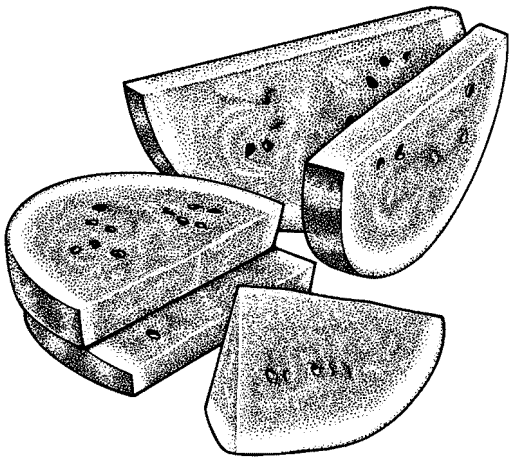
U.C. COOPERATIVE EXTENSION

SAMPLE COST TO ESTABLISH AND PRODUCE

WATERMELON



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

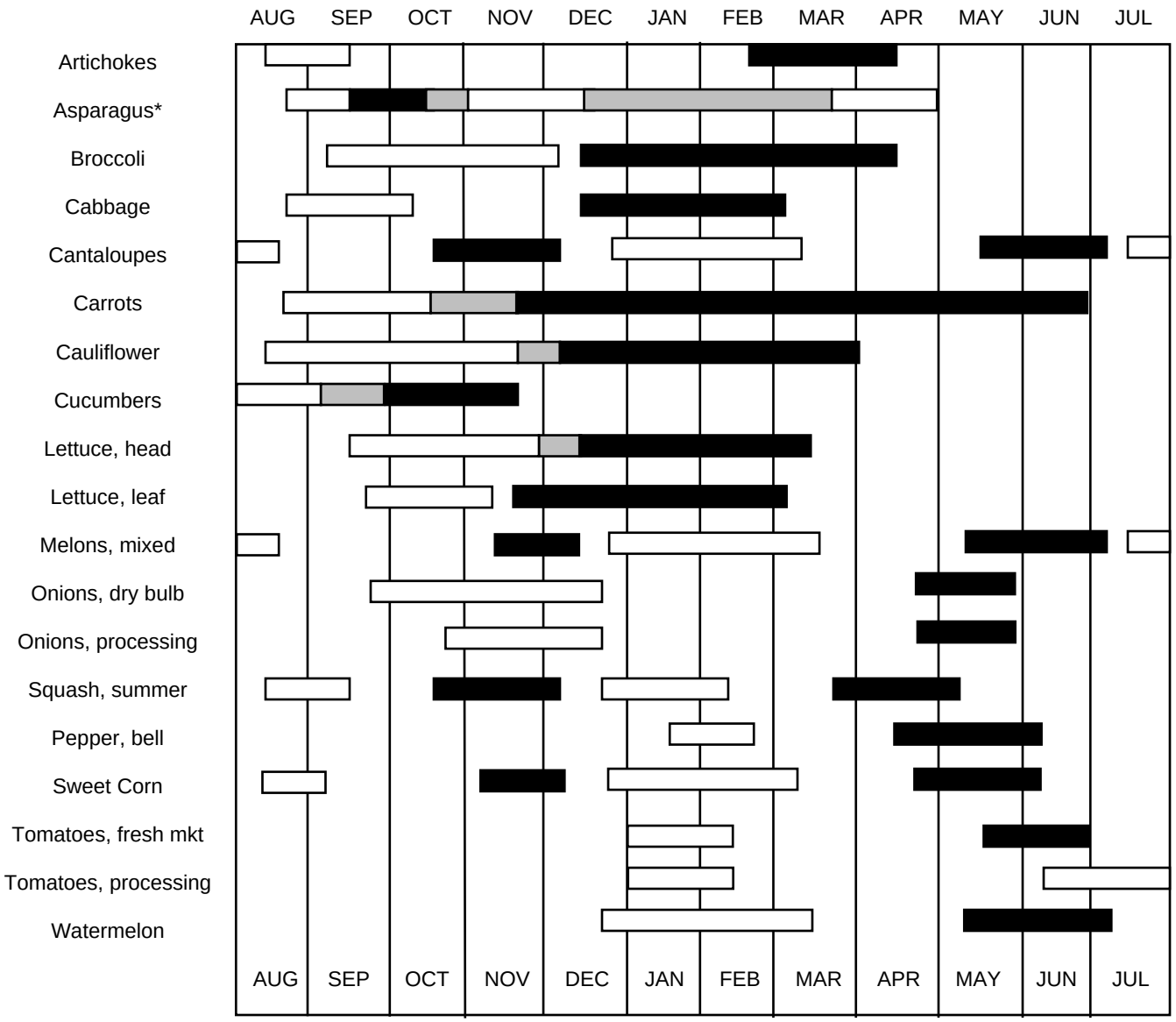
HARVEST COSTS-FIELD CROPS

	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

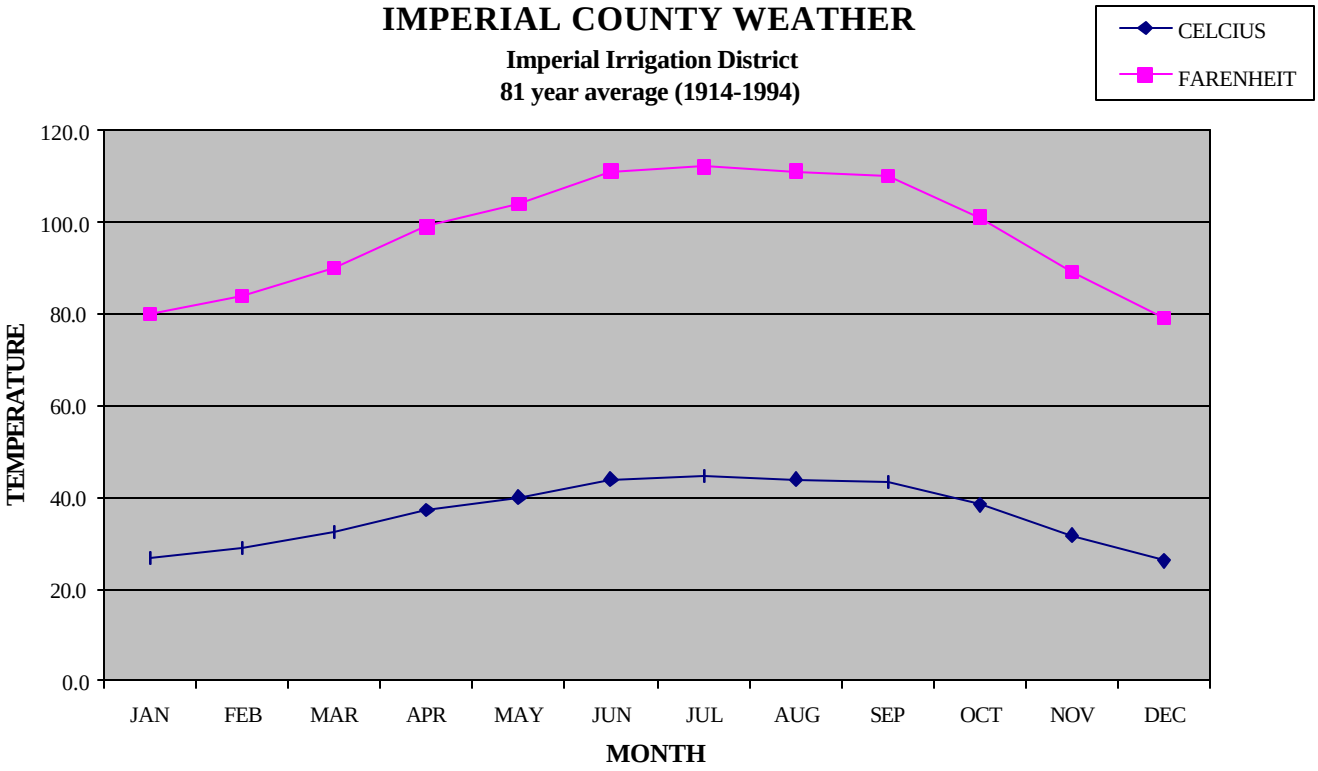
planting/harvesting

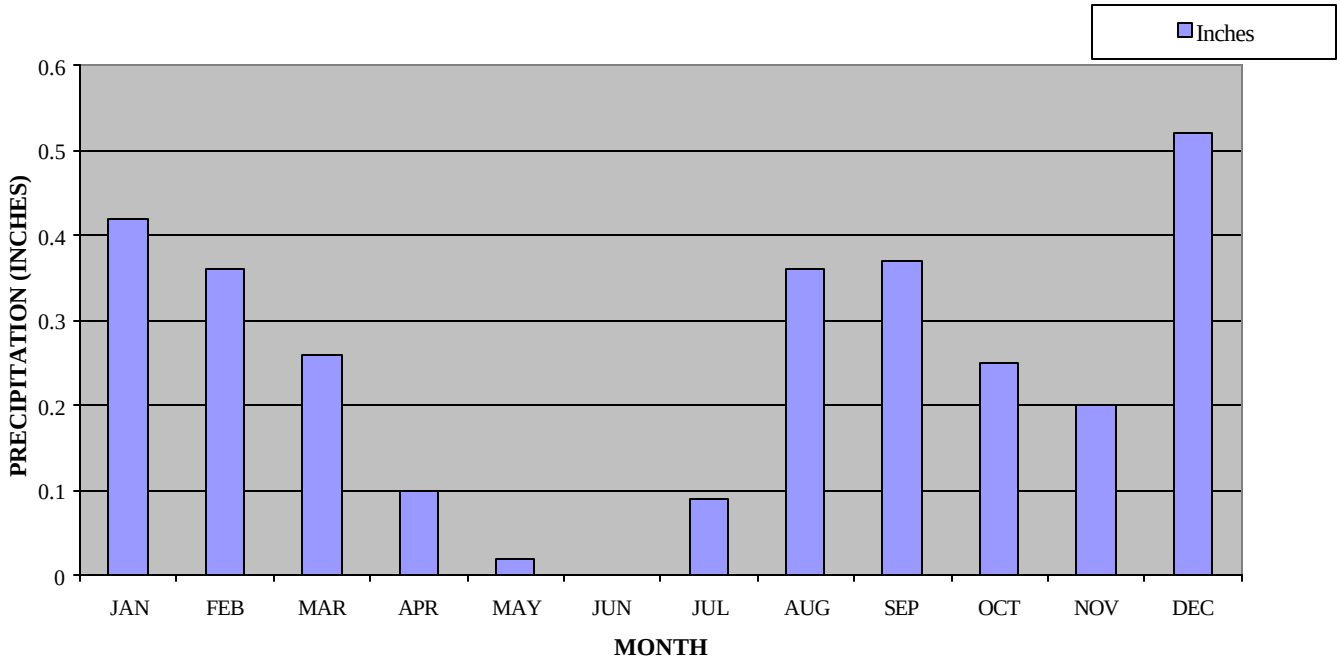
harvesting

* 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 DRIP IRRIGATED SEEDLESS WATERMELON 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-- 30 tons per acre. 2/3 bin containers

OPERATION	RATE	Materials		Hand Labor		Cost
		Type	Cost	Hours	Dollars	Per acre
LAND PREPARATION						
Stubble disc / ring roller	24.50					24.50
Subsoil 2nd gear	45.00					45.00
Disc 2x	12.50					25.00
Triplane	12.00					12.00
Border, cross check and break borders	23.75					23.75
Flood		Water 1 ac-ft	16.00	1	9.95	25.95
Disc 2x	13.00					26.00
Triplane	12.00					12.00
List beds	20.00					20.00
Rerun beds 2x	10.00					20.00
TOTAL LAND PREPARATION						**234.20**
GROWING PERIOD						
Shape beds	10.00					10.00
Install drip irrigation		Drip system & tape	600.00	12	119.40	719.40
Install plastic mulch	55.00	Plastic mulch	200.00			255.00
Metam sodium via drip		metam sodium	200.00			200.00
Seedless transplants		S-transpants	600.00	12	9.95	719.40
Pollinator transplants		P-transplants	100.00	4	9.95	139.80
Cultivate 2x	13.00					26.00
Irrigate 10x		Water 3 ac/ft	48.00	20	199.00	247.00
Fertilizer via drip		200 lb. N / UAN 32	76.00			76.00
		100# phosphate	30.00			30.00
Chemigation		Admire	60.00			60.00
Drip maintenance		Chemicals	25.00			25.00
Hand weed 2x				12	119.40	119.40
Pollination		2 hives @ 27.00	54.00			54.00
Vine turn 2x (hand)				14	139.30	139.30
Insect control 4x	14.00	Insecticides	80.00			136.00
Disease control 4x	11.50	Fungicide	60.00			106.00
Remove mulch & tape		Disposal fee	20.00	15	149.25	169.25
Dessication		metam sodium	32.00			32.00
TOTAL GROWING PERIOD						**3,263.55**
GROWING PERIOD & LAND PREPARATION COSTS						**3,497.75**
Land Rent (net acres)						215.00
Cash Overhead--	15 % of preharvest costs & land rent					556.91
TOTAL PREHARVEST COSTS						**4,269.66**
HARVEST						
Pick, load, haul, sort and sell		30 tons/ acre @	95.00 /ton*		(.0425 per lb)	2,850.00
TOTAL OF ALL COSTS						**7,119.66**

PROJECTED PROFIT OR LOSS PER ACRE

		Price/ton (dollars)					
		200	210	220	230	240	Break-even ¢/ pound
Tons per acre	20	-2170	-1970	-1770	-1570	-1370	15.4
	23	-1855	-1625	-1395	-1165	-935	14.0
	27	-1435	-1165	-895	-625	-355	12.7
	30	-1120	-820	-520	-220	80	11.9
	33	-805	-475	-145	185	515	11.2

* Harvest cost may vary substantially depending upon the melon type, container packed, resorting and yard fees.

IMPERIAL COUNTY WATERMELON CULTURE 2004-2005

Annual acreage, yield (tons), and value of watermelons
Imperial County, CA (1999-2003)

Year	Acres	Yield/Acre	Gross Value/Ton
2003	1,118	28.2*	$240
2002	955	23.0	$263
2001	769	29.2	$221
2000	1,254	30.0	$181
1999	2,315	20.7	$149

*Tons
Source: Imperial County Agricultural Commissioner's Reports 1999-2003

PLANTING-HARVESTING DATES: Watermelons are planted mid-December to February 1st, and harvested between mid-May to mid-July. Major competition in the market comes from Mexico, Arizona, and Texas. Yields can be as high as 35 to 50 tons per acre under ideal conditions.

PLANTING INFORMATION-SEEDED VARIETIES: Some seeded watermelons are grown on 80-inch south-sloped beds. The beds are slanted to the south at a 35-37^{o} angle from horizontal. This practice allows for increased heat in the seed line by capturing the incoming sunrays at a near perpendicular angle, thus increasing absorbed energy.

Seed is sown ½ inch deep using random flow or precision air planters. The thinned plant spacing varies from 2-3 feet depending upon variety.

SEEDED VARIETIES: Sangria *Syngenta*; Celebration *Syngenta* and Fiesta *Syngenta* are popular "All-Sweet" hybrids. Royal Sweet *Seminis*, Carnival *Syngenta* and A&C 800 are some other hybrid varieties used.

PLANTING INFORMATION-SEEDLESS VARIETIES: Seedless varieties are usually grown using transplants, drip irrigation, plastic mulch bed covers and occasionally hooped tunnels. From 1-3 drip lines may be used per 80-inch bed. Production of seedless watermelon is very expensive for both plants and culture. Triploid, seedless watermelon needs temperatures near 80°F for germination that is best achieved in a greenhouse.

SEEDLESS VARIETIES: Commonly used seedless varieties include: Ultrakool *Headstart*; Tri-X 313 *American Sun Melon*; Nova *Sakata*; Fandango *Shamrock*; Laurel *Takii*; AC-5244 *Abbott & Cobb*; and Millionaire *Harris Moran.*

To determine the amount of seed needed for transplants, compensate for germination percentage plus 25% more for losses in the greenhouse during the growing process.

Seedless watermelons are usually spaced 24-to 28-inches down the row. This allows for greater density of vines, higher yields and less sunburn.

Some growers plant one row of pollinator plants for every two rows of seedless. Fiesta, Mardi Gras, Sangria, and Royal Sweet are used as pollinator varieties. Fruit from the pollinator rows are sold as a separate product. Other growers intersperse the pollinators down the seedless row with one pollinator plant for every three or four seedless plants.

Seedless transplants cost between $0.30-$0.40 per plant depending upon the variety selected. This does not include the cost of labor to install the plants.

Some growers use plastic drinking cups to protect the transplants for the first couple of weeks after transplanting. The cost of cups, installation and removal is estimated to be an additional $300 per acre.

SOILS: Watermelons grow best on non-saline, sandy loam or silt loam soils. Some watermelons are successfully grown on dune sand when given ample moisture and fertilizer. A soil temperature of 95^{o}F is optimum for germination of seeded melons.

IRRIGATION: The germination irrigation should run until the beds are completely wet. Following emergence, water may be withheld for a long period of time. After the plants start to set fruit, watermelons should not be stressed for water. Insufficient irrigation will result in small melon size and increased blossom end rot. Excessive irrigation after the melons have been water stressed may result in fruit splitting.

Watermelons respond very favorably to drip irrigation. Applying water regularly will increase fruit set, fruit size, and yield. The use of drip irrigation increases growing costs roughly $600 per acre. The additional expense of the drip irrigation system must be offset by higher yields in order to justify its cost. Some fields that are not held back by virus, soilborne disease or insects may yield 35 to 50 tons of seedless watermelons per acre.

FERTILIZERS: Thirty-five gallons of 10-34-0 liquid fertilizer may be applied preplant during planting-shaping. Up to 200 pounds of actual nitrogen fertilizer are later sidedressed in split applications. Less fertilizer is needed when watermelons follow a lettuce crop.

POLLINATION: Two bee colonies per acre should be placed in the field when male flowers begin to appear. Poor pollination is often the cause for misshapen fruit. Seldom will a watermelon plant produce more than 2-3 harvestable fruit. While it is too expensive to prune off excess fruit, often misshapen and split fruit are removed.

PEST AND DISEASE CONTROL: Silverleaf whitefly, cutworms, aphids, spider mites, darkling ground beetles, leafhoppers, cabbage loopers, beet army worm, and leafminers are the most serious insect pests of watermelon. Neonicitinoid insecticides applied at planting or through the drip system followed by foliar insecticide sprays are used to control whiteflies on melons. Rind scaring is a serious defect caused by worm feeding that reduces market value. Shaking the vines and turning them over to look for worms on the ground will give an indication of worm populations.

Zucchini yellow mosaic virus (ZYMV) and watermelon mosaic virus (WMV) is transmitted by aphids and can severely distort the fruit and vines, thus reducing yield. Charcoal rot (*Macrophomina phaseolina*) and powdery mildew (*Sphaerotheca fuliginea* or *Erysiphe cichoracearum*) may also require control.

Melon vine decline (*Monosporascus cannonballus)* can cause serious damage at harvest. Other than soil fumigation by methyl bromide, there is no control. Various *Pythium* sp. cause sudden wilt symptoms, which can kill the vine after fruit set. Careful water management can reduce the likelihood of the occurrence of this disease.

Blossom end rot is a physiological disorder that may be a problem when melons are grown under salt stress, water stress, or waterlogging. Varieties vary in their susceptibility to this disorder.

Rind necrosis can be a problem. The tissue discoloration rarely affects the flesh of the melon; however, melons with necrosis may be discounted in price. Some researchers believe a bacterium may be involved in causing the disorder.

HARVESTING: A sharp knife is used to cut melons from the vines; pulled melons may crack open. Melons are picked on the basis of color change, blossom end conditions, and rind roughness. Color change is the most reliable. Harvested fruit are windrowed near roadways usually spaced about 10 beds apart. A pitching crew follows the cutters and forms a line between outside row and a truck. Melons are pitched man-to-man and loaded in bins on trucks to be transported to the shed. Melons should never be stacked on the blossom end or excess breakage may occur.

Loss of natural protection on the fruit can increase sunburn. Exposed fruit are covered with vines as they start to mature near harvest to prevent sunburn. Each time the field is harvested, workers need to cover the exposed fruit with vines.

Most fields are picked at least twice and some a third or fourth time depending upon fruit prices in the market and the degree of sunburned fruit. Drip irrigated watermelons will be harvested several more times than conventional grown melons.

The seeded melons are sorted and packed in large, sturdy, "triwall" fiberboard containers. The melons are sorted according to grade and number. Bins hold 60 to 80 melons and will weigh 1,100 to 1,200 pounds. Discolored, misshapen, sugar cracked, blossom end rot, and insect damaged fruit are culls, but still may be sold to nearby markets.

The containers are loaded on flat bed, 18-wheel trucks destined for terminal market resale. The tops of the containers should be covered to prevent sunburn in transit. Watermelon sales usually are based upon a 1 to 2 percent shrink, because of breakage. The buyer is responsible for supplying bins and lids or the shipper will bill for the cost of those items.

Seedless watermelons are sorted according to size and packed in cartons containing 4, 5, 6, or 8 fruit. "Fours" and "fives" are preferred sizes. "Sixes" and "eights" are common later in the season after the crown-set melons are removed from the vine. The rough weight of a carton is 40 to 50 pounds. Some bins and cartons have high-resolution graphics for logos that may increase overall cost.

POSTHARVEST HANDLING: Watermelons are not adapted to long-term storage. Normally about three weeks is the upper limit of suitable storage, however, this will vary from variety to variety. Storage for more than two weeks triggers a loss in flesh crispness.

Watermelons store and ship better when held at temperatures of 50° to 60°F and 90 percent relative humidity. Storing melons for several weeks at room temperature will result in poor flavor. However, when fruit are held just a few days at warmer temperatures, the flesh color tends to increase. Sugar content does not change after harvest.

Chilling injury will occur after several days' storage below 41°F. Decay-causing organisms will invade the resulting pits in the rind. Watermelons flesh will tend to lose its red color if held too long at temperatures below 50°F.

For more information see "Watermelon Production in California", DANR Publication 7213 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.