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**SAMPLE COSTS TO ESTABLISH AND PRODUCE
ORGANIC ALFALFA HAY**



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CALIFORNIA

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In California – 2020

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INTRODUCTION

Organic alfalfa production involves growing, labeling, and marketing the crop according to National Organic Program (NOP) standards as defined by the United States Department of Agriculture (USDA). These standards require that alfalfa be produced with approved inputs, including non-synthetic biological materials and a small number of synthetic materials approved for use in organic which are specified in the National List of Allowed and Prohibited Substances. In California, approved organic fertilizers must be registered with the California Department of Food and Agriculture's (CDFA) Organic Input Material Program. Farmers must also take precautions against pesticide drift and other sources of prohibited contaminants. In addition, hay handling equipment as well as storage areas must be designated organic or properly cleaned between conventional and organic use, with documentation. Fields must have no prohibited substances applied to them for at least three years prior to harvest of a certified organic crop.

Federal laws regulating organic products require producers to be certified organic through a USDA-accredited certifier (public or private) and they must also register with California's State Organic Program. Organic growers must register with the California Department of Food and Agriculture and organic processors with the California Department of Public Health. The certification process requires that the producer develop a written organic farm plan that describes how the farm is to be managed in accordance with USDA-NOP rules and approval of the plan by the certifier. In addition, updates to the farm plan, payment of certification fees, and on-site farm audits by the certifier to ensure compliance with federal regulations are required annually. USDA's Organic Integrity

Database lists 33 accredited certifiers who certify clients in California. Because costs and fees vary among certifiers, sample fees are included in this study.

USDA standards require the use of organic seeds, but if they are not commercially available, conventionally grown, non-treated seeds may be used as long as they are not genetically engineered and the grower can document non-availability of organic seed that is adapted to the growing area.

Sample costs to establish an organic alfalfa stand and produce organic alfalfa hay using flood irrigation in the California are shown in this study. 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 for labor, materials, equipment, and custom services are based on November 2020 figures. Practices described are based on production practices considered typical for the crop and region, but will not apply to every situation. “Your Costs” columns in Tables 1, 2, 4, and 5 are provided for entering your farm costs. Tables 1-3 show costs per acre for establishing an organic alfalfa stand. Tables 4-10 show costs for producing organic alfalfa.

For an explanation of calculations used in the study, refer to the section titled Assumptions. For more information contact Jeremy Murdock, University of California Agriculture and Natural Resources, Agricultural Issues Center, Department of Agricultural and Resource Economics, at 530-752-4651, jmmurdock@ucdavis.edu. The local UC Cooperative Extension office can be contacted through Michelle Leinfelder-Miles, mmleinfeldermiles@ucanr.edu, Sarah Light, selight@ucanr.edu, and Rachael Long, rflong@ucanr.edu.

Costs and Returns Study Program/Acknowledgements. A cost and returns study is a compilation of specific crop production data collected from meetings with professionals working on alfalfa hay from the study area. The authors thank farmer cooperators, UC Cooperative Extension, and other industry representatives who provided information, assistance, and expert advice. **The use of trade names and farming 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.** *The University is an affirmative action/equal opportunity employer.*

ASSUMPTIONS

The following assumptions refer to Tables 1 to 10 and pertain to sample costs to establish and produce organic alfalfa in California using flood irrigation. Practices described are not recommendations by the University of California, but rather represent production practices considered typical of a well-managed farm for California. Costs and practices detailed in this study may not be applicable to all situations. Cultural practices and varieties for the production of alfalfa vary by grower and region, so differences in costs may occur. The practices and inputs used in this cost study serve only as a sample or guide. These costs are represented on an annual, per acre basis.

Farm. This study is based on a 1,500 acre organic and conventional field, row crop, fruit and nut crop farm, of which 100 acres are dedicated to growing organic alfalfa hay, 1,390 acres are used to grow other crops (organic and conventional field and row crops such as melons, beans, processing tomatoes, mixed vegetables, fruit and nut crops), and 10 acres are occupied by roads and the farmstead. Typically, the grower will rotate a portion of the alfalfa crop each year and establish a new stand on land previously occupied by rotation crops.

Stand Establishment Practices and Material Inputs

Land Preparation. The ground is ripped to a depth of 18 to 24 inches to fracture the soil to improve water infiltration. The field is disced to break up large clods, creating better seed-to-soil contact for good seed germination. Prior to planting, the grower or PCA/CCA collects one composite soil sample per 20 acres and has it analyzed by a lab for phosphorous (P) and potassium (K). Composted poultry (e.g. chicken) manure is spread over the ground and incorporated by a second discing. The land is leveled with a GPS drag scrapper and the fields are floated to remove high and low spots that may affect stand establishment due to too much or too little water. Borders are pulled every 50 feet down the length of the field to make checks for flood irrigation. Healthy alfalfa stands compete well against weeds, insects, and diseases, so it is important to spend time on land preparation to ensure a dense and vigorous stand. This is particularly important for organic production for weed control. In this study we have included one pre-irrigation followed by a cultivation of germinated weed seed to help reduce weed pressure prior to planting.

Planting. A custom operator plants the alfalfa seed with an airflow planter. A cultipacker is used to firm the seedbed prior to and after planting to assure good seed-soil contact. Certified alfalfa seed is recommended for nematode and weed management and genetic purity. In addition, select a variety with the appropriate fall dormancy rating and pest resistance for your area. Adapted varieties for California can be found on the UC Davis Alfalfa Workgroup website (Putnam, 2021) and NAFA, National Alfalfa and Forage Alliance website (NAFA, 2021). USDA standards require the use of organic seeds, but if not available, conventionally-produced seeds may be used as long as they are not genetically engineered and there is clear documentation of non-availability of organic seed that is adapted to the growing area. The seed should be inoculated with the appropriate organically-approved nitrogen-fixing bacteria.

Early planting (with irrigation) is particularly important for organic production due to the danger of winter weed competition. The optimum planting time varies throughout the state. For example, in the Intermountain area seeding should be done from mid to late-August, but successful seeding can still be done in the early spring. In the Sacramento and San Joaquin Valley, planting should occur from mid-August to early-September. The optimal planting date is important to minimize weed competition and maximize alfalfa vigor. Early fall is the best time to plant alfalfa when summer weeds are less aggressive and before winter weeds germinate, to minimize weed competition during stand establishment. In this study, alfalfa is planted in August at 25 pounds per acre to a depth of 1/4 inch. Slightly higher seeding rates are recommended in organic alfalfa production to ensure strong, competitive stands. The life of an organic alfalfa stand varies from the northern to the southern area of the state. Alfalfa in the Intermountain region typically has a longer productive life (typically 5 to 8 years) than the Southern San Joaquin Valley but will have less hay cuttings (3-4) annually than a stand further south (6-9 cuts). The Sacramento Valley persistence usually ranges from three to five years, and Imperial Valley stands typically last three years depending upon cutting schedules. Stand life in this study is set at four years.

Fertilization. Sample and analyze soils as required by the National Organic Program to determine crop needs, such as pH and nutrient levels. Incorporate the recommended amounts of nutrients using compost or other approved materials. Alfalfa frequently needs supplemental phosphorus (P), and sometimes sulfur (S), and potassium (K), depending on inherent soil fertility and previous crop fertilization. After planting, alfalfa does not need supplemental nitrogen because the plant fixes its own from the atmosphere via nitrogen-fixing nodules on the roots. In this study, composted poultry manure (90% dry matter, 2.29% P₂O₅) at four tons per acre is applied prior to planting. Other manures with high P and K concentrations can be considered. Manures should provide about 165 lbs. of P₂O₅ and sufficient sulfur and potassium for several years of production. If the soil is too

acidic (pH less than 6.3), add an organically-approved liming material such as ash or limestone to ensure a neutral pH which is optimum for nitrogen fixation by the Rhizobia bacteria that colonize the alfalfa roots. The composted poultry manure is custom spread at a cost of \$11.00 per ton, then disced and incorporated by the grower during field preparation. Manure breaks down gradually, and the nutrients contained in them are slower to become available than those in commercial fertilizer. Therefore, a portion of the nutrients from the chicken or poultry manure will be available in subsequent years. The cost is allocated over the four-year stand life at 25% per year. Use plant tissue sampling and analysis during the summer of the first year's growth, and in additional years, to assess plant nutrient needs for the second and subsequent years' production. In this study, it is assumed that no additional nutrients are applied. See http://alfalfa.ucdavis.edu/IrrigatedAlfalfa/pdfs/UCAlfalfa8292Fertilization_free.pdf for more nutrient information.

Irrigation. The field is pre-irrigated once using flood irrigation before seeding and then irrigated with sprinklers after planting for stand establishment. Fields are sprinkled once in August, September, and October for a total of three acre-inches applied after seeding in addition to three acre-inches applied before seeding via flood irrigation. Water costs are \$100 per acre-foot or \$8.33 per acre-inch. Irrigation costs shown in the tables include the water costs and labor for setting up, moving, taking down sprinkler pipe, siphon tubes, and/or gated pipe.

Pest Management. The organic pesticides, rates, and procedures mentioned in this cost study are listed in the UC *Integrated Pest Management Guidelines: Alfalfa*. For more information on other available organic pesticides, pest identification, monitoring, and management visit the UC IPM website at <http://www.ipm.ucdavis.edu/PMG/crops-agriculture.html> and CDFA's Organic Input Materials Program, https://www.cdca.ca.gov/is/ffldr/fertilizer_OIM.html. For information and specific pesticide use, contact your organic certifier.

Weeds. Weed management is a major challenge for organic alfalfa during stand establishment. A late summer or fall planting will help reduce weed competition because the alfalfa seedlings emerge after most summer weeds have completed their lifecycle and before winter weeds have a chance to emerge and compete. Pre-irrigation to germinate weeds followed by a shallow cultivation in the top three inches of soil to terminate weed seedlings can help reduce weed density in seedling alfalfa. Care should be taken after this practice to avoid bringing soil with new weed seeds up to the top of the soil profile. Unfortunately, there is not an effective method for selectively controlling emerged weeds in organically-grown seedling alfalfa, but a strong stand will help the alfalfa suppress weeds by out-competing them. If the weed pressure is severe and weeds overtop the alfalfa, it may be beneficial to graze the field with sheep or clip or remove during dry winter periods, or to cut early to allow sunlight to reach the young alfalfa plants. When grazing seedling alfalfa fields, make sure that the field is dry so that the soil will not be compacted and the stand weakened. Rotate the sheep on and off quickly so fields are not overgrazed and the young seedlings damaged.

Harvest. Fall or late-summer plantings will produce a crop the following spring (not during the calendar year of establishment).

Production Cultural Practices and Material Inputs for Established Alfalfa

Irrigation. Once fields are established, water use ranges from about 18-28 acre-inches in Northern California (Intermountain) to over 50 acre-inches in the Southern San Joaquin Valley. For this study, a total of 42 acre-inches of water per acre per year is applied. Flood irrigation of established fields starts in April and continues through September. Irrigation frequency during production years is likely to be once or twice during each growth period using flood irrigation, depending upon soil

type. A total of 3.5 acre-feet of water (42 acre-inches) per year at \$100.00 per acre-foot or \$8.33 per acre-inch are applied. Irrigation costs shown in the tables include the water costs and labor for setting up, moving, taking down sprinkler pipe, siphon tubes, and/or gated pipe.

Pest Management. The organic pesticides, rates, and procedures mentioned in this cost study are listed in the UC *Integrated Pest Management Guidelines: Alfalfa*. For more information on pest identification, monitoring, and management visit the UC IPM website at <http://www.ipm.ucdavis.edu/PMG/crops-agriculture.html>.

Insects: Alfalfa weevils are the most serious pests of alfalfa, causing yield and quality losses to the first harvest in late winter/early spring. Entrust (Spinosad) with a surfactant is applied in March by the grower for weevil control (suppresses weevils with 70% control). Sheep grazing in the winter may provide partial weevil control by destroying the eggs that are laid in the old alfalfa stems. Some organic growers rely on early harvest to minimize weevil damage, but yields will be reduced and weevils can continue to feed on regrowth under windrows. Microbial insecticides are used to control armyworms and alfalfa caterpillars during the summer months (one application per year is assumed). An application of XenTari, a *Bacillus thuringiensis* (Bt) containing organically-approved insecticide, is assumed in this study. Entrust can also be used, but is not efficacious on western yellowstriped armyworms. Aphids are managed with resistant alfalfa varieties or early harvest before economic damage occurs.

Pathogens & Nematodes: Avoid planting alfalfa after alfalfa that has been plowed under within two years. Diseases are managed through the use of resistant varieties or early harvest before the pathogens cause economic damage. Nematodes (root knot and stem) are managed primarily via resistant plant varieties and equipment sanitation (do not move nematodes from infected fields). Stem nematode may further be managed by crop rotation and the use of certified seed. Maintaining long-term soil health through cropping rotations and the use of cover crops in the farming system will also help improve soil and plant health, potentially mitigating pathogen problems.

Weeds: If weeds are particularly troublesome (e.g. poisonous ones like groundsel), they can be lightly harrowed in January two to three years for weed management. This can cause some injury to the alfalfa crowns so is not a recommended yearly practice, only suggested as a way to manage tough to control weeds. Winter grazing by sheep when the alfalfa is dormant can also be used to control winter weeds in the first year of establishment as well as subsequent years. Sheep grazing may also provide some weevil control, as the sheep consume the old alfalfa stems where weevils often lay eggs. Watch for soil compaction and stand loss when “sheeping off”, especially in wet years on heavy soils. Grazing costs or revenues are not included in this study.

Harvest. Alfalfa is custom harvested in this cost study. The NOP requires that organic growers use harvesting equipment that has been designated organic, or properly cleaned between organic and conventional uses, with documentation of this practice noted in the organic plan. A custom operator cuts the hay with a self-propelled swather. After drying in windrows for several days, the hay is turned with a center-delivery rake. When dried to the correct moisture, the hay is baled with a pull-type baler and then picked up with a harrowbed and moved to hay stacks. In this study, a custom harvest charge of \$40 per ton to swath, rake, bale, and roadside (haul and stack near field) organic alfalfa hay has been used. There would be an additional charge to have the hay moved into a barn.

Growers may choose to own harvesting equipment, purchased either new or used, or hire a custom harvester. Many factors are important in deciding which harvesting option a grower uses. The options are discussed in "*Acquiring Alfalfa Hay Harvest Equipment: A Financial Analysis of*

Alternatives". The publication can be found at <http://www.ipm.ucdavis.edu/PMG/selectnewpest.alfalfa-hay.html>.

Yield. Average annual yields in California range from 5.0 to 10 tons per acre with three to ten cuttings depending on location and alfalfa variety. Eight tons per acre over seven cuttings per year is common in the Central Valley. The crop in this study is assumed to yield 7.0 tons of hay per acre because yields of organic alfalfa are often slightly lower than conventional due to only partial control of many pests and weeds and the difficulty meeting the nutritional needs of alfalfa using solely organic sources. Yields in intermountain regions are likely to be lower and yields in the Southern San Joaquin Valley and Imperial Valleys are likely to be higher, so yield estimates must be adjusted for the region.

Returns. Returns will vary during the season, depending upon the market and quality of the hay, but are approximately 20% higher than conventionally grown alfalfa. Based on current organic markets for premium to rain damaged hay, an estimated price (rounded) of \$260 (\$220 + 20%) per ton of hay is used to calculate returns. In some areas in the state, additional revenue is generated by charging a per head fee for grazing sheep on alfalfa during the dormant season, a practice that will also help control winter weeds and weevils. However, this income is not included in this study. Table 7 shows a range of yields over a range of returns.

Labor, Equipment, and Interest

Labor. Hourly wages for workers are \$16.00 per hour for machine operators and \$13.50 per hour non-machine labor. Adding 46 percent for the employer's share of federal and state payroll taxes, insurance, and other possible benefits gives the labor rates shown of \$23.36 and \$19.71 per hour for machine labor and non-machine labor, respectively. The overhead includes the employer's share of federal and California state payroll taxes, workers' compensation insurance for field crops and a percentage for other possible benefits. Workers' compensation insurance costs will vary among growers. The cost is based on the average industry rate as of January 2020. Labor for operations involving machinery are 20 percent higher than the operation time given to account for the extra labor involved in equipment set up, moving, maintenance, work breaks, and field repair.

California Minimum Wage and Overtime Rules. In 2016, The California State Government passed new legislation concerning overtime and minimum wage rates that may affect farm labor costs. The California minimum wage rate for 2019 is \$12.00 per hour for companies with more than 25 employees and will rise each year by \$1.00 per hour until it reaches \$15.00 per hour in 2022. Businesses with 25 or fewer employees are given an additional year to comply with the changes. For businesses with 25 or fewer employees, the minimum wage rate is \$10.50 per hour for 2018 and increases to \$11.00 per hour in 2019; thereafter, their minimum wage rate increases by \$1.00 per hour each year from \$11.00 per hour in 2019 to \$15.00 per hour in 2023.

Recent California regulations also decrease the overtime threshold—the number of hours required to be worked before overtime benefits are received—for agricultural workers. The regulations decrease the overtime threshold for agricultural workers from 60 hours per week and 10 hours per day by 5.0 hours per week and 0.5 hours per day each year until it reaches 40 hours per week and 8.0 hours per day in 2022. Businesses with 25 or fewer employees are given an additional three years to comply with the regulation's changes. By January 1st, 2019 (2022 for employers with 25 or fewer employees) employees will also be entitled to overtime for 8 hours on the seventh consecutive day of work.

Equipment Operating Costs. Equipment repair costs are based on purchase price, annual hours of

use, total hours of life, and repair coefficients formulated by the 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 January 2020 data from the Energy Information Administration are \$3.73 and \$3.46 per gallon, respectively. The cost includes a 13.0 percent sales tax and \$0.36/gal excise tax on diesel fuel, and a 10.17 percent sales tax and \$0.42/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. 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.

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 5.25% per year. A nominal interest rate is the going 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 loan factors. The rate in this study is considered a typical lending rate by a farm lending agency as of January 2020.

Risk. The risks associated with the production of organic alfalfa hay should not be minimized. Weather and other risks are a continual concern for conventional growers, but organic growers face additional risks such as pest outbreaks that cannot be adequately controlled with organic methods. Stand establishment failure is more likely with organic methods, since weeds are not easily controlled. 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 the profitability and economic viability of organic alfalfa hay production. Because of the risks involved, access to a market is crucial. A grower should identify potential markets and, where possible, have a market for their hay before an organic alfalfa hay stand is established.

Cash Overhead

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. These costs can include property taxes, interest on operating capital, office expense, liability and property insurance, sanitation services, equipment repairs, and management.

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. County taxes are calculated as 1 percent 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. This cost provides coverage for property loss and is charged at 0.886 percent of the average value of the assets over their useful life.

Liability insurance. A standard farm liability insurance policy will help cover the expenses for which an employer becomes legally obligated to pay for bodily injury claims on the property and damages to another person's property as a result of a covered accident. Common liability expenses

covered under the policy include attorney fees and court costs, medical expenses for people injured on the property, and injury or damage to another's property. Liability insurance costs \$1,461 per year for the entire farm or \$1.46 per acre.

Land Rent. The 100 acres are leased on a share-rent basis with the land owner receiving 19 percent of the gross returns from the organic alfalfa hay crop (share rent can range from 17 percent to 21 percent). Therefore, land rent is based on the yield and the price. In this study the yield is 7 tons valued at \$260 per ton which equals a gross return of \$1,820. The land rent in this scenario is \$345.

Office Expense. Various farm and office expenses are estimated at \$20.00 per acre for the ranch. These expenses include office supplies, utilities, telephones, computers, bookkeeping, accounting, and miscellaneous administrative charges.

Organic Certification: Cost and fees will vary with different organic certifiers used by organic growers in California. In this study, a site visit and annual certification is assumed to cost \$1,600 or \$16 per organic acre. Certification and their associated costs are for the whole farm, paid annually. The state and many certification agencies have a onetime fee when a grower first becomes organic. This cost is not included in this study.

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

Non-Cash Overhead

Investment. The investments shown in Tables 3 and 8 are those that are partially or completely allocated to the organic alfalfa hay operation. Costs of investments such as tractors, trucks, buildings, etc. can be spread over the whole farm. Annual investments shown in the tables represent depreciation and opportunity cost for each investment on an annual per acre basis.

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 the American Society of Agricultural and Biological Engineers (ASABE) based on equipment type and years of life. The life in years is estimated by dividing the wearout 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 Table 3 and 8.

Capital Recovery Factor. Capital recovery factor is the amortization factor or annual payment whose present value at compound interest is 1. It is the function of the interest rate and equipment years of life.

Interest Rate. An interest rate of 5.50% is used to calculate capital recovery. The rate will vary depending upon loan amount and other lending agency conditions, but is the basic suggested rate by a farm lending agency as of January 2020.

Non-Cash Equipment Costs. Much of the equipment used on a typical organic alfalfa hay farm in California has high hours of use, which reduces its value. This study shows current purchase prices for new equipment with an adjustment of 50% of new value to indicate a mix of new and used equipment.

The equipment listed in Tables 3 and 8 indicates only that equipment which is used in the organic alfalfa hay enterprise and does not necessarily include all of the equipment that would be found on a typical organic farm growing alfalfa hay.

Establishment Costs. The establishment cost is the sum of cash costs for land preparation, planting, production expenses, and cash overhead for growing the alfalfa stand. NOTE: there will not be returns during the fall of the establishment year. The Total Accumulated Net Cash Cost in the first year as shown in Table 1 represents the establishment cost per acre. For this study, the cost is \$879 per acre or \$87,900 for the 100 acres. The establishment cost is amortized over the remaining four years of stand life.

Land. Cropland with district water suitable for alfalfa production typically ranges in value among counties from \$10,000 to \$22,000 per acre. As noted, land in this study is rented by the grower for \$345 per acre.

Buildings. Buildings include a shop/shops and pole barn to store hay.

Siphon tubes. Two-hundred siphon tubes are in inventory and used on other fields in addition to the organic alfalfa.

Fuel tanks. Two fuel tanks with pumps are placed in cement containment for use on the farm. A fuel wagon is also maintained to service field equipment (tractors, etc.)

Tools. Includes shop tools/equipment, hand tools and field tools such as shovels.

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 AN ORGANIC ALFALFA STAND
 CALIFORNIA – 2020

Operation	Operation		Cash and Labor Costs per Acre				Total Cost	Your Cost
	Time (Hrs/A)	Labor Cost	Fuel	Lube & Repairs	Material Cost	Custom/ Rent		
Preplant:								
Subsoil/Rip Ground	0.13	4	8	3	0	0	15	
Disc Field 2X	0.33	9	13	4	0	0	27	
Laser level	0.00	0	0	0	0	110	110	
Soil Sampling	0.00	0	0	0	0	4	4	
Fertilize: Compost 1X/4Yrs	0.00	0	0	0	65	11	76	
Float Field	0.12	3	2	1	0	0	5	
Pull Borders	0.22	6	8	2	0	0	17	
Pre-Irrigate (Flood) 1X	0.00	0	0	0	25	0	25	
Cultivate- Harrow	0.08	2	3	1	0	0	6	
TOTAL PREPLANT COSTS	0.87	25	34	12	90	125	285	
Cultural:								
Roll Field 2X (pre & post plant)	0.20	6	3	1	0	0	9	
Plant: 25 Lbs./Acre	0.00	0	0	0	106	19	125	
Sprinkler Irrigate 3X	0.00	14	0	0	25	0	39	
Pickup Truck Use	0.57	16	6	2	0	0	24	
TOTAL CULTURAL COSTS	0.77	35	8	3	131	19	197	
Interest on Operating Capital at 5.25%							7	
TOTAL OPERATING COSTS/ACRE							489	
CASH OVERHEAD:								
Liability Insurance							1	
Office Expense							20	
Land Rent							345	
Property Taxes							5	
Property Insurance							0	
Investment Repairs							18	
TOTAL CASH OVERHEAD COSTS/ACRE							390	
TOTAL CASH COSTS/ACRE							879	
NON-CASH OVERHEAD:								
		Per Producing Acre		Annual Cost				
				Capital Recovery				
Fuel Tanks & Pumps		7		1			1	
Fuel Wagon		2		0			0	
Hay Barn		525		44			44	
Shop Building		40		3			3	
Shop Tools		9		1			1	
Siphon Tubes		11		1			1	
Sprinkler Pipe		325		27			27	
Equipment		139		17			17	
TOTAL NON-CASH OVERHEAD COSTS		1,058		94			94	
TOTAL COSTS/ACRE							973	

**UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 2. MATERIAL COSTS PER ACRE TO ESTABLISH ORGANIC ALFALFA
CALIFORNIA – 2020**

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS					
Alfalfa Hay	0	Ton	260.00	0	
TOTAL GROSS RETURNS	0	Ton		0	
OPERATING COSTS					
Fertilizer:				65	
Composted Poultry Manure (includes delivery)	1.00	Ton	65.00	65	
Custom:				144	
Laser Level	1.00	Acre	110.00	110	
Soil Test P	1.00	Each	2.00	2	
Soil Test K	1.00	Each	2.00	2	
Compost Spreading	1.00	Ton	11.00	11	
Plant Alfalfa	1.00	Acre	19.00	19	
Seed:				106	
Seed - Alfalfa	25.00	Lb.	4.25	106	
Irrigation:				50	
Water- District & Pumped	6.00	Ac In	8.33	50	
Labor				60	
Equipment Operator Labor	1.98	hrs	23.36	46	
Non-Machine Labor	0.70	hrs	19.71	14	
Machinery				57	
Fuel-Gas	1.71	gal	3.40	6	
Fuel-Diesel	9.73	gal	3.75	36	
Lube				6	
Machinery Repair				8	
Interest on Operating Capital @ 5.25%				7	
TOTAL OPERATING COSTS/ACRE				489	

**UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 3. WHOLE FARM ANNUAL EQUIPMENT COSTS- ESTABLISHMENT YEAR
CALIFORNIA 2020**

Yr.	Description	Price	Yrs. Life	Salvage Value	Capital Recovery	Cash Overhead		Total
						Insurance	Taxes	
19	165 HP 4WD Tractor	155,748	10	46,005	17,090	89	1,009	18,188
19	62 HP 2WD Tractor	46,000	10	13,588	5,047	26	298	5,372
19	Cultipacker - 16'	6,000	10	1,061	714	3	35	752
19	Disc - Border	2,000	10	354	238	1	12	251
19	Disc Stubble 14'	28,500	12	3,947	3,066	14	162	3,243
19	Float - 16'	2,800	15	269	267	1	15	284
19	260HP4WD Tractor	341,906	10	100,994	37,516	196	2,214	39,927
19	Chisel - Heavy 25'	51,218	10	9,057	6,092	27	301	6,420
19	150HP4WD Tractor	163,954	10	48,429	17,990	94	1,062	19,146
19	Spring tooth harrow	18,300	10	3,236	2,176	10	108	2,294
19	Pickup 3/4 Ton	42,000	5	18,823	6,463	27	304	6,794
	TOTAL	858,426	-	245,764	96,658	489	5,521	102,668
	50% of New Cost*	429,213	-	122,882	48,329	245	2,760	51,334

**UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 4. COST PER ACRE TO PRODUCE ORGANIC ALFALFA HAY**

Operation	Time (Hrs/A)	Labor Cost	Fuel	Lube &Repairs	Material Cost	Custom/ Rent	Total Cost	Your Cost
Cultural:								
Weed: Harrow (1/3 cost-Year 3 Only)	0.03	1	0	0	0	0	1	
Insect: Weevil (Entrust)	0.05	1	0	0	66	0	67	
Irrigate- Flood 6X	0.00	30	0	0	350	0	379	
Fertilizer: Tissue Analysis	0.00	0	0	0	0	2	2	
Fertilizer: Compost (1/4 cost)	0.00	0	0	0	60	13	73	
Insect: Worms (XenTari)	0.05	1	0	0	43	0	45	
Pickup Truck Use	0.57	16	6	2	0	0	24	
TOTAL CULTURAL COSTS	0.69	49	6	3	519	15	591	
Harvest:								
Harvest - 7X	0.00	0	0	0	0	280	280	
TOTAL HARVEST COSTS	0.00	0	0	0	0	280	280	
Interest on Operating Capital at 5.25%							15	
TOTAL OPERATING COSTS/ACRE	1			3	519	295	886	
CASH OVERHEAD:								
Liability Insurance							1	
Office Expense							20	
Organic Certification							16	
Land Rent							345	
Property Taxes							3	
Property Insurance							0	
Investment Repairs							12	
TOTAL CASH OVERHEAD COSTS/ACRE							398	
TOTAL CASH COSTS/ACRE							1,284	
NON-CASH OVERHEAD:								
		<u>Per Producing Acre</u>		<u>Annual Cost Capital Recovery</u>				
Establishment Cost		879		251			251	
Fuel Tanks & Pumps		7		1			1	
Fuel Wagon		2		0			0	
Hay Barn		525		44			44	
Shop Building		40		3			3	
Shop Tools		9		1			1	
Siphon Tubes		11		1			1	
Equipment		36		5			5	
TOTAL NON-CASH OVERHEAD COSTS		1,509		306			306	
TOTAL COSTS/ACRE							1,589	

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 5. COSTS AND RETURNS PER ACRE TO PRODUCE ORGANIC ALFALFA
CALIFORNIA 2020

	Quantity/ Acre	Unit	Price or Cost/Unit	Value or Cost/Acre	Your Cost
GROSS RETURNS					
Alfalfa Hay	7	Ton	260.00	1,820	
TOTAL GROSS RETURNS	7	Ton		1,820	
OPERATING COSTS					
Fertilizer:				60	
Composted Chicken Manure	1.00	Ton	60.00	60	
Irrigation:				350	
Water	42.00	AcIn	8.33	350	
Insecticid:				109	
Entrust SC	4.00	FlOz	16.40	66	
XenTari	2.00	Lb	21.54	43	
Custom:				295	
Organic Hay Harvest	7.00	Ton	40.00	280	
Plant Tissue Analysis	0.05	Each	35.00	2	
Compost Spreading	1.00	Ton	13.00	13	
Labor				49	
Equipment Operator Labor	0.82	hrs	23.36	19	
Non-Machine Labor	1.50	hrs	19.71	30	
Machinery				9	
Fuel-Gas	1.78	gal	3.40	6	
Fuel-Diesel	0.09	gal	3.75	0	
Lube				1	
Machinery Repair				2	
Interest on Operating Capital @ 5.25%				15	
TOTAL OPERATING COSTS/ACRE				886	
TOTAL OPERATING COSTS/TON				127	
NET RETURNS ABOVE OPERATING COSTS				934	
CASH OVERHEAD COSTS					
Liability Insurance				1	
Office Expense				20	
Organic Certification				16	
Land Rent				345	
Property Taxes				3	
Property Insurance				0	
Investment Repairs				12	
TOTAL CASH OVERHEAD COSTS/ACRE				398	
TOTAL CASH OVERHEAD COSTS/TON				57	
TOTAL CASH COSTS/ACRE				1,284	
TOTAL CASH COSTS/TON				183	
NET RETURNS ABOVE CASH COSTS				536	
NON-CASH OVERHEAD COSTS (Capital Recovery)					
Establishment Cost				251	
Fuel Tanks & Pumps				1	
Fuel Wagon				0	
Hay Barn				44	
Shop Building				3	
Shop Tools				1	
Siphon Tubes				1	
Equipment				5	
TOTAL NON-CASH OVERHEAD COSTS/ACRE				306	
TOTAL NON-CASH OVERHEAD COSTS/TON				44	
TOTAL COST/ACRE				1,589	
TOTAL COST/TON				227	
NET RETURNS ABOVE TOTAL COST				231	

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 6. MONTHLY COSTS PER ACRE TO PRODUCE ALFALFA HAY
CALIFORNIA 2020

	JAN 20	FEB 20	MAR 20	APR 20	MAY 20	JUN 20	JUL 20	AUG 20	SEP 20	Total
Cultural:										
Weed: Harrow (1/4 cost, Year 3 only)	1									1
Insect: Weevil (Entrust)			67							67
Irrigate- Flood 6X				55	55	63	80	72	55	379
Fertilizer: Tissue Analysis				2						2
Fertilizer: Compost (1/4 cost)				73						73
Insect: Worms (XenTari)							45			45
Pickup Truck Use	3	3	3	3	3	3	3	3	3	24
TOTAL CULTURAL COSTS	4	3	70	132	58	66	127	74	58	591
Harvest:										
Harvest - 7X				40	40	40	40	80	40	280
TOTAL HARVEST COSTS	0	0	0	40	40	40	40	80	40	280
Interest on Operating Capital @5.25%	0	0	0	1	2	2	3	3	4	15
TOTAL OPERATING COSTS/ACRE	4	3	70	173	99	108	170	158	101	886
CASH OVERHEAD										
Liability Insurance									1	1
Office Expense									20	20
Organic Certification									16	16
Land Rent	345									345
Property Taxes	1						1			3
Property Insurance	0						0			0
Investment Repairs	1	1	1	1	1	1	1	1	1	12
TOTAL CASH OVERHEAD COSTS	348	1	1	1	1	1	3	1	39	398
TOTAL CASH COSTS/ACRE	352	4	72	175	100	109	173	159	140	1,284

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 7. RANGING ANALYSIS
CALIFORNIA 2020

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

	YIELD (TON)						
	4.00	5.00	6.00	7.00	8.00	9.00	10.00
OPERATING COSTS/ACRE:							
Cultural	591	591	591	591	591	591	591
Harvest	160	199	240	280	320	361	400
Interest on Operating Capital @ 5.25%	13	14	14	15	15	16	17
TOTAL OPERATING COSTS/ACRE	764	804	846	886	926	968	1,008
TOTAL OPERATING COSTS/TON	191.00	160.84	141.00	126.59	115.79	107.57	100.83
CASH OVERHEAD COSTS/ACRE	398	398	398	398	398	398	398
TOTAL CASH COSTS/ACRE	1,162	1,202	1,244	1,284	1,324	1,366	1,406
TOTAL CASH COSTS/TON	290.40	240.35	207.26	183.39	165.49	151.74	140.59
NON-CASH OVERHEAD COSTS/ACRE	306	306	306	306	306	306	306
TOTAL COSTS/ACRE	1,467	1,507	1,549	1,589	1,630	1,671	1,712
TOTAL COSTS/TON	367.00	301.00	258.00	227.00	204.00	186.00	171.00

Net Return per Acre above Operating Costs for Organic Alfalfa Hay

PRICE (\$/ton)	YIELD (ton/acre)						
Alfalfa Hay	4.00	5.00	6.00	7.00	8.00	9.00	10.00
200.00	36	196	354	514	674	832	992
220.00	116	296	474	654	834	1,012	1,192
240.00	196	396	594	794	994	1,192	1,392
260.00	276	496	714	934	1,154	1,372	1,592
280.00	356	596	834	1,074	1,314	1,552	1,792
300.00	436	696	954	1,214	1,474	1,732	1,992
320.00	516	796	1,074	1,354	1,634	1,912	2,192

Net Return per Acre above Cash Costs for Organic Alfalfa Hay

PRICE (\$/ton)	YIELD (ton/acre)						
Alfalfa Hay	4.00	5.00	6.00	7.00	8.00	9.00	10.00
200.00	-362	-202	-44	116	276	434	594
220.00	-282	-102	76	256	436	614	794
240.00	-202	-2	196	396	596	794	994
260.00	-122	98	316	536	756	974	1,194
280.00	-42	198	436	676	916	1,154	1,394
300.00	38	298	556	816	1,076	1,334	1,594
320.00	118	398	76	956	1,236	1,514	1,794

Net Return per Acre above Total Costs for Organic Alfalfa Hay

PRICE (\$/ton)	YIELD (ton/acre)						
Alfalfa Hay	4.00	5.00	6.00	7.00	8.00	9.00	10.00
200.00	-667	-507	-349	-189	-30	129	288
220.00	-587	-407	-229	-49	130	309	488
240.00	-507	-307	-109	91	290	489	688
260.00	-427	-207	11	231	450	669	888
280.00	-347	-107	131	371	610	849	1,088
300.00	-267	-7	251	511	770	1,029	1,288
320.00	-187	93	371	651	930	1,209	1,488

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 8. WHOLE FARM ANNUAL EQUIPMENT, INVESTMENT, AND BUSINESS OVERHEAD COSTS
CALIFORNIA 2020

ANNUAL EQUIPMENT COSTS

Yr. Description	Price	Yrs. Life	Salvage Value	Capital Recovery	Cash Overhead		Total
					Insurance	Taxes	
20 90 HP 4WD Tractor	53,423	10	15,780	5,862	31	346	6,239
20 ATV	6,640	7	2,519	864	4	46	914
20 Pickup 3/4 Ton	42,000	5	18,823	6,463	27	304	6,794
20 Spring tooth harrow	18,300	10	3,236	2,176	10	108	2,294
20 ATV Sprayer System	9,700	10	1,715	1,154	5	57	1,216
TOTAL	130,063	-	42,074	16,518	76	861	17,455
50% of New Cost*	65,032	-	21,037	8,259	38	430	8,728

*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								
Establishment Cost	87,900	4	0	25,077	0	0	0	25,077
Fuel Tanks & Pumps	10,500	20	0	879	5	53	210	1,146
Fuel Wagon	2,500	10	0	332	1	13	50	395
Hay Barn	52,500	20	0	4,393	23	263	1,050	5,729
Shop Building	60,000	30	0	4,128	27	300	1,200	5,655
Shop Tools	13,000	10	0	1,725	6	65	260	2,055
Siphon Tubes	17,000	20	0	1,423	8	85	340	1,855
TOTAL INVESTMENT	243,400	-	0	37,956	69	778	3,110	41,913

ANNUAL BUSINESS OVERHEAD COSTS

Description	Units/ Farm	Unit	Price/ Unit	Total Cost
Liability Insurance	100.00	Acre	1.46	146
Office Expense	100.00	Acre	20.00	2,000
Organic Certification	100.00	Acre	16.00	1,600
Land Rent	100.00	Acre	345.00	34,500

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 9. HOURLY EQUIPMENT COSTS
 CALIFORNIA 2020

Yr. Description	Alfalfa Hay	Total		Cash Overhead		Operating			Total Costs/Hr.
	Hours Used	Hours Used	Capital Recovery	Insurance	Taxes	Lube & Repairs	Fuel	Total Oper.	
20 90 HP 4WD Tractor	8	1600	1.83	0.01	0.11	3.66	16.57	20.23	22.18
20 ATV	10	285	1.52	0.01	0.08	0.75	2.27	3.01	4.62
20 Pickup 3/4 Ton	57	400	8.08	0.03	0.38	4.13	10.20	14.33	22.83
20 Spring Tooth Harrow	2	200	5.44	0.02	0.27	3.11	0.00	3.11	8.85
20 ATV Sprayer System	10	150	3.85	0.02	0.19	2.17	0.00	2.17	6.22

UC COOPERATIVE EXTENSION-AGRICULTURAL ISSUES CENTER
TABLE 10. OPERATIONS WITH EQUIPMENT & MATERIALS
 CALIFORNIA 2020

Operation	Operation Month	Tractor	Implement	Labor Type/ Material	Rate/ acre	Unit
Weed: Harrow	Jan	90 HP 4WD Tractor	Spring tooth harrow	Equipment Operator Labor	0.02	hour
Insect: Weevil (Entrust)	Mar		ATV	Equipment Operator Labor	0.06	hour
			ATV Sprayer System	Entrust SC	4.00	FLOz
Irrigate- Flood 6X	Apr			Non-Machine Labor	0.25	hour
				Water	6.00	AcIn
	May			Non-Machine Labor	0.25	hour
				Water	6.00	AcIn
	June			Non-Machine Labor	0.25	hour
				Water	7.00	AcIn
	July			Non-Machine Labor	0.25	hour
				Water	9.00	AcIn
	Aug			Non-Machine Labor	0.25	hour
				Water	8.00	AcIn
	Sept			Non-Machine Labor	0.25	hour
				Water	6.00	AcIn
Fertilizer: Tissue	Apr			Plant Tissue Analysis	0.05	Each
Fertilizer: Compost	Apr			Composted Chicken Manure	1.00	Ton
				Compost Spreading	1.00	Ton
Insect: Worms	July		ATV	Equipment Operator Labor	0.06	hour
			ATV Sprayer System	XenTari	2.00	Lb
Pickup Truck Use	July		Pickup 3/4 Ton	Equipment Operator Labor	0.68	hour
Harvest - 7X	Apr			Organic Hay Harvest	1.00	Ton
	May			Organic Hay Harvest	1.00	Ton
	June			Organic Hay Harvest	1.00	Ton
	July			Organic Hay Harvest	1.00	Ton
	Aug			Organic Hay Harvest	2.00	Ton
	Sept			Organic Hay Harvest	1.00	Ton