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# ***Staff Paper***

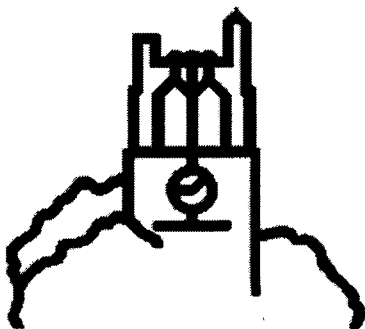
## **Cost of Processing Carrot Production in West Central Michigan**

by

**Barbara Dartt  
Roy Black  
Jim Breinling  
Vicki Morrone**

**Staff Paper 2002-35**

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## **Cost of Processing Carrot Production in West Central Michigan**

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Barbara Dartt, Roy Black, Jim Breinling, Vicki Morrone<sup>1</sup>

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” carrot management strategies found in west central 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.

### **Carrot Production**

Carrots are grown primarily in Montcalm, Newaygo, and Oceana counties in western Michigan and in Lapeer County in southeast Michigan. Approximately 75% of carrots are grown for fresh market and 25% for processing. A percentage of the fresh market carrots are utilized in processing – specifically the cut and peel market. Under favorable conditions, processing carrots can yield 35-40 tons per acre, and fresh market production may exceed 15 tons per acre.

### **Site Selection & Planting**

Carrots grow well in deep, well-drained muck and mineral soils. Carrots are extremely sensitive to environmental conditions such as heat, soil compaction, and particularly water stress and saturation. To protect young carrots from wind damage, Michigan farmers often interseed carrots with barley to protect the young seedlings from wind damage. Carrots should be planted early in the season so seedlings avoid high temperatures. Typically, carrots are planted between mid-April to mid-June to avoid excessive heat. Most carrot varieties mature in 120-180 days. Fresh market carrots are harvested in late July thru October while most processing carrots are harvested in October thru November.

### **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*

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*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.*

Pest management is critical to reduce damaged roots and disease build-up. A field scout can notice early pest outbreaks and greatly reduce yield losses and unnecessary pesticide applications. 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>

*Insect pests* The aster leafhopper (*Macrosteles fascifrons*) is a key pest of carrots. The aster leafhopper does not seriously damage carrots. However, it transmits a phytoplasma that causes aster yellows. Under severe pressure, aster yellows can effect up to 10% of the crop causing quality and yield loss. The carrot weevil (*Listronotus oregonensis*), although a minor insect pest in Michigan, can cause serious economic damage. Nematodes can do substantial damage to carrot crops in Michigan. Root knot and carrot cyst are the biggest problems. Chemical controls and crop rotation are necessary for controlling nematode populations.

*Diseases.* Major foliar diseases of carrot in Michigan are Cercosera (early) blight and Alternaria (late) blight. If these diseases are left uncontrolled, mechanical harvesting will be difficult because harvesters will be unable to remove carrot roots due to weakened tops. Alternaria leaf blight causes black spots with yellow margins on the leaves. Weakened leaves also affect mechanical harvesting. Crop rotation and well-timed fungicide application are needed for control of foliar diseases.

### **Harvest and Handling**

Carrots are mechanically harvested in Michigan. The roots are undercut and then they are lifted out of the soil by grasping the tops. Fresh market carrots are loaded onto machinery, washed, cooled and packaged, then placed in storage. Loose carrots can be hydrocooled from 75 to 40°F in about 9 minutes if the water is 33°F. Bitterness in carrots, which may develop in storage, is due to abnormal metabolism caused by ethylene. This gas is given off by apples, pears, and certain other fruits and vegetables and from decaying tissues. Storing carrots away from such produce can prevent bitterness. Also, development of bitterness can largely be avoided by low-temperature storage, as it minimizes ethylene production. Some surface browning or oxidative discoloration often develops in stored carrots. The most immature carrots are the most susceptible to surface browning.

### **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 cultural practices for production of fresh market and processing carrots are similar, this budget could easily be adapted to a fresh market system.

Because expected prices and yields vary across years and producers, no revenue was included in this budget. However, Table 2 shows 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 carrot 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 carrot production system and strategic planning context representative of west central 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. Processing carrot budget. Michigan, 2002.**

<b>Carrot, Processing</b>					
Planted April 15 to June 15 for harvest August 1 through November 15					
	Quantity	Unit	Price per Unit	Cost per Acre	Your Farm
<b>REVENUE SOURCES</b>					
Carrots	35	ton	\$	-	
<b>TOTAL REVENUE</b>				<b>\$</b>	<b>-</b>
<b>EXPENSES</b>					
Soil sampling <sup>1</sup>				\$	2
<i>Fall ground preparation</i>					
Tillage <sup>2</sup>				\$	23
Rye seed				\$	6
<i>Spring ground preparation</i>					
Tillage <sup>3</sup>				\$	37
Herbicide & Application <sup>4</sup>				\$	66
<i>Seed</i>					
Carrot	225	1,000 seeds	\$ 0.27	\$	61
Barley <sup>5</sup>				\$	8
Planting				\$	25
<i>Fertilizer</i>					
Nitrogen	150	lb	\$ 0.20	\$	30
P <sub>2</sub> O <sub>5</sub>	90	lb	\$ 0.18	\$	16
K <sub>2</sub> O	200	lb	\$ 0.13	\$	26
Micronutrients <sup>6</sup>				\$	10
Limestone	0.3	ton	\$ 20	\$	7
Applications	4	apps	\$ 6	\$	24
Scouting				\$	10
Herbicide Materials <sup>7</sup>				\$	45
Insecticide & Nematicide Materials <sup>8</sup>				\$	80
Fungicide Materials <sup>9</sup>				\$	58
Spray applications	13.5	apps	\$ 7	\$	95
Hand weeding				\$	30
Cultivation				\$	8
Irrigation <sup>10</sup>				\$	45
<i>Harvest</i>					
Harvester <sup>11</sup>				\$	99
Tractors <sup>12</sup>				\$	75
Buggies <sup>13</sup>	35	ton	\$ 1.00	\$	35
Labor, skilled	1	hr	\$ 15.00	\$	15
Labor, unskilled	1	hr	\$ 10.00	\$	10
Research check-off	35	ton	\$ 0.28	\$	10
Land rent <sup>14</sup>				\$	200
Insurance				\$	7
Interest <sup>15</sup>	7%			\$	16
Tool shed & repair overhead <sup>16</sup>				\$	-
Marketing, management & supervision <sup>17</sup>				\$	175
<b>TOTAL EXPENSES</b>				<b>\$</b>	<b>1,352</b>

## FOOTNOTES

<b>1</b>	Assumes one soil test every 2-3 years.
<b>2</b>	Includes chisel plowing and broadcasting rye.
<b>3</b>	Includes chisel plowing, field cultivation and v-ripping.
<b>4</b>	Includes one application of Roundup to burn down cover crop.
<b>5</b>	Barley is planted with carrots to protect seedlings from wind damage.
<b>6</b>	Includes Boron and Zinc applied with dry fertilizer or foliar nutrients.
<b>7</b>	Includes 2 applications of Fusilade, 3 applications of Lorox and Gramoxone applied to half the acreage.
<b>8</b>	Includes 5 applications of Asana and 1 application of Vydate at planting to control nematodes.
<b>9</b>	Includes 3 applications of Kocide, 5 applications of Bravo Ultrex.
<b>10</b>	Assumes a variable expenses only for a center pivot system. There is no charge for water. See "Selecting a Sprinkler Irrigation System" in the Reference section for more details.
<b>11</b>	Assumes a 3 row harvester that can cover 500 acres.
<b>12</b>	Assumes 2 tractors used at harvest. Both are over 100 hp.
<b>13</b>	Assumes use of 2 12 ton buggies full time during harvest and use of one 6 ton buggy part-time.
<b>15</b>	Operating capital assumed to be half of the variable costs (excluding custom charges) for half of the year.
<b>16</b>	These costs are included in custom rates.
<b>17</b>	Includes cost of marketing, management and supervision time and a vehicle for the manager.

**Table 2. Expected processing carrot net income (loss) per acre at selected price and yield combinations.**

Price	Yield, Tons				
	25	30	35	40	45
\$ 40	\$ (339)	\$ (145)	\$ 48	\$ 242	\$ 436
\$ 45	\$ (214)	\$ 5	\$ 223	\$ 442	\$ 661
\$ 50	\$ (89)	\$ 155	\$ 398	\$ 642	\$ 886
\$ 55	\$ 36	\$ 305	\$ 573	\$ 842	\$1,111
\$ 60	\$ 161	\$ 455	\$ 748	\$1,042	\$1,336