U.C. COOPERATIVE EXTENSION

SAMPLE COST TO ESTABLISH AND PRODUCE

ARTICHOKES

IMPERIAL COUNTY – 2003

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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, chemical applicators and dealers, custom farm operators, fertilizer dealers, seed companies, contract harvesters, equipment companies, and the Imperial County Agricultural Commissioners office 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 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. They do 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. 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.

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.

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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2002-2003 Field/Vegetable Prevailing Rate for Field Operations
IMPERIAL COUNTY

HEAVY TRACTOR WORK & LAND PREPARATION

OPERATION	$/ACRE
Plow	30.50
Subsoil, 2nd gear	39.00
Landplane	12.75
Triplane	11.25
Chisel 15”	25.00
Wil-Rich chisel	16.00
Big Ox	24.00
Slip plow	41.00
Pull/disc borders	6.75
Make cross checks (taps)	6.25
Break border	6.00
Disc, stubble	21.00
Disc, regular	12.50
Corrugate	11.00
Disc, regular with ring roller	13.50
List 30” beds 12-row	15.00
List 40” beds 8-row	15.00
Float	10.00
Disc, borders	7.00
Dump (scraper) borders	14.50

LIGHT TRACTOR WORK

Power mulch dry	25.00
Power mulch with herbicide	28.00
Shape 30” 6 row	10.75
Shape 40” 4 row	10.75
Plant 30” beds nonprecision	20.00
Plant 40” beds nonprecision	18.00
Precision plant 30” beds	22.00
Precision plant 40” beds	20.00
Mulch plant wheat	19.50
Plant alfalfa (corrugated)	17.50
Plant bermudagrass (flat)	13.75
Plant sudangrass	14.75
Cultivate 30” beds 4-row	16.00
Cultivate 40” beds 4-row	14.00
Spike 30” beds 4-row	13.25
Spike 40” beds 4-row	11.25
Spike and furrow out 30” 4-row	14.00
Spike and furrow out 40” 4-row	12.00
Furrow out 30” beds 4-row	13.25
Furrow out 40” beds 4-row	11.25
Lilliston 30” beds 6-row	13.00
Lilliston 40” beds 4-row	13.00
Lilliston 30” beds with/herbicides 6-row	15.00
Lilliston 40” beds with/herbicides 4 -row	15.00
Inject fertilizer & furrow out 30” beds 4-row	15.00
Inject fertilizer & furrow out 40” beds 4-row	13.00
Fertilize dry & furrow out 30” beds	17.00
Fertilize dry & furrow out 40” beds	15.00
Flat inject fertilizer NH_3	15.00
Broadcast dry fertilizer	7.00
Ground spray 40” 8-row	12.00
Ground spray 30” 8-row	14.00
Chop cotton stalks	13.75

HARVEST COSTS Field Crops

	BY UNIT
Combine alfalfa seed	41.75/acre
Windrow alfalfa seed	17.50/acre
Rake bermudagrass	5.00/acre
Swath bermudagrass	13.50/acre
Swath sudangrass	11.25/acre
Rake sudangrass	5.25/acre
Swath alfalfa	8.00/acre
Rake alfalfa	4.50/acre
Bale (all types of hay- small bale)	0.65/bale
Haul & stack hay – small bale	0.25/bale
Bale (large bale 4X4)	10.00/bale
Bale (large bale Jr. 3X4)	9.00/bale
Stack & load large bale	6.00/bale
Dig sugar beets	2.60/clean ton
Haul sugar beets	2.45/clean ton
Combine wheat	15 per acre + 0.55 /cwt over 1 ton
Haul wheat	5.50/ton
Combine bermudagrass seed 1st time	40.00/acre
Combine bermudagrass seed 2st time	25.00/acre
Haul bermudagrass seed (local)	175/load
Haul bermudagrass seed (Yuma)	300/load

MISCELLANEOUS OPERATIONS BY THE HOUR

Motor grader	48.00
Backhoe	45.00
Water truck	40.00
Wheel tractor	35.00
Scraper	36.00
Versatile	56.00
D-6	56.00
D-8	70.00
Buck ends of field	28.00
Pipe setting (2 men)	37.00
Laser	88.00
Work ends (disc out rotobucks)	35.00

ARTICHOKE CULTURE 2002-2003

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 a growth regulator to increase earliness of bud formation was applied.

The desert-grown artichokes compete in the marketplace with those produced in the Central Coast of California. 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 vegetative 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 make 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, irrigate every few days.

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 fertilizer 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 that 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 overly mature 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 periods 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

DIRECT SEEDED ARTICHOKE PROJECTED PRODUCTION COSTS 2002-2003

Hand labor at $9.25 per hour ($6.75 plus SS, unemployment insurance, transportation, supervision, workman's compensation, 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	21.00					21.00
Subsoil	39.00					39.00
Disc 2x	12.50					25.00
Triplane 1x	11.25					22.50
Border, cross check & break borders	19.00					19.00
Flood irrigate		Water 1 ac/ft.	16.00	1	9.25	25.25
Disc 2x	12.50					25.00
Triplane 1x	11.25					11.25
Fertilizer, spread	7.00	500 lb. 11-52-0	58.75			65.75
List 80" beds	19.00					19.00
TOTAL LAND PREPARATION						**272.75**
GROWING PERIOD						
Precision plant and shape	26.00	Seed 0.85 lb @ 300	255.00			281.00
Apply herbicide	12.50	Kerb	70.00			82.50
Sprinkler irrigate	185.00					185.00
Thin				5	46.25	46.25
Apply growth regulator 3x	10.00	Giberellic acid	27.00			57.00
Cultivate and reshape 2x	15.00					30.00
Fertilize and furrow out 1x	16.50	100 lb. N @ .32	32.00			48.50
Water-run fertilizer		60 lb. N @ .32	19.20			19.20
Hand weed 2x				8	74.00	74.00
Layby herbicide	12.00	Goal	16.00			28.00
Irrigate 6x		Water 3 ac/ft.	48.00	7	64.75	112.75
Gated pipe	55.00					55.00
Chop residue 2x	13.75					27.50
TOTAL GROWING PERIOD						**1046.70**
GROWING PERIOD & LAND PREPARATION COSTS						1319.45
Land Rent (net acres)						225.00
Cash Overhead-----	13 % of preharvest costs & land rent					200.78
TOTAL PREHARVEST COSTS						**1745.23**
HARVEST COST						
Cut, pack, haul, cool and sell	600 cartons@ 4.25 per carton					2550.00
TOTAL OF ALL COSTS						**4295.23**

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	-1445	-1045	-645	-245	155	8.61
Cartons	500	-1370	-870	-370	130	630	7.74
per	600	-1295	-695	-95	505	1105	7.16
acre	700	-1220	-520	180	880	1580	6.74
	800	-1145	-345	455	1255	2055	6.43

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