U.C. COOPERATIVE EXTENSION

SAMPLE COST TO ESTABLISH AND PRODUCE

ARTICHOKES

IMPERIAL COUNTY – 2000

Prepared by:
Keith S. Mayberry Farm Advisor, U.C. Cooperative Extension, Imperial County

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%.

Keith S. Mayberry
(Principal researcher and editor)
Farm Advisor
Vegetable Crops

Refugio A. Gonzalez
County Director

Tom Turini
Farm Advisor
Plant Pathology

Khaled M. Bali
Farm Advisor
Irrigation/Water Science

Eric T. Natwick
Farm Advisor
Entomology

Jose L. Aguiar
Farm Advisor
Vegetable Crops
Coachella Valley

Mark D. Stutes
C.E. Staff

August 2000

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.

ARTICHOKE CULTURE 2000-2001

ACREAGE AND YIELD There are roughly 300-400 acres of artichokes grown in Imperial County. Yields vary from a low yield of 300 cartons per acre to a high of over 1100 cartons per acre. Often higher yields are produced in fields utilizing drip irrigation.

Fields are planted in late August or early September. Harvest begins in late fall or early spring depending upon planting date and whether growth regulators were applied.

The desert-grown artichokes compete in the marketplace with those produced in the Central Coast. When cold weather and freezes occur in coastal California, a high market value for the desert crop can be realized. Conversely when production increases in coastal California in mid-spring, the value of desert-grown artichokes diminishes rapidly.

Warm weather increases the toughness and decreases flavor in artichoke buds. For this reason desert-grown 'chokes will seldom be marketable after early April.

VARIETIES Desert-grown artichokes are direct-seeded or grown from transplants. Few, if any, are grown from mother plant cuttings, a practice commonly used in coastal California.

Imperial Star is a public variety that may be grown from seed or used to produce transplants. This variety produces a large volume of glossy-green, large-to-extra-large buds (3½-4½" diameter). Imperial Star was released by the University of California from selections made from advanced breeding material obtained from the USDA. Emerald is another variety available as seed for local use. There are a number of other cultivars grown locally, many of which are grown by individual shippers as proprietary lines.

PLANTING INFORMATION Artichokes are grown on a wide range of bed widths from 44 to 80 inches, with 72 inches being common. Some growers list 36- or 40-inch beds and plant on the alternate beds. This system allows for irrigation by furrow or by sprinklers. Narrow-bed spacing (<60") has not worked out as well. Crowding of the plants causes smaller buds to develop and harvesting is more difficult due to foliage density.

Artichoke seed is quite large (roughly 13,000 seed/lb.). Seed may be planted hill-drop style with 2 to 4 seed every 30 inches in-row, or planted every 6 inches and thinned. Final plant spacing is generally around 30 inches in-row, however, some growers plant closer or farther depending upon personal preference. While the overall number or artichokes is increased with narrow spacing, the average size of the buds is reduced. The percent germination on artichoke seed is low, especially in hot weather. Artichokes are cool-season vegetables grown out-of-slot in order to hit a specific market window. This should be kept in mind as stand failures may occur under adverse conditions even with sprinkler irrigation.

Precision air or belt planters are commonly used for artichokes. Some random flow plate planters are also used.

Transplants are usually placed 30 inches apart on 80-inch beds. This practice would require 2,489 plants per acre.

SOILS AND IRRIGATION Artichokes are grown on a wide range of soil types including sandy loams and silty clays, provided that soil moisture is adequate. Drip irrigation is often used to supply near optimum soil moisture.

Artichokes are moderately salt tolerant. Yield depressions in bud weight occur beyond an EC_e of 6 mmhos/cm (dS m^{-1}). A salinity induced calcium deficiency has been identified which is similar to tipburn in lettuce.

During the initial part of the growing season, high temperatures reduce plant growth. Sixty-day-old plants may not be much larger than a dinner plate (10-12" diameter). As the weather cools, plants grow more vigorously. During the rapid vegetative growth stage, artichokes will need lots of water. As the crop approaches maturity, irrigation is needed often.

FERTILIZATION Preplant applications of 200 pounds P_20_5 as 11-52-0 per acre are broadcast and listed into the beds. Another alternative is to apply 10-34-0 liquid injected into the beds at planting.

During the season, an additional 150-200 pounds actual nitrogen (N)/ac is often used. Commonly used nitrogen sources are liquid ammonium nitrate or UAN 32 solution.

PEST CONTROL Crickets, darkling ground beetles, grasshoppers and armyworms, may attack artichokes at planting. Foliage pests include painted lady butterfly, cutworms, and saltmarsh caterpillar. Aphids may colonize some plants but often ladybeetles move in and control the problem.

The artichoke plume moth has not become an established pest in the desert. The best way to keep the moth from becoming a problem is to not bring in artichoke transplants from infested areas and to avoid over-summering of established plants.

Damping off (*Pythium* spp.) may cause seedling or transplants to wilt or collapse. Avoid saturated soil conditions.

There are some unidentified root rotting fungi that occur on occasion.

GROWTH REGULATORS Gibberellic acid (GA) is sometimes used to force bud initiation for late fall, and winter harvest. Three applications of GA at 20 ppm are made starting roughly 8

weeks after transplanting or when the plants are approximately dinner plate size (10-12" diameter). GA is applied to plants as an aqueous spray in sufficient quantity to wet the foliage.

HARVESTING Artichokes are harvested when there are sufficient numbers of primary or "king" buds of sufficient size to warrant their removal. King buds may grow as large as 8-10 inches in diameter and still be marketable. The sizes most preferred by the buyers are extra large 24's (4-4½" diameter) and large 36's (3½-4" diameter). Other sizes sold are medium 48's and occasionally jumbo 18's and small 60's. Bags of small, loose "baby artichokes" containing 70-120 buds may be sold if the price warrants the expense of harvesting.

Artichokes are subject to bruising during harvesting and packing. The damage is not expressed until several days after harvest. Bruises will appear as darkened, off-color areas that can become a site for infection by molds and bacteria.

Harvesting is normally by hand. The buds are cut from the plant with a sharp knife with a 2-inch stem remaining on the choke. The chokes are placed in bins, trailers or directly on field packing machines, then hand-sorted, sized and packed in waxed, fiberboard cartons.

Full cartons of chokes should be hydrocooled soon after harvest and then held in cold storage until transit to terminal markets.

"Frost-kissed" chokes are those which have been exposed to a mild frost. The epidermal layers blister and whiten after exposure. After a few days the bracts turn a bronze color. While the frost changes the cosmetic appearance, the quality of the choke is unaffected.

Harvesting overmature buds should be avoided because they are woody, strong flavored, and can influence the buyer to avoid future purchases.

POSTHARVEST HANDLING Normally artichokes should not be stored for long period of time. Chokes should be held at temperatures just above freezing and 95-100 percent relative humidity. Cartons should be well ventilated to allow for water escape after hydrocooling and for the release of heat and gases produced by respiration of the buds.

For more information see "Artichoke Production in California", DANR Publication 7221 available from the Imperial County Cooperative Extension Office or on the Internet at http://anrcatalog.ucdavis.edu/specials.ihtml

TRANSPLANT ARTICHOKE PROJECTED PRODUCTION COSTS 2000-2001

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

Yield--600 23 lb. cartons per acre | Imperial Star variety | Transplanted

OPERATION	Cost	Materials		Hand Labor		Cost
		Type	Cost	Hours	Dollars	Per Acre
LAND PREPARATION						
Stubble disc	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 irrigate		Water 1 ac/ft.	14.56	1	7.75	22.31
Disc 1x	11.50					11.50
Triplane 1x	11.00					11.00
List 80" beds	17.00					17.00
Mulch 3-row bed	21.00					21.00
TOTAL LAND PREPARATION						**208.06**
GROWING PERIOD						
Apply herbicide	12.00	Herbicide	22.00			34.00
Install drip system & tape		Drip system	600.00	15	116.25	716.25
Transplanting		Transplants	630.00	10	77.50	707.50
Apply growth regulator 3x	8.50	Giberellic acid	27.00			52.50
Drip maintence		Chemicals	40.00	10	77.50	117.50
Cultivate 2x	14.50					29.00
Fertilizer via drip		200 lb. N @ .35	70.00			70.00
		300 lb. Phosphorus	150.00			150.00
Irrigate 20x		Water 4 ac/ft.	58.24	20	155.00	213.24
Chop residue 2x	12.00					24.00
TOTAL GROWING PERIOD						**2113.99**
GROWING PERIOD & LAND PREPARATION COSTS						2322.05
Land Rent (net acres)						225.00
Cash Overhead-----	13 % of preharvest costs & land rent					331.12
TOTAL PREHARVEST COSTS						**2878.17**
HARVEST COST						
Cut, pack, haul, cool and sell	600 cartons@	4.00 per carton				2400.00
TOTAL OF ALL COSTS						**5278.17**

PROJECTED PROFIT OR LOSS PER ACRE

	Price / 23 lb. carton (dollars)					
	5.00	6.00	7.00	8.00	9.00	**Break-even $/carton**
400	-2478	-2078	-1678	-1278	-878	11.20
Cartons per acre 500	-2378	-1878	-1378	-878	-378	9.76
600	-2278	-1678	-1078	-478	122	8.80
700	-2178	-1478	-778	-78	622	8.11
800	-2078	-1278	-478	322	1122	7.60

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

DIRECT SEEDED ARTICHOKE PROJECTED PRODUCTION COSTS 2000-2001

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

Yield--600 23 lb. cartons per acre | Imperial Star variety | direct seeded

OPERATION	Cost	Materials		Hand Labor		Cost
		Type	Cost	Hours	Dollars	Per Acre
LAND PREPARATION						
Stubble disc	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 irrigate		Water 1 ac/ft.	14.56	1	7.75	22.31
Wil-Rich chisel plow	14.75					14.75
Disc 1x	11.50					11.50
Triplane 1x	11.00					11.00
Fertilize, double spread	8.00	500 lb. 11-52-0	63.75			71.75
List 80" beds	17.00					17.00
Mulch 3-row bed	21.00					21.00
TOTAL LAND PREPARATION						**294.56**
GROWING PERIOD						
Precision plant	17.50	Seed 0.85 lb @ 300	255.00			272.50
Apply herbicide	12.00	Kerb	87.60			99.60
Sprinkler irrigate	145.00					145.00
Thin				5	38.75	38.75
Apply growth regulator 3x	8.50	Giberellic acid	27.00			52.50
Spike and furrow out 1x	10.25					10.25
Cultivate and reshape 3x	14.50					43.50
Fertilize and furrow out 1x	12.50	100 lb. N @ .35	35.00			47.50
Water-run fertilizer		60 lb. N @ .35	21.00			21.00
Hand weed 3x				12	93.00	93.00
Layby herbicide	22.00	Goal	22.00			44.00
Irrigate 6x		Water 3 ac/ft.	43.68	7	54.25	97.93
Gated pipe	53.00					53.00
Chop residue 2x	12.00					24.00
TOTAL GROWING PERIOD						**1042.53**
GROWING PERIOD & LAND PREPARATION COSTS						1337.09
Land Rent (net acres)						225.00
Cash Overhead-----	13 % of preharvest costs & land rent					203.07
TOTAL PREHARVEST COSTS						**1765.16**
HARVEST COST						
Cut, pack, haul, cool and sell	600 cartons@	4.00 per carton				2400.00
TOTAL OF ALL COSTS						**4165.16**

PROJECTED PROFIT OR LOSS PER ACRE

		Price / 23 lb. carton (dollars)					Break-even
		5.00	6.00	7.00	8.00	9.00	$/carton
	400	-1365	-965	-565	-165	235	8.41
Cartons	500	-1265	-765	-265	235	735	7.53
per	600	-1165	-565	35	635	1235	6.94
acre	700	-1065	-365	335	1035	1735	6.52
	800	-965	-165	635	1435	2235	6.21

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