

# **Hazelnut Production in Wisconsin:**

## **Results of the 2008 Statewide Hazelnut Growers Survey**

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**Upper Midwest Hazelnut Development Initiative**

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## 2008 Wisconsin Hazelnut Growers Survey Report

### **Upper Midwest Hazelnut Development Initiative**

The Upper Midwest Hazelnut Development Initiative is an effort by organizations in Wisconsin and Minnesota to support the emerging hazelnut industry in the Upper Midwest through targeted research and development activities. This survey was conducted by the Wisconsin Hazelnut Research Team consisting of Jason Fischbach, Agriculture Agent, UW-Extension Ashland/Bayfield County UW-Extension; Mike Demchik, Associate Professor of Forestry, UW-Steven's Point; and Brent McCown, Gottschalk Distinguished Professor, UW Madison Department of Horticulture.

### **Acknowledgements**

The 2008 Wisconsin Hazelnut Growers Survey was conducted to better understand the extent of the hazelnut industry in WI and the challenges faced by hazelnut growers. Thanks to Brandon and Phil Rutter at Badgersett Research Corporation and Mark Shepard with Forest Agriculture Enterprises for their cooperation in distributing the survey to their customers. The survey was conducted in support of an on-farm hazelnut evaluation project funded by Cooperative State Research, Education, and Extension Service (CSREES).

### **Background**

Bush-type hazelnuts (*Corylus* spp) are a multi-purpose nut crop with significant potential for the Upper Midwest. Nut yield data from single-plant accessions of hybrids of *C. americana*, *C. cornuta*, and *C. avellana* have demonstrated yields of 4 tons/ha of husked nut in Nebraska (Hammond, 2006) and up to 6 tons/ha in Wisconsin (Shepard, 2006), suggesting significant potential for fresh-eating and processing markets. Hybrid hazelnuts are equally well-suited as a feedstock source for the bioeconomy. Oil yields from the top 25 producing hybrid plants in a Nebraska planting yielded an equivalent of 892 lb oil/ac, nearly twice that of soybeans (Xu et al, 2007). Coppice wood, husks, and shell are well-suited for second-generation biofuels. Furthermore, perennial native plants have been proposed as foundations for the bioeconomy, due to their lower input needs, higher net energy ratios, and more effective provision of ecosystem services compared to non-native annual plants (Tilman et. al, 2006; Cox et. al, 2006). Multi-functional crops, such as bush-type hazelnuts can provide the essential ecosystem services of cycling nutrients, conserving soil, building soil fertility, storing carbon, and protecting surface and groundwater quality more effectively than annual row crops. (Jordan et. al, 2007).

Seed-propagated half-siblings from early selections of crosses of *C. americana*, *C. cornuta*, and *C. avellana* have been sold to early adopters in the Upper Midwest since the 1990s. Collectively, these early-adopters of bush-type hazelnuts have deployed a significant population of genetically unique hazelnut plants.

Survey work conducted by Rural Advantage and the University of Minnesota in 2007 identified 12 growers growing nearly 31,000 hazelnuts, this number does not include Badgersett Research Corporation, the primary grower and

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breeder of hazelnuts in Minnesota. In 2008 the Minnesota Hazelnut Foundation was established as a grower organization dedicated to the improvement of hazelnut genetics and commercialization of the crop.

The number of growers and plants in Wisconsin is unknown, despite anecdotal evidence of a significant number of small plantings throughout the State.

The 2008 Hazelnut Growers Survey was conducted to identify growers in WI, determine how many and where the hazelnut plants are in the State, and better understand the challenges faced by the growers. This information will be used by the University of Wisconsin researchers to more effectively support growers and commercialization of the hazelnut industry.

### **Methods**

A survey was developed by the researchers with the Upper Midwest Hazelnut Development Initiative and reviewed by the two main suppliers of bush-type hybrid hazelnut seedlings: Forest Agriculture Enterprises in WI and Badgersett Research Corporation in MN. The two-page survey is included in this report as Appendix A. The survey was sent by mail to 405 individuals in WI that had purchased hazelnuts from one of the two organizations. Growers were asked to return the survey within three weeks. In addition, growers were given directions on how to download the survey from the Bayfield County UW-Extension website, complete it electronically, and return it via email.

In total, 66 people responded to the survey, 4 of whom reported having no living hazelnuts in 2008 due to 100% plant mortality or being a potential grower. The 16% response rate is certainly less than ideal, but perhaps understandable given the nature of new crop development. This survey is the first time the University of Wisconsin has reached out to the hazelnut growers in Wisconsin and it will take time for the relationship between the University and hazelnut growers to develop. As has occurred with grape growers in WI, it will also take time for the growers themselves to identify each other and start working together toward the collective development of the industry.

The results from this survey are an initial snapshot of the hazelnut industry in WI and, as such, yield valuable information as to the state of the industry. As the industry grows, surveys such as these will have higher response rates and more robust information.

### **Results**

#### ***Plants and Acreage***

A total of 17,339 living hazelnut plants were reported in the 66 returned surveys. Assuming a 6' plant by 10' row spacing, this equals roughly 24 acres of hazelnuts. Figure 1 shows the distribution of growers by number of

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plants. As is common with early-adopters of new crops, most of the growers are trialing the hazelnuts with small plantings of 50 plants or less. A few growers have made significant investments in hazelnut plantings with plantings over 1000 plants.

| # of Plants | # of Growers |
|-------------|--------------|
| 1000+       | 4            |
| 100-999     | 10           |
| 50-99       | 5            |
| 1-49        | 43           |

**Figure 1.** The number of hazelnut growers by number of plants grown (N=62)

Figure 2 shows the location of hazelnuts being grown in WI. The growers are widely distributed across Wisconsin with respondents from 33 of the 72 Wisconsin counties. The wide distribution indicates knowledge about hazelnuts as a potential crop has reached most areas of the State.

| County      | # of Plants | County        | # of Plants |
|-------------|-------------|---------------|-------------|
| Adams       | 5           | Monroe        | 19          |
| Ashland     | 890         | Oconto        | 40          |
| Bayfield    | 1465        | Ozaukee       | 121         |
| Buffalo     | 35          | Pepin         | 23          |
| Columbia    | 20          | Pierce        | 213         |
| Crawford    | 253         | Polk          | 112         |
| Dane        | 53          | Portage       | 150         |
| Door        | 9           | Racine        | 20          |
| Douglas     | 10          | Richland      | 7975        |
| Fond du Lac | 35          | Sauk          | 321         |
| Grant       | 18          | Shawano       | 48          |
| Green       | 75          | Sheboygan     | 61          |
| Jackson     | 15          | St. Croix     | 12          |
| Kenosha     | 46          | Vernon        | 4340        |
| Kewaunee    | 8           | Waukesha      | 18          |
| La Crosse   | 40          | Wood          | 3           |
| Marathon    | 161         | Not Specified | 725         |

**Figure 2.** Number of hazelnut plants by Wisconsin County.

Figure 3 shows where the survey respondents sourced their hazelnut seedlings. The three largest suppliers of hazelnut seedlings are Badgersett Research Corporation, Forest Agriculture Enterprises, and the Wisconsin Department of Natural Resources (DNR). The hazelnuts from Badgersett and Forest Agriculture are hybrids of *Corylus avellana*, *Corylus americana*, and *Corylus cornuta*, while the hazelnuts from the DNR are either *C. americana* or *C. cornuta*.

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| <b>Reported Hazelnut Sources</b> |
|----------------------------------|
| National Arbor Day Foundation    |
| Badgersett Research Corporation  |
| Extension                        |
| Forest Agriculture Enterprises   |
| Griffith Nursery (DNR)           |
| Grimo Nursery                    |
| Jung's                           |
| Michigan State Ext. Service      |
| Miller Nursery                   |
| Ozaukee Co.                      |
| seedlings from largest seed      |
| Self grafted                     |
| Smith Nursery                    |
| St Lawrence Nurseries            |
| Not Known                        |

**Figure 3.** Hazelnut sources as reported by survey respondents in alphabetical order.

### ***Plant Mortality***

The survey asked how many hazelnuts were planted since 2000 by year and from which nursery the plants were purchased. The respondents report planting 41,706 hazelnut plants with 17,339 still alive as of 2008. Across the state, the hazelnut plantings have experienced 58% mortality, which is an expensive and major problem faced by the growers. Mortality in individual plantings ranged from 100% to 0% with an average of 40%. The survey did not specifically ask about cause of mortality, but based on written comments in the surveys the majority of the mortality is occurring in the year of planting due to a multitude of causes, primarily rodents, deer, drought, transplant shock, and weeds.

### ***Hazelnut Yield***

Figure 4 shows the total hazelnut yield as reported by the 66 respondents by year since 2004. Figure 5 shows the number of living hazelnuts as of 2008 and when they were planted. The large increase in yield between 2007 and 2008 is likely due to the 2000 planting coming into full production. It is unclear how much of the nut production has been harvested by growers and how accurately it has been weighed. Grower experience suggests significant hazelnut production doesn't happen until year 6 at the earliest and later if competition from weeds has been severe. Figures 4 and 5 confirm this and demonstrate that the hazelnut plantings in WI are still relatively young and are only now beginning to yield.

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| Year | lbs   |
|------|-------|
| 2004 | 20    |
| 2005 | 180   |
| 2006 | 428   |
| 2007 | 1389  |
| 2008 | 20256 |

**Figure 4.** Total hazelnut yield by year as reported by the growers (N=62).

| Year Planted  | Living Plants<br>(as of 2008) |
|---------------|-------------------------------|
| Prior to 2000 | 1284                          |
| 2000          | 3170                          |
| 2001          | 155                           |
| 2002          | 824                           |
| 2003          | 963                           |
| 2004          | 826                           |
| 2005          | 1367                          |
| 2006          | 3119                          |
| 2007          | 4146                          |
| 2008          | 1580                          |

**Figure 5.** The number of living hazelnut plants as of 2008 by planting year.

### ***Grower Challenges***

The survey provided a list of challenges to hazelnut production and asked growers to choose the three they felt were most important. Figure 6 shows the percentage of growers that checked each of the listed challenges. Consistent with the mortality data, the most important challenge to growers is seedling mortality. Rodents, deer, and weed control are the next most important challenges, all of which are likely contributors to the low seedling survival. Interestingly, there doesn't appear to be serious insect and disease problems. Most of the hazelnut plantings are fairly young and there is not much hazelnut production. As the plantings mature and production increases, hazelnut husking, cracking, and uniformity will likely become more important to the growers.

The lack of technical assistance for hazelnut growers is an important issue to growers suggesting that the University of Wisconsin, particularly UW-Extension, can play an important role in assisting growers, especially with seedling establishment and management.

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| Challenges                     | Percent |
|--------------------------------|---------|
| Getting seedlings to survive   | 47      |
| Lack of technical assistance   | 24      |
| Rodent pests                   | 24      |
| Weed control                   | 21      |
| Deer browse                    | 18      |
| Difficulty of husking/cracking | 17      |
| Cost of seedlings              | 17      |
| Variability of nut size        | 12      |
| Lack of irrigation             | 12      |
| Bird pests                     | 9       |
| Availability of seedlings      | 8       |
| Insect pests                   | 8       |
| Variability among plants       | 6       |
| Difficulty of harvest          | 5       |
| Plant disease                  | 5       |
| Lack of markets                | 3       |

**Figure 6.** The percent of survey respondents that indicated the listed challenges were important to them. (N=66)

### **Conclusion**

With hybrid hazelnuts planted in at least 33 WI counties it is clear there is considerable interest in hazelnut production in WI. Furthermore, because all of the 17,000+ hybrid hazelnuts are propagated from seed, the growers have effectively deployed significant genetic diversity across the state, creating opportunities for mass selection and identification of promising locally-adapted genotypes.

The high mortality rate of 60% is a major problem for growers, and it will be important to better understand what is causing the mortality. Certainly, basic agronomics of site preparation, time of planting, weeding, watering, and protection from herbivory are likely factors affecting establishment, but quality of nursery stock and genetics are likely also playing a role.

The results of this survey indicate two important supporting roles for the Wisconsin Hazelnut Research Team. The first is to provide outreach education to growers on the agronomics of growing woody shrubs, particularly site preparation and plant establishment. The second is to assist growers in evaluating the performance of their plants and helping identify high-performing plants worthy of vegetative propagation and further breeding efforts.

*Comments and questions regarding this report should be directed to Jason Fischbach at 715-373-6104 ext 5 or [jason.fischbach@ces.uwex.edu](mailto:jason.fischbach@ces.uwex.edu).*