Staff Paper

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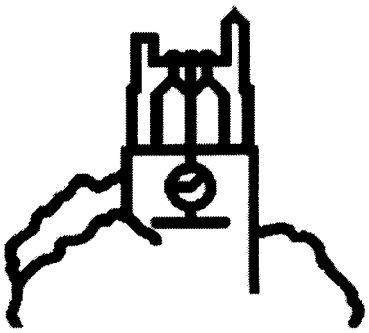

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This bulletin represents a tool that can help producers, consultants, educators, and agribusinesses working with producers estimate costs of production and expected profit based on "typical" pumpkin management strategies found in Macomb County, Michigan. The budget included in this bulletin will allow users to revise inputs based on their management strategies and calculate their expected cost and procit. 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.

Pumpkin Production

Michigan pumpkins are grown primarily for jack-o-lanterns. They are produced in all areas of the southern half of the Lower Peninsula, with about 50% grown in the southeast region. Pumpkin production requires careful attention to potential insect and diseases, discussed briefly below.

Site Selection and Planting

The soil where pumpkins are grown should be well drained with a pH of 6.0-7.0. Clay soils are suitable but can make harvest difficult when the soils are wet. Pumpkins are seeded in the field after the soil temperature exceeds 60° F, usually about June 1. In general, plants should be spaced 1-2 feet apart in rows spaced 6 to 8 feet apart. Smaller-fruited varieties can be grown at closer spacing. Seed should be planted 1-1.5 inches deep, in moist soil, at a rate of 2-4 lb of seed/acre for large seeded cultivars, depending upon the precision of the seeder. The amount of tillage necessary depends upon the previous year's crop. Pumpkins require moderate amounts of fertilizer. A soil test is recommended every two years to help maintain soil test levels of phosphate (P_2O_5) at 100 to 120 lb/acre and of potash (K_2O) at 250 to 300 lb/acre. A total of 100 lb nitrogen is recommended per year with phosphorus and potassium amounts based on a soil test.

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Honeybees are important for complete pollination and fruit set. To assure sufficient pollination, one to two beehives per acre should be placed in pumpkin fields during the flowering period. Insecticides applied to crops or weeds in bloom can adversely affect pollinating insect populations, especially honeybees.

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.*

Pest management is critical to reduce damaged fruit 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

Weed control will require a combination of mechanical and chemical measures. Weeds that are hosts to insect pests of pumpkin, such as aphids, should be carefully controlled since these insects can vector viruses. Since herbicides currently registered on vine crops do not provide season-long control of most weeds, cultivation is an important part of a weed control program. However, because the root systems of pumpkins are large and shallow, excessive and deep cultivation will harm many of the fine roots near the soil surface. Hand weeding and hoeing are effective if done when weeds are young. Proper nutrition and vigorous growth is key to effective weed control. As the plants cover the ground, they shade out many weeds.

Insect Pests The most important insect pests of pumpkin include striped and spotted cucumber beetles, squash bugs and squash vine borers. Aphids may spread viruses or damage plants directly. Insecticide applications cannot prevent virus transmission. Frequent use of some insecticides (such as pyrethroids) that do not effectively control aphids may cause outbreaks by destroying natural enemies. Mites may need control if populations become high under hot, dry and dusty conditions.

Diseases. Economically important fungal diseases of pumpkins include powdery mildew, *Phytophthora* and *Fusarium* root and fruit rots and gummy stem blight or black rot. Bacterial diseases of occasional importance include angular leaf spot and bacterial fruit –spot sometimes called pumpkin pox. Several viruses are vectored by aphids and infect pumpkins as well as squash and cucumbers. Among these is cucumber mosaic virus, zucchini yellows mosaic virus, and watermelon mosaic virus 2. Each of these viruses may infect squash, cucumber and pumpkins alone or in combination with any of the other viruses. Infected plants may be stunted, distorted or exhibit mosaic symptoms on foliage and fruit. Plants are especially damaged when infected early because the yields are reduced and fruit quality is often affected by bumps and

discoloration. Positive identification of the virus(es) infecting the crop is based primarily on serological tests such as ELISA (enzyme-linked immunosorbent assay). Identification based on field symptoms alone can be misleading.

For the most effective control of disease, crop protection materials must be used in conjunction with cultural controls and crop rotation. Growers should plan to control diseases preventively. A high-risk field is one that has had pumpkins or other vine crops, peppers, eggplant, and tomatoes planted in the last two years, or has a history of certain diseases.

Harvest & Handling

Pumpkins should be harvested when the rind surface is hard, vines have died down and the fruits have developed full color. The fruits should be clipped from the vine leaving a 3 to 4 inch stem. Care must be taken during handling to ensure that the stems are not knocked off, making the fruit undesirable for jack-o-lanterns. Fungal diseases must be controlled during the growing season to maintain healthy stems at harvest. After harvest, cure pumpkins at a temperature of 75°F or higher for 10 days. Try to keep the fruit surface clean and dry during the storage period. Pumpkins can be stored 2-3 months at 50-55°F and 50-75% relative humidity.

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, 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 pumpkin 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 pumpkin production system and strategic planning context representative of Macomb County, Michigan. Subsequently, both the sequence of decisions and the information necessary to make these key decisions was 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.

Resources

2002 Insect, Disease and Nematode Control Recommendations. George Bird, Beth Bishop, Ed Grafius, Mary Hausbeck, Lynnae J. Jess, William Kirk and Walter Pett. 2002. Michigan State University Extension Bulletin E-312. Michigan State University, East Lansing, Michigan. [On-line]. Available September 13, 2002: 517-353-7168 or http://www.msue.msu.edu/vegetable/Resources/E312/E312.htm

2002 Weed Control Guide for Vegetable Crops. Bernie Zandstra, et. al. 2002. Michigan State University Extension Bulletin E-433. Michigan State University, East Lansing, Michigan. [On-line]. Available September 13, 2002: 517-353-7168 or http://www.msue.msu.edu/vegetable/Resources/weeds/weed.htm

Fertilizer Recommendations for Vegetable Crops in Michigan. D.D. Warncke, , D.R. Christenson, L.W. Jacobs, M.L. Vitosh, and B.H. Zandstra. 1994. Michigan State University Extension Bulletin E-550B. Michigan State University, East Lansing, Michigan. [On-line]. Available September 13, 2002: http://www.msue.msu.edu/msue/imp/modaf/55092001.html

2002 Ohio Vegetable Production Guide, Pumpkins. The Ohio State University, Extension Bulletin 672-02. Robert J. Precheur, Editor, Department of Horticulture and Crop Science, The Ohio State University, Columbus, Ohio. [On-line]. Available September 13, 2002: 614-292-1607 or http://ohioline.osu.edu/b672/index.html

Agricultural Alternatives: Pumpkin Production. Mike Orzolek. 2001. Pennsylvania State University College of Agricultural Sciences Publication UA293. Pennsylvania State University, State College, Pennsylvania. [On-line]. Available September 13, 2002: 814-865-6713 or http://agalternatives.aers.psu.edu/crops/pumpkin/index.htm.

Table 1. Jack-o-Lantern Pumpkin budget. Michigan, 2002.

Pumpkins, Jack-o-Lantern Wholesale					
	Quantity	**Unit**	**Price per Unit**	**Cost per Acre**	**Your Farm**
REVENUE SOURCES					
Pumpkins	12	ton	$ -	$ -	
TOTAL REVENUE				**$ -**	
EXPENSES					
Soil test				$ 2	
Fall tillage[1]				$ 18	
Spring ground preparation					
Tillage[2]				$ 29	
Fertilizer					
Potash	200	lb	$ 0.13	$ 26	
Limestone	0.33	lb	$ 20.00	$ 7	
Seed	2	lb	$ 16.00	$ 32	
Planting[3]				$ 16	
Fertilizer					
20-20-20	250	lb	$ 0.54	$ 135	
20-20-20 with micros	5	lb	$ 0.70	$ 4	
Calcium nitrate	350	lb	$ 0.15	$ 53	
Herbicide Materials[4]				$ 22	
Insecticide Materials[5]				$ 25	
Fungicide Materials[6]				$ 156	
Spray applications	12	apps	$ 7.00	$ 84	
Hoeing				$ 25	
Cultivate[7]				$ 16	
Bees - Hive rental				$ 70	
Harvest					
Windrowing				$ 240	
Labor[8]	34	boxes	$ 9.00	$ 309	
Boxes[9]	34	boxes	$ 12.00	$ 411	
Pallets	34	boxes	$ 5.00	$ 171	
Land rent				$ 50	
Insurance				$ 7	
Interest[10]	7%			$ 29	
Tool shed & repair overhead[11]				$ -	
Marketing, management & supervision[12]				$ 150	
TOTAL EXPENSES				**$ 2,086**	

FOOTNOTES

1	Includes chisel plowing and v-ripping every 3rd year. Amount of fall preparation needed is highly dependent on previous year's crop.
2	Includes discing, field cultivation (herbicide is sprayed at this time), rotary hoeing and fertilizer spreading.
3	Plant using a planter with custom-made plates or a plateless planter.
4	Includes one pre-plant application each of Curbit and Command.
5	Includes 3.5 applications of Asana.
6	Includes 10 total applications of disease control materials which include Bravo Weatherstick, Champ, Kocide and Nova alone or in combination
7	Includes field cultivation an average of 1.5 times per year and sidedress of calcium nitrate.
8	Includes clipping pumpkin from vine, minor cleaning and putting into the box.
9	Pumpkins are sold in 700 lb boxes.
10	Operating capital assumed to be half of the variable costs (excluding custom charges) for half of the year.
11	These costs are included in custom rates.
12	Includes cost of marketing, management and supervision time and a vehicle for the manager.

Table 2.
Expecte

	Yield, tons				
Price	10	10.5	11	11.5	12
$ 120	$ (737)	$ (714)	$ (692)	$ (669)	$ (646)
$ 140	$ (537)	$ (504)	$ (472)	$ (439)	$ (406)
$ 160	$ (337)	$ (294)	$ (252)	$ (209)	$ (166)
$ 180	$ (137)	$ (84)	$ (32)	$ 21	$ 74
$ 200	$ 63	$ 126	$ 188	$ 251	$ 314