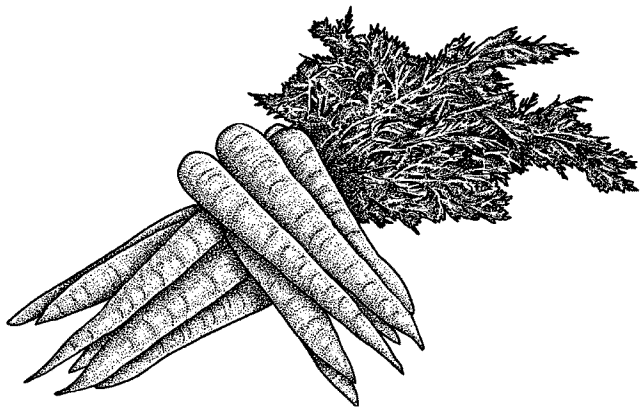
U.C. COOPERATIVE EXTENSION

SAMPLE COST TO ESTABLISH AND PRODUCE

MARKET CARROTS



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

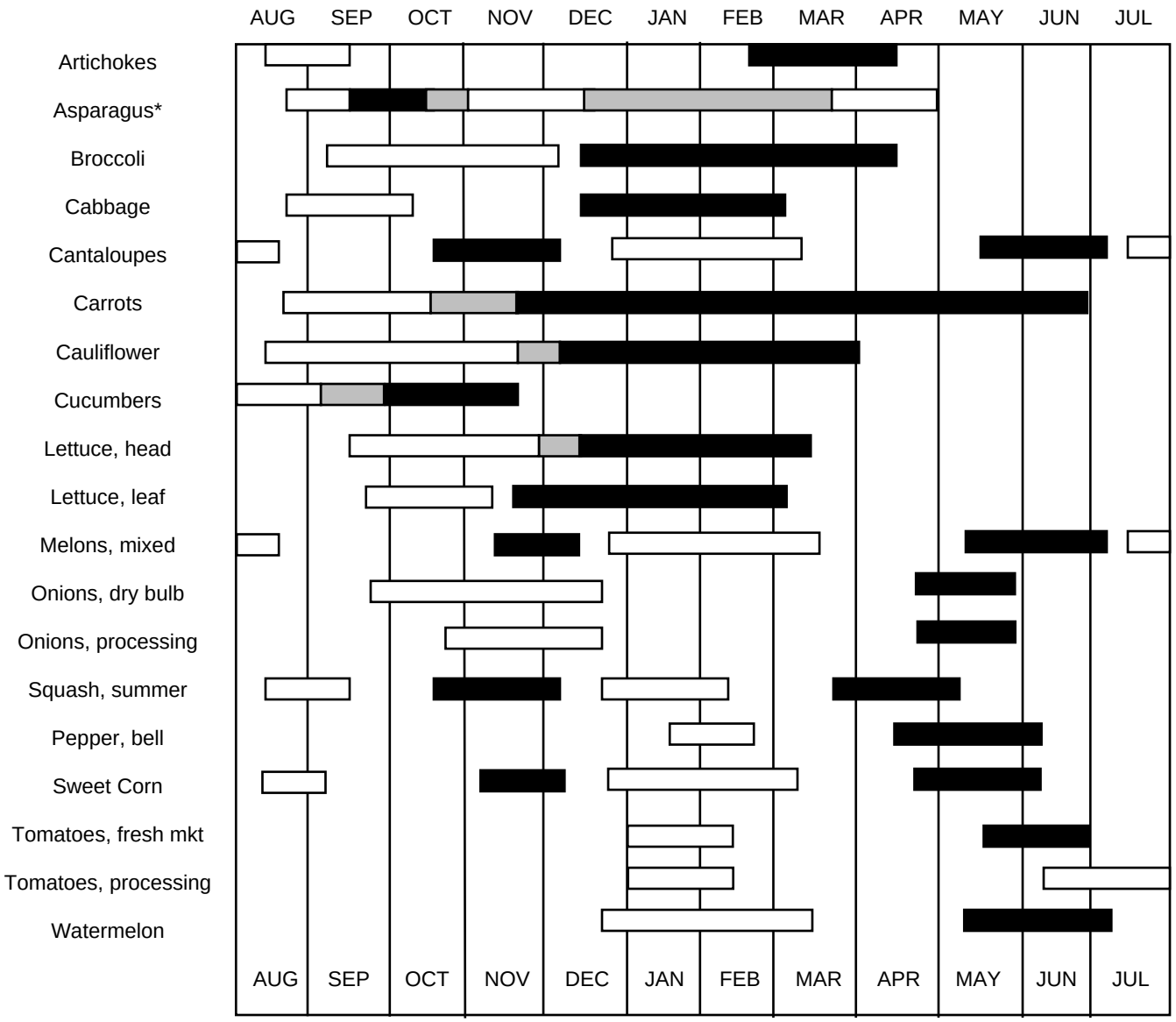
HARVEST COSTS-FIELD CROPS

	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

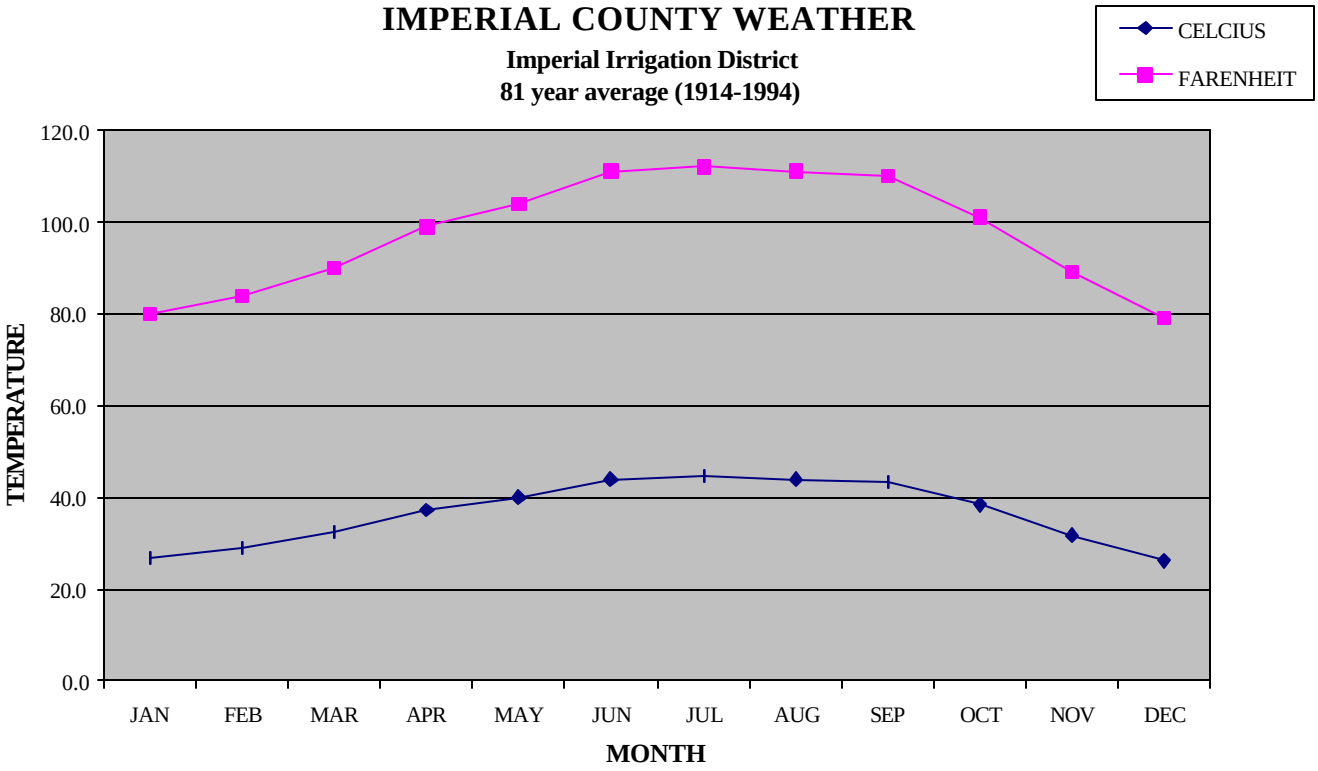
planting/harvesting

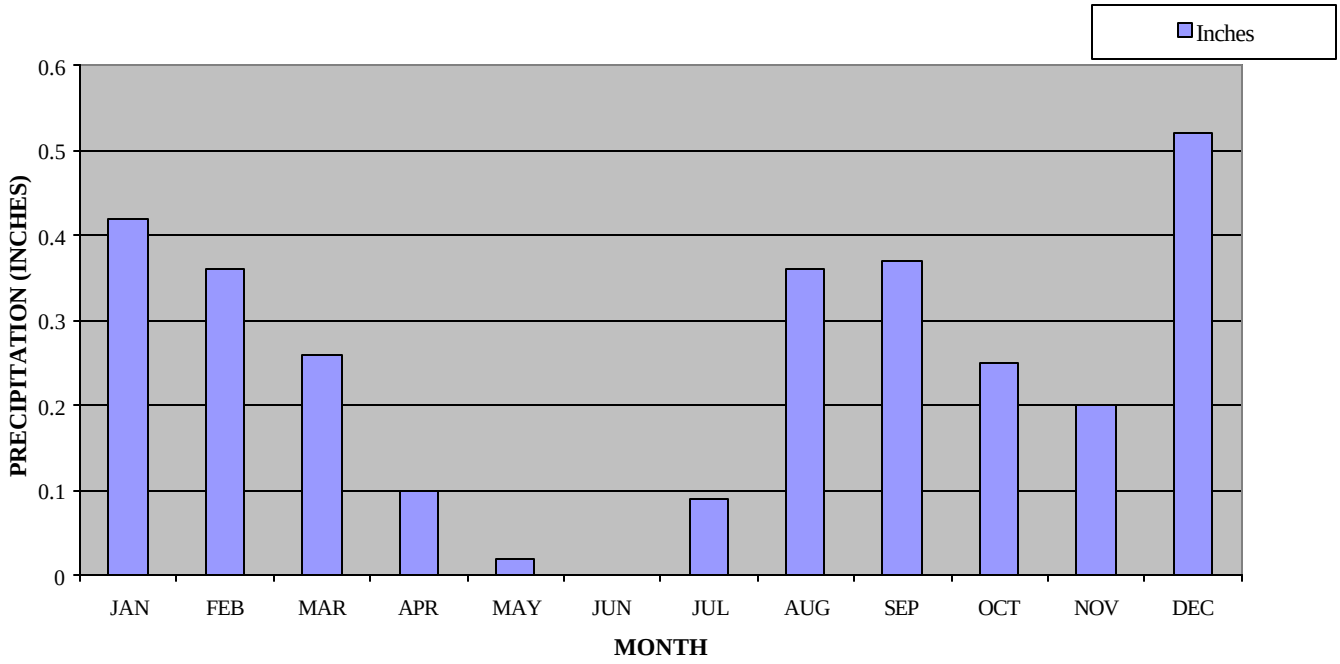
harvesting

* 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 CARROT PROJECTED PRODUCTION COSTS 2004-2005

40 Acre Field

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

Yield--800 50-lb. Master poly containers

OPERATION	Cost	Materials		Hand Labor		Cost
		Type	Cost	Hours	Dollars	Per Acre
LAND PREPARATION						
Stubble disc	22.50					22.50
Subsoil 2nd gear	45.00					45.00
Disc 2x / ring roller	15.00					30.00
Triplane	12.00					12.00
Border, cross check & break borders	23.75					23.75
Flood 1x		Water 1 ac/ft	16.00	1	9.95	25.95
Chemigation		metam sodium	145.00			145.00
Flood 1x		Water 0.5 ac/ft	8.00	1.00	9.95	17.95
Disc 1x	13.00					13.00
Triplane	12.00					12.00
Fertilizer,spread	8.00	500 lb. @ 11-52-0	75.00			83.00
List 40" beds	16.50					16.50
TOTAL LAND PREPARATION						**446.65**
GROWING PERIOD						
Plant	20.00	Hybrid seed 550M	180.00			200.00
Sprinkler irrigate	185.00					185.00
Weed Control/incorporation*	15.00	Herbicide	5.00			20.00
Weed Control/chemigation		Herbicide	5.00			5.00
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
Weed control, post 3x	12.50	Herbicide	60.00			97.50
Water-run fertilizer		50 lb. N / UAN 32	19.00			19.00
Irrigation 6X		Water 2.5 ac/ft	40.00	3.5	34.83	74.83
Disease control 1x	10.50	Fungicides/Sulfur	5.00			15.50
Insect control 2x	11.50	Insecticide	25.00			48.00
GROWING PERIOD						**800.83**
GROWING PERIOD & LAND PREPARATION COSTS						1,247.48
Land Rent (net acres)						225.00
Cash Overhead	13 % of harvest costs and land rent					191.42
TOTAL PREHARVEST COSTS						**1,663.90**
HARVEST COSTS**						
Harvest by machine, haul to Bakersfield, cool, pack and sell	800 -50 lb. sacks @ (Packout 85% Cellos & 15 % Jumbos)		5.00 /sack (contract rate)			4,000.00
TOTAL OF ALL COSTS						**5,663.90**

***Some growers prefer to disc in treflan in addition to chemigation depending on weed pressure.

PROJECTED PROFIT OR LOSS PER ACRE

		Price/master poly sack (dollars)					
		5.00	5.50	6.00	6.50	7.00	Break-even $/sack
Poly	750	-1664	-1289	-914	-539	-164	7.22
sacks	800	-1664	-1264	-864	-464	-64	7.08
per	850	-1664	-1239	-814	-389	36	6.96
acre	900	-1664	-1214	-764	-314	136	6.85
	950	-1664	-1189	-714	-239	236	6.75

** Harvest cost may vary with the shipper, the field conditions and the market.

IMPERIAL COUNTY CARROT CULTURE 2004-2005

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

Year	Acres	Yield/Acre*	Value/Acre
2003	6,520	713	$6,189
2002	6,142	801	$7,850
2001	4,534	800	$5,000
2000	7,420	780	$3,900
1999	6,798	834	$7,681

Annual acreage, yield, and value of processing & other carrots
Imperial County, CA (1999-2003)

Year	Acres	Yield/Acre*	Value/Acre
2003	9,781	25.32	$2,026
2002	9,044	22.42	$1,794
2001	10,578	29.00	$2,320
2000	11,130	30.00	$2,400
1999	10,197	33.62	$2,452

*50 pound master poly sacks containing cello packs basis. Many sold bulk.
Source: Imperial County Agricultural Commissioner's Reports 1999-2003

PLANTING-HARVESTING DATES: Early maturing carrots are planted in early September. Later maturing carrots are planted in October and early November. Most of the carrots grown locally are shipped to Bakersfield for packing. The majority of the harvest starts in February and runs through mid-May. Carrots could be harvested December to early June if desired. Florida, Texas, Bakersfield, and Arizona provide the most market competition during our shipping season.

VARIETIES: Trinity *Sakata*; Caro Pak; *Seminis*; Apache *Sunseeds*; Navajo *Sunseeds*; and HM 02 *Harris Moran*. Varieties used for shortcuts or cut and peel includes: Primecut 59 *Sunseeds*; Sugar Snax *Sunseeds;* Tripleplay 58 *Sunseeds*; and Snackpack *Seminis*.

PLANTING INFORMATION: Carrots may be planted 6 seed lines per 40-inch bed. Three rows are placed on each bed shoulder. Rows are usually 1-½ inches apart. However, there are many variations of the number of lines, spacing between lines and bed width depending upon the shipper's needs and ultimate product use. A ballpark value is 38-42 plants per foot of bed. Planting fewer seed produces large carrots for the shredder processing use. Smaller diameter carrots for short cut use requires planting large amounts of seed.

Natural and pelleted seed are both used. For natural seed, most growers use converted Planet Jr. planters utilizing a random flow distribution of seed drop. Stanhay planters with split shoes have been used for precision planting.

Seed is placed in a shallow groove and not covered. Enough sandy soil will cave into the groove during sprinkler irrigation to place the seed at the proper depth.

Carrots may be sown at a rate of 1,000,000 live seed per acre. Germination is often 80-90 percent and seed counts may be 175,000 to 400,000 seed per pound. The seeding rate per acre is calculated accordingly. Again this seeding rate is a variable factor and the ultimate control over population should be the decision of the shipper.

SOILS: Carrots have been grown on many of the soil types in the low desert. However, best root development is obtained with the lighter, sandy-textured soils. Carrots should not be grown on stratified soils. If soils are too heavy (clayey), deformed and hairy roots will result. A deep orange colored root will not develop properly if the soil stays too wet.

IRRIGATION: Carrots are sprinkle irrigated for stand establishment. Carrots germinate slowly; therefore, the beds must be kept moist to prevent crusting. They may take as long as 10 days to germinate in cool weather.

Sprinklers also reduce salinity, which is important, since carrots are very sensitive to salt. Sprinkler costs include rent, in-and-out labor, system maintenance, and sprinkler operation.

After sprinkling, carrots are normally furrow irrigated for the remainder of the season. The number of irrigations may vary with climatic conditions, soil type, ultimate use of the carrot crop, and variety. The number of irrigations may vary from 4 to 6 per season after sprinkling.

Drip irrigation has not worked well with carrots. Excess water due to over-irrigation or producing carrots on poorly drained soils tends to increase the incidence of hairy roots.

If carrot fields are allowed to become too dry and then irrigated, there may be significant splitting of roots. Dryness tends to cause the cell walls to harden and lose elasticity. When more water is applied the carrot core expands while the outer layers do not, resulting in splits.

FERTILIZERS: Previous crop history is helpful in determining early-season nitrogen fertilizer requirements. If the field has some residual nitrogen (N), there is no need to apply more N until the seedlings emerge. Carrot roots are vulnerable to forking if too much nitrogen is applied preplant. Phosphate is applied before listing at rates of 450 to 500 pounds of 0-45-0 per acre. Preplant fertilizer should be disced into the soil before listing to prevent forking.

Sidedress applications of 60 to 80 pounds of actual N are made during the growing season. Commonly used materials are dry ammonium nitrate (34-0-0), liquid ammonium nitrate (20-0-0), and UAN 32 (32-0-0). Shippers may wish to vary nitrogen recommendations to the grower based upon knowledge of the varietal performance and plant spacing.

Nitrogen deficiency in carrots is not readily apparent when viewing a field. Deficient fields might show an irregular pattern in height of the top growth, but the foliage will still be green in color. Since carrots are often grown on sandy soils, taking petiole analysis on a regular basis will help monitor the fertilizer status.

NEMATODE CONTROL: Needle nematode (*Longidorus africanus*) and root knot nematode (*Meloidogyne* spp.) must be controlled by fumigation or chemicals to prevent forked carrot roots.

A common method of nematode control is to apply metam sodium at a rate of 45 gallons per acre in preplant flood irrigation prior to listing the beds. The soil needs to be pre-irrigated and the material applied in a second irrigation a week to ten days later. Carrot shippers have discovered that metam sodium used on carrots will provide beneficial effects to crops that are later planted in the same soil. This phenomenon is most likely due to reduction in nematode and soil borne diseases.

PESTS AND DISEASES: Crickets, grasshoppers, pale-striped flea beetle larvae and cutworms can be a problem when seedlings emerge. Later, aphids, whiteflies and spider mites may attack the leaves. Cutworms may attack crowns and have been a major problem in recent years.

Powdery mildew (*Erysiphe polygoni*) needs to be controlled if detected early in the growing season. Damping-off fungi (*Rhizoctonia solani* and *Pythium* sp.) are controlled by seed treatment. Cavity spot (*Pythium* sp.) and forking disorders have become serious problems in some fields. Root rots (*Pythium* spp.) and bacterial soft rot (*Erwinia* spp. and *Pseudomonas* spp.) are usually absent when carrots are grown in fields that have good drainage.

Early blight (*Cercospora carotae*) and late blight (*Alternaria dauci*) are fungal diseases that are occasionally found in carrots. These diseases must be controlled to prevent economic damage.

Black Crown (*Alternaria radicina*) is borne on seed and in soil. It has been detected in Imperial County.

Plant clean seed, use crop rotation or deep till to burry the inoculum away from the crown.

WEED CONTROL: Trifluralin is used for early season weed control in carrots. It can be disced in prior to listing or applied through the sprinkler system at germination. Later, Lorox is used for post-emergence broadleaves and Fusilade for grass control.

HARVESTING: The majority of the carrots are harvested by machines, however, a small acreage is hand bunched (with tops intact). Harvest machines can handle two full beds at a time. Loaded semi-trucks and trailers haul fresh dug carrots to local sheds or transport them to Bakersfield for washing, sizing, grading and packing. Growers must share in the freight to ship field-run carrots to Bakersfield.

The packout percentage of field-run carrots is variable depending upon variety, growing conditions, disease incidence, insect damage, mechanical damage during harvest and packing conditions. Packout rates of 70 to 80 percent are excellent, 60 to 70 percent is good, and below 55 to 60 percent is poor.

Carrots are marketed with tops on (bunched carrots), in 1-to 2- pound cello bags or topped loose in master poly containers. Prices vary according to container size.

Two sizes of cello carrots are packed: 'Jumbos' and 'Standards'. Standard cellos must be between 6 to 12 inches long and greater than 5/16 inch in diameter. There must be no less than 7 and no more than 13 carrots for a 1-pound cello. Carrots over 1½inch in diameter at the crown are classified as Jumbos. Normally a master container with 48 "one pound" bags weighs 55 to 59 pounds as additional weight per bag.

The shortcut or baby-carrot market has exploded in recent years. Substantial acreage is planted specifically for the short-cut market. Growers often receive rebates for the culls, which are used for secondary peeler or diced carrot markets.

Precut carrot sticks, shredded carrots, matchstick cuts (Julienne cut), crinkle cut and coins are styles of cut carrots that may be purchased after processing.

Bunched carrots are undercut and hand-sorted with 24 bunches per carton. The tops are bound with a wire twist tie. Master bunches are windrowed and loaded by hand onto special types of trucks which have moveable chain-link beds. Full loads are taken to sheds where electric motors are hooked up to rotate the chain-link beds (similar to a continuous conveyer belt) and unload the bunches into a water bath. This cushions the fall and reduces carrot shattering and cracking.

Bunches are washed and hand loaded into waxed cartons. Top-loaded crushed ice is used to cool the roots that are then taken to cold storage.

POSTHARVEST: Mature, topped carrots have a very long shelf life if stored properly. At 34°F and 98 percent relative humidity, carrots may be stored for up to five months. Washing helps remove decay

organisms and reduce loss. However, most of the carrots grown locally are shipped to retail markets soon after harvest.

Bunched carrots are highly perishable because of the tops. They may be stored for only two weeks under temperatures of 32°F and 98 percent relative humidity. Carrots should not be stored near ethylene sources (ripening fruits in particular) or they may develop a bitter flavor.

For more information on carrots, see "Carrot Production in California", DANR Publication 7226 available from the Imperial County Cooperative Extension Office or for a free Internet download 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.