Staff Paper

Cost of Chip Potato Production in Central Michigan

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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" chip potato production management strategies found in Montcalm 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 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.

Chip Potato Production

Michigan potatoes are grown primarily for potato chips and the state is the principal chip producing state in the nation. Chip production is centered in Montcalm, St. Joseph, Tuscola, Mecosta and Sanilac counties. Planting begins in early April in Southern Michigan and early digging for out-of-field deliveries begins in mid-July. Harvest for storage begins in mid-September and continues through October.

Potatoes grow on a wide range of soils, but are best suited to the coarse textured and well-drained sandy loan or loamy soil soils. Potato production requires irrigation to maintain uniform soil moisture.

Site Selection and Planting

Soil properties, cropping history and presence of pest and disease organisms should be considered in selecting a field for potato production. The production of uniform, high quality tubers requires a site where the manager can provide the best conditions for uniform plant growth throughout the growing season. An appropriate crop rotation needs to be established that favors production of a quality potato crop.

Proper pre-plant tillage of the field, and a fertilization program based on soil tests that meets the crop's needs throughout the growing season are required. Fields may be fumigated for pest control in the fall or sometimes in the spring if weather conditions permit.

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Appropriate cultivars must be selected and top quality certified seed tubers should be secured, properly handled and stored and then cut and suberized for planting. The ideal soil temperature for planting potatoes is 55 to 60 degrees F, although many early fields are normally planted at temperatures of 45 to 50 degrees F. Tubers are spaced according to requirements of cultivar selected and market of the crop. Generally tubers are placed two to four inches below the surface.

Fertilizer is applied pre-plant, at planting and post-plant according to cultural system used soil test information. Systemic insecticides and nematacides are frequently applied at planting, and herbicides are usually applied post-planting.

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. Also see the Potato section of "Weed Control Guide for Field Crops" (Extension Bulletin E-434). 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 tubers 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 cultural, mechanical and chemical measures. Appropriate management practices utilized throughout the entire crop rotation can greatly enhance weed control. Cultivation is effective against annual weed species when they are in an early growth stage. However, late cultivation can cause direct damage to the plant roots and may cause compaction that is detrimental to the crop. Herbicide applications that are effectively integrated with timely cultivation are very effective components of a good weed management program. These can be applied through ground operated boom sprayers or with cultivators. Vine killers are applied before harvest to stop tuber growth, stabilize tuber solids and promote skin set. These are applied by ground operated boom sprayers and aircraft.

Insect pests that are important to control include Colorado potato beetle, potato leafhopper, aphids and flea beetles. Insecticides applied in the furrow at planting or foliar treatments applied later in the season are effective to control these insects.

Nematode pests include root lesion, root knot and potato rot nematodes that can reduce potato yields. Fields should be sampled for plant parasite nematodes and nematacides applied as

recommended. Alternatives for control include fall or spring soil injection or chemigation, or soil treatment at planting.

Diseases. Potatoes are susceptible to many diseases and their management is crucial to successful potato production. Common foliar diseases that are economically important include early blight, late blight, botrytis blight and white mold. Foliar treatments of protective fungicides are applied on 5 to 14 day intervals to control these diseases, and are one of the most critical and expensive inputs for potato production. Disease forecasters should be used to help time sprays and fine tune application rates.

Tuber diseases that are economically important include late blight tuber rot, pyhthium leak and bacterial soft rot. These can cause problems in storage and preventative fungicide programs can help control these when applied as foliar treatments.

Storage diseases of importance include bacterial soft rot and fusarium dry rot. Treatment of tubers as they are put into storage can help with these problems. Disinfecting of storages and equipment are also important in controlling these diseases.

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.

Harvest and Handling

The maintenance of healthy, damage free tubers through harvest, storage and post storage handling is a priority for the successful potato producer.

Careful management of fertility, irrigation and vine killing are necessary to control potato maturity. Nitrogen and water should be reduced as the crop matures and vine killing applications timed to promote skin set on the mature tubers. Storages and equipment should be cleaned and sanitized to control disease organisms and all harvesting and handling equipment should have necessary maintenance performed to assure it can function to harvest the crop with a minimum of bruising and mechanical damage. Operators of harvesting and handling equipment must be trained to minimize tuber damage during harvest. Pulp temperature and soil moisture should be monitored so harvesting is done under appropriate tuber temperature and soil moisture conditions. Tuber curing, cooling and holding temperature and relative humidity should be carefully monitored to optimize tuber quality during storage.

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 potato 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 potato production system and strategic planning context representative of Montcalm County, 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.

References

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Table 1. Chip potato budget. Michigan, 2002.

Potatoes, Chip	Quantity	Unit	Price per Unit	Cost per Acre	Your Farm
REVENUE SOURCES					
Potatoes	325	cwt		$ -	
TOTAL REVENUE				**$ -**	
EXPENSES					
Soil testing & analysis[1]				$ 8	
Soil preparation[2]				$ 33	
Planting					
Seed	25	bags	$ 11	$ 275	
Seed treatment				$ 10	
Labor[3]	0.4	hr	$ 10	$ 4	
Planter[4]				$ 126	
Truck[5]				$ 18	
Fertilizer					
Nitrogen (28%)[6]	775	lb	$ 0.20	$ 155	
Nitrogen (urea)[7]	87	lb	$ 0.25	$ 22	
P_2O_5	75	lb	$ 0.18	$ 14	
K_2O	300	lb	$ 0.13	$ 39	
Sulfur[8]	100	lb	$ 0.17	$ 17	
Application[9]	3	app	$ 6.00	$ 18	
Herbicide Materials[10]				$ 32	
Insecticide Materials[11]				$ 79	
Fungicide Materials[12]				$ 427	
Spray applications	12	apps	$ 5.00	$ 60	
Sprout Inhibitor					
Materials[13]				$ 25	
Vine Kill					
Materials[14]				$ 34	
Application	2	apps	$ 5.00	$ 10	
Cultivation[15]				$ 17	
Irrigation[16]				$ 94	
Scouting				$ 20	
Harvest					
4-Row harvester				$ 61	
Other machinery[17]				$ 70	
Field Labor[18]	2.14	hours	$ 15.00	$ 32	
Shed Labor[19]	1.4	hours	$ 10.00	$ 14	
Storage	325	cwt	$ 1.00	$ 325	
Storage Machinery[20]				$ 28	
Shipping Labor	325	cwt	$ 0.10	$ 33	
Land rent[21]				$ 225	
Insurance				$ 35	
Interest[22]	7%			$ 32	
Tool shed & repair overhead[23]				$ -	
Marketing, management & supervision[24]				$ 225	
TOTAL EXPENSES				**$ 2,617**	

FOOTNOTES

1	Includes soil test and petiole analysis.
2	Includes labor and machinery costs for discing or stalk chop, chisel plow and final discing pass.
3	Includes 0.05 hour to unload and wash, 0.3 hour to cut and treat and 0.05 hour to load for delivery to the planter.
4	Includes 160 hp tractor and an 8 row planter.
5	To haul chemicals and water.
6	Applied during spring tillage, planting, and cultivation.
7	Applied after petiole analysis.
8	Applied with Potash.
9	Two ground applications and one by air after petiole analysis.
10	Includes one application each of Lorox, Dual Sencor.
11	Includes one application of Admire at planting and 2 applications of Baythroid or Asana XL.
12	Includes fall fumigation with Vapam on 40% of acreage, 4 applications of Bravo Ultrex, 4 applications of Manzate and 2 applications of Ridomil Gold. In a year that is high risk for blight, 1-2 applications of Curzate may be added to the above program.
13	Includes one application of maleic hydrazide.
14	Includes two applications of Reglone, LI700 (surfactant) and copper sulfate.
15	Potatoes are cultivated twice - the 2nd pass hills field.
16	Variable costs of center pivot irrigation.
17	Includes a windrower and six tandem-axle trucks.
18	Includes 11 people handling machinery and hauling potatoes to sheds 6 days a week over a 5 week harvest season for 8 hours a day per 1,000 acres.
19	Includes 8 people on sorting line and moving potatoes to storage sheds 6 days a week over a 5 week harvest season for 8 hours a day per 1,000 acres.
20	Includes one skid steer, a bin piler and dirt eliminator, and loading equipment including a payloader and washer.
21	Land rent includes fixed cost of center pivot irrigation.
22	Operating capital assumed to be half of the variable costs (excluding custom charges) for half of the year at 8% interest.
23	These costs are included in custom rates.
24	Includes cost of marketing, management and supervision time and a vehicle for the manager.

Table 2. Expected chip potato net income (loss) per acre at selected price and yield combinations.

Price	Yield, cwt			
	300	325	350	375
$ 5.00	($1,089)	($992)	($894)	($797)
$ 5.50	($939)	($829)	($719)	($609)
$ 6.00	($789)	($667)	($544)	($422)
$ 6.50	($639)	($504)	($369)	($234)
$ 7.00	($489)	($342)	($194)	($47)
$ 7.50	($339)	($179)	($19)	$141