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Staff Paper

Cost of Fresh Market Celery Production in Southwestern Michigan

by

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Celery Production in Michigan

This bulletin represents a tool that can help producers, consultants, educators, and agribusinesses working with producers estimate costs of production and expected profit based on "typical" celery management strategies found in southwestern Michigan. The budget included in this bulletin will allow users to revise inputs based on their management strategies and calculate their expected cost and profit. This flexibility provides a decision aid to search for systems that generate higher net returns to the farm's resource base.

The brief outline of cultural and pest management practices included in this publication should be supplemented with publications from Michigan State University or from other Universities. See the References section for resources. Many are available on-line.

Celery Production

Michigan is the third largest producer of celery in the United States. Approximately 50% of celery planted in Michigan is marketed as fresh crop. The balance is used for processing. Celery does best in a muck soil (high organic matter) and it is grown primarily near Lake Michigan in Allegan, Barry, Kent, Muskegon, Newaygo, Ottawa and Van Buren counties where these soils are found.

Site Selection and Planting

Celery is planted as transplants and grows best when air temperature is between 60ºF-80ºF. Since its roots are shallow, it requires one to two inches of water per week. Therefore, it should be grown in fields with irrigation. The plants can withstand light frosts but the crop may be damaged if prolonged temperatures below 28ºF occur. Celery is started from seed in a greenhouse near the beginning of February and transplanted after seed bed preparation is completed. Transplantation can occur as early as April 1st when row covers are used. Planting seed continues through June 1 for July transplanting. From 30,000 to 45,000 plants are set per acre; an ounce of seed yields about 15,000 transplants (2, 5). Soil should be maintained at a pH of 6.0 to 6.5. See the Michigan State University publication "Fertilizer Recommendations for Vegetable Crops in Michigan" written by Darryl Warncke in 1994 for recommended rates of nitrogen, phosphorus, and potassium.

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Pest Management

When seeking advice on use of labeled pesticides (including herbicides), please refer to the most current versions of Michigan State University Extension Bulletins titled "Insect, Disease and Nematode Control for Commercial Vegetables" (Extension Bulletin E-312) and "Weed Control Guide for Vegetable Crops" (Extension Bulletin E-433). They are available on-line at http://www.msue.msu.edu/vegetable/Resources/E312/E312.htm and http://www.msue.msu.edu/vegetable/Resources/weeds/weed.htm *respectively. Specific herbicide and pesticide names have been used in this publication to facilitate accurate budgeting, but Michigan State University does not endorse any of the brand name products listed and does not direct producers to limit management systems to these products.*

Several sources provided at the end of this introduction could be used to help identify common celery pests. A subscription to the MSU Vegetable Crop Advisory Alert would provide a good pest management reference. It is available as a mail subscription or over the internet at http://www.msue.msu.edu/ipm/vegCAT.htm

Weed control is important to minimize competition for water and nutrients. Weeds that are secondary hosts to celery diseases and harbor insect pests are especially important to control. Inoculum of aster yellows is can be introduced through infected wild carrot, pineapple-weed, or plantain weed.

Diseases of celery can originate from water splashing, soil or seed contamination, crop residue or insects. Celery is a high input crop and is susceptible to several foliar and stem diseases. A crop management program that combines cultural practices, constant monitoring, and treating the problem efficiently will afford a good harvest.

Fusarium yellows (*Fusarium oxysporum* f. Sp. *apii*), the most important problem facing celery growers. The initial symptom is a lag in growth, usually followed by yellowing of foliage. Severely infected plants often have an orange-brown or black dry rot in the interior of the crown and vascular discoloration that often extends into the petiole. The fungus is soil borne and there are no chemical controls. Good sanitation in the greenhouse and resistant varieties are two recommended management practices. The fungus may also live in celery refuse for as long as 18 months, so a rotation to crops other than celery or celeriac is suggested. *Aster yellows* is caused by a mycoplasma-like organism that causes celery plants to yellow and dwarf, and acquire an unpleasant taste. Leaves of infected plants become twisted, stunted, and yellow, and most develop a dense cluster of dwarfed and chlorotic adventitious shoots. Celery infected at early stages is not likely to survive. Crop losses range between 10-25%. Early leaf blight, *Cercospora apii*, and Late leaf blight, *Septoria apiicola* can be controlled by soaking seed in hot water (118ºF) for 30 minutes or using 3 year old seed. Early leaf blight appears first as yellow spots visible on both sides of the foliage. Spots enlarge rapidly and become ashen gray and papery. Late leaf blight appears as yellow specklings that become darker over time. Look for small, black, pycnidia within spots. Weekly applications of fungicides are needed for control in the field.

Insect pests include the Aster yellows leafhopper, which transmits Aster yellows disease through its salvia. This disease causes dwarfing and abnormal shaping of the celery, and often causes a

bitter flavor and reduces stalk size leading to losses in both quality and quantity of celery yields. The leafhopper migrates from an over wintering site to celery and acquires the mycoplasma organism (Aster yellows disease). Two weeks after acquisition, the leafhopper can infect plants. It takes two weeks for the plant to express symptoms. The leafhopper should be controlled when the transplants are young. Control should be discontinued 2 weeks prior to harvest.

Green Peach aphids are key pests of celery, but are generally are not a big problem because of the effective natural enemies (lady beetles, lacewings, hover fly larvae, lacewing larvae, fungal diseases, and tiny wasps). Insecticide or fungicide sprays sometimes disrupt beneficial insect control and cause aphid outbreaks. Aphids damage the crop by transmitting mosaic viruses. These viruses cause twisting and distortion of new plant growth.

Celery and Cabbage Loopers (*Anagraoha falcifera* and *Trichoplusia ni*) are similar in appearance. Celery loopers over winter in Michigan and become active in early May. Cabbage loopers migrate into the state and become a problem in late June and July. The larvae feed on the foliage and petioles and make holes and small pits. The larvae generally do only minor damage to celery, but may be serious contaminants of harvested celery, and are difficult to clean.

Harvest and Handling

Under typical conditions, celery reaches marketable size 80 to 90 days after transplanting. The crop is cut and loaded mechanically in the field. Wagons with harvested celery are transported to on-farm sheds for hand trimming, washing and packing. Celery should be cooled quickly to temperatures below 45°F by hydrocooling, vacuum cooling, icing, or other means of refrigeration and can be held a few weeks or more if storage is near 32°F with high humidity. A yield of 1,000 or more 60 pound crates per acre is good.

Cost of Production Budget

The budget developed using information gathered from growers is presented in Table 1. Details of some practices are mentioned in footnotes. To adapt this budget, insert or remove individual practices as necessary.

Because expected prices and yields vary across years and producers, no revenue was included in this budget. However, Tables 2 and 3 show expected net returns at a variety of typical prices and yields. Where indicated in the budget, the cost structure does vary by yield. Use of this table should help producers compare expected returns from typical prices and yields using practices outlined above and detailed in the budget. ***If the budget is modified to better fit a different production system, Table 2 will not accurately represent net returns per acre.***

Approach

The information on celery cost structure and yields was developed using a focus group of growers with a good knowledge of the industry and good field, enterprise, and financial records. The process was initiated by defining a celery production system and strategic planning context representative of southwestern Michigan. Subsequently, both the sequence of decisions and the information necessary to make these key decisions were collected. This process resulted in a list of inputs and input prices that were then translated into costs, which were verified against grower records.

Because the production system and details were derived from grower input, fertilizer and chemical use may not match some horticultural recommendations. All grower practices were verified and do reflect current procedures. The following budget reproduces, as completely as possible, all costs incurred by these growers.

Pricing Annual Costs of Capital Services (Buildings, Machinery, and Equipment)
Estimating the annual cost of using buildings, machinery, equipment and other assets is a challenge in cost of production studies. In previous studies of Michigan horticultural crops, focus groups constructed a representative farm with fixed acreage and then constructed the buildings, machinery, and equipment needed to operate this farm. They also generated associated labor needs and repair and operating costs. This approach has the advantage of being very tangible but also makes it difficult to interpret results for alternative farm sizes.

In this study, an alternative approach was taken. Buildings, machinery and services were priced to the enterprise on a "custom" basis. Further, services such as land preparation were priced to the enterprise as a "bundled" service/task reflecting both the machinery and labor components of the service.

This approach requires some judgment because costs such as buildings to house machinery and equipment, the farm shop, and labor used in maintenance of machinery and equipment must be included in the "custom fee" as well as the "depreciation and interest" on the machinery and equipment. The fact that this custom fee approach was used does not imply that custom operators did all the tasks. It simply means the tasks are priced to the enterprise as if a custom operator had completed them. The services may well have been provided by the "machinery services enterprise" of the farm. As a double check, members of the focus group attempted to compare the aggregate custom fee costs to those based on their accounting records which included labor, custom fees, and depreciation and interest on buildings, machinery, and equipment. Custom fees were also double-checked against survey information when available.

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Table 1. Fresh market celery budget. Michigan, 2002.

Celery, Fresh Market	Quantity	Unit	Price per Unit	Cost per Acre	Your Farm
REVENUE SOURCES					
Celery[1]	800	cartons		$ -	
TOTAL REVENUE				**$ -**	
EXPENSES					
Soil test				$ 2	
Fall ground preparation					
Tillage[2]				$ 17	
Rye seed				$ 6	
Spring ground preparation[3]				$ 50	
Greenhouse charge					
Building & machinery costs[4]				$ 123	
Seed				$ 47	
Operating costs[5]				$ 218	
Labor, unskilled[6]	9	hr	$ 10.00	$ 90	
Labor, skilled[7]	14	hr	$ 15.00	$ 210	
Planting					
Machinery[8]				$ 70	
Labor	18	hr	$ 10.00	$ 180	
Tent plastic[9]				$ 50	
Fertilizer					
Nitrogen	200	lb	$ 0.25	$ 50	
P_2O_5	150	lb	$ 0.18	$ 27	
K_2O	900	lb	$ 0.13	$ 117	
Micronutrients[10]				$ 100	
Limestone	0.33	ton	$ 20	$ 7	
Applications	2	apps	$ 6	$ 12	
Scouting				$ 10	
Herbicide Materials[11]				$ 48	
Insecticide Materials[12]				$ 101	
Fungicide Materials[13]				$ 142	
Spray applications	12	apps	$ 7	$ 84	
Cultivate[14]				$ 16	
Irrigation[15]				$ 91	
Harvest					
Machinery[16]				$ 218	
Labor, skilled[17]	16	hr	$ 15.00	$ 240	
Packing					
Cartons	800	cartons	$ 1.25	$ 1,000	
Labor	800	cartons	$ 1.20	$ 960	
Sales Commission	800	cartons	$ 0.60	$ 480	
Cooling	800	cartons	$ 0.60	$ 480	
Research check-off	800	cartons	$ 0.0125	$ 10	
Land rent				$ 250	
Insurance				$ 7	
Interest[18]	7%			$ 91	
Tool shed & repair overhead[19]				$ -	
Marketing, management & supervision[20]				$ 300	
TOTAL EXPENSES				**$ 5,904**	

FOOTNOTES

1	One carton contains 55 pounds of celery.
2	Includes broadcasting rye and dragging.
3	Includes moldboard plowing, discing (twice) and field drainage and cleanup.
4	Charge for a 2,880 square foot greenhouse and equipment needed to fill and seed trays.
5	Includes soil and vermiculite, trays, electricity, heat, and fertilizer.
6	Includes labor to mow transplants, fill trays, and water and care for seedlings.
7	Includes labor to monitor and care for seedlings.
8	Includes a 4-row transplanter and the powertrain to run it.
9	Plastic used on approximately 10% of acreage during earliest plantings to protect against frost. Cost includes plastic and installation labor.
10	Includes magnesium, manganese and boron applied as foliar nutrients with other spray applications.
11	Includes 1 application of Dual Magnum, 1 application of Caparol, 1 application of Lorox and an application of Poast on 50% of the acreage.
12	Includes 4 applications of Lannate, 1.5 applications of Orthene and 1.5 applications of Ambush.
13	Includes 6 applications of Bravo Ultrex, 2 applications of Tilt, 2 applications of Quadris and 9 applications of Kocide.
14	Assumes field is cultivated twice.
15	Assumes a variable expenses only for a solid set system. There is no charge for water.
16	Includes cost of harvester, 6 wagons, and 2 tractors.
17	Includes 2 machinery operators for an 8 hour day.
18	Operating capital assumed to be half of the variable costs (excluding custom charges) for half of the year.
19	These costs are included in custom rates.
20	Includes cost of marketing, management and supervision time and a vehicle for the manager.

Table 2. Expected fresh market celery net income (loss) per acre at selected price and yield combinations.

	Yield, 55 pound cartons				
Price	700	750	800	850	900
$ 6.00	$ (1,338)	$ (1,221)	$ (1,104)	$ (987)	$ (870)
$ 7.00	$ (638)	$ (471)	$ (304)	$ (137)	$ 30
$ 8.00	$ 62	$ 279	$ 496	$ 713	$ 930
$ 9.00	$ 762	$ 1,029	$ 1,296	$ 1,563	$ 1,830
$ 10.00	$ 1,462	$ 1,779	$ 2,096	$ 2,413	$ 2,730