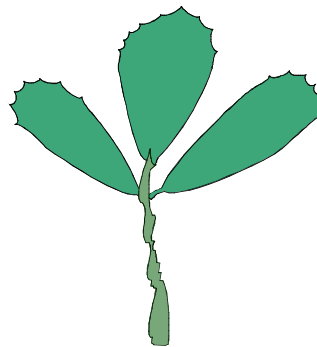


U.C. COOPERATIVE EXTENSION

SAMPLE COST TO ESTABLISH AND PRODUCE

ALFALFA HAY



**BED PLANTED
HAY PRODUCTION**

IMPERIAL COUNTY – 2004

Prepared by:
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For an explanation of calculations used for the study refer to the attached General Assumptions or call the author, Herman Meister, at the Imperial County Cooperative Extension office, (760)352-9474 or e-mail at hmeister@ucdavis.edu.

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University of California and the United States Department of Agriculture cooperating.

FOREWORD

We wish to thank growers, pest control advisors, chemical applicators and chemical dealers, custom farm operators, fertilizer dealers, seed companies, contract harvesters, equipment companies, and the Imperial County Agricultural Commissioner's office for providing us with the data necessary to compile this circular. Without their cooperation we could not have achieved the accuracy needed for evaluating the cost of production for the field crop industry in Imperial County.

The information presented herein allows one to get a "ballpark" idea of field crop production costs and practices in the Imperial County. Most of the information was collected through verbal communications via office visits and personal phone calls. The information does not reflect the exact values or practices of any one grower, but are rather an average of countywide prevailing costs and practices. Exact costs incurred by individual growers depend upon many variables such as weather, land rent, seed, choice of agrichemicals, location, time of planting, etc. No exact comparison with individual grower practice is possible or intended. The budgets do reflect, however, the prevailing industry trends within the region.

Overhead usually includes secretarial and office expenses, general farm supplies, communications, utilities, farm shop, transportation, moving farm equipment, accountants, insurance, safety training, permits, etc. Eleven to 13% of the total of land preparation, growing costs and land rent was used to estimate overhead. Hourly rates vary with each crop depending on the workman's compensation percentages.

Since all of the inputs used to figure production costs are impossible to document in a single page, we have included extra expense in man-hours or overhead to account for such items as pipe setting, motor grader, water truck, shovel work, bird and rodent control, etc. Whenever possible we have given the costs of these operations per hour listed on the cultural operations page. Some custom operators have indicated that they are instituting a "fuel surcharge" to reflect "spikes" in fuel cost.

Not included in these production costs are expenses resulting from management fees, loans, providing supervision, or return on investments. The crop budgets also do not contain expenses encumbered for road and ditch maintenance, and perimeter weed control. If all the above items were taken into account, the budget may need to be increased by 7-15%.

Where applicable we have used terminology that is commonly used in the agricultural industry. These terms are compiled in a glossary at the end of the circular. We feel that an understanding of these terms will be useful to entry-level growers, bankers, students and visitors.

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**2004-2005 Tillage & Harvest Rates
IMPERIAL COUNTY**

**HEAVY TRACTOR WORK & LAND
PREPARATION**

<u>OPERATION</u>	<u>\$/ACRE</u>
Plow.....	32.00
Subsoil 2 nd gear.....	45.00
Subsoil 3 rd gear.....	38.00
Landplane.....	14.00
Triplane.....	12.00
Chisel 15".....	26.00
Wil-Rich chisel.....	17.00
Big Ox.....	25.00
Slip plow.....	43.00
Mark/disc borders.....	10.50
Make cross checks (taps).....	6.75
Break border.....	6.50
Stubble disc/with cultipack.....	22.50/24.50
Regular disc/with cultipack.....	13.00/15.00
List 30"-12 row/40" 8 row.....	16.50
Float.....	11.50
Dump (scraper) borders.....	18.25
Corrugate.....	14.00

LIGHT TRACTOR WORK

Power mulch dry.....	27.50
Power mulch with herbicide.....	31.00
Shape 30" 6-row / 40" 4-row.....	12.75/12.75
Plant sugar beets & cotton 30"/40".....	17.00/15.00
Plant vegetables.....	20.00
Mulch plant wheat.....	20.25
Plant alfalfa (corrugated).....	18.50
Plant alfalfa (beds).....	19.00
Plant bermudagrass.....	13.75
Plant with drill (sudangrass, wheat).....	14.75
Plant corn slope.....	17.00
Cultivate 30"/40" beds 4-row.....	16.00/14.00
Spike 30"/40" beds 4-row.....	13.00/11.00
Spike and furrow out 30"/40" 4-row.....	14.00/12.00
Furrow out 30"/40" beds 4-row.....	13.00/11.00
Lilliston 30" 6-row / 40" 4-row.....	14.00/14.00
Lilliston 30" 6 row / 40" 4-row/ herb.....	15.50/15.50
Inj fert & fur out 30"/ 40" beds 4-row.....	16.50/14.50
Fertilize dry & fur out 30"/ 40" 4-row.....	17.00/15.00
Inject fertilizer flat.....	15.00
Broadcast dry fertilizer.....	8.00
Ground spray 30"/40" 8-row.....	12.00
Chop cotton stalks 30"/40"beds.....	16.00/14.00
List 80" melon beds.....	20.00
Plant 80" melon slope beds.....	22.00

Back fill furrow (melons).....9.5

Cultivate 80" melon slope beds.....	18.00
Center 80" melon beds.....	17.00
Re-run 80" melon beds.....	11.00
Inject fertilizer & furrow out 80" melon beds.....	18.00
Bust out 80" melon beds.....	12.00

HARVEST COSTS-FIELD CROPS

BY UNIT

Windrow alfalfa seed.....	17.50/acre
Combine alfalfa seed.....	41.00/acre
Swath bermudagrass.....	13.75/acre
Rake bermudagrass.....	5.50/acre
Swath sudangrass.....	11.25/acre
Rake sudangrass.....	6.00/acre
Swath alfalfa.....	8.75/acre
Rake alfalfa.....	5.00/acre
Bale (all types of hay- small bale).....	0.70/bale
Haul & stack hay – small bale.....	0.27/bale
Bale (large bale 4X4).....	7.50/bale
Haul & stack big bale.....	3.50/bale
Load with hay squeeze.....	62.50 / load
Dig sugar beets.....	2.65/clean ton
Haul sugar beets.....	2.50/clean ton
Combine wheat16.00 per acre + 0.60 /cwt. over 1 ton	
Haul wheat.....	5.00/ton
Combine bermudagrass seed 1st time.....	42.50/acre
Combine bermudagrass seed 2nd time.....	26.50/acre
Haul bermudagrass seed (local).....	175/load
Pick Cotton 1 st /2 nd03cts/lb/35.00/acre

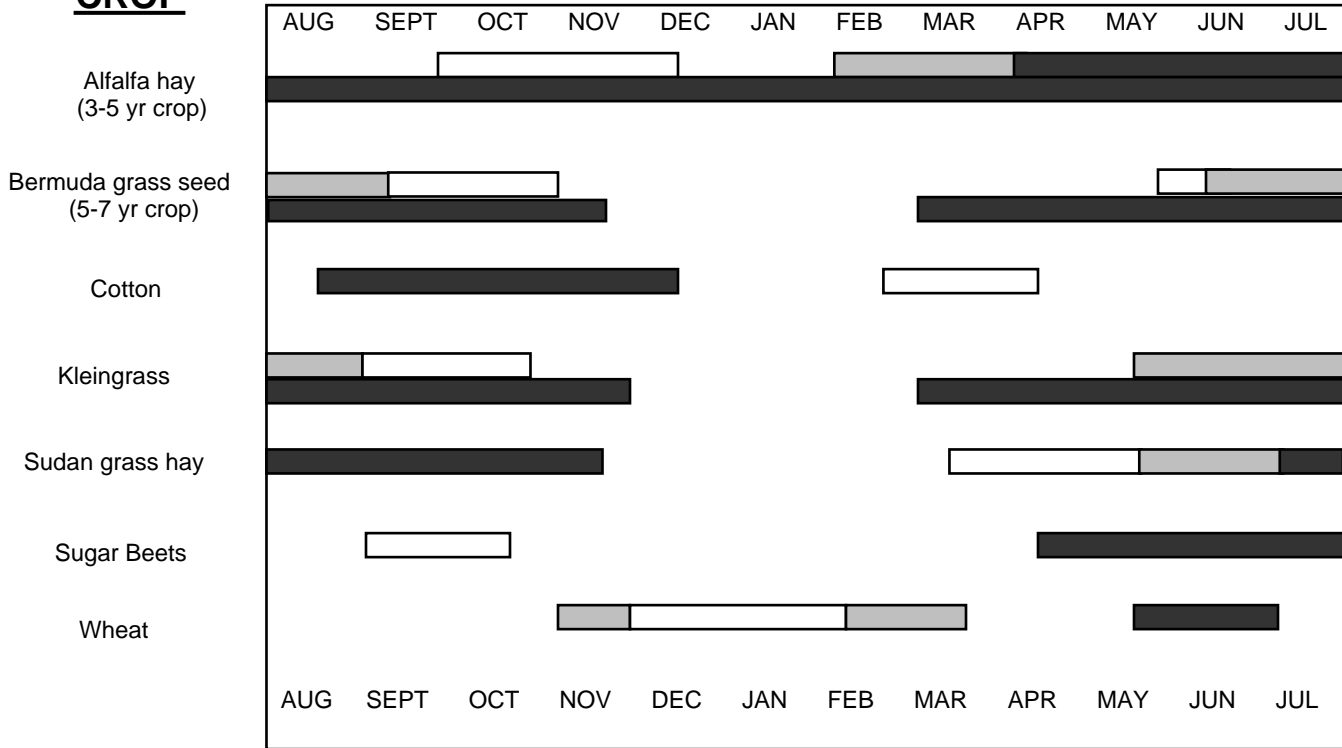
MISCELLANEOUS RATES BY THE HOUR

\$/HR

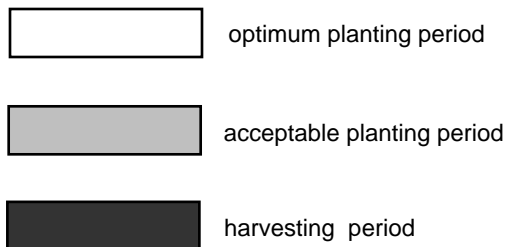
Motor grader.....	55.00
Backhoe.....	50.00
Water truck.....	40.00
Wheel tractor.....	35.00
Scraper.....	36.00
Versatile.....	60.00
D-6.....	56.00
D-8.....	73.00
Buck ends of field.....	35.00
Pipe setting (2 men).....	38.00
Laser level.....	90.00
Work ends (disc out rotobucks).....	40.00

FIELD CROPS PLANTING & HARVESTING CALENDAR IMPERIAL VALLEY, CALIFORNIA

CROP

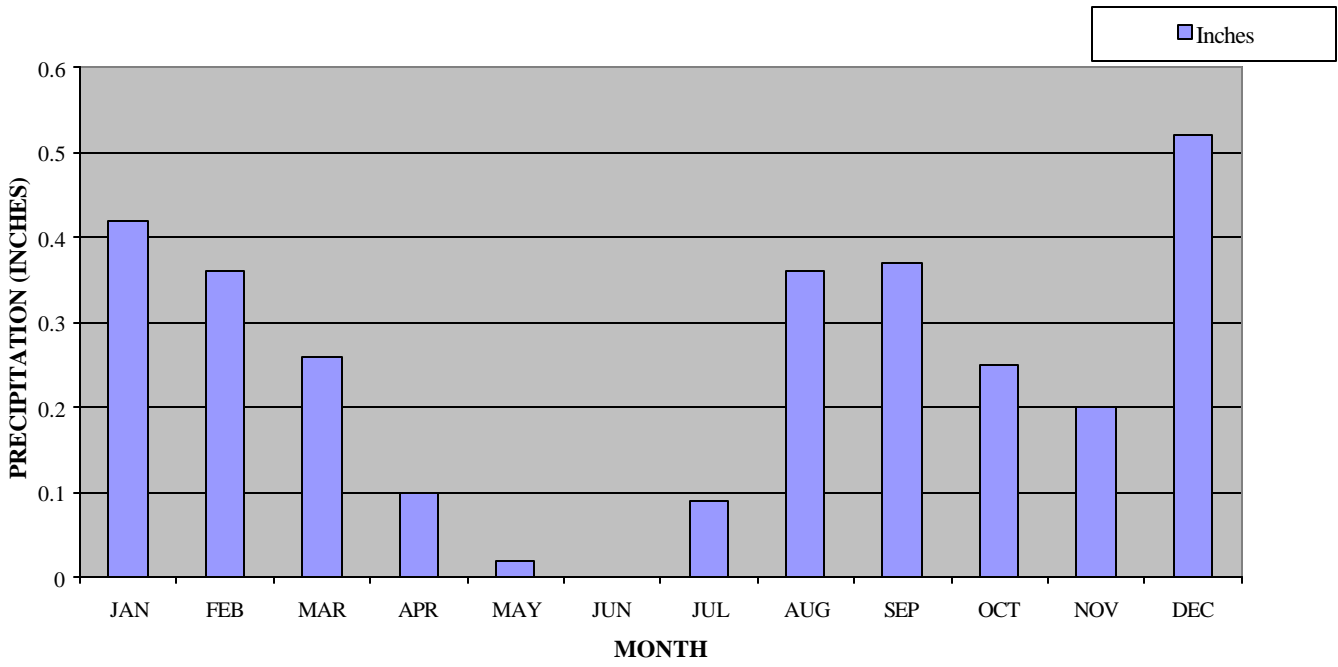
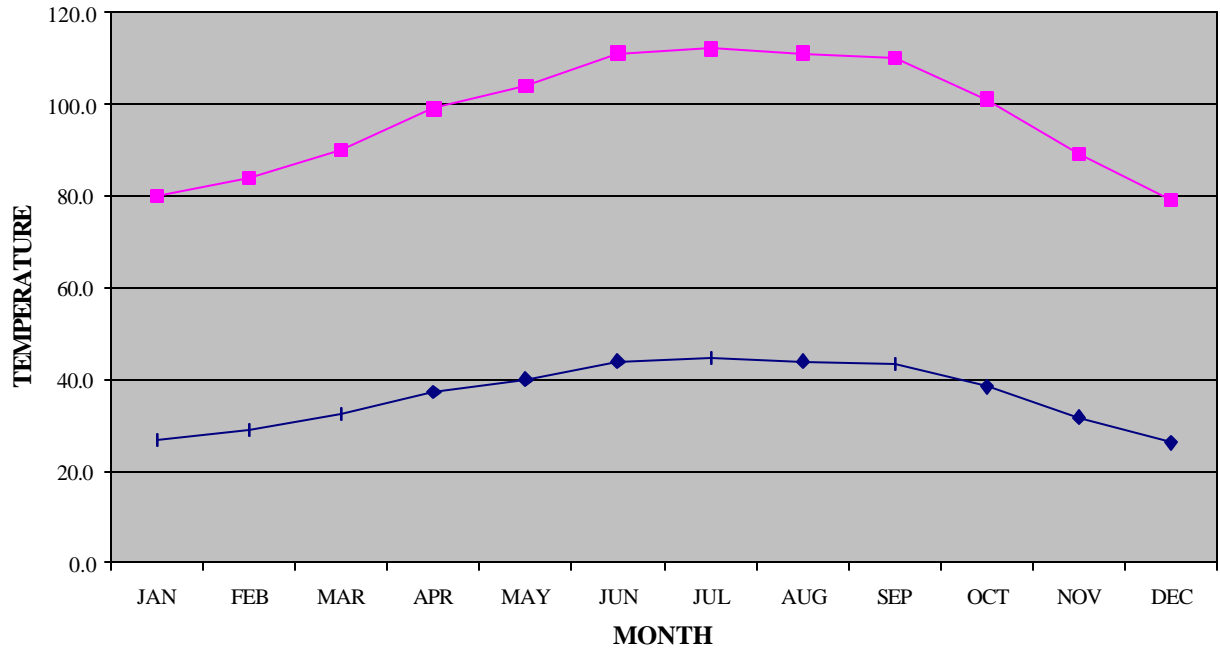
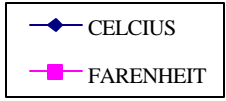


MONTH



IMPERIAL COUNTY WEATHER

Imperial Irrigation District
81 year average (1914-1994)



IMPERIAL COUNTY PROJECTED ALFALFA HAY PRODUCTION COSTS 2004-2005

Mechanical operations at prevailing rates. Hand labor at \$9.45/hr (\$6.75 plus SS, workman's compensation, unemployment and fringe benefits).

8 ton average estimated

80 Acre on Beds

OPERATION	Prevailing Rate	MATERIALS		HAND LABOR		COST Per Acre
		Type /Amount	Cost	Hours	Dollars	
LAND PREPARATION						
Stubble disc	22.50					22.50
Subsoil 2nd gear	45.00					45.00
Disc	13.00					13.00
Triplane	12.00					12.00
Corrugate	14.00					14.00
Flood		1 ac-ft	16.00	1	9.45	25.45
Disc with ring roller	15.00					15.00
Fertilize	8.00	300 lb 11-52-0	45.00			53.00
Disc with ring roller	15.00					15.00
Triplane	12.00					12.00
List	16.50					16.50
TOTAL LAND PREPARATION COSTS						243.45
COST OF ESTABLISHMENT						
Plant	19.00	20lb seed @ 1.50	30.00			49.00
Irrigate 3x		1.5 ac-ft	24.00	1.5	9.45	38.18
Weed control 1x ground	12.50	Herbicide	35.00			47.50
Insect control 1x air	6.50	Insecticide	10.00			16.50
Row tubes 2 inch		12	7.20			7.20
End disk, roto buck	5.00					5.00
COST OF ESTABLISHMENT						163.38
TOTAL COST OF STAND ESTABLISHMENT						406.83
ANNUAL COST OF HAY PRODUCTION (3-4 years)						
Spike 2x	11.00					22.00
Inject fertilizer & furrow out	14.50	10-34-0(25 gal)	41.25			55.75
Weed control 2x ground	12.50	Herbicide	28.00			53.00
Irrigate 18x		7.0 ac-ft	112.00	5.5	51.98	163.98
Insect control 4x air	6.50	Insecticide	50.00			76.00
End disk, roto buck	30.00					30.00
TOTAL ANNUAL CULTURAL COSTS						400.73
Land rent (net acres)						170.00
Amortization--		33 % of total cost of stand establishment				134.25
Cash overhead--		13 % of annual costs, land rent and amortization				91.65
TOTAL PREHARVEST COSTS						796.62
HARVEST COSTS						
Swath 9X	8.75					78.75
Rake 12x	5.00					60.00
Bale	0.70 /bale	128 bales (8 tons)				89.60
Haul & stack	0.27 /bale	128 bales (8 tons)				34.56
TOTAL HARVEST COSTS						262.91
TOTAL ALL COSTS						1,059.53

PROJECTED NET GAIN (PER ACRE)

Yield (tons/ac)	Price/ton (\$)							Breakeven (\$/ton)
	70	80	90	100	110	120	130	
7	-554	-484	-414	-344	-274	-204	-134	149
8	-500	-420	-340	-260	-180	-100	-20	132
9	-445	-355	-265	-175	-85	5	95	119
10	-391	-291	-191	-91	9	109	209	109
11	-336	-226	-116	-6	104	214	324	101



IMPERIAL COUNTY ALFALFA CULTURE 2004-2005

Annual acreage, yields, and value of alfalfa in
Imperial County, CA for five consecutive years

Year	Acres	Yield/Acre (tons)	Value/Acre
2003	159,482	7.33	\$609
2002	186,641	7.70	\$734
2001	184,126	8.11	\$786
2000	182,451	8.10	\$666
1999	172,771	8.04	\$687

(Source: I.C. Agricultural Commissioner's Reports)
Does not include cubed or green chopped.

SOIL PREPARATION: A uniform seedbed is prerequisite to producing a good stand. High and low spots in the field can cause uneven irrigation, resulting in poor stands. A well-drained field is necessary to prevent problems with salinity, scald, and root rot. Most growers subsoil fields prior to the pre-irrigation to break the hardpan and to improve leaching of salts.

Laser leveling is helpful to reduce summer scald and allow for more uniform irrigation. The price of laser leveling is \$85-90 per hour, which normally works out to be \$40-45 per acre for light leveling. Prices vary according how much soil has to be moved.

PLANTING RATES: One pound of seed per acre will provide 4-5 seeds per square foot. At a seeding rate of 25 pounds per acre, 100-125 seeds per square foot are sown. Growers plant 15-30 pounds of seed depending on the condition of their field, cost of seed, method of planting, and time of planting. Planting alfalfa on 40-inch beds on heavy soils is a common practice now where poor drainage is a problem. Approximately the same amount of seed is used for alfalfa planted on 40-inch beds. There are 4-6 seed lines on bed-planted alfalfa. A rough-textured seedbed is preferred to a fine-textured seedbed. A fine-textured, powdery seedbed will crust over reducing seedling emergence.

Planting may be achieved by broadcasting seed and rolling the soil with a ring roller, or planted with a Brillion-type seeder flat or planted on corrugations. The seed should be planted ¼ inch deep or less. Planting deeper may reduce seedling emergence. Some precision planting is done with bed culture.



PLANTING DATES: Late September and October are the preferred months for planting. December plantings often result in poor germination and heavy weed infestation. Spring plantings are occasionally made in February and March. Alfalfa plantings normally stay in production 3 to 5 years.

VARIETIES: "CUF 101" has been the most popular variety grown. Some other commercial varieties that are becoming popular with growers include "Mecca", "Cibola", "Hiline", "Impalo", "SW 100", and "La Jolla". Impalo is the "whitefly" tolerant variety developed in the Imperial Valley. Varieties that have tolerance to the silver leaf whitefly and resistance to the spotted alfalfa aphid and blue alfalfa aphid should be considered. Yields vary depending upon the variety and soil type. Consult your seed dealer for the current variety selections.

FERTILIZATION: Approximately 100 pounds of phosphate (P_2O_5) are removed from the soil for every 7-8 tons of alfalfa hay produced. This amount of phosphate must be replaced to maintain maximum hay production. A preliminary application of at least 100-150 pounds of phosphate per acre is recommended prior to planting. Additional annual applications of 100 pounds of phosphate are recommended during the early spring in split applications.

On soils low in nitrogen, the application of 20-30 pounds of actual nitrogen will stimulate seedling growth. A nitrogen deficiency may occur on virgin soils recently brought into production. In rare cases, it may be necessary to apply a bacterial inoculum (*Rhizobium meliloti*) to speed up the process of fixing atmospheric nitrogen. Very sandy soils usually benefit from the addition of the inoculum.

IRRIGATION: One or two irrigations (2-3 days apart) may be needed to establish a stand, depending upon soil type and weather. Some growers use sprinklers for alfalfa stand establishment. If sprinklers are used, the normal custom rate is \$150-165 per acre.

Two to three irrigations per cutting are necessary depending on the soil type and time of year. During summer irrigations, increase the flow rate down each land to irrigate fewer lands to prevent scalding, a condition causing death of plants by suffocating the roots when temperatures exceed 104°F. No more than 4-6 hours should be required per set on quarter mile runs. Normally growers cut off the irrigation water when it is about 75-80 percent of the way down the length of the field to prevent over-irrigation of the ends of the field.

PEST CONTROL: The spotted alfalfa aphid can cause damage to non-resistant alfalfa. Control is often necessary for the Egyptian alfalfa weevil, the pea aphid, the blue alfalfa aphid and the cowpea aphid. These pests are most active in the winter and spring months. Leafhoppers may damage alfalfa from April through September. The potato leafhopper causes damage to hay in the late summer and fall. Alfalfa caterpillar and beet armyworm may require control in mid to late summer if numbers reach economic thresholds. Occasionally, cutworm outbreaks occur from spring through the fall months. Alfalfa planted on beds is more susceptible to cutworm damage than flat-planted alfalfa.



The silverleaf whitefly can reach high population densities, but no chemical control is recommended. Root rot caused by *Phytophthora* spp. can be a severe problem. Stem canker (*Rhizoctonia solani*) and anthracnose (*Colletotrichum trifolii*) can be severe problems as well.

WEED CONTROL: Light weeds infestations during stand establishment normally do not cause crop yield in most cases. However, most hay growers protect their crop by controlling weeds to guarantee quality hay production and good stands of hay. Some growers will pasture the alfalfa with sheep when mature the first time. Weeds add to the total animal forage for the first *pasturing*, but often cause some yield reduction at the second harvest (compared to herbicide-treated fields). By the third cutting of a new stand, most weeds no longer have an effect on crop yield. However, weeds such as wild oats, canarygrass, and creeping wartress can cause stand loss and consequently yield loss in new fields. Several herbicides are available for weed control in seedling alfalfa. Consult your pest control advisor or Weed Science Farm Advisor for the latest recommendations.

Summer annual grasses are a common problem in established alfalfa. Grasses invade areas where there has been alfalfa stand loss caused by wheel traffic, root diseases or scald. Herbicides are available to prevent or control these grasses. Laser leveling increases positive water management and reduces alfalfa stand loss.

HARVESTING: Alfalfa is normally baled from February through November. Some limited baling is done year round. During winter months, both sheep pasturing and green chopping are normally practiced. Pasturing may return from \$40-50 per acre for the winter months. The value depends upon weed growth and weather conditions.

Maximum yield and high quality hay are seldom attainable at the same time. Hay quality decreases with increasing yield. A good compromise is to cut fields at roughly 10% bloom. Hay cut during the late afternoon or early evening produces higher quality than hay cut in the early morning. Hay should be baled with moisture content of 10-15%. Less moisture causes loss of leaves, thereby decreasing quality. Hay baled with more moisture may mold or overheat in the stack.



GLOSSARY

- 10% Bloom** stage of growth in alfalfa when 10% of the stems are flowering.
- Bale or Baling** Compacting dried alfalfa or grass into a compact package usually weighing 100-120 lbs.
- Bed** Mounded soil that is shaped and used for planting; beds are separated by furrows.
- Berry** see *kernel*
- Big Ox®** A chisel with 7 shanks used to rip soil 18-24 inches deep.
- Blacken the beds** To thoroughly wet/darken a bed with irrigation water applied in furrows.
- Black point** Darkened, sometimes shriveled embryo end of wheat seed; caused by several fungi including *Alternaria*, *Fusarium*, and *Helminthosporium*; also called kernel smudge.
- Bleach** Loss of green color in hay due to sun exposure.
- Boot stage** Stage of wheat development when the sheath surrounding the inflorescence expands.
- Break borders** To tear down flat flood borders or flat crop borders.
- Broadcast** To spread seed on the soil surface.
- Buck ends of field** The remaking of beds at the end of a field in order to channel when beds at the end of a field are destroyed due to insufficient turn around space for farm equipment.
- Chisel** A tractor-mounted, knifelike implement used to rip soil 15-20 inches deep.
- Corrugation** Ridges made in soil to control the flow of water down a field (mini-beds). Name stems from the resemblance to corrugated sheet metal.
- Crimping** Mechanical operation used to crush stems of hay for better curing.
- Cross checks** Small dikes at perpendicular angles to borders used for water diversion into a field; also called taps.
- Cultipacker** A farm implement used to break up clods of soil; consists of groups of knobbed metal rings stacked together; also called a ringroller.
- Cultivate** To work beds after planting in order to control weeds, loosen soil, and allow for application of fertilizer
- Custom rate** The value assigned to a cultural operation by farmers or contractors for cost accounting; normally includes the cost of the operator.
- Cwt of CWT** One hundred pounds
- Damping-off** A fungal disease of seedlings
- Dough stage** Stage of wheat kernel development, when kernels are mature, but not hardened.
- Dormant varieties** Alfalfa varieties which do not produce much growth in cold weather.
- Drill** Type of planter used for cereals.
- Dump borders** See *scraper borders*
- Eagle beak** Type of planter shoe shaped like an eagle's beak used in mulch planting crops such as wheat.
- Float** A large, wooden frame pulled with a tractor for rough leveling of the soil surface.
- Flood irrigation** A method of irrigation where water is applied a field by gravity; the water is channeled by earth borders that are usually 70-200 feet apart.
- Full bloom** Alfalfa blooming at maximum potential.
- Furrow irrigation** A method of irrigation where water is applied to fields by gravity flow, down furrows; the water enters the bed by capillary action.
- Furrow out** The movement of soil from furrows to beds by tractor-mounted shovels; removes impediments to irrigation water.
- Grated pipe** Large diameter pipes used to deliver low pressure water to each furrow; used to keep head end of field dry for cultivation or harvesting.
- Green chop** Alfalfa that is cut green and dehydrated for making alfalfa pellets.
- Ground spray** The application of an agrichemical by a tractor-mounted sprayer.
- Inject fertilizer** The application of liquid or liquid fertilizer in the top or sides of a bed.
- Irrigate up** To irrigate a crop to emergence.
- Kernel smudge** See *black point*.
- Landplane** A large, tractor-pulled land leveling machine.
- Laser level** A land surface leveler that uses a laser guiding device to maintain an accurate grade.
- Layby** To apply an herbicide or other agrichemical at the last opportunity to enter a field with a tractor prior to harvest.
- Lilliston** A rolling cultivator with curved tines which uses ground speed to assist in working up the soil surface in order to destroy weeds.
- Listing** Throwing soil into a mound to make beds.
- Lodge** Cereals falling over due to the weight of the seed and lack of stem strength.
- Motor grader** A large grader normally used to cut tail ditches for draining off excess surface water.

- Mulch plant** Planting seed into moist soil; no additional irrigation needed to germinate crop.
- Noncruciferous** Any crop other than members of the cabbage family (e.g., broccoli, brussels sprouts, cauliflower, etc.)
- Nondeterminant** Describes a plant's growth habit; plant size is not determined and may increase (within limits) as long as proper growth conditions exist.
- Off types** Plant types whose characteristics differ from those of the true variety.
- Pipe setting** Installing 2-inch plastic tubes through a soil berm with a hydraulic ram; the pipes are used to control the flow of irrigation water.
- Pinch wheel** Type of sugar beet harvester which grasps the beet leaves by pinching.
- Planting to stand** Planting the same number of seeds as the desired number of plants in a field.
- Plow** To mix soil by inversion.
- Power mulch** A tractor-mounted, power rototiller.
- Pull borders** To make flood berms used to channel the flow of surface applied water.
- Punching pipe** see *pipe setting*.
- Raking** Rolling hay to a windrow in order to dry, or combining windrows.
- Random flow planter** A non-precision planter; seed drop is regulated by agitating the seed in a hopper over a hole; planting rate depends upon hole size and tractor speed.
- Rank growth** Excessive growth.
- Roll beds** To roll a large, metal roller over the tops of beds in order to firm them prior to thinning.
- Rototill** To mechanically mix soil.
- Row** A line of plants or a bed with a single line of plants.
- Scald** Death of plants due to excessive soil moisture during period of high temperature causing lack of oxygen to the plant roots; e.g., alfalfa, bermuda grass, and sudan grass.
- Scraper borders** Method of making borders without leaving low spots in soil within the area to be planted; helps to prevent water puddling thus preventing scald and root diseases.
- Seed line** A line down a bed in which seeds are planted.
- Semolina flour** Flour made from Durum wheat and used to make pasta.
- Shatter** Loss of grain from the seed heads prior to harvest, often caused by wind or moisture.
- Sidedress** To place pesticides or fertilizers in a band next to a row of plants.
- Slip plow** An implement pulled by a caterpillar and used to make deep cuts into the soil whereby soil from below is carried upward into the cut; used to improve drainage.
- Solitary bees** Type of bee used for pollination which lives alone, not in colonies.
- Spike** The running of tractor-mounted shanks into the soil or beds to improve aeration and drainage.
- Spike wheel** Type of sugar beet harvester using long metal spikes to penetrate the beets and hold them while lifting them out of the ground.
- Stand** The density of plants in a field after emergence.
- Stubble disc** An implement used to chop crop residue and incorporate it into the soil; the blades are scalloped unlike a standard disc..
- Subbing** Irrigation method where water is applied to a field in furrows and allowed to travel across beds by capillary action.
- Subsoil** The pulling of large, hard-faced shanks through the soil up to 42 inches deep; used to shatter soil layers and improve drainage, and leach salts.
- Top crop** Cotton bolls set at the top of the plant; the late crop.
- Triplane** A smaller, three-wheeled version of a *landplane*.
- Versatile** A large 4-wheel drive tractor used to pull discs and other implements.
- Water back** Irrigate again, often after sprinkling.
- Water fun** An application of an agrichemical in irrigation water (i.e., furrow irrigation).
- Wil-rich chisel plow** An implement used to work wet or moist soils prior to making beds.
- Windrow** Forage cut from the plants and raked into a single line for curing and baling.
- Work ends** Miscellaneous field operations including use of a motor grader to cut a tail ditch for irrigation drain water; or bucking ends and pipe punching.
- Yellowberry** wheat kernels that are yellow rather than the normal opaque; usually the result of insufficient, nitrogen fertilization.