
UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION
AGRICULTURE AND NATURAL RESOURCES
AGRICULTURAL ISSUES CENTER

2016

**SAMPLE COSTS TO ESTABLISH AND PRODUCE
ALFALFA**



**TULARE COUNTY, SOUTHERN SAN JOAQUIN VALLEY
300 Acre Planting**

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Acknowledgements. Appreciation is expressed to the UC Cooperative Extension, growers, packers, input suppliers, and other industry representatives who provided information, assistance, and expertise for this study

INTRODUCTION

This study is intended as a guide only. It can be used to help 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 early 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 the University of California Agriculture and Natural Resources, Agricultural Issues Center, Department of Agricultural and Resource Economics, Donald Stewart, at 530-752-4651 or destewart@ucdavis.edu, or Christine Gutierrez, at 530-752-5021 or cagut@ucdavis.edu. The local extension office can be contacted through Nicholas Clark, UC Cooperative Extension Farm Advisor, at 559-852-2788 or neclark@ucanr.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.

ASSUMPTIONS

The assumptions refer to Tables 1 through 11 and pertain to sample costs to establish an alfalfa stand, and produce alfalfa hay and haylage in the southern San Joaquin Valley. Cultural practices and costs for alfalfa 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 hypothetical farm consists of 1,200 non-contiguous acres of field and row crops of which 300 acres are alfalfa and the remaining 900 acres are planted to other crops such as cotton, corn, grains, processing tomatoes, and dry beans. The 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.

Stand Establishment Operating Costs

(Tables 1-3)

Tables 1 through 3 show the costs associated with ground preparation, planting and establishing an alfalfa stand. Land preparation and planting are done in the fall. The establishment year ends after the herbicide application in December.

Land Preparation. Stand establishment begins by discing down (stubble disc) the residue from the previous crop, followed by a pass with a rice roller. Next, the ground is chiseled to a depth of 18 to 24 inches to fracture the soil, which improves root penetration and water infiltration. Afterward, the field is rolled again with the rice roller. The fields are then laser leveled by a custom operator at a cost of \$175/acre. Borders (levees) for irrigation checks are made at periodic intervals (60 feet in this study) through the field. Lastly, the fields are then disced and harrowed with a ring roller to prepare the seedbed.

Fertilization. Pre-plant soil testing for phosphorous (P) and potassium (K) is recommended. In this study, the PCA collects one soil sample per 20 acres at a cost of \$10.60 for each test. Nitrogen (N) and phosphorus (P) as 11-52-0 at 200 pounds per acre of material are applied in September prior to the final discing.

Planting. A custom operator plants Roundup Ready alfalfa seed with a Brillion seeder 1/4 inch to 1/2 inch deep at 25 pounds of seed per acre. The seed is planted in September or October and the stand life is expected to be three years. Cost of seed varies, Roundup Ready seed is used in this study at a cost of \$5.84 per pound with an additional \$3.00 per pound tech fee.

Irrigation. In this study, the irrigation method is sprinkler irrigation during establishment, followed by border flood irrigation during production. Water for seed germination is applied using a sprinkler irrigation system in early fall immediately after planting (8 acre-inches). If winter rains do not occur, a second irrigation may be necessary. Water is supplied by the irrigation district and is supplemented by well water. Prices for water vary considerably among irrigation districts and pumping costs vary due to well depth, pumping level and type of irrigation system. This study applies a charge of \$130 per acre-foot, (\$10.83 per acre inch). Irrigation labor is provided as a separate line item and includes the cost of setting up and taking down the sprinkler irrigation system.

Pest Management. The pesticides and rates mentioned in this cost study are listed in *Integrated Pest Management for Alfalfa* and *UC Pest Management Guidelines, Alfalfa*. **Pesticides mentioned in this study**

are not recommendations, but those commonly used in the region. For information and pesticide use permits, contact the local county Agricultural Commissioner's office. For information on other pesticides available, pest identification, monitoring, and management, visit the UC IPM website at www.ipm.ucdavis.edu. **Pest control costs can vary considerably each year depending upon local conditions and pest populations in any given year.** 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). Written recommendations are required for many pesticides and are available from licensed pest control or certified crop advisers. In addition, the PCA or an independent consultant will monitor the field for agronomic problems including irrigation and nutrition. Growers may hire a private PCA or receive the service as part of a service agreement with an agricultural chemical and fertilizer company. In this study, the PCA services are provided by the fertilizer company free of charge.

Application Methods. After planting, treatment of alfalfa with pesticides are made by either chemigation (pesticides and/or fertilizers applied through the irrigation water), by tractor or ATV mounted ground/boom sprayer, or foliar-broadcast by airplane. Some pesticides and fertilizers are mixed and applied together during the same irrigation. Some pesticides are applied to a portion of the alfalfa acreage. Pesticides with different modes of action and different active ingredients should be rotated to avoid resistance development by the targeted pests. Fertilizer is applied using a tractor pulled fertilizer spreader and pesticides are applied via an ATV sprayer system with a 30' boom.

Weeds. Broad-spectrum post-emergent herbicides, such as Roundup PowerMax, are applied depending on environmental conditions. In this study, Roundup PowerMax is applied to the field at a rate of 2 pints per acre in December of the establishment year. A pre-emergence herbicide such as Treflan TR or Prowl H20 could be applied for grass control, but is not included in this study during the establishment year. Contact herbicides, such as Gramoxone, or Select Max, could also be applied for selective weed control and to combat species shift & resistance. In some areas of the San Joaquin Valley, sheep are introduced and allowed to graze the alfalfa fields in January as a weed, Sclerotinia Stem, and Crown Rot control measure. This operation and associated costs are not included in this study.

Production Operating Costs

(Tables 4-11)

Irrigation. During the production years, this study uses border flood irrigation. The water is pumped through alfalfa valves at the head of the field and flows down the alfalfa check between the borders. A semi-permanent drain ditch is dug at the edge of the field using a V-Ditcher pulled by a tractor. All field operations turn inside the field and do not cross the drain. From April to October, ten irrigations totaling 64 acre inches (5.3 acre-feet) of water are applied by flooding the checks based on evapotranspiration (ET) requirements. Applied water values are greater than the actual water requirement due to an estimated application efficiency of 75 percent. The actual water requirement will vary each year based on soil, climatic, and plant physiological factors.

Irrigation includes the water and pumping costs, with irrigation labor provided as a separate line item. Water costs will vary considerably depending upon the irrigation district and, when pumped, upon the due to well depth, pumping level and type of irrigation system. A cost of \$10.83 per acre inch (\$130 per acre foot) is used in this study. Due to the high cost and/or unavailability of water in recent years, some growers have reduced water usage or summer fallowed the fields at a cost of lower yields.

Fertilization. After establishment, plant tissue tests should be taken each year to determine nutrient requirements. Tissue samples should be scheduled once during the growing season and your Ag consultant

(PCA) may recommend this be done in either the spring or fall. Tissue testing in this study is done each year in August to determine the levels of P and K. Costs shown are for the analysis based on one sample per 20 acres collected by the PCA at a cost of \$25.90 per sample. In this study, an allocation of phosphorous as 11-52-0, at 200 pounds per acre is charged to the field each year in the fall. Subsequent micro-nutrient fertilizers are applied as needed based on the tissue analysis and PCA recommendations.

Pest Management. The pesticides and rates mentioned in this cost study are listed in *Integrated Pest Management for Alfalfa* and *UC Pest Management Guidelines, Alfalfa*. **Pesticides mentioned in this study are not recommendations, but those commonly used in the region.** For information and pesticide use permits, contact the local county Agricultural Commissioner's office. For information on other pesticides available, pest identification, monitoring, and management, visit the UC IPM website at www.ipm.ucdavis.edu. **Pest control costs can vary considerably each year depending upon local conditions and pest populations in any given year.** Pesticides with different modes of action and sites of action, and different active ingredients should be rotated to avoid resistance development by the targeted pests. Adjuvants are recommended for many pesticides for effective control and are an added cost. Adjuvants are not included as a cost in this study.

Weeds. Prior to the first cutting, a post-emergence herbicide can be applied to control broadleaf and other grasses, such as 2,4-D (Butyrac 200), Buctril, Raptor, or Pursuit, or a combination thereof. During production years, herbicides other than Roundup should be used at least once to avoid weed shifts and selection for resistance. In this study, Roundup PowerMax is applied at a rate of 2 pints per acre in February of the production year.

During the second year, a pre-emergence herbicide (Treflan TR-10 or Prowl H2O) may be applied in January for grass control with a second application in April if dodder is expected (the study does not include this application). Residual herbicides for control of winter weeds could be applied starting at the end of the first year, such as Karmex DF, Velpar L, Chateau or Prowl H2O. This application is included in this study at a rate of 4 oz/acre of Chateau and 1 gallon/acre of Prowl H2O in December of the production year. A contact herbicide (Gramoxone) may be applied at the end of the second year, and is included at a rate of 1.5 pints per acre in this study.

In May of the third year, a post-emergence herbicide (SelectMax or Roundup) is applied to control summer grasses. This application is included in this study at a rate of 2 pints per acre of Roundup PowerMax during May of the production year. The herbicide costs will vary slightly during the production years due to the difference in weed control each year. For additional information regarding weed management, refer to the "Herbicide Treatment Table for Seedling Alfalfa" available on the UC Davis IPM website (<http://www.ipm.ucdavis.edu>). The table provides a listing of available herbicides and their application rates and times.

Insects. Several insect species attack alfalfa, but alfalfa weevil, aphids, alfalfa caterpillar, and armyworms are the pests that cause the most economic damage. Weevils and aphids are assumed to reach population levels requiring a single treatment for control for which the insecticide Warrior II (lambda-cyhalothrin, a synthetic pyrethroid) is applied at a rate of 1.5 fl oz per acre in March of the production year. Aphids can also be controlled with an application of Sivanto (flupyradifurone). Worms, alfalfa caterpillar and armyworms are controlled in July with the insecticide Coragen (chlorantraniliprole) application of 3.5 fl. oz. per acre during July of the production year.

Harvest. In this study, the alfalfa is harvested for hay seven times: April, May, June, July, August, September, and October, and for haylage two times, March and November. Alfalfa for hay is cut with a self-propelled swather and left to dry for several days before it is turned and windrowed using a rake. Once the hay

has dried to the correct moisture content, it is baled into 1,300-pound square bales. The bales are picked up with a bale wagon that moves them from the field and roadsides them in a stack. A conversion kit is attached to the standard bale wagon to handle 1,300 pound square bales. For haylage, the alfalfa is cut and wilted in the field, then chopped into a truck or trailer and taken to the dairy where it is placed in a bag, pile, or bunker for ensiling. Haylage is typically produced for a dairy enterprise and is harvested by the buyer.

Custom Harvest versus Grower Harvest. This study uses a custom harvesting company to swath, rake, bale, and roadside (pickup bales and stack) the harvested alfalfa. In this study, the custom harvester charges are: swathing/raking at \$22.50 per acre, baling at \$12.00 per bale, with a roadside charge of \$5.00 per bale for 1300 pound bales. For growers using their own equipment, see Table 10.

Yields. The crop is assumed to yield a total of 10.00 tons of hay per acre at 90 percent dry matter (DM) per year. In this study 9 tons is harvested as hay (90% DM) and 3 green tons (30% DM) or 1-ton hay equivalent, is harvested as haylage. Annual yields range from 8 to 13 tons of hay per acre in this region. In this study, yields are calculated as the same for each cutting, but most often the first and second cuttings are the largest and the mid-summer cuttings have the lowest yield.

Returns. A price of \$250 per ton for premium hay is based on USDA first quarter 2016 averages for the central San Joaquin Valley market districts. Hay prices and hay quality will vary during the season and by district. USDA alfalfa hay standards are Supreme, Premium, Good, Fair, and Utility, with Supreme garnering the highest price. The hay price in this study is based on 90 percent dry matter and the haylage on 30 percent dry matter. The haylage buyer pays a price per green ton relative to the current hay market price less harvesting costs and is estimated at \$68. (The haylage return equals market price less harvest cost, times % haylage dry matter, divided by % hay dry matter $(\$250 - \$45) \times (30\%DM/90\%DM) = \68). Table 7 shows grower returns based on hay yields ranging from 7.5 to 10.5 tons per acre and haylage yields ranging from 2.25 to 3.75 tons per acre.

Pickup/ATV. The pickup is used for business purposes as needed. The ATV is used for irrigation and pesticide applications. Associated costs are included in this study.

Labor, Equipment and Interest

Labor: The labor rates of \$20.44 per hour for machine operators and \$17.52 for general labor include overhead of 46 percent. The basic hourly wages are \$14.00 for machine operators and \$12.00 for general 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 January 12, 2016. Labor costs for operations involving machinery are 20 per cent 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.

Equipment Operating Costs. Repair costs are based on purchase price, annual hours of use, total hours of life, and repair coefficients formulated by ASAE. Fuel and lubrication costs are also determined by ASAE equations based on maximum PTO horsepower, and fuel type. The cost includes a 9.25 percent sales tax on diesel fuel and 2.25 percent sales tax on gasoline. Prices for on-farm delivery of diesel and gasoline are \$2.38 and \$2.65 per gallon, respectively. The costs are based on the last quarter of 2015 and first quarter of 2016 Energy Information Administration (EIA) price information. Gasoline also includes federal and state excise tax, which can be refunded for on-farm use when filing your income tax. The fuel, lube, and repair cost per acre for each operation in Table 2 is determined by multiplying the total hourly operating cost in Table 6 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.

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 per cent per year. A nominal interest rate is the typical market cost of borrowed funds. The interest cost of post-harvest operations is discounted back to the last harvest month using a negative interest charge. The rate will vary depending upon various factors, but the rate in this study is considered a typical lending rate by a farm lending agency as of January 2016.

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 alfalfa 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.

Cash Overhead

Cash overhead consists of various cash expenses paid out during the year that are assigned to the whole farm, not to a particular operation. Employee benefits, payroll taxes and workers' compensation insurance are included in labor costs and not under cash overhead.

Property Taxes. Counties charge a base property tax rate of 1 per cent 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 per cent of the average value of the property. Average value equals new cost plus salvage value divided by 2 on a per acre basis.

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 per cent of the average value of the assets over their useful life. Liability insurance covers accidents on the farm and costs \$1,543 for the entire farm.

Office Expense. Costs are estimated at \$50 per acre for the ranch and are not based on any specific information, except that there is a cost involved for bookkeeping, payroll, tax preparation, and telephone.

Investment Repairs. Annual repairs on investments or capital recovery items that require maintenance are calculated as 2 per cent of the purchase price. Repairs are not calculated for land and establishment costs.

Non-Cash Overhead

Non-cash overhead is calculated as the capital recovery cost for equipment and other farm investments. A portion of the overhead costs in the establishment year are allocated to the previous crop

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 (Purchase Price – Salvage Value) x Capital Recovery Factor) + (Salvage Value x 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 3.25 per cent is used to calculate capital recovery. The rate will vary depending upon size of loan and other lending agency conditions, but is a suggested rate by a farm lending agency in January 2016.

Tools. Includes shop equipment/tools and other tools used on the farm and does not recognize any specific inventory.

Irrigation System. Irrigation practices in the southern San Joaquin Valley range from the dominant border flood, to sprinkler, to subsurface drip, or a combination thereof. More information regarding Alfalfa raised on sub-surface drip irrigation can be found in the “2014 Sample Costs to Establish and Produce Alfalfa in the Sacramento and Northern Delta using Sub-Surface Drip Irrigation” study at <http://coststudies.ucdavis.edu>.

The system utilizes a combination of well water and district water. Some growers include a tail water return system, which may increase water application efficiencies up to 85 percent. The flood irrigation system consists of underground lines with alfalfa valves. The cost for the 300 acres is based on a quarter section (160 acres) with one-quarter mile runs. There are two 18-inch mainlines each approximately 2,625 feet with 10 or 12-inch alfalfa valves every 60 feet and a quarter mile intertie line (connects two mainlines) with 12-inch PVC. During establishment, a sprinkler irrigation system is used in this study, which consists of pipes & risers, laterals lines, valve openers/bonnets and booster pumps owned by grower and shown under non-cash overhead. The permanent irrigation system consists of wells, pumps and buried mainline included in the land purchase price.

Land. Cropland with district water or well water suitable for alfalfa production typically ranges in value among counties from \$15,000 to \$25,000 per acre. The land in this study is owned by the grower and cost \$15,000 per acre. Land rents for \$300 per acre for cropland within a water district and may vary according to value or type of crop planted.

Establishment Costs. Costs to establish the alfalfa stand are used to determine capital recovery expenses, depreciation, and interest on investment, during the production years. The establishment cost is the sum of cash costs for land preparation, planting, and cash overhead for establishing the alfalfa. The Total Cash Cost shown in Table 1 represents the establishment cost per acre. For this study, the cost is \$888 per acre or \$266,400 for the 300 acres. The alfalfa stand establishment cost is amortized over the 3-year stand life.

Hay Barn. The open barn with metal roof covers 5,000 square feet and is 20 feet high. The building's ten support poles are on concrete piers with a natural floor (ground).

Shop Building. A shop building is used for equipment maintenance and repairs, parts and supply storage, a bathroom and it houses the farm office. The building encompasses 2,400sf with concrete floors, plumbing and electrical wiring as needed to meet building codes.

Fuel Tanks. Diesel is stored in a 10,000 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.

Equipment. Although, farm equipment is purchased new or used, the study shows the current purchase price for new equipment. The new purchase price is adjusted to 60 per cent to indicate a mix of new and used equipment. Equipment costs are composed of three parts: non-cash overhead, cash overhead, and operating costs. Both of the overhead factors have been discussed in previous sections. The operating costs consist of repairs, fuel, and lubrication and are discussed under operating costs.

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 ALFALFA (300 Acres)
 SOUTHERN SAN JOAQUIN VALLEY (2016)

Operation	Cash and Labor Costs per Acre							Total Cost	Your Cost
	Operation Time (Hrs/A)	Labor Cost	Fuel	Lube & Repairs	Material Cost	Custom Rent			
Cultural:									
Soil Analysis (P&K)	0.00	0	0	0	0	1		1	
Disc (Stubble) Field	0.22	5	7	4	0	0		16	
Roll Field (2x)	0.31	8	10	4	0	0		22	
Chisel Field	0.10	3	3	2	0	0		8	
Laser Level Field (Custom)	0.00	0	0	0	0	175		175	
Disc Boarder Ridges (60ft. intervals)	0.10	2	1	1	0	0		4	
Fertilize - 11-52-0 (P2O5)	0.05	1	1	0	74	0		76	
Finish Disc	0.09	2	3	2	0	0		7	
Finish Roll	0.08	2	2	1	0	0		5	
Plant - Roundup Ready Seed	0.33	8	4	3	221	0		236	
Irrigate (2x) – Sprinkler Irrigation	0.00	18	0	0	87	0		104	
Weed Control – Roundup Power Max	0.07	2	0	0	7	0		9	
TOTAL CULTURAL COSTS	1.34	50	30	18	389	176		664	
Interest on Operating Capital at 4.25%									3
TOTAL OPERATING COSTS/ACRE	1.34	50	30	18	389	176		667	
CASH OVERHEAD:									
Liability Insurance									1
Office Expense									50
Property Taxes									152
Property Insurance									13
Investment Repairs									5
TOTAL CASH OVERHEAD COSTS/ACRE									221
TOTAL CASH COSTS/ACRE									888
NON-CASH OVERHEAD:									
		Per Producing Acre		Annual Cost		Capital Recovery			
Land (300 acres of alfalfa)		15,000		488				488	
Shop Tools		17		1				1	
Hay Barn (500 Tons)		50		3				3	
Fuel Tanks & Pumps (10,000gal)		25		3				3	
Shop Building (2,400sf)		50		3				3	
Sprinkler Pipe (300 acres)		113		7				7	
Equipment		200		21				21	
TOTAL NON-CASH OVERHEAD COSTS		15,454		527				527	
TOTAL COSTS/ACRE									1,415

UC COOPERATIVE EXTENSION – AGRICULTURAL ISSUES CENTER
TABLE 2. MATERIAL and INPUT COSTS to ESTABLISH ALFALFA (300 Acres)
 SOUTHERN SAN JOAQUIN VALLEY (2016)

OPERATING COSTS	Quantity/Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
Fertilizer:				74	
11-52-0 (P2O5)	200.00	Lb	0.37	74	
Custom:				176	
Soil Test P	0.05	Each	10.60	1	
Soil Test K	0.05	Each	10.60	1	
Laser Level Field	1.00	Acre	175.00	175	
Seed:				221	
Alfalfa Seed - Roundup Ready	25.00	Lb	5.84	146	
Seed Tech Fee	25.00	Lb	3.00	75	
Herbicide:				7	
Roundup PowerMax	2.00	Pint	3.59	7	
Irrigation:				87	
Water	8.00	AcIn	10.83	87	
Labor				50	
Equipment Operator Labor	1.60	hrs	20.44	33	
Irrigation Labor	1.00	hrs	17.52	18	
Machinery				48	
Fuel-Gas	0.07	gal	2.65	0	
Fuel-Diesel	12.72	gal	2.38	30	
Lube				5	
Machinery Repair				13	
Interest on Operating Capital @ 4.25%				3	
TOTAL OPERATING COSTS/ACRE				667	

UC COOPERATIVE EXTENSION – AGRICULTURAL ISSUES CENTER
TABLE 3. WHOLE FARM ANNUAL EQUIPMENT COSTS - ESTABLISHMENT YEAR (300 Acres)
 SOUTHERN SAN JOAQUIN VALLEY (2016)

Yr	Description	Price	Yrs Life	Salvage Value	Cash Overhead			Total
					Capital Recovery	Insurance	Taxes	
16	205HP Crawler	233,353	10	68,929	21,762	127	1,511	23,401
16	Disc - Finish 25'	55,406	10	9,798	5,734	27	326	6,087
16	Chisel - Heavy 27'	50,417	10	8,916	5,217	25	297	5,539
16	90HP 4WD Tractor	76,839	10	22,697	7,166	42	498	7,706
16	Fertilizer Spreader - Pendular	1,350	10	239	140	1	8	148
16	ATV Sprayer System 30'	5,646	10	998	584	3	33	620
16	Ringroller - 25'	29,200	10	5,164	3,022	14	172	3,208
16	Rice Roller-18'	22,500	10	3,979	2,328	11	132	2,472
16	Disc- Border-8'	15,606	10	2,760	1,615	8	92	1,715
16	Brillion Seeder 12'	21,282	6	6,135	3,019	12	137	3,167
16	Disc - Stubble 18'	52,300	5	17,036	8,309	29	347	8,685
16	ATV	8,350	5	3,742	1,135	5	60	1,200
	TOTAL	572,249	-	150,393	60,030	305	3,613	63,948
	60% of New Cost*	343,349	-	90,236	36,018	183	2,168	38,369

*Used to reflect a mix of new and used equipment

UC COOPERATIVE EXTENSION – AGRICULTURAL ISSUES CENTER
TABLE 4. COSTS PER ACRE to PRODUCE ALFALFA (300 Acres)
 SOUTHERN SAN JOAQUIN VALLEY (2016)

Operation	Cash & Labor Costs per Acre							Your Cost
	Operation Time (Hrs/A)	Labor Cost	Fuel	Lube & Repairs	Material Cost	Custom Rent	Total Cost	
Cultural:								
Weed Control - Roundup PowerMax	0.13	3	0	0	14	0	18	
Semi- Perm. Drain Ditch (2% of acres)	0.03	1	0	0	0	0	1	
Insect - Aphid/Weevil – Warrior II	0.07	2	0	0	8	0	10	
Irrigate – 10x Flood Irrigation	0.00	32	0	0	693	0	725	
Insect - Worms – Coragen	0.07	2	0	0	29	0	31	
Tissue Sample (P&K) Analysis	0.00	0	0	0	0	1	1	
Fertilize (11-52-0)	0.05	1	1	0	74	0	76	
Weed Control – Chateau & Prowl H2O	0.07	2	0	0	63	0	65	
Weed Control – Gramoxone	0.07	2	0	0	11	0	13	
Pickup Truck	0.25	6	1	1	0	0	8	
ATV	0.25	6	1	0	0	0	7	
TOTAL CULTURAL COSTS	0.97	55	4	2	893	1	956	
Harvest:								
Harvest – Silage (Buyer harvest)	0.00	0	0	0	0	0	0	
Harvest – Hay (Custom harvest)	0.00	0	0	0	0	379	379	
TOTAL HARVEST COSTS	0.02	0	0	0	0	379	379	
Interest on Operating Capital at 5.75%							11	
TOTAL OPERATING COSTS/ACRE	0.91	54	4	2	893	380	1,346	
CASH OVERHEAD:								
Liability Insurance							1	
Office Expense							50	
Property Taxes							157	
Property Insurance							13	
Investment Repairs							8	
TOTAL CASH OVERHEAD COSTS/ACRE							229	
TOTAL CASH COSTS/ACRE							1,575	
NON-CASH OVERHEAD:								
		Per Producing Acre	Annual Cost Capital Recovery					
Shop Building (2,400sf)		50	3				3	
Fuel Tanks & Pumps (10,000gal)		25	3				3	
Hay Barn (500 Ton)		50	3				3	
Irrigation System for 300 acres		250	16				16	
Land (300 acres of alfalfa)		15,000	488				488	
Shop Tools		17	1				1	
Establishment Costs for 300 acres of alfalfa		888	315				315	
Equipment		34	4				4	
TOTAL NON-CASH OVERHEAD COSTS		16,313	834				834	
TOTAL COSTS/ACRE							2,409	

UC COOPERATIVE EXTENSION – AGRICULTURAL ISSUES CENTER
TABLE 5. COSTS and RETURNS PER ACRE to PRODUCE ALFALFA (300Acres)
 SOUTHERN SAN JOAQUIN VALLEY (2016)

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS					
Alfalfa Hay	9	Ton	250.00	2,250	
Silage	3	Ton	68.00	204	
TOTAL GROSS RETURNS	12	Ton		2,454	
OPERATING COSTS					
Fertilizer:					74
11-52-0 (P2O5)	200.00	Lb	0.37		74
Custom:					380
Haylage (Buyer Harvests)	3.00	Ton	0.00		0
Swath & Rake Alfalfa	7.00	Acre	22.50		158
Bale 1300# Bale	13.00	Bale	12.00		156
Roadside Hay (1300# Bale)	13.00	Bale	5.00		65
Tissue Sample (P&K)	0.05	Each	25.90		1
Herbicide:					89
Roundup PowerMax	4.00	Pint	3.59		14
Chateau	4.00	Oz	4.62		18
Prowl H2O	1.00	Gal	44.93		45
Gramoxone	1.50	Pint	7.33		11
Insecticide:					37
Warrior II	1.50	Fl Oz	5.25		8
Coragen	3.50	Fl Oz	8.25		29
Irrigation:					693
Water	64.00	AcIn	10.83		693
Labor					56
Equipment Operator Labor	1.17	hrs	20.44		24
Non-Machine Labor	0.02	hrs	17.52		0
Irrigation Labor	1.80		17.52		32
Machinery					7
Fuel-Gas	0.64	gal	2.65		2
Fuel-Diesel	1.02	gal	2.38		2
Lube					1
Machinery Repair					2
Interest on Operating Capital @ 4.25%					11
TOTAL OPERATING COSTS					1,346

UC COOPERATIVE EXTENSION – AGRICULTURAL ISSUES CENTER
TABLE 6. MONTHLY CASH COSTS PER ACRE to PRODUCE ALFALFA (300 Acres)
 SOUTHERN SAN JOAQUIN VALLEY (2016)

Cultural:	JAN 16	FEB 16	MAR 16	APR 16	MAY 16	JUN 16	JUL 16	AUG 16	SEP 16	OCT 16	NOV 16	DEC 16	Total
Weed Control-Roundup Power Max		9			9								18
Semi – Perm. Drain Ditch (2% of ac)			1										1
Insect - Aphid/Weevil – Warrior II			10										10
Irrigate – 10x Flood Irrigation				77	77	139	139	139	77	77			725
Insect - Worms – Coragen							31						31
Tissue Sample (P&K) Analysis								1					1
Fertilize (11-52-0)										76			76
Weed Control – Chateau & Prowl H2O												65	65
Weed Control - Gramoxone												13	13
Pickup Truck	1	1	1	1	1	1	1	1	1	1	1	1	8
ATV	1	1	1	1	1	1	1	1	1	1	1	1	7
TOTAL CULTURAL COSTS	1	10	13	78	87	140	171	141	79	79	77	80	956
Harvest: Silage (Buyer harvests)			0								0		0
Harvest: Hay (Custom harvest)				54	54	54	54	54	54	54			379
TOTAL HARVEST COSTS		0	0	54	54	54	54	54	54	54	0	0	379
Interest on Operating Capital @ 4.25%				1	1	2	3	3	4	-1	-1		11
TOTAL OPERATING COSTS/ACRE	1	10	13	133	143	196	227	199	136	131	77	79	1,346
CASH OVERHEAD													
Liability Insurance		1											1
Office Expense	4	4	4	4	4	4	4	4	4	4	4	4	50
Property Taxes			78						78				157
Property Insurance			7						7				13
Investment Repairs	1	1	1	1	1	1	1	1	1	1	1	1	8
TOTAL CASH OVERHEAD COSTS	5	6	90	5	5	5	5	5	90	5	5	5	229
TOTAL CASH COSTS/ACRE	6	17	103	138	147	201	232	204	226	136	82	84	1,575

UC COOPERATIVE EXTENSION – AGRICULTURAL ISSUES CENTER
TABLE 7. RANGING ANALYSIS ALFALFA (300Acres)
 SOUTHERN SAN JOAQUIN VALLEY (2016)

Costs per Acre at Varying Yields to Produce Alfalfa							
YIELD (Ton)							
	9.75	10.50	11.25	12.00	12.75	13.50	14.25
OPERATING COSTS/ACRE:							
Cultural	956	956	956	956	956	956	956
Harvest	307	333	355	379	403	427	450
Interest on Operating Capital @ 4.25%	10	11	11	11	11	12	12
TOTAL OPERATING COSTS/ACRE	1,274	1,299	1,322	1,346	1,370	1,394	1,418
TOTAL OPERATING COSTS/TON	130.62	123.73	117.50	112.15	107.44	103.27	99.52
CASH OVERHEAD COSTS/ACRE							
	229	229	229	229	229	229	229
TOTAL CASH COSTS/ACRE	1,503	1,528	1,551	1,575	1,599	1,623	1,647
TOTAL CASH COSTS/TON	154.10	145.53	137.85	131.23	125.39	120.23	115.59
NON-CASH OVERHEAD COSTS/ACRE							
	834	834	834	834	834	834	834
TOTAL COSTS/ACRE	2,336	2,362	2,385	2,409	2,433	2,457	2,481
TOTAL COSTS/TON	239.62	224.94	211.97	200.72	190.79	181.99	174.10

Net Return Per Acre Above Operating Costs For Alfalfa (300 Acres)								
PRICE (\$/ton)		YIELD (Ton/acre)						
		7.50	8.00	8.50	9.00	9.50	10.00	10.50
Alfalfa Hay		7.50	8.00	8.50	9.00	9.50	10.00	10.50
	Silage	2.25	2.50	2.75	3.00	3.25	3.50	3.75
190.00	48.00	259	341	425	508	591	674	757
210.00	55.00	425	518	614	709	804	898	993
230.00	62.00	591	696	804	910	1,017	1,123	1,229
250.00	68.00	754	871	990	1,108	1,226	1,344	1,462
270.00	75.00	920	1,048	1,179	1,309	1,439	1,568	1,698
290.00	82.00	1,086	1,226	1,369	1,510	1,652	1,793	1,934
310.00	88.00	1,249	1,401	1,555	1,708	1,861	2,014	2,167

Net Return Per Acre Above Cash Costs For Alfalfa (300 Acres)								
PRICE (\$/ton)		YIELD (Ton/acre)						
		7.50	8.00	8.50	9.00	9.50	10.00	10.50
Alfalfa Hay		7.50	8.00	8.50	9.00	9.50	10.00	10.50
	Silage	2.25	2.50	2.75	3.00	3.25	3.50	3.75
190.00	48.00	30	112	196	279	362	445	528
210.00	55.00	196	289	385	480	575	669	764
230.00	62.00	362	467	575	681	788	894	1,000
250.00	68.00	525	642	761	879	997	1,115	1,233
270.00	75.00	691	819	950	1,080	1,210	1,339	1,469
290.00	82.00	857	997	1,140	1,281	1,423	1,564	1,705
310.00	88.00	1,020	1,172	1,326	1,479	1,632	1,785	1,938

Net Return per Acre above Total Costs for Alfalfa (300 Acres)								
PRICE (\$/ton)		YIELD (Ton/acre)						
		7.50	8.00	8.50	9.00	9.50	10.00	10.50
Alfalfa Hay		7.50	8.00	8.50	9.00	9.50	10.00	10.50
	Silage	2.25	2.50	2.75	3.00	3.25	3.50	3.75
190.00	48.00	-803	-722	-638	-555	-472	-389	-306
210.00	55.00	-638	-544	-448	-354	-259	-164	-70
230.00	62.00	-472	-367	-259	-153	-46	60	167
250.00	68.00	-308	-192	-73	45	163	281	399
270.00	75.00	-143	-14	117	246	376	506	635
290.00	82.00	23	163	306	447	589	730	872
310.00	88.00	187	338	492	645	798	951	1,104

UC COOPERATIVE EXTENSION – AGRICULTURAL ISSUES CENTER
TABLE 8. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT and BUSINESS OVERHEAD COSTS ALFALFA (300 Acres)
 SOUTHERN SAN JOAQUIN VALLEY (2016)
 ANNUAL EQUIPMENT COSTS

Yr	Description	Price	Yrs Life	Salvage Value	Capital Recovery	Cash Overhead		Total
						Insurance	Taxes	
16	ATV	8,350	5	3,742	1,135	5	60	1,200
16	90HP 4WD Tractor	76,839	10	22,697	7,166	42	498	7,706
16	Fertilizer Spreader - Pendular	1,350	10	239	140	1	8	148
16	Pickup 1/2 Ton	34,000	5	15,238	4,621	21	246	4,888
16	ATV Sprayer System 30'	5,646	10	998	584	3	33	620
16	Ditcher	6,630	10	1,172	686	3	39	728
TOTAL		132,815		44,087	14,332	75	885	15,291
60% of New Cost*		79,689		26,452	8,599	45	531	9,175

*Used to reflect a mix of new and used equipment

ANNUAL INVESTMENT COSTS

Description	Price	Yrs Life	Salvage Value	Capital Recovery	Cash Overhead			Total
					Insurance	Taxes	Repairs	
INVESTMENT								
Shop Building 2,400sf	60,000	20	3,600	3,996	27	318	1,200	5,541
Fuel Tanks & Pumps 10,000gal	29,500	10	2,950	3,248	14	162	590	4,014
Hay Barn/Pole Barn	60,000	20	0	4,127	25	300	1,200	5,652
Irrigation System for 300 acres	74,994	20	7,500	4,886	35	412	1,500	6,833
Land (300 acres of alfalfa)	4,500,000	40	4,500,000	146,250	3,794	45,000	0	195,044
Shop Tools	20,000	20	7,500	1,103	12	138	400	1,653
Establishment (300 Acres)	266,400	3	0	94,634	112	1,332	0	96,087
TOTAL INVESTMENT	5,010,894	-	4,521,550	258,244	4,018	47,662	4,890	314,814

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/ Farm	Unit	Price/ Unit	Total Cost
Liability Insurance (1200 acres)	1200.00	Acre	1.286	1,543
Office Expense (1200 acres)	1200.00	Acre	50.00	60,000

UC COOPERATIVE EXTENSION – AGRICULTURAL ISSUES CENTER
TABLE 9. HOURLY EQUIPMENT COSTS ALFALFA (300 Acres)
 SOUTHERN SAN JOAQUIN VALLEY (2014)

Yr	Description	Hours Used	Hours Used	Capital Recovery	Cash Overhead		Operating Costs			Total Costs/Hr.
					Insurance	Taxes	Lube & Repairs	Fuel	Total Operat.	
16	ATV	192	400	1.70	0.01	0.09	1.02	2.65	3.67	5.47
16	90HP 4WD Tractor	27	1200	3.58	0.02	0.25	3.15	10.52	13.67	17.52
16	Fertilizer Spreader - Pendular	14	120	0.70	0.00	0.04	0.53	0.00	0.53	1.27
16	Pickup 1/2 Ton	75	400	6.93	0.03	0.37	3.44	5.95	9.39	16.73
16	ATV Sprayer System 30'	117	150	2.34	0.01	0.13	1.54	0.00	1.54	4.02
16	Ditcher	10	200	2.06	0.01	0.12	1.92	0.00	1.92	4.10

UC COOPERATIVE EXTENSION – AGRICULTURAL ISSUES CENTER
TABLE 10. GROWER COSTS PER ACRE to HARVEST ALFALFA HAY (300 Acres)
 SOUTHERN SAN JOAQUIN VALLEY (2016)

Operation	Cash and Labor Costs per Acre							Total Cost	Your Cost
	Operation Time (Hrs/A)	Labor Cost	Fuel	Lube & Repairs	Material Cost	Custom Rent			
Harvest:									
Harvest - Swathing	0.68	17	13	10	0	0		39	
Harvest - Raking	0.60	15	7	3	0	0		25	
Harvest - Baling	1.27	31	17	9	5	0		62	
Harvest – Road-siding	0.23	6	9	10	0	0		25	
TOTAL HARVEST COSTS	2.78	68	46	32	5	0		151	
Interest on Operating Capital at 4.25%									1
TOTAL OPERATING COSTS/ACRE	2.78	68	46	32	5	0		152	
CASH OVERHEAD:									
Property Taxes									5
Property Insurance									0
Investment Repairs									0
TOTAL CASH OVERHEAD COSTS/ACRE									5
TOTAL CASH COSTS/ACRE									157
NON-CASH OVERHEAD:									
		Per Producing Acre		Annual Cost Capital Recovery					
Equipment		780		80					80
TOTAL NON-CASH OVERHEAD COSTS		780		80					80
TOTAL COSTS/ACRE									237

SUMMARY of COSTS PER ACRE to HARVEST ALFALFA (300 Acres)

	Quantity/Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
OPERATING COSTS					
Miscellaneous:					
Bale Twine	980.00	ft	0.01	5	68
Labor					
Equipment Operator Labor	3.34	hrs	20.44	68	78
Machinery					
Fuel-Gas	0.00	gal	2.65	0	
Fuel-Diesel	19.22	gal	2.38	46	
Lube				7	
Machinery Repair				25	
Interest on Operating Capital @ 4.25%				1	
TOTAL OPERATING COSTS/ACRE				152	

ANNUAL HARVEST EQUIPMENT COSTS (300 Acres)

		Cash Overhead						
Yr	Description	Price	Yrs Life	Salvage Value	Capital Recovery	Insurance	Taxes	Total
16	Rake 20'	14,394	10	2,545	1,490	7	85	1,581
16	Bale Wagon 1300# Attm	148,625	10	24,531	15,531	73	866	16,470
16	Swather 14'	104,703	10	18,516	10,835	52	616	11,503
16	90HP 4WD Tractor	76,839	10	22,697	7,166	42	498	7,706
16	130 HP 4WD Tractor #1	117,421	10	34,684	10,951	64	761	11,775
16	Baler 1300# PTO #1	133,330	10	25,150	13,662	67	792	14,521
16	Baler 1300# PTO #2	133,330	10	25,150	13,662	67	792	14,521
	TOTAL	728,642	-	152,274	73,295	372	4,410	78,077
	60% of New Cost*	437,185	-	91,964	43,977	223	2,646	46,846

*Used to reflect a mix of new and used equipment

UC COOPERATIVE EXTENSION – AGRICULTURAL ISSUES CENTER
TABLE 11. OPERATIONS WITH EQUIPMENT ALFALFA (PRODUCTION ONLY) (300 Acres)
 SOUTHERN SAN JOAQUIN VALLEY (2016)

Operation	Operation Month	Tractor	Implement	Labor Type/ Material	Rate/ acre	Unit
Weed Control - Round	Feb		ATV	Equipment Operator Labor	0.08	hour
			ATV Sprayer System 30'	Roundup PowerMax	2.00	Pint
	May		ATV	Equipment Operator Labor	0.08	hour
			ATV Sprayer System 30'	Roundup PowerMax	2.00	Pint
Semi- Permanent Drain Insect - Aphid/Weevil	Mar	90HP 4WD Tractor	Ditcher	Equipment Operator Labor	0.04	hour
	Mar		ATV	Equipment Operator Labor Warrior II	0.08 1.50	hour FIOz
Irrigate - 10X Flood	Apr		ATV Sprayer System 30'			
			ATV	Irrigation Labor	0.18	hour
	May		ATV	Water SJV - S Alfalfa	6.82	AcIn
			ATV	Irrigation Labor	0.18	hour
	June		ATV	Water SJV - S Alfalfa	6.82	AcIn
			ATV	Irrigation Labor	0.36	hour
	July		ATV	Water SJV - S Alfalfa	12.22	AcIn
			ATV	Irrigation Labor	0.36	hour
	Aug		ATV	Water SJV - S Alfalfa	12.22	AcIn
			ATV	Irrigation Labor	0.36	hour
	Sept		ATV	Water SJV - S Alfalfa	12.24	AcIn
			ATV	Irrigation Labor	0.18	hour
	Oct		ATV	Water SJV - S Alfalfa	6.84	AcIn
			ATV	Irrigation Labor	0.18	hour
Insect - Worms	July		ATV	Water SJV - S Alfalfa	6.84	AcIn
			ATV Sprayer System 30'	Equipment Operator Labor Coragen	0.08 3.50	hour FIOz
Tissue Sample (P&K) Fertilize (11-52-0)	Aug	90HP 4WD Tractor		Tissue Sample Analysis (P & K)	0.05	Each
	Nov		Fertilizer Spreader - Pendular	Equipment Operator Labor 11-52-0 (P2O5)	0.06 200.00	hour Lb
Weed Control	Dec		ATV	Equipment Operator Labor	0.08	hour
			ATV Sprayer System 30'	Chateau	4.00	Oz
Weed Control	Dec		ATV	Prowl H2O	1.00	Gal
			ATV Sprayer System 30'	Equipment Operator Labor Gramoxone Max	0.08 1.50	hour Pint
Pickup Truck ATV	Dec		Pickup 1/2 Ton	Equipment Operator Labor	0.30	hour
	Dec		ATV	Equipment Operator Labor	0.30	hour
Harvest - Haylage	Mar			Non-Machine Labor	0.01	hour
				Buyer Harvests	2.00	Ton
	Nov			Non-Machine Labor	0.01	hour
				Buyer Harvests	1.00	Ton
Harvest - Hay	Apr			Swath & Rake Alfalfa	1.00	Acre
				Bale 1300# Bale	1.86	Bale
	May			Roadside Hay 1300#	1.86	Bale
				Swath & Rake Alfalfa	1.00	Acre
	June			Bale 1300# Bale	1.86	Bale
				Roadside Hay 1300#	1.86	Bale
	July			Swath & Rake Alfalfa	1.00	Acre
				Bale 1300# Bale	1.86	Bale
	Aug			Roadside Hay 1300#	1.86	Bale
				Swath & Rake Alfalfa	1.00	Acre
	Sept			Bale 1300# Bale	1.86	Bale
				Roadside Hay 1300#	1.86	Bale
	Oct			Swath & Rake Alfalfa	1.00	Acre
				Bale 1300# Bale	1.85	Bale
				Roadside Hay 1300#	1.85	Bale