U.C. COOPERATIVE EXTENSION

SAMPLE COST TO ESTABLISH AND PRODUCE

CARROTS

IMPERIAL COUNTY – 2000

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For an explanation of calculations used for the study refer to the attached General Assumptions or call the author, Keith S. Mayberry , at the Imperial County Cooperative Extension office, (619)352-9474 or e-mail at ksmayberry@ucdavis.edu.

FOREWORD

We wish to thank growers, pest control advisors, seed companies, transplant producers, contract harvesters, fertilizer dealers, and equipment companies for providing us with the data necessary to compile this circular. Without them we could not have achieved the accuracy needed for evaluating the cost of production for the dynamic and important vegetable industry in Imperial County.

The information presented herein allows one to get a "ballpark" idea of vegetable production costs and practices in the Imperial County. They do not reflect the exact values or practices of any grower or shipper, but are rather an amalgamation 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, 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, supplies, donations, utilities, transportation, accountants, insurance, safety training, permits, etc. In most of the crop guidelines contained in this circular we used 13% of the total of land preparation, growing costs and land rent to estimate overhead. For crops that require additional labor or extra operations (i.e. leaf lettuce) we used 17% overhead to account for the additional expenses.

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, etc. Whenever possible we have given the costs of these operations per hour.

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

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2000-2001 VEGETABLE CROPS PREVAILING RATES
IMPERIAL COUNTY

HEAVY TRACTOR WORK & LAND PREPARATION

OPERATION	$/ACRE
Plow	27.75
Subsoil, 2nd gear	38.75
Subsoil, 3rd gear	32.75
Landplane	12.00
Triplane	11.00
Chisel 15"	24.75
Wil-Rich chisel	14.75
Big Ox	21.25
Slip plow	39.00
Pull/disc borders	6.00
Make cross checks (taps)	6.00
Break border	5.75
Disc, stubble	21.75
Disc, regular	11.50
List 40" beds	13.50
Float	10.00
Disc, borders	11.25
Laser (acre)	34.00-38.00
Dump (scraper) borders	14.00

PLANTING, CULTIVATING & LIGHT TRACTOR WORK

	$/HR
Power mulch dry	23.00
Power mulch with herbicide	27.00
Shape 40" beds	9.50
Precision plant 40" beds	17.50
Cultivate 4-row 40" beds	13.00
Spike 40" beds	9.75
Spike and furrow 4-rows 40" beds	10.25
Furrow out 40-42" beds	9.75
Lilliston 40" beds	10.75
Lilliston 40" beds with/herbicides	14.50
Inject fertilizer and furrow out 40" beds	13.50
Fertilize dry and furrow out 40" beds	13.50
Broadcast dry fertilizer >300lb/a	7.00
Broadcast dry fertilizer <300lb/a	6.00
Ground spray 4-row	10.00
Ground spray 8-row	9.00
Layby herbicide	22.00

PREVAILING RATES BY THE HOUR

	$/HR
Motor grader	50.00
Backhoe	42.50
Water truck	39.00
Wheel tractor	32.00
Scraper	27.00
Versatile	53.00
D-6	46.50
D-8	65.00
Burn ditches	28.00
Buck ends of field	30.00
Pipe setting (2 men)	33.00
Laser	70.00
Work ends	40.00

IRRIGATION

Sprinkler irrigate	$125-160.00/acre
1 acre-foot of water	14.56
Sprinkler irrigate carrots	155.00

*Note – Cultural rates for specific crop operations listed on crop budgets.

CARROT CULTURE 2000-2001

Annual acreage, yield, and value of fresh market carrots
Imperial County, CA (1995-1999)

Year	Acres	Yield/Acre*	Value/Acre
1999	6,798	834	$7,681
1998	6,692	796	$6,253
1997	6,560	777	$5,359
1996	6,588	708	$4,036
1995	14,959	820	$7,109

Annual acreage, yield, and value of processing & other carrots
Imperial County, CA (1995-1999)

Year	Acres	Yield/Acre*	Value/Acre
1999	10,197	33.62	$2,452
1998	9,724	32.66	$2,301
1997	9,454	33.90	$1,058
1996	9,881	33.90	$2,892
1995	14,959	NA	$7,109

Annual acreage, yield, and value of fresh market carrots
Total units, Imperial County, CA (1995-1999)

Year	Total Acres	Yield/Acre*	Value/Acre
1999	16,995	834	$4,544
1998	16,416	796	$3,912
1997	16,014	777	$3,903
1996	16,469	708	$3,350
1995	14,959	820	$7,109

*50 pound master poly sacks containing cello packs basis. Many sold bulk.
Source: Imperial County Agricultural Commissioner's Reports 1995-1999

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 Caro Pak; *Asgrow*; Apache *Sunseeds*; Navajo *Sunseeds*; Indiana *Bejo*; and HM 02 *Harris Moran*. Varieties used for shortcuts or cut and peel include: Primecut 59 Sunseeds; Tripleplay 58 Sunseeds; and Snackpack Asgrow.

PLANTING INFORMATION Carrots may be planted 6 seed lines per 40 inch bed. Three rows are placed on each bed shoulder. Rows are usually 1½ inches apart. However, there are many variations of the number of lines, spacing between lines and bed width depending upon the shippers needs and ultimate product use. A ball park value is 38-42 plants per foot of bed. Planting fewer seed produces large carrots for the shredder processing use, planting large amounts of seed is necessary for smaller diameter carrots for short cut use.

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 color will not develop if the soil stays too wet.

IRRIGATION Carrots are sprinkler 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 tend 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 60 gallons per acre in a 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, 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 found occasionally 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.

HARVESTING The majority of the carrots 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 cost of hauling normally runs $21- to $28 per ton to the grower.

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 is excellent, 60 to 70 percent is good, and below 55-60 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 1½ inch 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 short-cut or baby-carrot market has exploded in recent years. Some 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 are now being marketed nationally. Shredded carrots, match stick cuts (Julienne cut), crinkle cut and coins are also marketed.

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 reducing 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^{o}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^{o}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.

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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

CELLOPACK CARROT PROJECTED PRODUCTION COSTS 2000-2001

Hand labor at $7.75per hour ($5.75 plus SS,unemployment insurance, and transportation, supervision and fringe benefits).

Yield--850 50-lb. Master poly containers

OPERATION	Cost	Materials		Hand Labor		Cost
		Type	Cost	Hours	Dollars	Per Acre
LAND PREPARATION						
Stubble disc 1x	21.75					21.75
Subsoil	38.75					38.75
Disc 2x	11.50					23.00
Landplane 2x	12.00					24.00
Border, cross check & break borders	17.75					17.75
Flood 1x		Water 2 ac/ft	14.56	2	7.75	30.06
Disc 1x	11.50					11.50
Custom apply metam sodi	30.00	metam sodium	146.25			176.25
Disc 1x	11.50					11.50
Triplane 1x	11.00					11.00
Fertilize (double spread)	8.00	500 lb. @ 0-45-0	63.75			71.75
List 40" beds	13.50					13.50
TOTAL LAND PREPARATION						**450.81**
GROWING PERIOD						
Plant	22.00	Hybrid seed 550M	150.00			172.00
Sprinkler irrigate	155.00					155.00
Herbicide	12.00		2.25			14.25
Cultivate 2x	13.00					26.00
Spike 2x	9.75					19.50
Fertilize & furrow out 2x	13.50	150 lb. N @ .35	52.50			79.50
Layby herbicide 1x	22.00	linuron	28.00			72.00
Water-run fertilizer		50 lb. N @ .35	17.50			17.50
Irrigation 6X		Water 3 3/4 ac/ft	54.60	9	69.75	124.35
Disease control 1x	10.00	Fungicides	25.00			35.00
Insect control 2x	9.50	Insecticide	31.00			50.00
GROWING PERIOD						**765.10**
GROWING PERIOD & LAND PREPARATION COSTS						1215.91
Land Rent (net acres)						225.00
Cash Overhead	10 % of harvest costs and land rent					144.09
TOTAL PREHARVEST COSTS						**1585.00**
HARVEST COSTS						
Harvest by machine, haul to Bakersfield, cool, pack and sell	850 -50 lb. sacks @ (Packout 85% Cellos & 15 % Jumbos)		3.65 /sack (contract rate)			3102.50
TOTAL OF ALL COSTS						**4687.50**

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	-573	-198	177	552	927	5.76
sacks	800	-505	-105	295	695	1095	5.63
per	850	-438	-13	412	837	1262	5.51
acre	900	-370	80	530	980	1430	5.41
	950	-303	172	647	1122	1597	5.32

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