP-WT, Disk & Pack	2.27	1.50	0.19	3.96	1.16	1.83	3.96	6.95	10.91
250HP-WT, Disk Ripper	3.12	2.09	0.26	5.47	1.76	2.77	5.97	10.50	15.97
150HP-WT Seedbed Maker	2.09	1.35	0.17	3.61	0.93	2.44	3.12	6.49	10.10
150HP-WT, Disk Drill	4.19	2.55	0.72	7.46	2.24	4.00	4.67	10.91	18.37
150HP-WT, 20' Side Delivery Rake	1.43	0.93	0.12	2.48	0.47	2.06	2.73	5.26	7.74
150HP-WT, 1500-lb Baler	3.89	1.89	0.55	6.83	0.41	1.55	2.05	4.01	10.34
150HP-WT, 2-tie Baler	2.67	1.48	0.38	4.53	0.89	2.21	2.54	5.64	10.17
Balewagon, Small Bales	4.22	1.95	0.81	6.98	0.82	1.47	1.20	3.49	10.47
Balewagon, Large Bales	2.53	1.17	0.48	4.18	0.49	0.88	0.72	2.09	6.27
14' Swather	4.42	2.76	1.18	8.36	2.83	3.24	3.46	9.53	17.89

*Taxes, housing, insurance, and licenses

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EM007