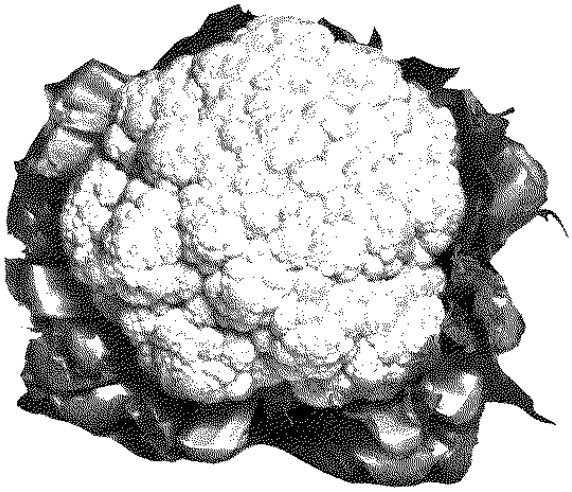
U.C. COOPERATIVE EXTENSION

SAMPLE COST TO ESTABLISH AND PRODUCE

CAULIFLOWER



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.

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

OPERATION	$/ACRE
Plow	32.00
Subsoil 2nd gear	45.00
Subsoil 3rd 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

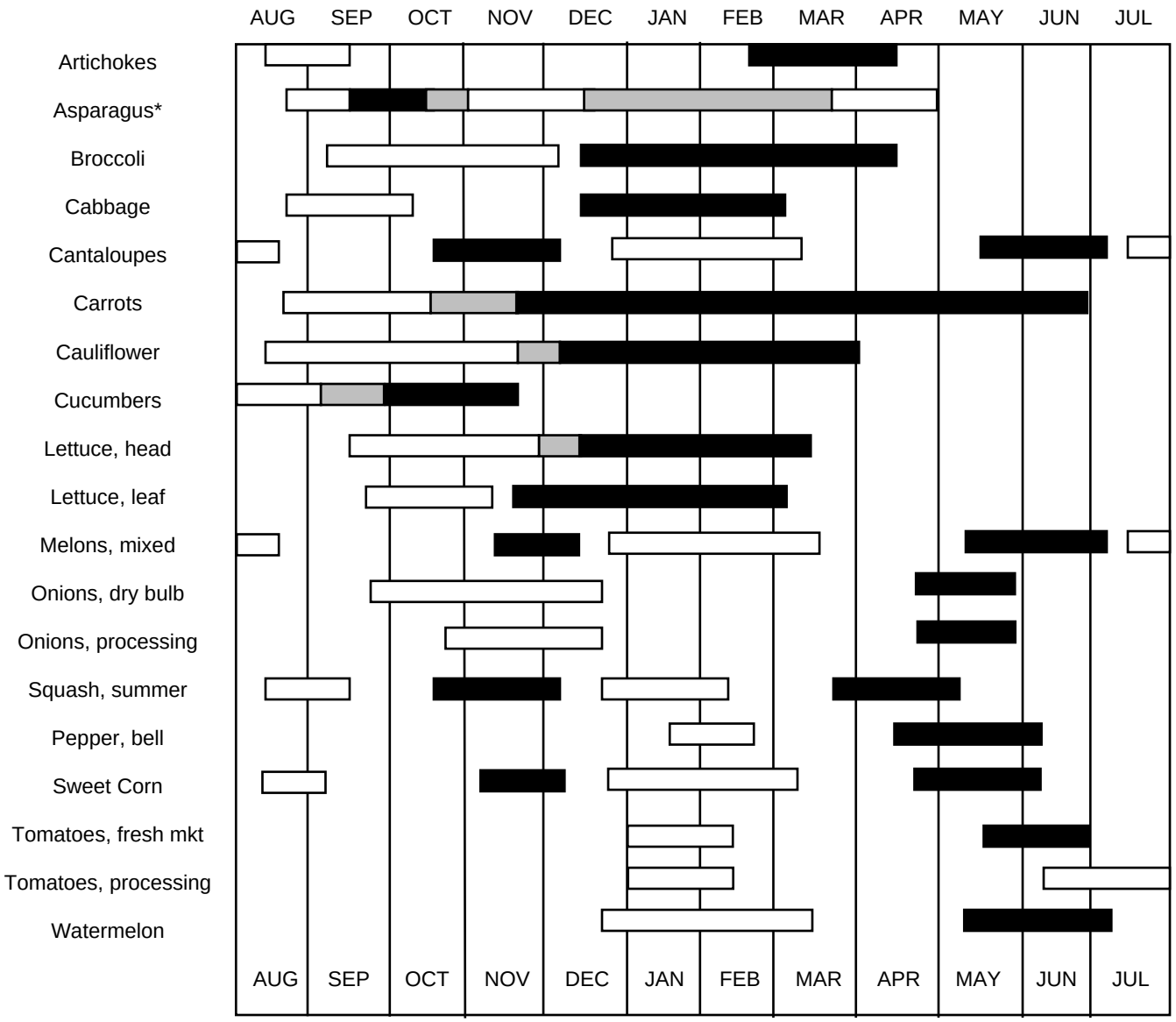
HARVEST COSTS-FIELD CROPS

	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 wheat	16.00 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 1st/2nd	03cts/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

VEGETABLE CROPS
PLANTING & HARVESTING CALENDAR
IMPERIAL VALLEY, CALIFORNIA



MONTH

planting

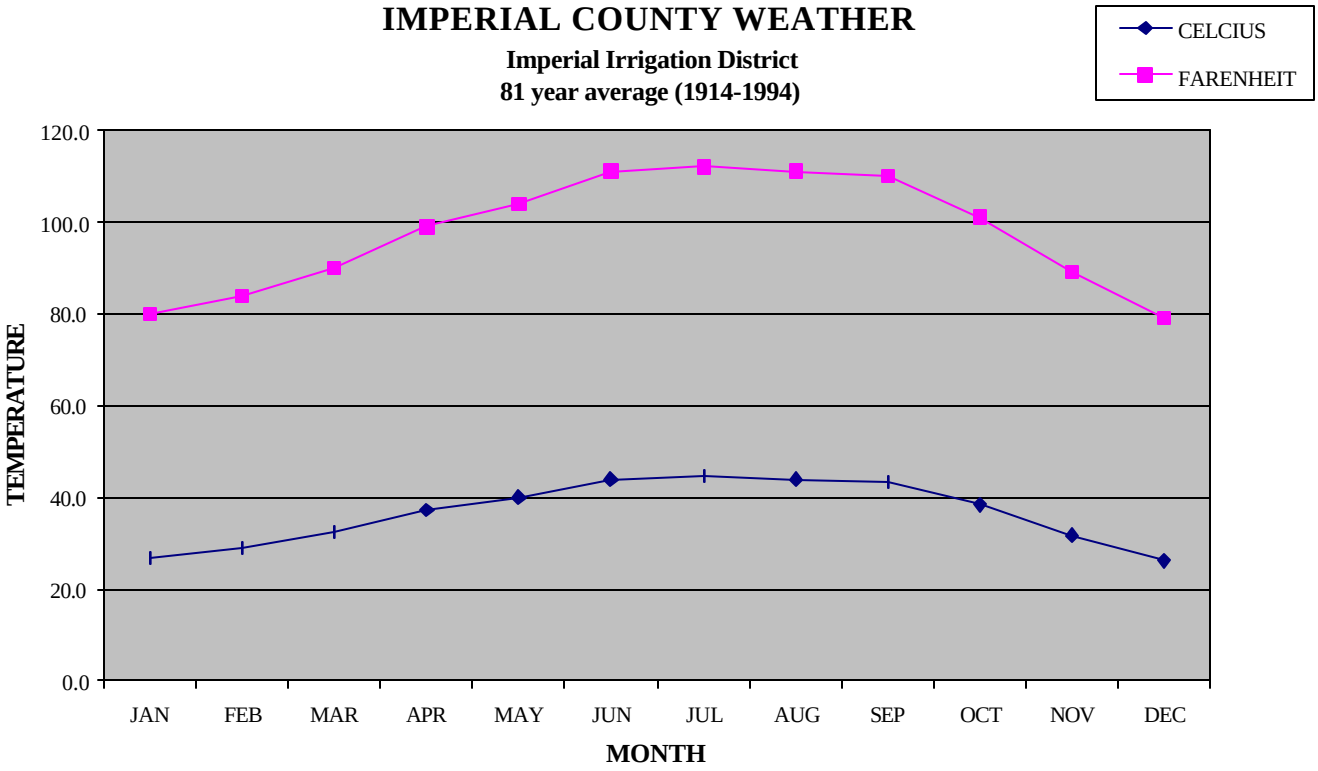
planting/harvesting

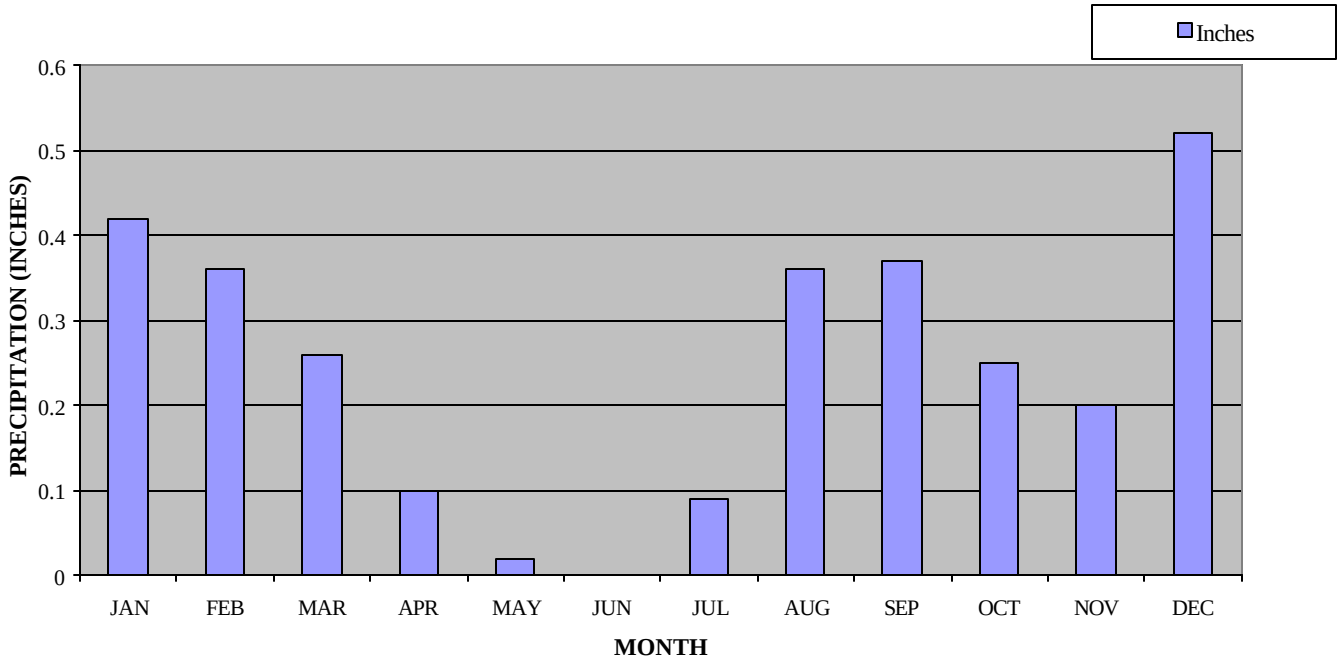
harvesting

* perennial

IMPERIAL COUNTY WEATHER

Imperial Irrigation District
81 year average (1914-1994)





DAYS REQUIRED FOR SEEDLING EMERGENCE* AT VARIOUS SOIL TEMPERATURES

Soil Temperature (°F)

Vegetable	32	41	50	59	68	77	86	95	104
Asparagus	NG	NG	53	24	15	10	12	20	28
Beet	/	42	17	10	6	5	5	5	/
Cabbage	/	/	15	9	6	5	4	/	/
Cantaloupe	/	/	/	/	8	4	3	/	/
Carrot	NG	51	17	10	7	6	6	9	NG
Cauliflower	/	/	20	10	6	5	5	/	/
Celery	NG	41	16	12	7	NG	NG	NG	/
Cucumbers	NG	NG	NG	13	6	4	3	3	/
Eggplant	/	/	/	/	13	8	5	/	/
Lettuce	49	15	7	4	3	2	3	NG	NG
Okra	NG	NG	NG	27	17	13	7	6	7
Onion	136	31	13	7	5	4	4	13	NG
Parsley	/	/	29	17	14	13	12	/	/
Parsnip	172	57	27	19	14	15	32	NG	NG
Peppers	NG	NG	NG	25	13	8	8	9	NG
Radish	NG	29	11	6	4	4	3	/	/
Spinach	63	23	12	7	6	5	6	NG	NG
Sweet Corn	NG	NG	22	12	7	4	4	3	NG
Tomato	NG	NG	43	14	8	6	6	9	NG
Watermelon	/	NG	/	/	12	5	4	3	/

*planting depth = 0.5 inches; NG = no germination; / = not tested; Source: Harrington, J. F. and P. A. Minges, Vegetable Seed Germination. California Agricultural Extension Mimeo Leaflet (1954).

SEED CALCULATIONS (M)

Number of seed (x1000) required[1] per acre for common plant spacing combinations within rows and between beds. Commonly coded as "M" or 1000 seed

	Spacing between beds[3] (inches)					
Plant spacing within rows[2] (inches)	**30**	**40**	**42**	**60**	**66**	**80**
1	209.1	156.8	149.4	104.5	95.0	78.4
1.5	139.4	104.5	99.6	69.7	63.4	52.3
2	104.5	78.4	74.7	52.3	47.5	39.2
2.5	83.6	62.7	59.7	41.8	38.0	31.4
3	69.7	52.3	49.8	34.8	31.7	26.1
4	52.3	39.2	37.3	26.1	23.8	19.6
6	34.8	26.1	24.9	17.4	15.8	13.1
8	26.1	19.6	18.7	13.1	11.9	9.8
10	20.9	15.7	14.9	10.5	9.5	7.8
12	17.4	13.1	12.4	8.7	7.9	6.5
14	14.9	11.2	10.7	7.5	6.8	5.6
24	8.7	6.5	6.2	4.4	4.0	3.3
36	5.8	4.4	4.1	2.9	2.6	2.2

[1] Seeds per acre was calculated assuming one seed per spacing combination. Factors influencing the actual amount of seed needed are seed delivery method and seed viability; [2] Values are based on beds with a single row. For multiple rows, multiply by the number of rows per bed; [3] Beds are measured from center to center.

Linear feet per acre for common bed widths

Bed width (inches)	Linear feet per acre
30	17,424
40	13,068
42	12,446
60	8,712
66	7,920
80	6,534

IMPERIAL COUNTY TRANSPLANT* CAULIFLOWER PROJECTED PRODUCTION COSTS 2004-2005

40 Acre Field

Hand labor at $9.95 per hour ($6.75 plus SS, unemployment insurance, workman's compensation, and fringe benefits)

Yield--550 23-lb. cartons | Direct Seed Hybrid Variety

OPERATION	Cost	Materials		Hand Labor		Cost
		Type	Cost	Hours	Dollars	Per Acre
LAND PREPARATION						24.50
Stubble disc / ring roller	24.50					45.00
Subsoil 2nd gear	45.00					26.00
Disc 2x	13.00					12.00
Triplane	12.00					
Border,cross check & break borders	23.75					23.75
Flood irrigate		Water 1 ac/ft.	16.00	1	9.95	25.95
Disc 2x / ring roller	15.00					30.00
Triplane	12.00					12.00
Fertilize, spread	8.00	500 lb. 11-52-0	75.00			83.00
List 40" beds	16.50					16.50
TOTAL LAND PREPARATION						**274.20**
GROWING PERIOD						
Shape &	12.00	Transplants	225.00	17	169.15	406.15
inject insecticide	2.50	Admire	60.00			62.50
Weed Conrtrol- pre-emergence	12.50	Herbicide	11.00			23.50
Sprinkler Irrigate	175.00					175.00
Cultivate 2x	14.00					28.00
Spike 2x	11.00					22.00
Fertilize & furrow out 2x	14.50	150 lb. N / UAN 32	57.00			86.00
Water-run fertilizer 2x		40 lb. N / UAN 32	15.20			15.20
Hand weed				5	49.75	49.75
Irrigate 8x		4 ac/ft	64.00	5	49.75	113.75
Gated pipe (harvest)	50.00					50.00
Insect control 4x	10.00	Insecticides	80.00			120.00
Disease control 1x	11.50	Fungicide	20.00			31.50
Chop stalks	14.00					14.00
TOTAL GROWING PERIOD COSTS						**1,197.35**
GROWING PERIOD & LAND PREPARATION COSTS						**1,471.55**
Land Rent (net acres)						220.00
Cash Overhead----		14 % of preharvest costs & land rent				236.82
TOTAL PREHARVEST COSTS						**1,928.37**
HARVEST (Field pack)**						
Custom harvest, pack, haul, cool, and sell		550 -23 lb. cartons @	5.00	per carton		2,750.00
TOTAL OF ALL COSTS						**4,678.37**

*The majority of the cauliflower is transplanted rather than direst seeded .

PROJECTED PROFIT OR LOSS PER ACRE

		price/ 23 lb. carton (dollars)					
		7.00	**8.00**	**9.00**	**10.00**	**11.00**	**Break-even $/carton**
	300	-1328	-1028	-728	-428	-128	11.43
Cartons	**400**	-1128	-728	-328	72	472	9.82
per	**500**	-928	-428	72	572	1072	8.86
acre	**600**	-728	-128	472	1072	1672	8.21
	700	-528	172	872	1572	2272	7.75

** Harvest varies with the shipper, the field conditions, and the market.

IMPERIAL COUNTY CAULIFLOWER CULTURE 2004-2005

Annual acreage, yield, and value of fresh market cauliflower in Imperial County, CA (1999-2003)

Year	Acres	Yield/Acre*	Value/Acre
2003	3,192	554	$4,221
2002	3,180	501	$5,795
2001	4,023	570	$4,201
2000	3,943	512	$4,086
1999	4,353	559	$4,386

* 23 lb cartons
Source: Imperial County Agricultural Commissioner's Reports 1999-2003

PLANTING-HARVESTING DATES: Planting starts in August and continues through early December (transplants). Cauliflower is usually grown with a single seed line on 40-or 42-inch beds. Transplants may be grown as greenhouse plugs or field-grown, bare-root seedlings. Several companies will custom install transplants. The transplant machines place seedlings into pre-moistened beds. Sprinklers are started as soon as the machines move to an adjacent area. Early season transplants are subject to "melting" by the fungus *Pythium aphanidermatum*. A chemical drench at transplanting alleviates the problem.

When growing cauliflower from seed, the natural seed is planted 2 to 3 inches apart at a ¼ inch depth using a precision planter such as a Stanhay or one of the various air planters. Seedlings are thinned to 12 to 18 inches between plants. Some late-season varieties are grown using double seed lines on 40- to 42-inch beds. Check with your seed dealer for recommendations.

The major competing areas for marketing winter cauliflower are western Arizona, coastal California, and Texas.

VARIETIES: Several cauliflower varieties are needed to produce a continuous supply throughout the season. Commonly used varieties include: Casper *Rijk Zwaan*; Cielo Blanco *Seminis*; Shasta *Syngenta*; Guardian *Seminis*; Rushmore *Seminis*; Ravella *Seminis*; Incline *Sakata*; Cumberland *Seminis*; Yukon *Sakata*; Minuteman *Seminis*; Fargo *Bejo*; and Chieftan *Seminis*.

Seed is priced per units of one thousand. At a 3-inch spacing, one would need approximately 50,000 seed per acre (M's). Price per acre will vary greatly depending upon variety.

Proper varietal selection keyed to specific planting dates is crucial for cauliflower production. Varieties have internal clocks based on plant age and ambient temperature that trigger the curd to develop into a marketable product. Depending on the variety, the period of adaptation may be only a couple of weeks or more than a month. Varieties grown out-of-slot will not develop satisfactorily.

Ricing, yellowing, light weight curds, and breaking apart of the florets are common defects that occur when a mistake is made in choosing the appropriate planting period for a given variety, or when the crop grows during adverse weather.

SOILS AND IRRIGATION: Cauliflower performs well on medium to medium-heavy soils provided there is adequate drainage. On sandy soils, extreme care must be taken not to stress the plants for water or premature heading may occur. Cauliflower is normally sprinkler irrigated for seedling emergence and then converted to furrow irrigation. Transplants are sprinkled until the new roots are established.

FERTILIZER: A 500-pound broadcast application of 11-52-0 before listing is normal practice. Some cauliflower varieties require more nitrogen (N) than others. The standard practice is to apply 200 pounds or more actual N per acre during the growing season to promote vegetative growth of the outer jacket leaves in order to protect the curds from solar yellowing.

Many types of nitrogen fertilizer may be used for sidedress applications: dry or liquid ammonium nitrate (34-0-0), AN20 (20-0-0), UAN 32 liquid, and occasionally CAN 17 liquid.

INSECTS, DISEASES AND MISCELLANEOUS PROBLEMS: Cabbage loopers, armyworms, flea beetles and aphids must be controlled. Flea beetles and worms are very active in late summer and early fall. These insects can destroy a stand in one day if not controlled.

Silverleaf whitefly will cause delayed and irregular maturity if not controlled. There are currently systemic neonicitinoid insecticides available for pre-plant application that work well on whiteflies.

Cauliflower should not be planted after sugar beets or in the same field for more than three consecutive years due to the possible infestation of sugar beet cyst nematode *(Heterodera schachtii)*. Broccoli and cabbage are also hosts for sugar beet cyst nematode.

Wind whip causes girdling and death of small seedlings. Later, surviving plants may wilt and fail to make a curd. The stems of affected plants become very brittle at the soil level. Seedlings are more susceptible to wind whip after thinning or weeding due to decreased wind impedance. Check the weather forecasts to avoid wind whip injury.

Field mice may be a problem near harvest. Once the mice have become established in a field they are nearly impossible to control. Pre-bait around and destroy grassy areas around the perimeter of the field.

Sooty mold or curd smudge (*Cladosporium* sp.) is a surface curd contaminant that frequently occurs near harvest. It is held in check by the use of chlorinated water sprays before packing. Washing also helps to remove dust and debris from the curds.

Blind bud is a condition where there is no curd formation. The cause may be due to mechanical injury or a genetic defect. Insect chewing and bird feeding are common causes.

Black rot (*Xanthomonas campestris* pv. *campestris*) occurs occasionally in Imperial County. Attempt to plant disease-free seed or transplants. Black rot is a seed-borne bacterial disease caused by *Xanthomonas campestris*. The disease is very destructive. To control seedborne black rot, the producers often use hot water treatment. The process is not 100 percent effective. Seed known to have black rot, or hot water treatment, should never be used for growing transplants. Seed is only hot water treated if it has been found to be infested with *X. campestris* bacteria since hot water treatment reduces seed viability.

Downy mildew (*Peronospora parasitica*) is a foliar fungal disease. Treat only when necessary to protect the leaf canopy.

WEED CONTROL: Herbicides are fairly effective at controlling weeds in cauliflower with the exception of London rocket and shepherd's purse. Hand weeding is often necessary to remove weeds that develop during the winter.

HARVESTING: All cauliflower is field harvested using tractor towed harvesting platforms. Each platform requires a crew of 18 to 21 people. Fields are normally harvested 2 to 4 times or more depending upon the market. Mature curds (6"or larger) are hand-harvested and trimmed. The field workers trimming curds say they are making a "corona" or crown cut. The curds are placed on the tables of field harvesting machines. Cauliflower should never be allowed to roll over and to touch the white curd on the table. Scuffed curds are subject to decay and browning.

The packing crew wraps curds in plastic bags, tapes the butt ends to seal and place-packs the curds according to size. Nine curds/carton (9's), 12's, 16's, and 20's are used, but shippers pack mostly 12's.

Some cauliflower is cut into florets for the food service trade. Cartons containing two 3-lb bags of 1½3 inch florets are common.

Yields of 500 to 600 cartons per acre are possible with good fields. Market demand often drives yields up; the higher the market, the more product will be harvested per acre.

POSTHARVEST HANDLING: Cauliflower is extremely perishable and should be stored for very short periods of time. The storage temperature should be 32°F and 95+ percent relative humidity. Storage at high temperature rapidly causes deterioration of cauliflower quality and shelf life. For example, at 32°F cauliflower can be stored 3 to 4 weeks, at 38°F the shelf life is two weeks, at 41°F it

is 7 to 10 days, at 50°F it is 5 days, and at 59°F only 3 days! When there is an oversupply, cauliflower is often stored at too high a temperature and too low a humidity. Long term or improper storage results in bad arrivals, price adjustments and poor quality product at retail markets.

For more information on cauliflower, see "Cauliflower Production in California", DANR Publication 7219 available from the Imperial County Cooperative Extension Office or for a free download from the Internet go to http://anrcatalog.ucdavis.edu/specials.ihtml .

GLOSSARY

Air spray The application of chemicals by aircraft.
Back fill furrows To shave soil off the top of melon beds and place it into a furrow in order to bring the irrigation water closer to the melon seedline.
Bed Mounded soil that is shaped and used for planting; beds are separated by furrows.
Bell Bell pepper.
Big Ox A chisel with 7 shanks used to rip soil 18-24 inches deep.
Blacken the beds To wet/darken a bed with irrigation water.
Black Ice Ice formation on asparagus that is clear and therefore difficult to detect.
Blanks Lack of individual kernel formation in corn.
Brassicas Plants belonging to the genus *Brassica*, of the mustard family (Cruciferae), including cabbage, kale, broccoli, cauliflower, turnip, and mustard; all brassicas are crucifers, but not all crucifers are brassicas.
Break a field To harvest a crop the first time in a season.
Break borders To tear down flat flood borders or flat crop borders.
Breaker A tomato fruit that is beginning to show color change from green to pink on the blossom end; preceded by the *mature green* stage.
Brix A measure of sugar content, especially in tomatoes; a graduated scale, used on a hydrometer, that indicates the weight of sugar per volume of solution.
Brown bead A physiological disorder of broccoli thought to be related to lack of calcium uptake and excessive heat during head formation.
Buck ends of field The remaking of beds at the end of a field in order to channel irrigation water properly; a necessary practice when beds at the end of a field are destroyed due to insufficient turn around space for farm equipment.
Cateye A condition in broccoli where some beads begin breaking into yellow flower; also called *starring.*
Cello Poly bags which hold one or two pounds of carrots; from "cellophane".
Chisel A tractor-mounted, knife-like implement used to rip soil about 20 inches deep.
'choke Artichoke
Cole crops Any of various plants of the genus *Brassica*, of the mustard family.
Cos Romaine Lettuce
Cross checks Small dikes at perpendicular angles to borders used for water diversion into a field.
Crucifers Plants belonging to the Cruciferae or mustard family (e.g., broccoli, brussel sprouts, cabbage, cauliflower, etc.).
Cucurbits Plants belonging to the melon or gourd family (e.g., cantaloupe, watermelon, pumpkin, cucumbers, squash, etc.).
Cull To separate unwanted product from desirable product.
Cultipacker A farm implement used to break up clods of soil; consists of groups of knobbed metal rings stacked together.
Cultivate To work beds after planting in order to control weeds, loosen soil, and allow for application of fertilizer.
Curd The edible portion of marketed cauliflower.
Custom rate The value assigned to a cultural operation by farmers for cost accounting; normally includes the cost of the operator.
Damping-off A fungal disease of seedlings that causes rotting of the stem at the soil level and collapse of the plant.
Doubles The placement of two seeds rather than one when one is intended.
Drift Agrichemicals, dust or pests, which inadvertently fall on nearby (usually adjacent) non-target crops; usually the result of spraying products (especially products of small particle size) on windy days or of poor equipment operation.
Drip Irrigation The slow application of low pressure water in tubes or pipes (buried or on the surface): sometimes called trickle irrigation.
Edema (oedema) A physiological disorder of plant resulting from over-watering; numerous small bumps on the lower side of leaves or on stems divide, expand, and break out of the normal leaf surface and at first form greenish-white swellings or galls; the exposed surface

later becomes rusty colored and has a corky texture; especially common in cabbage.
Excelsior Fine wood shavings; used for stuffing, packing, etc.
Feathering Premature flowering of asparagus due to high temperatures.
Flats Flattened asparagus spears caused by certain varietal characteristics.
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 to a field by gravity; the water is applied to a field by gravity; the water is channeled by earth borders that are usually 70 feet apart.
'flower Cauliflower
Forking The division of a tap root (especially carrots and lettuce) into branches; can be caused by nematode feeding, soil-borne pathogens, and soil texture.
Frost kissed Produce that has been frozen in the field and has a frosty appearance.
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 removal of soil from furrows by tractor-mounted shovels.
Gated 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 line A term used to describe the appearance of an emerging row crop as plants germinate and emerge above the soil line, a *green line* appears; often growers switch from sprinkler to furrow irrigation when a field can be *green-lined.*
Ground spray The application of an agrichemical by a tractor-mounted sprayer.
Hollow stem A physiological disorder in broccoli resulting from excessive plant spacing.
Honeydew Sweet excrement from aphids and whiteflies as a result of feeding on plant sap. Honeydew attracts ants and will support the growth of fungi (sooty mold).
Hydrocool To cool produce using ice cold water.
Inject fertilizer The application of liquid fertilizer in the top or sides of a bed.
Jelly Gelatinous material present in *mature-green* tomatoes (see also *locule*).
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 in to a mound to make beds.
Locules Tomato fruit seed cavity.
Mature-green A stage of tomato fruit development when the fruit is fully grown and shows brownish ring at the stem scar after removal of the calyx; color at the blossom end has changed from light green to yellow-green and the seeds are surrounded by *jelly*.
Motor grader A large grader normally used to cut tail ditches for draining off excess surface water.
Naked pack Head lettuce packed without a wrapper.
Pegging the emergence of a *radicle* from seed and its placement in the soil.
Pipe setting Installing 2-inch plastic tubes through a soil berm with a hydraulic ram; the pipes are used to control the flow or irrigation water.
Power mulch A tractor-mounted, power rototiller.
Precision planter Planters which drop seeds at exact intervals; may function mechanically or by vacuum.
Primed seed Lettuce seed that has been *primed* for germination by soaking in *osmotic* solutions (e.g., polyethylene glycol [PEG]) as a preventative to *thermodormancy.*
Pull borders To make flood berms used to channel the water.
Punching pipe see *pipe setting.*
Putting the crop to sleep A phrase used to describe the over-watering of tomatoes by furrow irrigation following sprinkler irrigation; encourages shallow rooting and decreased plant growth.
Radicle The embryonic root.

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.
Ricing Undesirable granulation of floret tips in cauliflower.
Roll beds A large, metal roller used to firm beds prior to thinning.
Rototill To mechanically mix soil.
Row A line of plants or a bed with a single line of plants.
Seedline A line down a bed in which seeds are planted.
Sidedress To place agrichemicals in a band next to a row of plants.
Silking Period of corn ear formation when silky threads emerge from the ear tip.
Slant bed A culturing technique where beds are slanted towards the winter sun (35-37 degrees from horizontal) such that the bed is perpendicular to the sun's rays.
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.
Slush-ice-cooling A cooling method used on broccoli; a mixture of water and ice is forced rapidly into cartons to cool the product.
Spike The running of tractor-mounted shanks into the soil or beds to improve aeration and drainage.
Sprinkler irrigate The application of irrigation water by pressurized injection into the air.
Starring see *cateye*
Stinger A root emerging from seed; a *radicle*
Stubble disc An implement used to chop crop residue and incorporate it into the soil; the blades are scalloped and operate like a pizza cutter.
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.
Swamper Watermelon harvesting crew member.
Swath To cut a tall crop such as asparagus fern.
Taps See *cross checks*
Tasseling The emergence of corn inflorescence.
Thermodormancy A condition of lettuce seed where high temperatures (>86°F) make seed go dormant, thus inhibiting germination.
Thin The removal of excess crop plants and weeds in the seedline in order to achieve desired plant spacing.
Tillering Emergence of multiple stalks from the same root in corn.
Tip burn A condition, especially in lettuce, where leaf tips are burned; thought to be due to lack of calcium uptake; foliar applications of calcium do not correct the problem.
Trio A head lettuce having crew unit consisting of two cutters and a packer; only used in *naked pack* lettuce.
Triplane A smaller, three-wheeled version of a *landplane.*
Triwall cardboard Triple-layered, corrugated cardboard used to make very sturdy fiberboard containers for watermelon.
Vacuum cooling A cooling method whereby commodities are placed in a strong-walled room, air pressure is reduced and heat consumed in the process cools the product.
Versatile A large caterpillar-sized tractor with rubber tread; used to pull discs and other implements; safe for crossing asphalt roads.
Water run An application of an agrichemical in irrigation water (i.e., furrow irrigation).
White star White markings at the blossom end of tomatoes that turn from green to white as the fruit matures; an indicator of maturity in tomatoes.
Wil-rich chisel plow An implement used to work wet or moist soils prior to making beds.
Wind whip Girdling of seedling stems due to high winds. Seedlings are especially susceptible following thinning or weeding; cole crops are most susceptible.