# POTENTIAL FOR PRODUCTION OF PROCESSING ONION IN WISCONSIN

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## Introduction

Onion has been a key crop for Wisconsin's commercial vegetable growers for a number of years, especially on muck soils. Most of the onions produced in Wisconsin are sold on the wholesale fresh market. Competition from other regions of the country has resulted in declining profit margins for onion growers and a slow decline in onion acreage in Wisconsin. Acreage on muck has also been taken out of production as the Wisconsin DNR has purchased property and has implemented permanent wetland restoration on many muck acres.

Onion is a high value vegetable crop with an average annual gross return per acre of approximately $4,000 and farm gate receipt value of $8 million in Wisconsin. Onion requires intensive management and high input levels to minimize the effect of key pests and environmental stress on yield and quality. Development of a processed onion market could provide a steady end market for Wisconsin onion thereby reducing the economic risk of onion production in the state and potentially increase the onion acreage.

Increasing acreage of a vegetable crop such as onion has always been a difficult challenge. Global competition and consolidation within the vegetable processing industry has demanded increasing efficiency within commercial food production and farming systems making this challenge more difficult than ever. However, opportunities such as the geographic location of Wisconsin relative to population centers within the U.S., the capacity of Wisconsin vegetable growers to produce a high quality and yielding crop, and the positive effects of harsh winter climate on pest species still creates positive incentives for vegetable processing within Wisconsin.

The snack food industry has several processing plants in Wisconsin. Snack food processing facilities produce products such as onion rings, breaded mushrooms, zucchini sticks, jalepeno poppers, and breaded cheese curds. Few if any Wisconsin grown onions are used in the onion ring product that is generated by Wisconsin processing facilities. Most of the onions processed into onion rings are purchased from the Treasure Valley in Oregon and shipped to Wisconsin. Wisconsin-produced onion could save $30 or more per ton in overland shipping costs giving locally produced onion a distinct market advantage. Profitability of Wisconsin grown onion could be ensured if savings in transportation costs were shared by the processor with local onion growers. The value of Wisconsin onion production could increase by $30 to 40 million/year if a small portion of the onions processed by the snack food companies were grown locally.

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Wisconsin vegetable farmers have demonstrated capacity to successfully produce onions on irrigated sand and muck soils. Yields averaged 300 to 400 cwt/A on sand and 700 to 900 cwt/A on muck in field research trials conducted by Stevenson and Wyman. Wisconsin onion growers produce onions targeted for fresh market consumption and so quality standards are based on those markets. Currently onions are targeted to average 2 to 3" in diameter, for storability, and with flavor characteristics appropriate for fresh market onion. Processing onion quality attributes include size range of 3 to 5" in diameter, single center, ring diameter and thickness, fry characteristics, flavor, and storability. Storage losses would need to be limited to one or two percent with a maximum of 5% in order to meet quality standards of onion processors. To achieve storage goals, optimal onion conditioning practices would need to be developed.

The Wisconsin onion growers and affiliated agricultural service industries need to demonstrate the capability to consistently produce onions with quality attributes that meet the needs of the snack food processing plant in order to secure contracts. In addition, Wisconsin growers must show they can produce yields of onion that would be profitable for the farm and the processing plant. Research is needed to define management systems that would enable growers to consistently produce high quality onion.

Specific management practices that need to be investigated for meeting size, ring, storability and other quality parameters include:

-Identify varieties with high processing quality that are suitable for planting and production in Wisconsin
-Study onion bulking patterns to identify stress factors that lead to interruptions in growth or loss of single centerness and could guide development of appropriate irrigation strategies.
-Evaluation of planting date, rate, pattern, and transplants for yield and quality attributes.
-Companion cropping strategies that will protect seedling onion plants from blowing sand when grown in the Central Wisconsin Vegetable Production region.

Goal: Develop management practices that ensure production of onion with high processing quality and demonstrate the ability of the Wisconsin vegetable industry to consistently produce onions that meet end use value of local processors.

Objectives:
1) Identify optimal management practices for production of onion with superior processing quality.
2) Quantify onion bulking rates over the growing season and measure response to different management practices and stress events.
3) Demonstrate the potential of Wisconsin vegetable growers to produce onions that meet the quality standards of onion processing plants.

## Materials and Methods

Field experiments were planned and conducted at two locations during 2005. The first location was in Central Wisconsin on irrigated sand soils. The second location was in Southern Wisconsin on irrigated muck soils. All experiments were repeated at both locations.

Objective 1: Identify optimal management practices for production of onion with superior processing quality. A series of small plot experiments were established on cooperating irrigated sand and muck farms to address specific production issues including variety trials, planting date, crop density, and comparing transplants to seed.

### Variety Trials

The purpose of these trials was to identify onions with potential value to the Wisconsin industry. The focus was identifying varieties for their potential processing quality which differs slightly from past trials. Yield was measured as well as growth habit, average bulb diameter, skin texture and storability, shrink in storage, number of rings, ring thickness, single centerness, and other characteristics. Variety trials included over 25 varieties in 2005

### Cultural Management Trials

In the future, varieties with the best promise as potential processing varieties will be studied to develop best management practices or production profiles for consistently high quality. Specific studies will identify optimal planting date and seeding rate for onion started from seed or from transplants.

Optimal planting dates were examined for transplanted and onion grown from seed. During 2005, Montero, Vaquero, Ranchero, and Granero were tested in transplant trials. Vaquero was evaluated in different planting date studies. Vaquero was planted at each site as early in the growing season as possible and then at 2-week intervals until the end of May. Similarly, transplanted onions were planted at 2-week intervals from April 15 until June 15. Transplants were purchased from a contract grower in Arizona. Onion were allowed to grow until maturity (when tops lodge) and then harvested. Yield, size, and other quality attributes were assessed for each treatment upon harvest

Optimal planting rates were evaluated for Vaquero only by varying plant spacing within the row, spacing between the rows, and planting in single vs. paired vs. triple rows. A Gasparta vacuum planter was used to precision plant the planting rate trials. Plant spacing within the row will be varied from 2 to 6 per foot. Onion seed rates were varied from 90 to 250 K seed/A. Row configurates were single and paired rows spaced 20” apart.

Objective 2: Quantify onion bulking rates over the growing season and measure response to different management practices and stress events. Onions are sensitive to biotic and abiotic stress like most other crops. Stress effects are often magnified on vegetable crops such as onion when trying to grow high quality end product. Quality factors such as size and single centerness are particularly sensitive to stress events such as drought or heat. Planting date trials were used to quantify the growth and development of onion. Samples of 10 onions were collected from each plot and weight, diameter, ring number, leaf number, and single centerness sampled. Correspondingly, climatic data were also collected to document growth response to potential stresses.

Objective 3: Demonstrate the potential of Wisconsin vegetable growers to produce a crop that meet the quality standards of onion processing plants. Several Wisconsin onion growers grew onion for processing during 2005. Onions were marketed to processors if meeting minimum quality parameters. Onions that failed to meet processing grade were sold on the fresh market.

## Results and Discussion

We are currently in the process of collecting quality data and analyzing data from research trials during 2005. Preliminary conclusions are drawn from preliminary analyses and primarily from field scale observations. The 2005 growing season was dry and hot. Early season thrip pressure and pink root limited late season bulking in onion on muck. This limited the size potential and yield of onion on Muck. In contrast, onions grew longer on sand resulting in better size and yield.

Vaquero is a common processing variety and was used because of processor approval. Vaquero grew to good size but was highly variable under WI conditions when planted from seed. Several other varieties had better size and yield potential when planted from seed compared to Vaquero especially under the sand. Growers who planted Vaquero from seed were unable to meet processor quality standards resulting in minimal shipping. Fortunately, the onions that failed to meet process grade were able to be marketed on the fresh market.

Onion transplants performed much better relative to seed. Average onion size was 3.5 to more then 4" in research trials. Planting onion transplants after May 1 greatly reduced yield potential. Wisconsin growers who planted Vaquero transplants had no problem meeting quality standards for processing. However, the cost of transplants could not be justified based on processing price. Growers were able to market large onions to specialty markets at premium prices.

Western onion growers typically grow high quality processing onions from seed at populations of 160,000 plants per acre. Vaquero is typically grown due to its high size potential, peeling characteristics, single centerness and other processing quality attributes. Western growers have little trouble growing onion from seed with average size of 4" in diameter. In contrast, Wisconsin growers face the challenge of growing onions with the same size profile, but with 10 to 30 days shorter growing season. To meet the processing

size standards, Wisconsin growers must minimize stress, maximize growing season and use season extension techniques such as transplanting.

Future research will focus on expanding current research. Several varieties showed better production potential relative to Vaquero under Wisconsin conditions. Optimizing cultural practices for varieties with good potential will be focus during 2007.