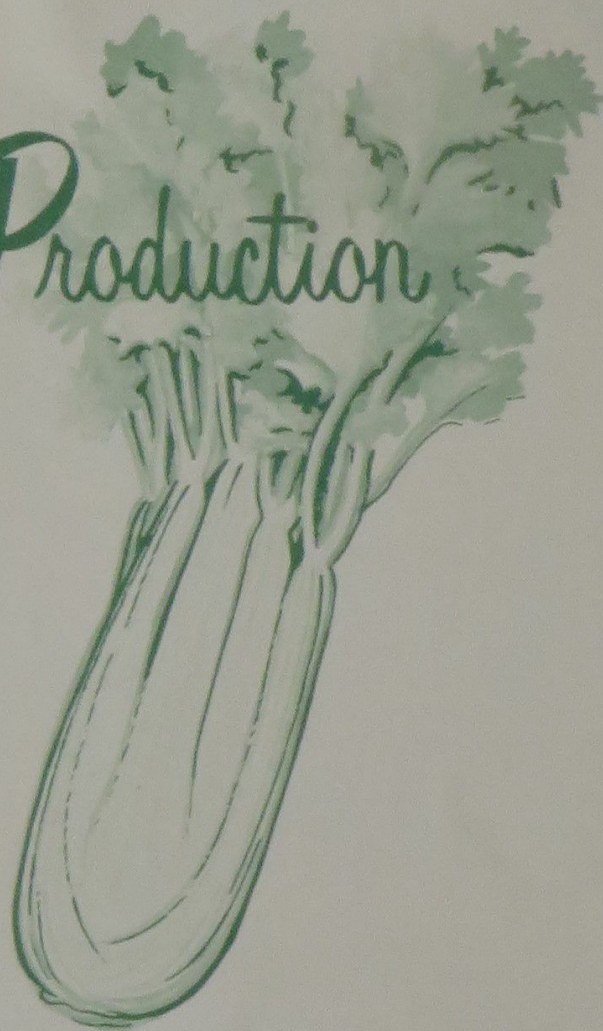


MARKETING BULLETIN 33

Celery Production

**COSTS
AND
RETURNS**

in Michigan



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East Lansing

MICHIGAN CELERY ACREAGE



...Counties which had at least 10 acres of celery according to the 1959 Agricultural Census. County acreage estimates have been printed above each county name, for those counties that had 50 or more acres. These county estimates are 1959 Census data adjusted to SRS estimates.

Rank: The five counties with the largest acreage according to the 1959 Agricultural Census in order of importance are as follows:

1. Ottawa
2. Muskegon
3. Kent
4. Allegan
5. Lapeer



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U.S.D.A. reports. Celery is one of the most important vegetables grown, ranking eighth in tonnage among fresh vegetables, coming after potatoes, lettuce, cabbage, onions, tomatoes, sweet potatoes, and carrots. In dollar value celery ranks fifth, behind only potatoes, lettuce, tomatoes, and onions.

Celery is the "youngest" of all our major vegetables. The "wild" celery, or smallage, as it was known to the residents around the Mediterranean Sea, was much too bitter and strong to serve as anything other than medicine. This was its primary use and as late as the 16th Century it was used as a medicinal plant only. In 1686, the Englishman, John Roy, wrote, "smallage transferred to culture becomes milder and less ungrateful, whence in Italy and France the leaves and stalks are esteemed as delicacies, eaten with oil and pepper."

This "milder and less ungrateful" celery was first planted in Michigan about a century ago, but it needed prolonged blanching to make it good. Farmers of "Dutch" ancestry in the Kalamazoo area first marketed celery in the U.S. It was a highly esteemed delicacy served in fancy cut glass celery dishes.

It was not however, until about 1920 that plant breeders began experimental work which has resulted in increasingly crisp, tender and sweet celery. At that time there were sixteen yellow varieties requiring blanching, and Michigan produced nearly the entire national supply. Today, 95 percent of all celery grown is the green or "Pascal" type which requires no blanching, and California has become the leading celery producing state. Celery consumption has risen steadily until the last decade when it has leveled off at about seven pounds per person per year.

Michigan's celery industry is making a spectacular comeback producing the "Pascal" variety celery. Michigan can grow the finest quality Pascal celery because of its nearly ideal climatic conditions for celery production. The prevailing, climatizing breezes blowing across Lake Michigan tend to reduce the

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damaging effects of frosts, and prevent high summer temperatures, which impair celery quality. The cool nights, and warm summer days, produce celery of ideal flavor and taste.

The Michigan Celery Promotion Cooperative was founded to capitalize on high quality celery. These growers working together, have set high quality standards for the celery they produce. Mandatory Federal-State inspection of all the celery produced by them assures that these rigid quality standards are met. About 75 percent of the celery produced in Michigan is marketed under the M.C.P.C. emblem of quality standards. Using this program, many celery markets have been recaptured by the Michigan celery industry.

PRODUCTION AND COMPETITION

The main sources of supplies of celery during the Michigan marketing season (July - October) are California, New York, Ohio, and New Jersey. Nearly all of the Eastern States' production is grown on organic muck soils, while that grown in California is produced on mineral soils. The Salinas-Watsonville area of California is the primary competitive region for Michigan celery markets throughout the season, with New York coming on strong during the latter part of August and September. Ohio celery is available much of the season while New Jersey tends to be available when New York is at its peak production season.

TABLE 1. RELATIVE IMPORTANCE OF CELERY AREAS (Summer-Fall) 1959-63 (USDA figures)

<u>State</u>	<u>Acreage</u>	<u>Yield Per Acre</u> Cwt.	<u>Production</u> Cwt.	<u>Value</u>
Michigan	2,440	379	863,000	\$2,660,000
California	4,380	501	2,194,380	6,688,000
New York	2,020	346	698,920	2,601,000
Ohio	660	331	218,460	958,000
New Jersey	400	260	104,000	369,000
Others	<u>930</u>	<u>256</u>	<u>237,000</u>	<u>1,176,000</u>
Totals	10,830	(ave.) 250	4,315,760	\$14,452,000

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It is estimated that there are around 100 celery producers in Michigan. The average celery farm size is 25 acres, but individual producers range from a low of 1 acre to 85 acres in size. The Michigan celery industry is concentrated in the Western Michigan area. Ottawa County has 600 acres under production, Muskegon County has 380 acres, Kent County has 290 acres, and Allegan County has 250 acres.

Much of the early celery produced in Michigan is grown from plants produced in greenhouses, started in February and March, and then transplanted to the field in April and protected by papering. Papering is a practice by which long rolls of parchment-like paper are suspended over each celery row by means of wire hoops and held in place by covering the edges of the paper with soil. This practice protects the small plants from frost and wind damage, and begins the Michigan celery harvest season about one month earlier than would otherwise be possible. This adds considerably to the cost of producing the earlier celery, but allows earlier market entry compared to other eastern production areas. Most growers depend on greenhouse grown plants until about June 1st when plants produced in outdoor beds are available.

The field operations begin in late March with the cleaning of ditches and the installation and operation of drainage pumps. Many of the muck farms are located in areas where either the excess ditch water has to be pumped into the main ditch, or else the tile drainage lines have to be pumped to establish a water table so tillage and planting equipment can be used.

Celery fields are usually plowed to a depth of 8 to 12 inches a day or two before planting. Late plowing aids in weed control and avoids having a large acreage of soggy, wet plowed soil in case of a heavy rain. After plowing the land is disked, and then 1,000 to 1,800 pounds of fertilizer of an analysis such as 5-20-20, 5-10-30, or 5-10-20 is broadcast. The land is then disked again and leveled with a float. A starting line is marked on the edge of the

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field for the planter guide to follow and the self propelled planter is started in the field.

A celery transplanter uses a crew of 1 to 4 planters. One person can plant about 15,000 plants per day. The plants are spaced from $4\frac{1}{2}$ to 7 inches apart in the row and the rows are spaced from 24 to 36 inches apart. The crop is then sprayed with a herbicide, and the April crop must then be covered with a long paper tent.

A paper tent operation increases production costs up to \$175.00 per acre. After the celery is transplanted and sprayed with the herbicide, wire hoops must be placed over the rows. The vented paper rolls are then stretched over the wire hoops and discs throw dirt up on the edges of the paper to keep it in place. The celery grows under the paper until the leaves touch the paper. The paper is then slit and the crop allowed to grow, harden off while still having some wind protection.

In mid-May the paper is removed from the field, the wire hoops are picked up, the excess soil is scraped away, the celery is weeded, a side dressing of nitrogen and fertilizer is applied, and the crop is sprayed or dusted for insects and disease.

The month to six weeks under the hot cap when the crop can not be touched leads to many problems. The paper crop is usually the most severely troubled by weeds and may come out of the paper infected with blight and pink rot.

Celery planting begins a whole series of operations. Plowing, disking, fertilizing, floating, planting, side dressing, irrigating, weed spraying, fungicide and insecticide treatments, cultivating, roto-tilling, weeding, and finally celery harvest.

Disease and insect control begins in earnest about June 1st. The diseases

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(6)

most common in Michigan are varied and are difficult to control. Some diseases are soil borne, others are airborne and still others, insect borne. Some are bacterial, others are virus, and still others fungicidal. Control materials must be regularly and carefully applied to give effective disease control. Some common diseases are Bacterial Leaf Spot, Early Blight, Late Blight, Pink Rot, Crater Rot and Phoma Butt Rot. These diseases may cause undesirable appearance and deterioration in quality during shipping.

The root feeding insects which infest the celery crop from time to time are cutworm and wire worm. Those which feed on the stalk and leaves are corn borer, celery leaf tier, spittle bug, green pea aphid and six spotted leaf hopper. The green pea aphid is carrier of the mosaic disease, "Blue Stem", and the leaf hopper carries the virus disease, "Aster Yellows". Aster Yellows in Michigan reduced celery yields by 100 cwt. per acre below average for the five year period 1956 to 1960. Nematodes are becoming an increasing problem and many producers are finding it profitable to fumigate their entire farm.

Celery harvest begins about July 1st. In spite of the many attempts to mechanize celery harvesting, the handknife method of cutting and stripping is used in most of the operations. The method is fast because each worker performs several operations while the stalk is being held. The root is cut with a single slice of the knife; the knife is then palmed while the stalk is stripped. The position of the hand that holds the stalk is never changed until the stalk is placed in the field box, pile, or placed on the harvester conveyer belt.

In hand cutting, the stalk must be grasped low. The worker must avoid bending the stalk as this cracks the petiolis. The stripping should be done by hand rather than with a knife; a knife may leave petiole stubs around the base of the stalk.

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month of October. It is generally marketed in those states lying east of the Mississippi River. It is moved to these markets almost entirely by refrigerated produce trucks. Michigan has a considerable freight advantage over much of the U. S. consumer market when compared to competitive celery producing areas.

USAGE OF MICHIGAN CELERY

About 25 to 30 percent of the Michigan celery crop is marketed directly to processors. These processors use celery primarily in producing soups, and juice mixtures. Most of this celery is sold in bundles but there is an increased interest and use of pallet boxes in celery harvesting. This reduces the amount of labor used in handling, loading and unloading, but requires the use of mechanical loaders on the producer's farm.

Production of prepackaged celery hearts is increasing rapidly. The Michigan Celery Promotion Cooperative reports an increase of 50 percent in production of celery hearts from 1963 to 1965. The 1965 production was 146,006 crates of 24 cello wrapped hearts containing 2 to 3 plants each. Celery hearts are harvested into field crates by the grower and delivered to the packing plant where the plants are stripped to hearts, washed, cut to length, and packaged. Some poorer quality hearts are produced by packaging small sized celery without stripping. Heart production accounts for about 20 percent of the total Michigan production.

Howard wire-bound crates are the standard package for Michigan celery being shipped to fresh market. In these standard sized crates are packed $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3, 4, 6 dozens of celery stalks. The largest volume of shipment is in the $2, 2\frac{1}{2}$, 3 dozen size. A corrugated half-crate has achieved some increasing usage in the past few years and about 5,000 were shipped in 1965. Wire-bound crated celery accounts for 75 percent of the Michigan fresh market celery sales.

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for Michigan celery. While such conditions do not exist for any commodity, real lessons in market locations and pricing can be gained from a study of the competitive factor of freight.

TABLE II. FREIGHT RATES AND PLUS OR MINUS COST COMPARISONS

City Shipped To:	POINTS OF ORIGIN*						
	TRUCK				RAIL		
	Mich.	West NY	East NY	Ave. N.Y.	Mich.	N.Y.	Calif.
Miami, Fla.	1.00	1.20+20	.85-15	1.02½	2.30	2.33	1.46+46
Tampa, Fla.	.90	1.05+15					
Jacksonville, Fla.	.90	.95+05	.70-20	.82½	1.93	1.96	1.46+56
Savannah, Ga.	.85	.95+10	.65-20	.80	1.85	1.80	1.46+61
Thomasville, Ga.	.75	.95+20					
Macon, Ga.	.75	.90+15					
Atlanta & N. Ga.	.50	.90+40	.65+15	.80	1.59	1.85	1.42+92
Birmingham, Ala.	.50	1.00+50	.75+25	.87½	1.54	1.83	1.33+83
Montgomery, Ala.	.65	1.05+40					
Mobile, Ala.	.75	1.15+40					
New Orleans, La.	.75	1.20+45	.90+15	1.05	1.89	2.22	1.20+45
Dallas-Ft. Worth, Tex.	.90	1.30+40	1.10+20	1.20	1.93	2.30	1.12+22
Houston, Tex.	1.00	1.35+35	1.10+10	1.22½	2.05	2.39	1.12+12
San Antonio, Tex.	1.00	1.40+40	1.20+20	1.30	2.17	2.55	1.12+12
Little Rock, Ark.	.75	1.10+35	.95+20	1.02½	1.56	1.93	1.20+45
Memphis, Tenn.	.75	1.00+25	.70-05	.85	1.44	1.83	1.20+45
Nashville, Tenn.	.60	.95+35	.70+10	.82½	1.28	1.64	1.33+73
Jackson, Miss.	.75	1.10+35	.80+05	.95	1.70	2.05	1.20+45
Meridian, Miss.	.75	1.10+35					
St. Louis, Miss.	.50	.90+40	.90+40	.90	1.15	1.64	1.20+70
Minneapolis, Minn.	.65	1.00+35	.90+25	.95	1.17	1.72	1.20+55
Kansas City, Mo.	.75	1.00+25	.95+20	.97½	1.40	1.89	1.15+40
Omaha, Neb.	.75	1.05+30	.95+20	1.00	1.40	1.91	1.15+40
Chicago, Ill.	.25	.70+45	.75+50	.72½	.76	1.34	1.20+95
Cincinnati, Ohio	.40	.55+15	.60-20	.57½	.95	1.25	1.40+1.00
Columbus, Ohio	.40	.65+25					
Cleveland, Ohio	.40	.45+05	.50+10	.47½	.92	.92	1.45+1.05
N. & S. Carolina	.85	(N) .75-10 (S) .85	.50-35	.62½	1.70	1.41	1.46+61
Norfolk, Va.	.75	.65-10	.45-30	.55	.91	1.31	1.46+71
Richmond, Va.	.75	.60-15					
Lynchburg, Va.	.75	.70-05					
Roanoke, Va.	.75	.70-05	.45-30	.57½	.90	1.31	1.46+71
Baltimore, Md.	.75	.45-30	.35-40	.40	.92	1.01	1.46+71
Philadelphia, Pa.	.75	.45-30	.30-45	.37½	.95	1.01	1.46+71
Buffalo, N.Y.	.60	.25-35	.40-20	.32½	1.06	.62	1.45+85
Milwaukee, Wis.	.35	.85+50	.80+45	.82½	.65	1.33	1.20+85
Detroit, Mich.	.25	.60+35	.60+35	.60	.72	1.01	1.40+1.15
Knoxville, Tenn.	.60	.85+25	.65-05	.75	1.35	1.64	1.42+82
Louisville, Ky.	.50	.65+15	.65+15	.65	1.04	1.41	1.33+83
Chattanooga, Tenn.	.65	.90+30					
New York City, N.Y.	.75	.45-30	.25-50	.35	.95	.98	1.46+71
Pittsburgh, Pa.	.50	.50	.45-15	.47½	1.09	1.01	1.45+95

The above chart illustrates the relative cost of delivery of one crate of celery.

*Data secured from area shippers and rail lines.

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Table II. illustrates the relative cost of delivery of one crate of celery into various markets from major production areas. It shows why Michigan has difficulty in holding certain markets at various times of the year. This is particularly true in areas where New York State has a big freight advantage over Michigan.

During the four months that Michigan celery is available in volume, about 27 percent of the annual supply is consumed. The average consumption indicated by equal monthly rates is 33 percent. There is a total consumption per capita of about 1.89 pounds during the four month period.

Celery is available to the market every month, with no very large seasonal peaks or valleys in supply. The largest quantity usually is available in May and the least in September. The following table shows availability by months expressed as a percentage of the annual production (using mid-1960 figure) of 1.2 billion pounds retail weight. During the Michigan marketing season, celery consumption is at its lowest ebb of the year. This is undoubtedly due in a large part to the availability of other salad vegetables locally produced and low priced, and produce from home gardens.

TABLE III. AVERAGE MONTHLY AVAILABILITY OF CELERY SHOWN AS PERCENTAGE OF ANNUAL SUPPLY*

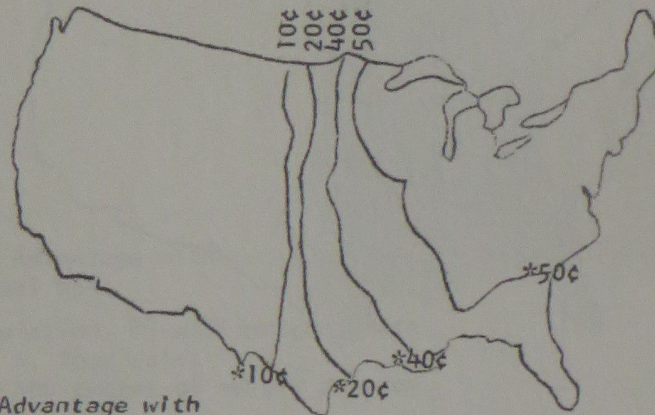
Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
9%	9%	9%	9%	10%	9%	7%	7%	6%	7%	9%	9%

The following maps illustrate the various market areas and freight differences of the Michigan, California, and New York production areas. Competitive relationships are compared at various F.O.B. price levels. They also show the population, percent of food sales, and crates of potential sales of celery per day in these areas.

*Percentages based on unloads at Atlanta, Boston, Chicago, Cincinnati, Los Angeles & New York for years 1955-59 inclusive. Total poundage calculated from U.S.D.A. data.

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TABLE IV. COMPARISON OF MICHIGAN ADVANTAGE OVER CALIFORNIA
(F. O. B. Prices the Same)

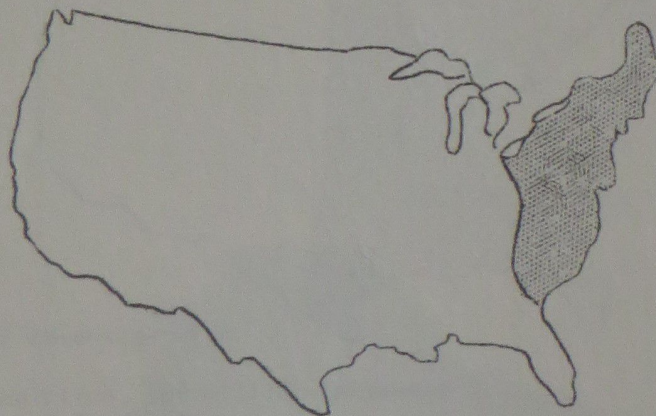


Michigan Area of Advantage with F.O.B. Prices equal has:

83½% of U. S. population, 159 million consumers
82% of total U. S. retail food sales, or \$47 billion annually
Consumption - 42,400 crates of celery per day

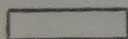
* Advantage per crate of freight rate for Michigan celery

TABLE V. COMPARISON OF FREIGHT COSTS, NEW YORK & MICHIGAN
(F. O. B. Prices the Same)

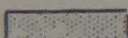


Michigan Area of Advantage with F.O.B. Prices equal has:

49½% of U. S. population, 94 million consumers
48% of U. S. retail food sales
Consumption - 25,000 crates of celery per day



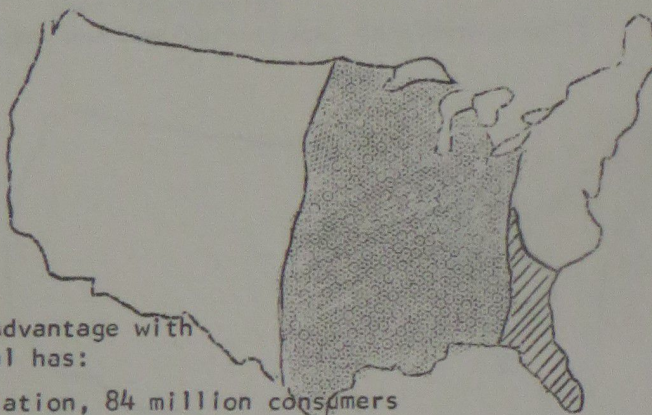
Michigan lowest freight cost



New York lowest freight cost (Western & Eastern N.Y. costs averaged)

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TABLE VI. COMPARISON OF FREIGHT COSTS, EASTERN & WESTERN NEW YORK & MICHIGAN



Michigan Area of Advantage with F.O.B. Prices equal has:

44% of U. S. population, 84 million consumers
43% of retail U. S. food sales
Consumption - 22,400 crates of celery per day

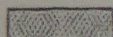
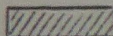
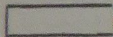
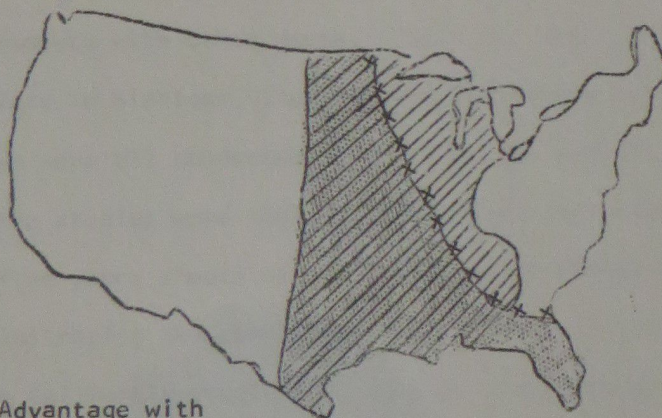

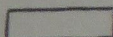

-  Michigan lowest freight cost
-  Eastern New York lowest freight cost
-  Eastern & Western New York lowest freight cost

TABLE VII. COMPARISON OF MICHIGAN CELERY PRICES TO NEW YORK AND CALIFORNIA
(Michigan F.O.B. 25¢ higher than New York and 50¢ higher than California)
(Michigan and New York-truck; California-rail)



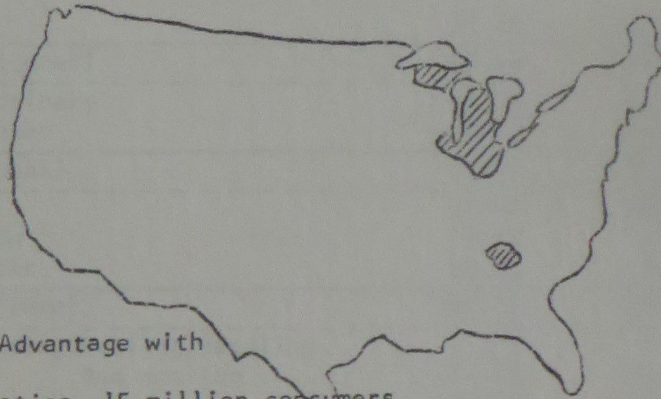
Michigan Area of Advantage with

20% of U. S. population, 38½ million consumers
19% of U. S. retail food sales
Consumption - 10,300 crates of celery per day - 72,100 per week

-  Michigan delivered costs lowest
-  New York delivered costs lowest
-  California delivered costs lowest


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
TABLE VIII. COMPARISON OF MICHIGAN CELERY PRICES TO NEW YORK AND CALIFORNIA
 (Michigan F.O.B. 50¢ higher than New York and \$1.00 higher
 than California)
 (Michigan and New York-truck; California-rail)



Michigan Area of Advantage with

8% of U. S. population, 15 million consumers
 Consumption of 4,000 crates of celery per day, 24,000 crates per week

 Michigan lowest delivered cost

 New York and/or California lowest delivered cost

COMPARISON OF PRODUCTION COSTS

If Michigan is to increase its share of the national celery production it must be able to compete with other areas. Table IX. shows the costs of producing and marketing celery in Michigan, Florida, and California, the three leading states. These cost surveys were all conducted during the same period. While costs may have increased since the studies were made it is believed the comparison is still valid. The increase in five years should not have been great enough to decrease their importance in illustrating the competitive position of the three areas. It should be noted that the California production costs on direct seeded celery would be significantly lower (probably as much as 25¢ per crate.)

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TABLE IX, COMPARISON OF COSTS OF PRODUCTION PER ACRE -
Michigan(1) California(2) Florida(3)

Data	Michigan	California	Florida
Plant Costs	98.29	227.50	29.64
Growing Costs (total)	355.06	469.45	399.29
a. labor & machinery	186.98	160.20	201.95
b. materials used	168.08	309.25	197.34
Fixed Costs (total)	177.13	410.75	86.55
a. land costs	23.42	340.00	24.40
b. depreciation	99.16	27.50	19.83
c. interest, misc.	54.55	43.25	43.32
Harvest Costs (total)	755.24	1550.00	624.45
a. cutting, grading, hauling, handling and cooling	311.03	890.00	318.54
b. containers	278.46	410.00	234.99
c. sales cost	165.75	250.00	70.92
Total Costs.....	\$1385.72	\$2489.85	\$1139.93
No. Crates Grown - per acre	663	1,000	572
Total Cost per crate	\$2.08	\$2.49	\$1.99

Equivalent costs of Michigan processing celery - \$45.54 per ton, celery hearts - \$1.80 per crate, packed out.

The results of these cost studies indicate Michigan is quite competitive in production costs. Important factors to note are:

1. California land costs are much higher than Florida or Michigan.
2. California labor costs seem to be significantly higher for packing and grading.
3. The relatively smaller sized unit of production in Michigan is illustrated by our high costs per acre of depreciation and interest on investment. Our farms are not approaching a size to allow economy of scale in equipment usage.
4. It would appear that selling Michigan celery for less than \$2.00 F.O.B. per

(1) Mich. State University Cost Study - George Stachwick, John Trocke 1957-58-64
(2) Celery Production in California - Cir. 522, 1962 (Orange Co.)
(3) Costs & Returns from Vegetable Crops in Florida - 1961-62 (Everglades area)

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crate is a money losing proposition for most producers.

Those participating in the Michigan study raised from 12 to 60 acres of celery and had yields ranging from a low of 449 crates per acre to a high of 914 crates per acre. The lowest yield was roughly one-half of the high yield. Production costs varied from a low of \$1.53 per crate to a high of \$2.29 per crate, or a variation of 76¢ per crate. The most important factor in determining cost per acre was production per acre. Actual size of operation had a much smaller affect on the cost per crate, favoring the larger producer. This was largely due to lower labor costs and using family labor on smaller farms, or size would have been a much more important factor.

PROCESSING CELERY COSTS

Costs were also kept on labor for harvesting processing celery by three of the growers. Labor ranged from about 5 to 7 hours per ton of processing celery. The average labor cost of processing celery tied in bundles, put up and loaded on a truck, was \$9.55 per ton. The equivalent amount of crated celery is 33 crates per ton of processing celery. (This is the common industry figure.) The cost, per crate equivalent, of processing celery for cutting, harvesting, handling, and loading is nearly 26¢. This, compared to the cost of 34¢ per crate for the average crate producer, is a saving on labor of approximately 9¢ per crate equivalent for processing celery.

In addition, the cost of the hauling, crates, and cooling must be deducted from the cost of processing celery production. If we use the data in Table IX, with processing celery yields of about 20 tons per acre, the costs of production, harvesting, and loading on the buyer's truck total \$45.54 per ton. The costs per acre of producing and marketing processing celery are about one-third less than producing crates for fresh market. For a fair pricing formula, take one-third off the F.O.B. crate price and multiply by 33 for a price per ton

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that is in the right relationship as far as costs of production and marketing are concerned.

HEART PRODUCTION COSTS

By using the data in Table IX, and the information from the Michigan Celery Promotion Cooperative records which indicates that production of crates is 1.6 times higher than heart production, a fairly accurate estimate of heart production can be made. 1965 season average yields showed 492 crates of hearts per acre and 776 crates of regular size per acre, a ratio of 1.6 more regular crates than hearts. This compilation was derived from all cooperative growers who were either 100% heart or regular crate producers.

The cost of crates, cooling, some stripping, sales, grading and sizing would have to be deducted. By using the average yield of 663 regular crates, we find the heart yield would be 416 crates per acre. By using the adjusted costs, the production, harvesting and delivery costs of hearts to packing plant location is \$1.80 per crate, packed out. All of the costs used for equivalent prices of crates, processing, or heart production include the cost of the owner-operator's labor and interest return on his investment in the business.

CONSOLIDATION OF OPERATIONS

Because of the relatively small size of Michigan celery producers, efforts to coordinate their functions and operations would help them lower their costs and make them even more competitive. During the 1964 season the author completed a time study and cost analysis of the harvesting, packing, and handling of celery. This information should be helpful in determining the need, and value of consolidating and mechanizing these operations.

Equipment is available to trim tops, cut and elevate to a wagon mechanically in the field. Equipment is available or can be adapted for mechanical unloading, washing, trimming, and sizing the celery. Mechanical

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box closers and motorized conveyors are available to speed handling operations. Division and specialization of labor can be devised if enough volume is available, accompanied by mechanization. Hydrocooling and shipment direct from a central packing shed would result in considerable saving of labor, trucking, and handling. Each of these improvements requires, and must be able to handle, enough volume to justify the expenditure. The savings, to justify investment, must be determined by comparison to present harvesting, packing, and handling methods and costs.

In regard to specialization of labor, it was found for instance, that a packer operating from a full belt load of pre-sized celery could increase his production over 400 per cent as compared to present belt selection systems where sizing decisions are made.

Table X. and Table XI. report the results of the studies made of the harvest, handling, and packing of Michigan celery. Growers varied in size from 20 to 80 acres and averaged 44 acres in size.

The following explanations are necessary to properly interpret the information:

Table X.

- #1. Indicates number of employees. The average is the number of employees there would be if all worked an 8-hour day. Some farms worked their help regular hours, others worked long hours, others had several youngsters who worked only a few hours. It was therefore felt important that as labor supplies change, a conversion to the actual number of workers into regular 8-hour employees be made.
- #2. Quality of the pack produced is related to costs. Therefore, as all celery was inspected by Federal-State inspectors the figure given indicated the number of times each grower was found out of grade.

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#3. & #4. Number 3 is the actual labor cost per crate of each of the various separate operations involved. Because it was found that an absolute relationship between size of celery and costs of harvesting exists, all celery was converted to the 2-dozen size in Number 4. The cost of labor for harvesting, grading, packing, and handling celery is essentially the same per stalk whether it is a 2-dozen or 6-dozen size.

Table XI.

- #6. Is the range of wages paid by each grower and the average paid for each operation.
- #7. Shows the average rate paid per hour with and without supervision costs.
- #8. Is a compilation of actual costs with the field harvest, and packing shed supervision costs separate.
- #9. Shows the same information on a corrected to 2-dozen size basis.
- #10. Shows the percent of costs accrued in harvesting, packing house, and supervision.

SUMMARY OF COSTS OF HARVESTING AND PACKING STUDY

Tables X. and XI. have a wealth of valuable information which can be used in the following manner:

1. Comparing the costs of each operational step in harvesting and packing with grower's own costs to evaluate their own system's efficiency.
2. Use of this material to aid decisions on wages, mechanization, and contemplated changes to be made in their own operation.
3. Use of this data as a guide to development of central packing plant facilities. Needed volume, equipment, mechanization, wages, etc., can all be determined or aided by referral to these figures.

There are some interesting highlights which have been identified by this study. First, it is quite apparent that the cost of harvesting and packing

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TABLE X. CELERY HARVESTING PACKING COST SUMMARY (labor only)

	Grower							Range	Average
	A	B	C	D	E	F	G		
Acreage	35+	40+	20+	35+	40+	35+	40+	20-80	35
Packing Facilities	Packing House	Packing House	Packing House	Packing House	Mule Train	Packing House	Mule Train		
1. Total No. of Employees:									
Average number	13½	31	5	19	16½	18	17	5-19	17
Actual number	12	31	6	16	24	24	21	6-31	19
2. Number of times Out-of-Grade	24	6	8	0	5	1	19	0-24	9
3. Actual Cost (per crate) each type job:									
Cutters & trimmers	\$.0960	\$.1485	\$.1336	\$.2245	\$.1496	\$.1821	\$.1104	\$.0960-\$.2245	\$.1493
Grade, Size & Pack	.0446	.0792	.0684	.0929	.0895	.0456	.0539	.0446-.0929	.0677
Loading	.0069	.0132	.0141	.0579	x	.0299	.0082	.0069-.0579	.0186
Unloading	.0255	.0088	.0228	.0525	.0135	.0190	.0210	.0088-.0255	.0233
Make crates	.0100	.0154	.0228	.0451	.0152	.0166	.0245	.0100-.0451	.0214
Close crates	.0328	.0176	.0228	.0296	.0217	.0300	.0245	.0176-.0328	.0256
Supervision	.0430	.0352	.0157	.0462	.0333	.0431	.0350	.0157-.0462	.0359
Per crate totals:	\$.2588	\$.3179	\$.3002	\$.5487	\$.3228	\$.3663	\$.2775		\$.3418
4. Corrected Cost (per crate) each type job:									
Cutters & trimmers	\$.0786	\$.1244	\$.0956	\$.1738	\$.1061	\$.1169	\$.0899	\$.0786-\$.1738	\$.1122
Grade, Size & Pack	.0365	.0663	0	.0719	.0635	.0293	.0439	.0293-.0719	.0515
Loading	.0057	.0111	.0101	.0446	x	.0192	.0066	.0057-.0446	.0139
Unloading	.0209	.0074	.0163	.0407	.0096	.0122	.0171	.0074-.0407	.0177
Make crates	.0082	.0129	.0163	.0348	.0108	.0107	.0200	.0082-.0348	.0162
Close crates	.0269	.0147	.0163	.0299	.0154	.0193	.0200	.0147-.0269	.0194
Supervision	.0353	.0295	.0112	.0358	.0236	.0277	.0285	.0112-.0358	.0274
Totals:	\$.2121	\$.2663	\$.2147	\$.4245	\$.2290	\$.2353	\$.2260		\$.2583
5. Percentage-Actual Basis each type job:									
Cutters & trimmers	37½%	52½%	44½%	41%	46%	50%	43%	37½% - 52½%	45%
Grade, Size & Pack	17	18½	22	17	28½	12½%	20	12½% - 28½%	19
Loading	2½	3	4½	10½	x	8	x	2 - 10½	4
Unloading	10	1½	8	9½	4	5	8	1 - 10	6½
Make crates	4	5½	8	8	4½	4½	8½	4 - 8½	6
Close crates	12½	6	8	5½	6½	8	8½	5½ - 12½	8
Supervision	16½	12½	5	8½	10½	12	12	5 - 16½	11

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TABLE XI. CELERY HARVESTING PACKING COST SUMMARY (labor only)

	Grower A	Grower B	Grower C	Grower D	Grower E	Grower F	Grower G	Range	Average
6. Wage Rate Range:									
Cutters & trimmers	\$1.00-1.50	\$1.00	\$1.00	\$1.25	\$.60-1.75	\$.50-1.10	\$.90	\$.50-1.75	\$.92
Grade, Size & Pack	2.00	1.50	1.00	1.10	.75-2.00	.70-1.10	1.10	.70-2.00	1.06
Loading	1.00-2.00	1.00	1.00	1.25	x	.50-1.10	1.50	.50-2.00	1.04
Unloading	1.00-1.50	1.00	1.00	1.10	1.75	.55-.60	1.00	.55-1.75	1.03
Make crates	1.00	.75-1.00	1.00	1.10	.55-1.00	.50-1.10	1.00	.50-1.10	.84½
Close crates	1.50	1.00	1.00	1.25	1.00	.75-1.10	1.00	.75-1.50	1.15
Supervision	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
7. Average Wage per Hour									
Including supervision:	\$1.65	\$1.21	\$1.14	\$1.29	\$1.50	\$.97	\$1.21	\$.97-1.65	\$1.28
Excluding supervision:	\$1.58	\$1.08	\$1.00	\$1.17½	\$1.40	\$.80	\$1.08	\$.80-1.40	\$1.16
8. Actual Cost per crate									
Field harvest:	\$1.1026	\$1.1617	\$1.1477	\$.2824	\$.1496	\$.2120	\$.1186	\$.1026-.2824	\$.1679
Packing	.1131	.1210	.1368	.2201	.1339	.1112	.1239	.1112-.2201	.1380
Supervision	.0431	.0352	.0157	.0462	.0333	.0431	.0350	.0157-.0462	.0359
Per crate totals	<u>\$.2588</u>	<u>\$.3179</u>	<u>\$.3002</u>	<u>\$.5487</u>	<u>\$.3328</u>	<u>\$.3663</u>	<u>\$.2775</u>		<u>\$.3418</u>
9. Corrected Cost per crate									
Field Harvest	\$.0843	\$.1355	\$.1057	\$.2184	\$.1061	\$.1361	\$.0965	\$.0843-.2184	\$.1216
Packing	.0925	.1013	.0978	.1703	.0993	.0715	.1010	.0715-.1703	.1048
Supervision	.0353	.0295	.0112	.0358	.0236	.0277	.0285	.0112-.0358	.0274
Per crate totals	<u>\$.2121</u>	<u>\$.2663</u>	<u>\$.2147</u>	<u>\$.4245</u>	<u>\$.2290</u>	<u>\$.2353</u>	<u>\$.2260</u>		<u>\$.2583</u>
10. Percentage - Actual Basis									
Field Harvest	40%	56%	49%	49½%	46%	58%	43%	40 - 58%	49%
Packing	43½	31½	46	39½	43½	30	45	30 - 46	40
Supervision	16½	12½	5	11	10½	12	12	5 - 16½	11

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celery is based upon the number of stalks. In other words, it costs about the same to harvest and pack a 4-dozen size celery stalk as a 2-dozen size stalk! In addition, when sizes of celery are down significantly yields are also down and production costs skyrocket. In brief, a very strong effort should be made by Michigan celery growers to produce larger size celery. The general market demands also indicate a desire for larger sized celery, as 2 and 2½ dozen sizes average 25 to 50¢ more per crate than 4 and 6 dozen sizes do on a yearly average. Probably no other single factor will increase profits more for Michigan celery growers than producing bigger stalks. Production costs will be lowered and per crate harvesting and packing costs will be lowered while prices received increase!

There is a definite relationship between the quality of pack produced and the cost of packing and harvesting. This is indicated in the following manner; the lowest cost packer had the highest out-of-grade reports, while the highest cost packer had zero out-of-grade reports. The three highest cost producers averaged only 2 out-of-grade reports while the three lowest cost packers averaged 17 times out-of-grade. This is even more startling when we note that the high cost producers producing nearly twice as much celery were out of grade only a very few times. There is a definite indication here that some producers are not putting enough emphasis on the quality of pack. Central grading would undoubtedly raise the quality turned out by many growers and would produce a more uniform pack as well.

It would appear that mechanical harvesting with a mule train is not the answer to cost cutting. The two lowest cost operators both used regular packing houses. It is interesting to note however, that the two producers using mule trains had costs significantly lower than the average of producers using packing houses. Their cost for harvesting and packing celery was over 4¢ per crate less than the average packing house operation. Results would indicate

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a well managed packing house could compete with a mule train costwise, but that an average packing house operation could not.

There is a slight indication of better quality produced in the packing house although this factor would seem to be mostly dependent upon management, and the money and attention given grading and packing rather than the means of packing used.

A most significant and interesting point seems to be indicated in the relationship between hourly rate of wages paid and labor costs of harvesting and packing celery. The two highest average hourly wage rates combined for an average wage rate of \$1.53 per hour, but their cost was nearly 4¢ per crate below average. Also, the highest average hourly wage producer in the survey was the lowest cost producer per crate. It would seem that paying higher wages can be justified and can return higher profits providing good management and control are exercised over this higher priced personnel. The highest cost per crate producer's (60 percent above average) hourly wage rate was only 1¢ above the average wage rate paid by all producers in the study. The higher wage earners can and seem to be more productive. A factor which seems to be very important, although not provable by objective means, is that those farm organizations operated by a single manager had the highest costs, while those in which there were two or more brothers or adult son and father relationships involved, were lowest! This indicates the inability to manage both harvesting and packing operations simultaneously. This could be corrected by central packing or hiring a competent foreman if the operation is large enough to justify it. The farm with the highest rate or percent of charge toward supervision also had the lowest labor costs. Farms with the higher percent of supervision costs tended toward lower costs per crate.

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mechanical handling. Packaging and uniform quality control will also become more important and essential to these outlets.

Sizes of our celery farms will increase and mechanical harvesting aids will become common. More time and skill will have to be devoted to production, and less to packing and sales by producers.

Labor conditions will become more critical. Labor will be hard to get, require better working conditions, better sanitary conditions, higher wages and more fringe benefits. Individual small farmers will not be able to deal with these situations, particularly if labor unions become a reality in the agricultural labor picture.

Central packing can provide all of these facilities and still allow the smaller grower to exist and devote more energy to producing to the best of his ability. Central packing facilities should be equipped to hydrocool and ship celery direct and avoid the present high cost of all the rehandling. A volume of uniform, high quality celery can be produced. Sufficient volume should allow mechanization to cut or at least preserve present packing and grading costs.

Processing celery will become more important. Using the waste and by-products and low quality celery are all problems that must be solved in the years ahead.

It appears that if the Michigan celery industry can meet these challenges, the years ahead will allow considerable expansion of the industry. These challenges, can only be met successfully if they are met on an organized industry-wide basis with the cooperation of all segments of the Michigan celery industry.

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The author wishes to recognize the assistance of George Stachwick, M.S.U. Marketing Coordinator; Albert Drost; the Michigan Celery Promotion Cooperative and its manager, Byron Carpenter; and all the growers who cooperated in making this study possible, also the shippers from other areas for providing freight rates and the C & O Railroad for providing rail freight rates.

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HARVESTING MICHIGAN CELERY



Cutting celery by hand with a knife.



Cutting and bundling soup.
(processing celery)



Removing sucker branches and
trimming to size.



Celery harvesting operation and
celery being loaded into field boxes
for transport to packing shed.

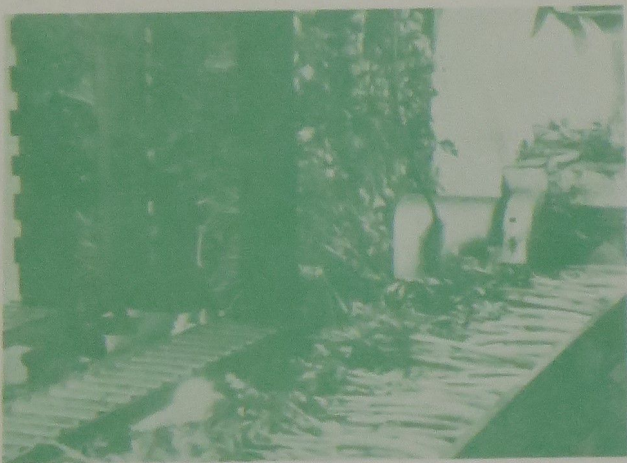


Cutting and trimming tops
mechanically.



Mechanical harvesting on a small
mule train.

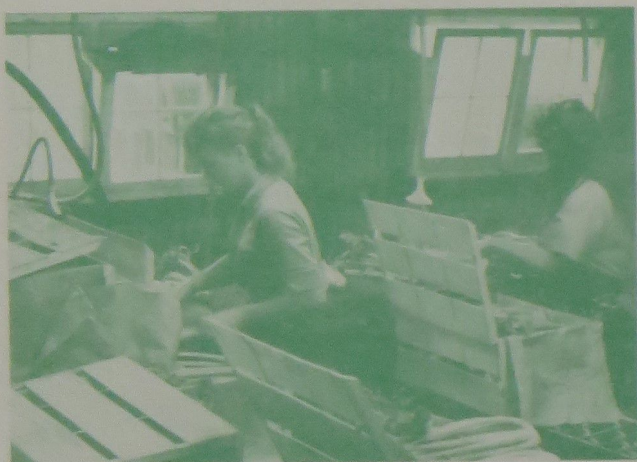
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Shows pallets used to transport from field to shed, and celery being conveyed to the saw.



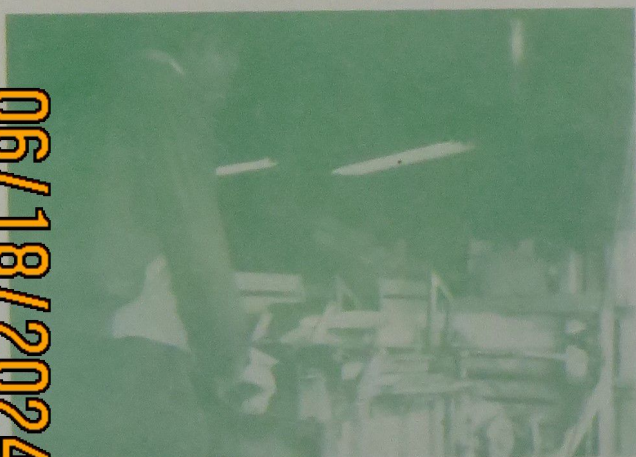
Shows how celery hearts and packaged celery are sleeved in poly packages.



Girls sizing celery and putting celery into crates.



Celery coming out of hydrocooler and going to loading dock.



A mechanical crate closer in action.



Fine Michigan packaged celery in the produce department ready for the consumer.

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