

Developing a hazelnut industry in the upper Midwest

A technical report on interviews, meetings and conferences

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Executive summary

Hazelnuts grown in the upper Midwest are a healthy, local food and offer new economic opportunities for the food industry and farmers, while providing continuous living landscape cover that protects Minnesota's soil and water resources. Despite the benefits, the nascent hazelnut industry face several challenges. This report presents research funded by a MN Drive Global Food Ventures grant to aid in the development of a hazelnut industry in the upper Midwest, and Minnesota in particular by identifying key barriers to and opportunities for industry development and providing recommendations to address them.

The findings of this report are based on 30 formal and 14 informal interviews with hazelnut growers, researchers, buyers, potential growers, non-governmental organization (NGO) staff and others involved in hazelnut development efforts. Interviews were analyzed qualitatively using MaxQDA data analysis software and grounded theory methodology. This research also builds on a 2015 study of local food chefs and small scale garden center and landscaping company owners as potential buyers of hazelnut products.

Key barriers identified in the report include:

- **Plant breeding and genetics:** The major bottlenecks affecting hazelnuts in the upper Midwest are the lack of micropropagation to create clonal material, and the slow pace of breeding and cultivar selection.
- **Supply availability and consistency:** Given the fractured nature of hazelnut production and processing, supplies remain small, and may create problems for buyers seeking consistently available product.
- **Harvesting and processing:** The most labor intensive aspect of growing hazelnuts are harvest and processing. Currently, the limited supply available make processing even less efficient.
- **Branding, marketing and pricing:** Growers and the American Hazelnut Company have struggled to identify and describe what makes upper Midwest hazelnuts unique and to produce final products as affordable prices.
- **Policies and public support:** The system of public policies, incentives and cost share programs does not work well for hazelnuts or other perennial crops, so most growers must move forward without financial assistance.
- **Relationships and communication:** Although typically positive, strained relationships can interfere with information sharing and communication both within and beyond the upper Midwest
- **Differing goals and visions for the future:** With a diverse range of actors involved, it is expected that some perspectives would clash, but anticipating the challenge does not make it easier to address.
- **Grower disillusionment:** There are widespread concerns that new growers will be unhappy with their first plantings, and frustrations with the lack of profitability that growers have found in hazelnuts in the upper Midwest.
- **Issues of scale:** Without dependable plants, growers have been hesitant to establish large plantings of hazelnuts. Instead, many growers are hobbyists who are unlikely to form the basis of a large and sustainable hazelnut industry.
- **Land access and finances for new growers:** New growers, especially those who are young and lack independent wealth, face major challenges in accessing the land and financial capital they would need in order to invest in perennial crops that take several years to mature.

Key opportunities for expanding the hazelnut industry in the upper Midwest include:

- **Interest in upper Midwest hazelnuts is high:** Both potential buyers and potential growers have an interest in hazelnuts, so when improved plants and clonal material become available, there is optimism that a market will easily develop.
- **Altruistic Growers:** Many current growers are truly interested in contributing to a future industry, even if they themselves never make any money or an industry doesn't develop in their lifetime. There are also many growers who support and participate in research efforts to advance the industry.
- **Hazelnuts are a healthy product:** The health benefits of hazelnuts may be a key marketing feature of final products.
- **Ecological benefits:** Hazelnuts don't just benefit the farmer and end consumer, they have important ecological benefit as well that benefit wildlife, soils, waters, and society at large, though the impact of that benefit depends on the where and how many hazelnuts are on the landscape.
- **Willing NGO partners:** A variety of NGOs have offered support to growers and researchers and serve as willing partners in research and industry development efforts moving forward.
- **Leadership:** One key individual appears to have the social capital and leadership skills to keep industry development efforts organized and moving forward.

These challenges and opportunities form the basis for a series of concluding recommendations. **The most important barriers and thus most significant long term needs are micropropagation and improved plant material.** Several additional recommendations are presented that could have more immediate, if less significant impacts on industry development. These include:

- Working to improve public policy supports for growers
- Investing in improved marketing materials
- Engaging research collaborators and partners earlier in the research process
- Increased collaboration with other hazelnut growing regions of North America
- Supporting partnerships and cooperative agreements to help more growers access harvesting and processing equipment.

Section 1. Introduction and purpose of study

Hazelnuts grown in the upper Midwest are a healthy, local food and offer new economic opportunities for the food industry and farmers, while providing continuous living landscape cover that protects Minnesota's soil and water resources. Growers and researchers have been exploring the potential of both the native American hazelnut (*C. americana*), and hybrid crosses that combine *C. americana* with the domesticated European hazelnut (*C. avellana*), which lacks the cold hardiness and disease resistance of native hazelnuts, but produces larger nuts and nut yields. Although progress on developing improved cultivars and propagation techniques has been slow, there is a growing network of farmers, landowners, researchers, and others working to establish or maintain hazelnut plantings, and develop an industry for hazelnuts grown in the upper Midwest.

Both American and hybrid hazelnuts have strong market potential. Rich in vitamin E, vitamin B6, thiamin and fiber (Braun & Jensen, 2015), the kernels can be eaten plain; or pressed into oil which results in hazelnut meal or flour that can also be used for culinary purposes. High in heart-healthy monounsaturated fatty acids, low in "unhealthy" fats, and with a well-tolerated flavor, hopes are high that hazelnut oil could become the olive oil of the Upper Midwest.

Hazelnuts could also help diversify Minnesota's agricultural economy. As long-lived woody perennials they provide continuous living cover and associated ecological benefits (Braun & Jensen, 2015). Their deep fibrous root systems hold soil in place and reduce leaching, thereby preventing soil erosion and protecting water quality. They photosynthesize for a greater portion of the year than annual plants, which leads to increased carbon sequestration, support of more resilient soil ecology, and enhanced wildlife habitat. Hazelnuts fit into many small niches in the agricultural landscape, and could add economic value to windbreaks, living snow fences, wetland and riparian buffers, CRP and other marginal land. The establishment of a hazelnut industry in the upper Midwest may make it profitable for farmers to retire steep, erodible or flood prone acreage, areas that contribute to environmental degradation, from tillage. Because they are less sensitive to drought and flooding than annual crops, and have lower input requirements, they could enhance the economic resilience of farmers facing threats such as climate variability (Braun & Jensen, 2015). Finally, because they are adapted to Northern Minnesota, they could provide non-extractive natural resource jobs in a region in need of new economic opportunities.

The objective of this project was to identify and address barriers to expanding Minnesota's hazelnut industry and to chart key steps needed to expand hazelnut supply and increase profitability. This report presents research funded by a MN Drive Global Food Ventures grant to aid in the development of a hazelnut industry in the upper Midwest, and Minnesota in particular. Many challenges faced by the hazelnut industry are common in the development of new crops: lack of product volume limits growers' access to existing markets, at the same time as lack of market access inhibits them from expanding acreage. Although the challenges to industry development are not new or unique to hazelnuts, they are still complex and are as much social as they are biophysical, technological or economic. This research will describe the state of current industry development efforts, with particular emphasis on the social aspects of those efforts, and suggest paths forward to hazelnut industry expansion.

Section 2. Methods

2a. Interviews

Data for this study were collected primarily through a combination of formal and informal interviews. The interviews focused on what people knew about hazelnuts, what they thought of the current state of hazelnut production in MN, what kind of future they envisioned for the industry, and where they found and shared information or resources. Participants in this study included hazelnut growers, potential growers, researchers, potential buyers, representatives of state and federal government, supporters of hazelnut industry development and individuals affiliated with nongovernmental organizations (NGOs) interested in hazelnuts in the upper Midwest.

Formal interviews were conducted in person, using a semi-structured interview guide (Appendix A). These formal interviews were conducted with 30 participants (Table 1). Interviews were typically conducted one on one, although some participants elected to be interviewed with their spouse or partner rather than separately. These interviews lasted an average of 1.25 hours. Informal interviews were not recorded and were significantly shorter than formal interviews, lasting typically 10-20 minutes. All took place with participant permission. A total of 14 stakeholders participated in informal interviews (Table 2).

Participants		Interviewed
Role in hazelnut industry development efforts	Growers	17
	Potential growers	4
	Researchers	5
	NGOs	3
	Potential buyers	4
Gender	Male	17
	Female	13
State or origin	Minnesota	18
	Wisconsin	7
	Other upper Midwest states	3
	States outside the upper Midwest	2
Total interviewed		30

Note: It is possible for participants to have more than one role in hazelnut industry development efforts.

Interview participants were identified based on recommendations from hazelnut researchers and other study participants and through attendance and participation in hazelnut related meetings and events. Potential participants were contacted by email using a recruitment letter or by phone using a recruitment script, and invited to participate in the research. Follow-up emails were sent or phone calls made if no response had been received within 2 weeks to offer a reminder about the study invitation.

With participants' permission, formal interviews were recorded and transcribed verbatim. For informal interviews and event or meeting observation, notes were taken in a field notebook. Interview transcripts and notes were analyzed using Max QDA qualitative data analysis software. Based on grounded theory methodology (Charmaz, 2006), transcripts and field notes were coded into analytic categories which were then grouped into broader themes to organize all the data from multiple sources to address the research objectives.

This work built on a previous study in which 7 chefs and restaurateurs were interviewed about their interest in using hazelnuts, oil and meal, and 3 garden center owners and landscapers were convened for a focus group about potential landscaping uses for hazelnut shells (Sames, 2015). The perspectives shared by potential buyers in that study have also been applied to the research presented here.

Table 2. Informal Interview Participants

Participants		Interviewed
Role in hazelnut industry development efforts	Government	3
	Potential growers	5
	Growers	7
	NGOs	4
Gender	Male	9
	Female	5
State	Minnesota	9
	Wisconsin	2
	Other upper Midwest states	3
Total interviewed		14

Note: It is possible for participants to have more than one role in hazelnut industry development efforts.

2b. Participation in meetings and conferences

Although the majority of research findings come from formal and informal interviews, participation in several events and meetings provided important context for analyzing interview results, and some cases provided opportunities to conduct formal or informal interviews. I attended or participated in the following conferences, meetings and conference calls:

- Rural Advantage 3rd winter series hazelnut meeting: Fairmont, MN, February 23, 2015
- North American Agroforestry Conference: Ames, IA, May 31-June3, 2015
- MN Agroforestry Institute: Pine River, MN, June 24-26, 2015
- Northern Nut Growers Conference: La Crosse, WI, July 26-29, 2015
- Meeting of the Upper Midwest Hazelnut Development Initiative : La Crosse, WI, July 30, 2015
- Green Lands, Blue Waters Conference: Minneapolis, MN, November 3, 2015
- Bimonthly upper Midwest hazelnut working group conference calls: July, 2015-June, 2016
- Hazelnut grower's conference: Gays Mills, WI, March 4-5, 2016
- Forever Green Lab meetings and events: St. Paul, MN, various dates
- Southeast Regional Sustainable Development Partnership Experiment in Rural Cooperation Board and Work Group Retreat: Zumbro Falls, MN, June 27, 2016
- Northern Nut Growers Association Annual Meeting: Nebraska City, NE, July 31-August 3, 2016

Field notes were taken either during the meetings or shortly afterwards. These notes were not transcribed or included for grounded theory analysis, but they served as a way to confirm or clarify the applicability of themes that emerged from the interview analysis.

Section 3. Findings

3a. Current barriers to expanding a hazelnut industry in the upper Midwest

Plant breeding and genetics

All participants agreed that one of the most important barriers to expanding hazelnut production is the hazelnut itself. Currently, growers and researchers are trying to select and breed promising plants, but progress has been slow. Neither the hybrids nor selections of *C. americana* produce consistently high nut yields, or easy processing characteristics (such as thin shells, consistent sizes and shapes). Some plants seem to bear every other year, or have nuts that vary in quality from year to year. For one researcher, *“[t]he biggest problem I have for breeding is that a plant that looks really promising one year will be totally different the next. And I’m not quite sure what to make of that.”* This inconsistency is partially the result of high genetic diversity within the hazelnut population, which many growers and some private plant breeders are anxious to maintain. However, the extreme diversity also makes it difficult for farmers to anticipate how young plants will perform before they put them in the ground. It typically takes at least 4 years for plants to begin producing nuts, so a grower planting hazelnuts in 2016 will not know whether the plants produce many good tasting, easy to harvest and easy to crack nuts until 2020 at the earliest. While genetically identical plants based on clonal material would eliminate some of the uncertainty, there is not yet an efficient process for developing them. The uncertainty makes planting hazelnuts seem like a risky proposition for some potential growers, and has been the reason that some current growers have not yet expanded their plantings.

Universities are relatively new players in the efforts to develop hazelnuts for an upper Midwest industry. Private breeders have been working to improve hazelnuts for production since at least the 1930’s (Weschke, 1953). More recently Badgersett Research Farm carried much of that work forward to promote hazelnuts as a crop in the upper Midwest and to sell seedlings from the research farm. Badgersett’s influence has been broad; nearly all the hybrid hazelnuts grown in the upper Midwest today descended from their seedlings. The universities entered the scene in the early 2000’s to advance work on native *C. americana* cultivars and to bring new basic science techniques to hybrid hazelnut development efforts. Today, much of the work at the University of Minnesota is focused more on hybrid hazels, while researchers at the University of Wisconsin have emphasized *C. Americana* because *“we would be remiss if we didn’t look at C. Americana. There is so much genetic diversity there.”*

But the process will be slow. According to one researcher, *“we have to wait till year 7 or 8 to know even what the nut quality is,”* so since it takes several years before growers or plant breeders can observe the nut characteristics of a plant, breeding efforts require a great deal of time. Getting to the point of cultivar selection takes even longer; *“Oregon State’s breeding cycle to get to cultivars is 17 years and ours will be just as long.”* Researchers in Minnesota and Wisconsin have worked together to select a number of varieties that will soon go into performance trials in partnership with several growers in the upper Midwest. The results of these trials are still several years away. For some growers and potential growers hoping to plant sooner than later, the timeline for achieving improved varieties seems to have stretched far beyond their initial expectations and in some cases is a source of frustration. One grower lamented, *“...someday they’ll have genetic improved plants, but that’s a long ways off, I think. First they were talking this year they were going to have some plants. Now it’s next year. Doesn’t seem like even next*

year is going to be realistic. And they're just taking plants that look good in somebody's yard, you know, there's no evidence that plant is good all over the place."

Current plant breeding efforts for hazelnuts in the upper Midwest have not been able to take advantage of micropropagation techniques. Micropropagation would allow more rapid replication of clonal plant material, making it faster and easier to advance breeding efforts and to conduct field trials on plants with consistent genetics. Efforts are underway at both public and private research institutions to find a way to micropropagate hybrid and *C. americana* hazelnuts.

Currently, micropropagation is used for European hazels, but the native and hybrid plants have proven much more difficult to reproduce this way. Early results from one lab at the University of Minnesota indicate that it may be possible to screen plants to determine whether or not they could be propagated via tissue culture. While this could be a significant advance, screening plants this way has at least one researcher worried that otherwise good plants might be screened out and it may become even harder to find plants with all the desired characteristics. They described the challenge breeders face with a hypothetical example,

Let's say you're looking for disease resistant plants... the frequency of them let's say is 1 in 10, for simplicity sake... but and then you're also looking for plants that are resistant to weevil damage, and that's also 1 in 10 and so if you're looking for ones that are disease resistant and weevil resistant, and then winter hardy, which is also 1 in 10, it's 1/10 times 1/10 times 1/10. So you come out with 1/1000, one plant out of a thousand combines those traits. So then you also are looking for good flavor, and that's one 10,000th, and then you're also looking for shellability. One out of one hundred thousand...we can't afford to say no just because they don't micro propagate just because, you know, like I was saying... if we add micro propagation to that list, that's ten times more plants that we have to do.

Even with a screening process to help select plants which can be micropropagated, it will be years before growers are able to get their hands on plant material produced this way. One grower, tired of waiting and interested in expanding his hazelnut production, "...had that conversation with a Canadian company and the response was 'that will be \$10 a plant, you'll have to do at least 1,000 plants, and we can't guarantee we can get them into the United States. Suffice to say I didn't have the resources to be able to do that.'" And so like others eager to see an industry develop, he waits for micropropagation to advance.

In the upper Midwest, developing more clonal material through micropropagation would also enable more reliable agronomic experimentation. Cloned plants make it possible to run experiments without needing to account for genetic variation between plants. Previous efforts to identify the effects of weed management or fertilization on hazelnuts were somewhat limited by the genetic diversity present in the hazelnut population, and made it difficult to determine whether plants responded differently to different management regimes solely because of the management and not genetics.

Several participants identified plant breeding and propagation as the most significant barriers to industry expansion. In terms of breeding, many participants were most concerned with improving yield, including one researcher who argued "we need improved plant material that has higher yields and more consistent

yields. If we can improve kernel quality and weevil resistance and make sure we've got a good flavor profile, that's all icing on the cake, which is just basic plant breeding." Similarly, one grower said "[t]here needs to be some reasonable ability to know what to expect, what you may or may not get, what the risks are. Because if I am a farmer and planning on these nuts to be a cash crop, I wouldn't do it the way I'm doing it." This grower was planting a diverse mix of plants and waiting to see how they would grow and produce. That lack of predictability can be a major deterrent to potential growers who lack the cash flow to sustain such an experiment.

Because of the need for improved plants and predictability for growers, many growers and some researchers have advocated against planting hazelnuts at the current time. They argue that *"nothing is going to happen with hazelnuts until we get better plants; it's just that simple."* Still others have encouraged planting hazelnuts because *"[i]f people wait for the perfect plants, they'll be waiting forever,"* and planting a diverse range of hazels will allow the grower to select those that perform best on their property. Whether advocating for or against planting at the current time, nearly all participants emphasized the importance of transparency about the lack of reliability and range of diversity in hazelnuts and *"think that the farmers who want to plant hazelnuts should know about all of these limitations. We should be transparent about that so farmers can evaluate and manage those risks."*

Supply availability and consistency

One of the most consistent comments from potential buyers, particularly chefs and restaurateurs, was that a dependable and predictable supply hazelnuts would be key to their interest in purchasing them. It requires significant effort to formulate and market a new dish or cosmetic product, so having a product that is there one week and sold out the next can be problematic. Several chefs lacked the available freezer or refrigerator space to store large amounts of nuts, so periodic purchasing was important to them. Although chefs were especially willing to work with a seasonally available ingredient, they still need a predictable schedule of availability and to be able to anticipate how many weeks they could keep a dish with hazelnuts on their menu. Small scale cosmetics producers were primarily interested in the hazelnut oil, and estimated that they might go through, at most, 8 gallons per year.

With the industry in its nascent stages, most growers are hobbyists. Many have under a thousand plants, and some have only a few dozen, though there is a small number of larger growers. Some growers are still waiting for a few or all of their plants to begin producing. And of the growers who do have plants producing nuts, not all even bother to harvest them. And many chose to sell their small amount of harvested nuts on their own, rather than pool them to create a larger supply. One researcher described this, *we have growers developing their own processing lines, their own marketing, and their own products, and that's totally fine, it's not for me to say that's wrong, and I support however they do it, but the reality is they're all fragmenting supply and they're all stuck at this really small scale and it really becomes an unsubsidized hobby, nothing more.*

As a result, the overall supply of hazelnuts produced and available for sale in the upper Midwest is still very small. It's difficult to develop an industry with such limited supply. And yet current growers are anxious to find dependable outlets for their nuts. This has created a chicken and egg situation, where many growers are hoping a good paying industry develops before they invest in larger acreage plantings, but potential large scale buyers are wary of creating demand based on a product with limited supply.

The American Hazelnut Company (AHC) was established to try to address this concern. The AHC is a grower owned company that purchases and processes hazelnuts to sell to restaurants and food processors interested in upper Midwestern hazelnuts. In order to sell nuts to the company, growers must purchase 10 grower shares for \$100 each. Nuts are purchased by the AHC in-shell for \$1-2/lb. The hope was that the AHC would be processing thousands of pounds of hazelnuts from throughout the upper Midwest, and using the upfront membership investments to help establish the industry. Unfortunately, although the plan was “*to have 7500 pounds, [the AHC] had less than 800 pounds*” in its first year. Still, at several hundred pounds, they have a larger supply than most individual growers.

Like those individual growers, the company must also be careful not to over promise, or become involved with more regular buyers than they can support with their supply. However, in the case of the AHC, the problem with quantity is a result of grower decisions on whether or not to harvest and sell their nuts to the company, rather than a dearth of plants in the ground. Even some AHC members sell outside the company because they can earn a higher return for their nuts. And for some non-members, the cost of membership is prohibitively high, even if they would be willing to accept AHC’s purchasing rate.

Harvesting and processing

A major challenge for nearly all growers is getting the nuts from field to consumer. All of the growers who do not currently harvest their nuts said it was because it wasn’t worth the cost or effort to harvest and process them. One couple stopped harvesting “*after the year when we [collected], I don’t know 6, 7, 8 gunny sacks full, then we found out how labor intensive it was to get the hulls off and get them winnowed, crack them and then separate everything after they were cracked.*” Although they and other non-harvesters might harvest for home use, they no longer make an effort to harvest more than they want to crack by hand.

The overwhelming majority of growers interviewed who do harvest their nuts, do so by hand either themselves or through hired labor. It is a very time and labor intensive process. Hiring workers to pick nuts quickly becomes expensive. Not all the nuts on a bush ripen at the same time, and the nature of each individual bush can make it difficult to rapidly pick the nuts. For those who prefer machine harvesting methods, the upfront expense is tremendous. A trio of growers in southeastern MN has purchased a blueberry harvester which works well to harvest hazelnuts. One grower was interested in a harvester but noted, “*[t]here’s only one other grower around, and he doesn’t harvest his nuts. There’s nobody around here who has mechanized hazel harvest or processing. And it wouldn’t pencil out for us to invest in that equipment on our own.*” Even a used machine can cost upwards of \$15,000, making them difficult for individual growers to own alone.

Once the nuts are harvested, processing presents further hurdles. Nuts must be cured for several months before the papery outer husks can be removed, often mechanically. Following the dehusking process, nuts may be sent through an aspirator to separate the nut from the husk material. Some growers and the AHC sanitize their nuts at this point, dipping them in a cleansing solution to eliminate any potential pathogens that might contaminate the nut kernels in later processing stages. The nuts are then usually sorted by size before they can be cracked out of their shells because most crackers must be adjusted for each size of in shell nut. Once cracked, the nuts are again put through an aspirator where the rounder, more aerodynamic nut kernels fall into a collection container and the jagged pieces of broken shell are suctioned away. This step rarely leaves the kernels completely free of shell fragments, so a final hand sort is common. At this

point, nuts may be sold as is, or processed into oil and meal. Some chefs are interested in blanched and peeled hazelnut kernels, where the thin, slightly bitter pellicle is removed, but no growers or processors I spoke with currently blanch and peel their nuts.

Hazelnut processing equipment does exist and is used in areas where larger industries support large quantities of hazelnuts for processing. However, all known commercial processing equipment is scaled for much larger quantities and would be extremely inefficient for processing the amount of nuts most growers have on hand. Furthermore, some of this equipment is designed to work best for very round nuts of consistent size and shape, which the upper Midwestern hazelnuts certainly are not.

The AHC has some smaller scale processing equipment. Through partnerships with an engineering program in the University of Wisconsin system, they have access to a machine that can process more nuts more quickly than a drill cracker, but are not as efficient as the large scale commercial equipment, and they still require hand sorting to remove shell fragments. Board members are candid about the inefficiencies of processing at the AHC while, at the same time, many are keen to show off the equipment the company uses.

Since few growers sell through the AHC, which had only around a dozen members in May of 2016, the majority of growers who harvest nuts have had to find ways to create or purchase small scale processing equipment of their own. Some use drill crackers, small, relatively cheap cracking devices powered by an electric drill, but they can only handle small amounts of nuts, or sometimes even a single nut at a time. Some have equipment that functions on par with the machines AHC uses. A handful of growers frequently tinker with their equipment, attempting to modify each piece of equipment to handle larger volumes or produce more efficient or consistent results. Others bring their nuts to another grower with equipment for processing, sometimes trading nuts in exchange for processing or access to the equipment.

Few growers currently have access to an oil press. The AHC has access to one machine, and in all the interviews, I was informed of only 2 other oil presses currently in use. Sending kernels through an oil press produces both oil and a dry extruded product which can be ground into flour and used in cooking or baking. Presses are expensive, again often costing thousands of dollars, so although oil tends to be the highest value product, the upfront cost is more than most growers are willing to bear at the current time.

Adding additional stress to processing considerations are food safety regulations. In most states, cracking hazelnuts is considered processing, and so must be done in a certified kitchen if it is to be done on a commercial scale. The AHC has a certified kitchen allowing them greater flexibility in selling their products to restaurants and retailers. All of their equipment is run within the facility, including the oil press. In some states, growers without certified kitchens may sell up to a specific amount of cracked out nut kernels direct to consumers at places like farmers markets or from their homes.

Some potential growers noted that the cost and complexity of equipment was a significant deterrent to growing hazelnuts. One potential grower lamented *“I like the thought of growing hazelnuts, but I don’t see myself able to afford the equipment really, and selling for \$1 a pound isn’t very compelling.”* Many were interested in the AHC, but some were disappointed in the cost of membership, or the purchasing price offered by the company. Both potential and current growers noted that the location of the AHC was also a barrier in delivering nuts for processing, since growers must deliver their nuts to the company. For growers outside of western Wisconsin or southeastern Minnesota, the location was not convenient. Two

interviewed growers who do not harvest their nuts said they would be willing to allow someone else to come in, harvest the nuts, and take them away for processing in exchange for a small fee or even a portion of the nuts returned as product after processing. However, when asked at the 2016 Hazelnuts Grower's Conference whether they would be interested in having the AHC come out to harvest their nuts and take them in for processing, no audience members raised their hands.

Branding, marketing and pricing

Improving processing efficiency is extremely important for developing a viable hazelnut industry in the upper Midwest. Current estimates are that given processing technology in use in the upper Midwest and the average ratio of kernel to shell, it costs over \$18 to produce a pound of raw kernels. This is before packaging, marketing, distribution or any profit. Several changes could help lower this cost of basic processing. Improved plants with a higher kernel to shell ratio to their nuts would allow processors to get more kernel per pound of purchased in shell nuts. Higher total volume to process would be beneficial because the cost per unit (be it a bottle of oil or 11b bag of shelled kernels) is higher when there is less volume to process. And more efficient processing equipment would also provide improvements. This might mean significantly more upfront investment for growers of the AHC, investing in commercial scale equipment, but the current volume of nuts available for processing in the upper Midwest has made many people wary of making that kind of significant investment.

Aggregating the supply of hazelnuts could also help lower processing and marketing costs per unit. One participant suggested that in order for AHC processing to become more affordable, *“we have to increase volumes running through this equipment to get the per unit cost down... We may not be selling pure American hazelnut products because then we could price ourselves right out of the market... Until you get pounds to scale, you're stuck.”* Bringing hazelnuts in from Oregon or other locations could help address the issue of scale, but as will be discussed later, it is not without controversy.

Lowering the per pound processing costs is important because the 2015 report on chef and restaurateur preferences (Sames, 2015) found that most chefs are currently paying between \$9 and \$12 per pound of hazelnut kernels. However, the report also indicated that the branding and story told about hazelnuts in the upper Midwest matter, and can have a direct impact on the price consumers are willing to pay. Several chefs and restaurateurs were willing to pay more for organic hazelnuts and hazelnut products, and more for a locally sourced product as well. This is especially true when the story of the farm, farmer, or environmental benefits of growing hazelnuts can be shared with the end consumer. If these additional criteria were met, many participating chefs would be willing to pay between \$14 and \$16 per pound for local and sustainably sourced nuts. Yet even at these higher prices, processing costs alone might be more than the market can bear.

Hazelnut oil is a much higher value product for chefs, but especially for cosmetic producers. Pricing for the oil differs between the culinary and cosmetic markets. According to interview results, the cosmetic market will bear a higher price for hazelnut oil although organic and locally sourced nut may not fetch as much of a premium in the cosmetic market since overall prices are already higher. Where the participating chef who was willing to pay the most for hazelnut oil would pay up to \$23 for 500ml, the cosmetic producers would not be thrown off by double that price. The small scale cosmetics producers interviewed could anticipate using up to 5 or even 10 gallons per year. This same pattern of oil selling for a higher price for cosmetic vs. culinary uses affected growers selling oil at farmers markets.

Most of the potential buyers interviewed in 2015 and 2016 indicated that certain features would make them willing to pay more for hazelnuts and hazelnut products. These include organic or locally grown nuts, sustainability benefits of hazelnuts on the landscape, and health benefits to the final product. This presents a marketing opportunity that some growers have been able to take advantage of, but given the small size of the industry and differences between growers, it is not yet clear whether the price premium provides a net benefit to the grower, and if so, how much.

The AHC faces a particular challenge in marketing these special features. Since the business model for the company depends on aggregating nuts from multiple growers, it is difficult to make any claims about the growing conditions of the hazelnuts in their finished products. And growers who use organic methods do not receive a price premium for nut sold to the company. As a result, current branding is necessarily somewhat generic. There was a surprising related complaint raised by chefs and restaurateurs in 2015. Several strongly disliked the name American Hazelnut Company, arguing that it made the product sound generic or industrial rather than special and local. One grower with a background in marketing recalled arguing against the name,

I said you cannot call it the American Hazelnut Company because our focus is Midwest. That's who we are and that is our key differentiator; we grow hazelnuts in the Midwest and they have the flavor of the Midwest. They could have done Midwest Hazelnut Company, but they said American because they wanted to buy nuts from Oregon and I told them that was a bad idea because you just totally confused your consumers. Am I getting Midwestern nuts or am I getting nuts from Oregon? Are you going to mark the bags? Or are you going to mix them altogether?...yeah, that's a disaster.

The question of whether or not to keep the focus on local hazelnuts was a topic of much debate at the 2016 Hazelnuts Grower's Conference, especially concerning the AHC. The company's board was considering whether it is too expensive to process pure upper Midwest hazelnuts, and if so, if imported nuts from Oregon or international suppliers should be purchased in order to develop more products and improve processing efficiency. One presentation given at the conference urged growers and the AHC to consider selling to high value markets in places like New York. The presenter argued that the local market for hazelnuts was likely to stay small, and that a better price and larger market might be available outside of the upper Midwest, especially if there are true claims about product quality, terroir, or sustainability that might set hazelnuts grown in the upper Midwest apart from other hazelnut on the market. While some attendees enthusiastically supported the idea, several described it as “*stupid*” or “*not what I think we should be about*” Questions and discussions about how much to focus on local sourcing and sales of hazelnuts came up several times with no clear consensus.

Some growers and researchers did express a desire to develop a more consistent story about upper Midwest hazelnuts, to test the claims that some people are making when they sell hazelnuts, and to create a more cohesive branding effort. The AHC only recently developed a consistent logo and packaging for all their products, but in an effort to keep the packaging as versatile as possible, there is little background information extolling the local sourcing, health benefits, sustainability or other features of hazelnuts. Although this makes the packaging versatile and ensures it will be usable even if imported nuts were to be incorporated into the product stream, it does little to identify the products as special. Multiple chefs and restaurateurs in 2015 indicated that they would like to see packaging that does highlight the factors that make upper Midwest hazelnuts unique and sustainable.

Even with minimally descriptive packaging, most growers attempting to sell their hazelnuts have been able to do so, with or without the AHC. Most sell through a combination of farmers markets, grocery co-ops, restaurants, or friends and family. But few of these growers are attempting to sell hundreds of pounds of kernel or oil. Nearly all growers are aware that to sell larger quantities, to make it worth planting more hazelnuts, a larger industry must develop. As noted above, this is where the AHC is trying to play a role. In the spring of 2016, they sent out 50 sample packs of hazelnut products, including a bag of kernels, a bottle of oil, and a package of meal to restaurants in the upper Midwest. The sample packs were intended to introduce chefs to the products and drum up interest in local hazelnuts. If all 50 restaurants were to place large orders, the AHC would struggle to meet demand, but they are hoping to receive a manageable number of orders for the coming year, and create awareness of the product so that as hazelnut supply increases, there is already an informed customer base. Still, they are trying to market realistically, to not oversell the hazelnut industry, and to avoid creating a demand that can't yet be met.

This is the major marketing challenge: how to establish an industry and develop excitement about a new product without creating more demand than current supply can address. Failure to live up to customer expectations or fulfill orders could present a major setback to the industry before it even gets off the ground. Supply is unlikely to increase significantly until improved plants are developed and widely used. Yet many current growers are looking for more lucrative and more dependable outlets for their hazelnuts. Some researchers have advocated waiting to promote hazelnuts beyond farmers markets and other small scale sales until improved plants are available and there are significantly more hazelnuts on the landscape. But this approach ignores the needs of many current growers who have several acres of hazel bushes, some of which are just starting to come into full production.

Policies and public support

The vast majority of hazelnut growers established their plantings without the aid or support of any local, state or federal agencies or programs. Two notable exceptions included county funding for a planting of hazels and cedars on private land to function as living snow fences and one farm that used Conservation Reserve Program (CRP) cost share funds to establish a planting of mixed perennials including hazelnut and Natural Resource Conservation Service (NRCS) funds to fence the planting. In the latter case, while hazelnuts were considered an allowable species, the hybrid hazels were more expensive than native seedlings that the county provides. Since the family wanted plants with nuts that could be harvested and sold, they wanted hybrid plants. There was some frustration because *“[w]e were getting cost share which was nice, but we had to cover the difference as I recall, between what they could access and what we wanted to get.”* Whether farmers can plant hybrid hazels or not appears to vary by county and state, and several other participants told me that they had been told hybrid hazels would not be eligible for CRP. The situation frustrated several participants because *“they’ll cost share, fencing and water lines for rotational grazing and you can run cows in there that day and make money. It doesn’t make any sense to not do hazelnuts.”*

However, most growers shied away from seeking cost share or other support through programs like CRP. One major drawback, and the one most often cited by participants for avoiding the program, is that you cannot harvest a crop from a CRP planting for 10 years. Since most hazels start producing after around 4 or 5 years, this would mean 5 years of lost production. While harvest for home use is allowed within the 10 year window, most potential growers are interested in commercial production, not just home

consumption. These programs treat perennial plants more like conservation practices than productive crops with conservation benefits. This frustrated several growers, NGO staff and researchers alike. One grower argued that new growers in particular “*need cost sharing programs to get through the first few years until nuts appear. You can't expect people to invest a lot of time and money into a product that can't be harvested for several years.*” Developing policy support for “*conservation on working lands*” was described by several participants as being “*common sense.*”

Interestingly, several potential growers described an intention to use some kind of cost share or other program to establish their hazels. In most cases, the potential growers interviewed had only recently acquired land, or were still looking for land. So the prospect of purchasing hundreds or thousands of plants at full price, establishing a planting and caring for it for several years before seeing any return on investment was a bigger financial burden than many of these participants were interested in taking on.

One lawmaker from an agricultural area told me that he has heard little from constituents about adapting policies to better support perennial crops. It simply isn't a topic many people are aware of, and given that, it certainly isn't one that helps win elections. Even one of the sponsors of a bill to provide funding for perennial crop research did so because he felt it was the right thing to do, but did not expect it would help him in his reelection campaign. If policies and programs are going to change to become more supportive of hazelnuts and other perennial crops, there will need to be more interest and advocacy from the public.

Relationships, collaboration and communication

Although there are strong information sharing networks among some hazelnut growers, researchers and NGO, these networks don't always include everyone. It is nearly impossible to describe the particulars of any strained relationships without making the identities of participants and their acquaintances known, but it is important to acknowledge that trust or willingness to collaborate has been lost in several relationships.

According to one participant, “*it's worth noting but people have their own agendas, and I use that word in a neutral way, but sometimes it's not beneficial for a person to believe everything they hear.*” Some participants pointed out that this is to be expected in efforts to develop a new crop or industry, “*...one of the issues we've got with any new crop, some people sniff it out and immediately start to put up barriers and get a little competitive. And we're starting to see that.*” As more people become involved, early leaders may find themselves or their ideas left behind in a wave of excitement for new directions. Diverse participants can mean diverse agendas, some of which may clash. And watching alternative agendas gain momentum or receive funding can leave some people disappointed.

For the most part, growers, researchers, NGOs and private breeders appear to work fairly well together. But when they don't, opportunities for collaboration and communication may be missed and potential growers or buyers may receive conflicting information.

Differing goals and visions for the future

The pool of interviewees described a wide range of goals for the future of a hazelnut industry in the upper Midwest. While not necessarily detrimental to establishing an industry, better coordination could help efforts advance faster.

One major area of disagreement in interviews was the question of whether new growers should be encouraged to plant hazelnuts. There are strong opinions on both side of the debate. Those who oppose encouraging more planting do so because they want people to wait until improved plant material is available. Some are concerned that if people plant hazelnuts now, they may become disillusioned with the crop. Others support promoting more hazelnut plantings because they want to see more plants on the landscape to both help feed the nascent industry, and to make sure there is a diversity of plants from which future selections might be made. A few participants take a middle ground approach, suggesting that if people are interested, they should plant some to see how they like them as a crop, but leave space to add improved varieties over time. Several participants argued that if we wait for perfect plants, we'll be waiting forever. There were also concerns that some growers may have been sold an overly optimistic about the current viability and potential of available plants and the hazelnut industry. For one grower, *“I think one of my biggest concerns is that people are going to be sold a concept that's not realistic. They'll be sold an ideal that's not real.”* However, while I spoke to several growers who had more difficulty establishing their plants than they expected, none expressed any other feelings of having been deliberately misled.

Another prominent question was whether or not hazelnuts should be promoted as a single crop, or part of a multispecies or polyculture system including other perennials or animals. Here, participants were less divided, with many believing there was space for all types of plantings. Supporters of polyculture systems that include hazelnuts argued that mixed species systems better mimic natural systems and provide greater ecological benefits than monocultures, and when taken as a whole, polyculture systems may also be more productive. One supported summarized several reasons for promoting polyculture systems,

So the benefits are potentially that we can have agriculture ecosystems that continue to give us food, fiber, fuel, things that we all need and at the same time, provide other things that we need to survive, other ecosystem services that include water, clean air, biodiversity, and these other things that in addition to food, fiber, and fuel are things that are necessary for humans and life on earth to continue so, that's the potential benefits of perennial polycultures.

Supporters of hazelnut production in monoculture argued that mixed species plantings might be too difficult to manage or harvest, and that hazelnuts would be more likely to be adopted by conventional farmers as a single field crop, though perhaps grown in riparian areas or marginal lands surrounding other crops. Rather than wanting to dictate what other growers do on their property, for most participants this was more an issue of research and funding. A few participants expressed frustration that most of the research they knew about at universities was not addressing hazelnuts as part of a polyculture system. However, two NGOs, The Main Street Project in Minnesota and the Savanna Institute in Wisconsin, are working to fill that gap. The Main Street Project is seeking to collaborate with the Universities of Minnesota and Wisconsin to assess the productivity of their mixed perennial and poultry system, with a particular emphasis on hazelnuts. And the Savanna Institute focuses on research and education, connecting farmers, researchers and others interested in perennial polyculture systems, as well as conducting some of their own research on their farm or using data shared by other farms.

Research agendas were another area of disagreement among participants. One grower bluntly stated, *“I am unaware of any research initiatives right now that are in keeping with our own farm's needs. We don't have any use at all for row crop tweaking. Not interested.”* Several other growers said that the

research conducted at the major research universities did not seem relevant to them. In some cases, this was because they were interested in polyculture systems, but in others, it was because they felt frustrated with the focus on breeding and propagation. As growers, several interviewees expressed frustration that the universities were not focusing more on agronomic trials in order to help current growers better manage their plants and that they would “*just like to see more relevant research for growers coming out of the university.*” Researchers, on the other hand, while interested in agronomic work, felt it was more important to focus on better cultivars and wait for clonal material in order to make agronomic trials more scientific and useful. Of the agronomic trials that have come out of the Universities, several growers were skeptical when the results were not what they expected. For example, one trial of nitrogen fertilization found that, at least in the first few years after planting, hazelnuts do not appear to benefit from nitrogen fertilizer application. A few growers “*do not believe that at all*” and instead believe firmly that nitrogen is necessary or at least beneficial and apply it every year. For some others, the very issue of fertilizer application is moot as they are committed to hazelnuts or perennial crops precisely because they don’t want to apply synthetic fertilizers or are trying to promote conservation, so updating this trial would not provide them with useful information. With growers who use such a wide range of agronomic practices, it would be difficult for researchers to design experiments that satisfy everyone. There are, however, a few agronomic topics that many growers expressed interest in including proper plant spacing, pest management, and a full range of nutrient applications.

One issue that was not very prominent in interviews, but was the source of some lively debate at the Hazelnut Growers Conference, was the questions of whether and when it will be beneficial to have clonal material. A few growers, including a private breeder, expressed concern that promoting clonal material could have a negative impact on overall genetic diversity within the commercial hazelnut population. They advocated for continued planting of diverse stock to help develop a broader gene pool for future selections and were concerned that moving toward clones too quickly could mean missing out on the discovery of new genetic potential and reduce the resilience of the hazelnut industry in the upper Midwest. Others felt that developing clonal material was important in order to have a viable industry and to conduct reliable research. Many on both sides of the issue felt that the development of clonal material should and would compliment continued efforts to plant and study a diverse genetic mix of plants. And one participant claimed that since the overwhelming majority of hybrid hazelnuts grown in the upper Midwest can be traced back to Badgersett Research Farm which made its original selections from Carl Weschke’s farm in Wisconsin, “*there really isn’t that much genetic diversity there to protect.*” However the wild American Hazelnut does still represent a source of genetic diversity which a few researchers and growers continue to explore.

Finally, as mentioned in the section on branding, marketing and pricing, there is some disagreement about whether it is even appropriate to try marketing upper Midwest hazelnuts yet given the small scale of current production. A few participants were very concerned that marketing at the current time could do more harm than good by disappointing potential buyers with the lack of available product. But developing better marketing strategies and connections was described by some growers as the greatest current need in the hazelnut industry.

Grower disillusionment

Several participants expressed fears that if current growers get disappointed with their plants, if they “burn out”, “give up”, and “rip out their plants,” it could set industry development efforts back significantly. One grower told the story of his neighbors who also planted hazelnuts:

My neighbors behind me, they hand planted; they're a lot younger, great physical shape but they just keep losing plants and I keep trying to tell them: do your irrigation and weed, pull the weeds. [The seedling vendor] said 'don't pull the weeds'. Well, weeds kill the seedlings, period...[and] they did 3 feet [spacing] per plant... yeah, they won't grow very well. They'll grow, but they're starving each other. They don't listen to anything I say. They just don't. I feel so sorry for them. They're so frustrated...Last time I talked to [my neighbor], he said 'I'm done with these nuts. I'm done'.

A few interviewees were concerned that false expectations created by individuals trying to sell plants could cause some of this disillusionment, and one participant described feeling “...concerned that growers are not going to get what they expect and that's I think, could be, maybe it already is, a black eye for hazelnuts because, you know, if it's going to be widely adopted, it needs a good reputation.” Another experienced the frustration of false expectations personally. After receiving seedlings in mid July and attempting to plant them immediately, “I mean, that was just a nightmare. Serious nightmare in July. We couldn't water them enough. We lost probably 50% to 60%. We lost a lot. And [for another grower]; same thing happened to him. He said that he planted in July and that was a disaster.” While this grower didn't blame the vendor directly, they did feel slightly misled and had to learn an expensive lesson through trial and error, and one that might have turned off other growers.

Some growers also expected to be able to make a profit from their plants, but when asked to consider whether that had been the case, no growers said they had yet recouped their investment. One grower who would not consider planting more because of the cost remembered his thoughts before planting, “I thought it would be a good hobby and keep me busy in retirement. I thought I would be able to make a few dollars at it. That was the disappointing part of it. Ten years later, you're still not making any dollars at it.” But this grower still enjoyed having hazelnuts and did not intend to take out the planting.

Others worried that a lack of outlets for selling nuts, or frustration with the challenges of processing could be the primary frustration for some growers. One grower was worried that new growers may not be thinking ahead about marketing. Some “think they'll have time to figure it out” while the plants grow over several years. And in their excitement, “they put in more plants and they build up and they don't have a place to market them, and they're like ‘oh crap, now what am I going to do?’” Another interviewee suggested an important impediment is that “[t]here's no infrastructure.” Even with the AHC willing to buy nuts, the location, lack of delivery infrastructure and low price for nuts make it challenging for some growers to sell to them.

Issues of scale

A few participants pointed out that the majority of current growers are hobbyists, growing at a very small scale. One recalled statistics, “...the 2010 survey found the average planting is 50 plants...compared to almonds in California where plantings are 50 acres we have a ways to go, it will take a generation to get there.” Large scale plantings are necessary to generate enough nuts to justify the more efficient processing equipment and begin to market nuts to larger commercial buyers. One grower noted,

sometimes I question whether or not we should be using the word industry. We're trying to build an industry...but we don't have an industry now. It's just this hodgepodge of hobbyist growers. When I talk about people's plots, I talk about them being experimental plots because we don't have any commercial plots that we can point to.

And another was frustrated at the slow pace of industry development, arguing (somewhat controversially) that it was because the most involved individuals had small plantings and so weren't willing to invest in better, high capacity processing equipment.

Because the thing is, everybody's like oh it takes forever to harvest a dozen. Well, you guys aren't farmers. You're retired engineers, or you're you know, people in the suburbs who have this little retirement hobby thing on the side. You're not farmers... They don't want to make the investments in high capacity processing equipment...50 plants doesn't do anything to you. If you're going to do it, you're going to experiment with it and get some real results out of it, then put in a few hundred acres.

Although several participants agreed that more commercial scale plantings were necessary before an industry would develop, no others advocated for such large scale plantings at the current time. Again, the major bottleneck is propagation. One participant described the future of a hazelnut industry in the Midwest as “...zero unless we figure out how to propagate. Well, it's a 1. It'll stay basically the way it is; hobbyists. But if you want to move it beyond hobbyists, we have to have the breakthrough with the propagation.” And another “...would put every single drop into money into micropropagation because it's such a bottleneck on so many fronts. It's a bottle neck to getting more growers, on so many levels... it's really limiting the growth, the speed and the breadth of which we can get hazelnuts out on the landscape.”

At the same time that many participants expressed concern that hobby growers are unlikely to support a major industry, there was broad recognition that small scale growers were playing and could continue to play an important role in raising awareness about the crop and helping to identify promising plants and cultivars.

Land access and finances for new growers

Although not an issue limited to hazelnut production, concerns about the accessibility of land for new growers came up in several interviews.

Land access, land stewardship, land tenure...we need them because with perennial crops, tenure is a big issue and access, and security around that...it is happening right now and so if that goes the wrong way... if the people who own lands don't have a good reason to want it in perennials, then it's much less likely to happen and it's going to be much more difficult for that to happen, so it needs to be a part of the conversation now and not when we're ready to plant or we'll find ourselves with a great crop but without the places to plant it that we...farmers just...yeah, need to have security of tenure and that could be ownership for long term spaces

Several participants also noted the apparent age disparity among growers. One conference attendee summarized the situation:

the reality is, if you're a hobby grower with 100 plants and you're 75, that's one thing. If you're 35 and you're planning to put in 2,000 acres of hazelnuts; that's your goal, well,

that's what will drive the industry. So we have an age problem...when you're old and retired, you've got money to spend...where you've got this big, upfront investment and you don't see a return or breakeven point until 11 or 12 years. When you're young, you've got time to grow crops but you don't have the money to cover those costs so we've got to deal with that challenge going forward with production.

The situation presents a significant challenge for young potential growers without the financial capital to wait several years to earn a profit. One young couple considering growing hazelnuts was shocked and dismayed by land prices that ran close to \$10,000/acre; *“the land is really, really expensive, which as crop land...is just crazy, but it's fine if you're already huge and going to grow corn and soy. But we're probably in this position that a lot of people are age are in. We can't afford it.”*

3b. Opportunities for expanding the hazelnut industry in the upper Midwest

Interest in upper Midwest hazelnuts is high

Interest in hazelnuts grown in the upper Midwest is high among potential buyers who *“would be very interested in hazelnuts”*, and according to some participants affiliated with NGOs, interest seems to be high among potential growers as well. One *“[could] think of quite a few people that have asked about hazelnuts and are interested in planting but they were just looking for some information.”* And another felt that *“hazelnuts are cool. People like them.”* Even though these hazelnuts are smaller than commercial hazelnuts from Oregon or Turkey, both chefs and some large food companies have expressed interest in the small nuts because they could be used whole in granola bars, trail mixes, or other foods. And while the pellicle, the thin, papery layer that surrounds the nut kernel, seems harder to remove than the pellicle on European hazelnuts, several chefs commented that it wasn't as bitter, so although many would prefer a blanched and peeled nut, working with unpeeled upper Midwest hazelnuts would not be a problem. It appears, based on the expressed interest of food companies and potential buyers interviewed for this work, that once a large supply of hazelnuts is available, there will be little difficulty finding outlets for the nuts.

Altruistic growers

Many current growers established their plants after retirement. Several were candid about growing older and not expecting to see an industry develop in their lifetime. One claimed, *“You know, I wasn't doing it for me, I was doing it for us, whoever us is, society I guess.”* He and other growers want to contribute regardless of personal gain and have taken on significant expense in order to do so. One researcher expressed appreciation for the investments these growers have made, *“...[if] you add up all of the plants and the cost for the site preparation, and the management over the years for all of these planting, there's at least millions of dollars in investments, so far by growers. They didn't know that's what they were doing, but that's what they've basically done.”* Several of these participants described just wanting to be *“pioneers”* paving the way for others to succeed. Many don't even expect to make a profit, ever, from their planting but they're still keeping them up because they believe it would be good ecologically, and for human health. *“They're all in it for the good of the planet in a sense, especially these people that jumped in early, they knew there was no money in it. I know there's no money in it right now.”*

Many current growers are also working with university researchers, allowing them to visit their farms, collect samples, and attempt to develop cultivars from some of their best plants. When one grower was asked if researchers could visit his farm, he replied, "...go ahead. I was a graduate from the university, we both were there and we both have a soft spot in our hearts on researchers doing things out in the countryside." Another shared a fairly common sentiment toward research, "Anybody ever wants to come out and see it, they're welcome to. Give us a call and I'll show them around. Or they can go out on their own. Long as they don't let the cattle out now." Because of this support for research, many growers were very willing to participate in interviews, and have been actively sharing information with others, trying to help others learn from their mistakes. A handful of growers are also meticulous record keepers and have been willing to share those records with researchers or others who might benefit from the data. The Minnesota Hazelnut Foundation was started as a way for growers around the state to share information and support one another in efforts to be successful hazelnut producers. Several current growers said they are willing to share information and support research efforts because they truly aren't just doing this for their own benefit, they're doing it for society as well.

The industry itself exists because early hazelnut enthusiasts were willing to share material and information. One participant recalled some of that history,

the point, is there's this whole history that I think a lot of folks aren't aware of in terms of nut culture hobbyists...you know, even back in the whole hybrid hazelnuts, that was all work that was based off Carl Weschke and then even before that, Cecil Ferris's work, so we stand on the shoulders of giants, and I always say that, because even where we are right now, there were literally dozens of individuals that got us to where we are now from sharing what they knew, their expertise and how to graft, where they got these really good nuts and how do propagate them and how do we get more of them.

It was through record keeping and willingness to share information that growers learned that their assumptions about planting hazelnuts might not be correct. Many growers started out by planting young seedling in the spring. Many saw unacceptably high mortality rates over the summer, even when following strict irrigation regimes and striving to take the best possible care of their plants. A few growers experimented with keeping the seedling in pots until they were bigger and stronger, planting later or even over wintering their seedlings to plant in the spring. This seemed to lead to better survival rates, so the results were quickly shared with others who used the information to improve the success of their plantings.

To be sure, there are a number of growers who are not engaged for altruistic reasons. The majority of those interviewed were affiliated with university researchers as growers who allow data collection on their farms. There are certainly growers who are not affiliated with the university, and their perspectives may not have been adequately captured in this set of interviews. And a few private breeders carefully guard their data and research methods as proprietary in order to support their businesses. Still, it is clear that many growers will continue to support research efforts and share information with new and potential growers so that mistakes of the past don't need to be repeated.

These altruistic growers represent a tremendous resource for researchers and future hazelnut growers in the upper Midwest. Many are financially stable enough, either through retirement savings or other businesses, to support their work with hazelnuts without taking on extreme financial risk. As one grower

commented, “...*the productivity of the cattle herd is what’s enabled us to tinker around with species like hazels.*” This makes it possible for them to experiment and learn from mistakes without the high stakes that a young grower trying to make a living off hazelnuts would face. Finding ways to keep altruistic growers engaged and recognizing their contributions will be important moving forward.

Hazelnuts are a healthy product

Several growers and buyers expressed interest in hazelnuts because of the health benefits. Some benefits are known, such as the heart-healthy fatty acids in the nuts and oil, the high vegetarian protein content of the nuts, and the SPF qualities of the oil. Others are anecdotal or speculated, including the effects of hazelnut oil on various skin conditions and scar reduction, or whether parts of the hazelnut plant might have medical or pharmaceutical applications. Both chefs and cosmetics makers said that customers are willing to pay more for products with health benefits and that the health benefits of hazelnuts of hazelnut oil would be a big selling point for them and their customers. One potential buyer emphasized the importance of describing the health benefits of hazelnuts, “*So I think too, the story line is really, really important. You know... Why do I want to have it, I know it’s great and grown in MN, but maybe the antioxidants are pretty high, maybe the alpha omega’s extremely high and good for me. Tell me why I should eat this and tell me the benefits so that I feel good about eating it.*”

A small handful of growers are actively searching for research articles that address the health benefits of hazelnuts. And at least one researcher has been exploring the nutritional benefits of hazelnuts. But given the interest among potential buyers, a more concerted effort to establish the health benefits, or compile those that are known, and incorporate them in the branding and marketing of hazelnuts might help growers take better advantage of this opportunity.

Ecological benefits

In addition to supporting human health, hazelnuts have ecological benefits, many of which are outlined in Section 1 of this report. Again, this can serve as a selling point for some customers. Chefs and cosmetic producers both indicated that customers like to know that their products come from sustainable sources or that they are supporting ecological health.

It may also serve as a selling point for potential growers. Many potential growers indicated they like that hazelnuts have native genetics, making them well suited to the region and indicating that hazelnuts “*really belong on this landscape.*” Several liked the wildlife benefits, or soil and water conservation that come from hazels as a perennial crop. A few want to see hazelnut replace crops like corn and soybeans, either on marginal lands or on a large scale. One participant commented that “*even if hazelnuts were grown in monoculture, which is not my vision...even if they were grown with heavily chemical intensive inputs with bare soil underneath, that would be an improvement with what we are doing now with soybeans.*” This interest in the ecological benefits of hazelnuts may provide opportunities to expand the industry and reach out to new growers, especially once better commercial varieties are available.

Willing NGO partners

In addition to altruistic growers, there are several NGOs involved with and interested in helping to promote hazelnuts and other perennial crops.

The Land Stewardship Project has taken the lead on lobbying Minnesota legislators to provide funding to the University of Minnesota's Forever Green Initiative which works to develop agriculturally productive perennial crops, including hazelnuts. They are perhaps best positioned to help advocate for policy changes to support more perennial crops.

The Savanna Institute is committed to promoting perennial polycultures through research and education. They have been and are interested in continuing to play a connecting role, bringing together farmers, researchers and others, both in person and virtually to support polyculture systems. They are interested in hazelnuts as productive components of polyculture systems, and have been active in efforts to improve hazelnut marketing and supply chain development in the upper Midwest.

Rural Advantage is an organization dedicated to third crops, crops other than corn and soybeans that provide some ecological benefit and income to the farmer. Hazelnuts are one of several crops and practices they promote. They have hosted several grower meetings and field days focused on hazelnuts. And they are also active in supply chain and marketing development efforts

The Main Street Project works to promote a system of mixed perennials and poultry. They are in the process of establishing demonstration farms to show how chickens can be raised under a canopy of hazelnuts and other woody perennial species to create multiple revenue streams and restore ecological health.

Trees Forever works in Iowa and Illinois to promote planting trees and woody shrubs, including several hazelnuts and other nut species. More so than the other organizations, they focus on planting trees in urban areas. They organize lobbying days at the Iowa state capitol and host field days and other events to help landowners learn about growing trees. Like the Savanna Institute and Rural Advantage, they are also involved in supply chain development work through one staff member with a particular interest in hazels.

The MHF is a grower-based organization that helps bring together growers and support research on growing hazelnuts in Minnesota. The organization started when growers realized that they were learning a lot through the experience of growing plants that countered information they had heard elsewhere. One participant who was involved in the early development of the MHF recalled,

so that was back in 2008 and it was basically, 'okay, wait a second here. We've got a lot of people promoting hazelnuts telling us this, that, and the other, and we need to get a bunch of growers together to essentially share our experiences and get down to the nitty-gritty of what some of the issues are with growing hazelnuts, why we're seeing so much more mortality... ', because we had early growers [who] had terrible mortality. I mean, we're talking 80% death; 20% survival? And that's just ridiculous. I can't think of any other woody out there where you'll have that same mortality and it wasn't just the growers not taking care of the plants, because plenty of growers watered them and did take care of them, so between the plant issue and a lot of this rampant baloney, that was the motivation to getting growers together. And...we wanted to pull the university in too. So, to have that science background to hazelnuts so we could feel confident in that we had the right partners to... develop cultivar best management practices, all that sort of thing and we certainly weren't going to get there with the yahoos that were promoting stuff for their own benefit. It was really about setting something up, an organization or structure that could move things along and so I think that was relatively successful...

In Iowa, the Iowa Nut Growers Association plays a similar role, though not limited to hazelnuts. And at the national level, the Northern Nut Growers Association hosts an annual meeting and maintains a resource library of nut growing information that is shared with members.

In all these cases, the groups provide essential opportunities for learning and information sharing between growers. One grower described an appreciation for NGOs because “*Land Stewardship Project and the Sustainable Farming Association were instrumental [in helping us get started] just because they were arenas that you could feel safe talking about weird planting stuff.*” It is important for growers, especially as they are just getting started to have supportive spaces and organizations where they can learn and ask questions of those with more experience.

In many ways, these organizations have also begun to take on roles similar to university Extension programs, sharing new research and best practices with growers in their organizations. One participant described the situation:

Extension is being gutted right now in a lot of places and so that's too bad to see. Other organizations like the Savanna Institute...there are other great organizations working in agriculture and education, so there is probably a role to play because organizations like Land Stewardship, or MOSES [Midwest Organic and Sustainable Education Service], or the Land Connection down in Illinois, Practical Farmers of Iowa, they have great networks and really good educational practices and so they're in a good position to be a part of outreach and education about hazelnuts.

As Extension programs have lost funding or been consolidated, several counties no longer have Extension staff that can help growers with questions about perennial woody crops like hazelnuts. At the Extension level, the state of MN does have a dedicated agroforestry team of 2 who work to help farmers and landowners around the state. They also work with other Extension staff, and staff at state agencies and help to translate the laws and requirements of cost share or other programs to farmers or others who aren't as familiar with the legal language. As a team of two, however, they can't be everywhere all the time, so the NGOs provide valuable support. In Wisconsin, several Extension staff members have played important roles in supporting hazelnuts development efforts and research. But again, as funding for the University system is cut, Extension budgets shrink; reducing the reach of staff and opening opportunities for more NGO involvement.

Leadership

One of the primary assets in upper Midwest hazelnut development efforts recognized by many interviewees is a person. Jason Fischbach has played a key leadership role in the Upper Midwest Hazelnut Development Initiative. As an Extension based researcher, his role has been to help develop the hazelnut industry and as such, he has been involved in nearly every aspect of hazelnut development. Several researchers described Jason as the go-to person for coordinating grant application efforts, and growers said they turn to him for information and organizational leadership. He was described in positive terms by every participant who mentioned him for being “*a great source of information,*” “*a real leader in hazelnut development,*” and “*fair and credible,*” putting Jason in the rare position of being able to work with groups or individuals who might otherwise have competing interests.

Through his efforts, UMHDI developed an online presence through a website (midwesthazelnuts.org), and the Hazelnut Improvement Program, where growers can submit and store data online about their

plants for their own benefit and in an effort to identify high performing plants. Growers can also choose to share their data with other growers. And to aid growers in planning financially for hazelnut production, he has developed and made available an enterprise budget tool on the UMHDI website. These and other projects have contributed to both growers and researchers feeling supported by his work, and thus contribute to his strongly positive reputation as a leader in hazelnut development efforts.

Section 4. Recommendations and conclusion

Expanding the hazelnut industry in the upper Midwest may require a dual focus, one on the long term future of upper Midwest hazelnuts, and the other on more immediate support for current growers. Although there was a lack of agreement on how much effort should be directed toward supporting growers versus trying to develop improved plants, it is clear from talking with growers that both must happen.

Taking the long term view, there will be little advancement of the industry until propagation is addressed and improved cultivars made available. To address this, long term financial investment in the basic science and micropropagation efforts is necessary. Short term funding may not allow the kind of continuous research efforts that lead to breakthroughs in propagation techniques and plant selection. The case should be, and is being made to potential funders that crops like hazelnuts provide multiple societal benefits, from providing healthy local foods, to improving the ecological quality of agricultural land to providing wildlife habitat, to diversifying farm incomes. But these advantages cannot be fully realized with a few small scale plantings. Several researchers expressed confidence that with enough investment of time and money, the micropropagation puzzle can be solved.

Of course, this brings up questions of whether the expense is worth it. Frank discussions about costs and likely outcomes have been and will continue to take place. And there were some participants who expressed concerns about funding, even as they advocated for it. One participant described the situation, *“I am concerned that there are a lot of resources going into hazelnuts in the Midwest. While we’re making progress, I think it’s in the right direction. There’s also part of me that says ‘there’s not enough results to show for it yet.’”* This is why long term investments are needed. Advancements in basic science may come slowly. According to one researcher, *“I think with a sustained budget...that’s about \$100,000 a year...I think we could actually do it at that price, but we’d need 20, 30 years at that price.”* For some participants, one key to easing some of the investment anxiety was bringing in more private investment money so that the burden of funding doesn’t fall on public institutions alone. One participant argued,

We also need private investment in this. I think there’s potential for that to go wrong if it’s...there might be private interests that have an interest or slowing, halting, or limiting it as well, so....we need to be careful around that, but there’s a lot of things that don’t happen unless there’s significant private investment.

There are researchers currently working to develop and enhance relationships with private industry and philanthropic organizations to compliment the public investments in hazelnut micropropagation, breeding, and other perennial crop research efforts. These efforts are necessary in order to create a sustainable hazelnut industry in the upper Midwest. However, securing that support may be difficult because, *“quite frankly, until we’ve got improved genetic materials and processing equipment, there isn’t the right scale in our immediate future and that’s where [private industry] would get involved.”*

But in the meantime, there are many growers with hazelnuts who could benefit from less ambitious efforts in other areas while they wait for improved plants and the ability to micropropagate them. The following recommendations address issues that while less pressing for industry development overall than micropropagation, could help keep current growers engaged with the crop.

Improving policies

Because of the ecological benefits that most interviewees associate with hazelnuts, many also indicated that having hazelnuts on the landscape benefits the public as well as the farmer. As such, a few participants envision hazelnuts as part of productive perennial buffers along waterways, particularly in agricultural areas. If policies in programs like CRP were to change to allow earlier harvest of fruit and nut crops established through cost share or other supports, both landowners and the public could benefit. Changing policy is rarely a simple matter, but the multiple economic and ecological benefits provided by perennial crops may make a compelling case. Several growers suggested changes they would like to see:

Now, I have always been on CRP's case that they should have a minimal CRP or an optional CRP, where if you are able to harvest say hazelnuts in five years, then you could get out, without any penalty, of a ten-year CRP planting program, and that you could be paid up to that point, and that if you want out and just agree that the planting is going to stay in existence the entire ten years, but you don't need to get any government payments, well, why not? Why wouldn't the government support that, because it would be saving money for the government.

and

We are going to have to have perennials on the landscape if we are going to meet the nutrient reduction strategy in the State of Iowa and I would imagine the same is true in the State of Minnesota as well as the State of Illinois as well as the other states that have contributors to the pollution load to the Mississippi River system, so whether it's hazelnuts or whether it's other agroforestry practices or other agroforestry crops, we need more perennials out there...I mean, if we want perennials on the landscape, we need to either eliminate the disincentives or provide some of the incentives necessary to have landowners plant them. That is the public policy role for perennials, specifically, because of the multiple benefits of the crop.

Yet another grower suggested, “providing incentives geared around property taxes, there's a lot of leverage there, because the mindset is I hate paying those taxes. If I could reduce them in half, whatever half is, the dollar value of whatever half is is way more powerful than “I'll give you \$100 to do this,” you know?”

These efforts would also benefit perennial crops beyond hazelnuts. Other fruits and nuts, such as elderberries, might similarly benefit, opening the door for what one participant called “restorative agriculture,” agriculture that can help restore soil and broader ecological health.

Hazelnut stories and marketing

The surprising disconnect between what buyers want to see on packaging and the way hazelnut products are currently presented can be fairly easily addressed. Even lawmakers and philanthropists that were engaged in informal interviews expressed great interest in hearing more of the story about the localness, the growing practices and the ecological benefits of upper Midwest hazelnuts. Hazelnut sellers, be they private growers or the AHC, should take heed of the call for descriptive product labeling and labeling that helps tell the story of how hazelnuts benefit the land and people. In some cases, Extension or state agency resources may be available to growers looking for assistance with developing marketing materials. It may

also be possible to partner with graphic design courses to enlist student help in brand design that captures the uniqueness of upper Midwest hazelnuts.

Currently, most growers are marketing on their own, separately from the AHC, and so there are many stories out there. While not necessarily a problem, it's important to realize the impact of the stories we tell, and to make sure they are consistent because one person's misleading brand or story could damage the reputation for everyone.

Given the far more daunting challenges of developing improved plant material and improving processing efficiency, addressing branding and marketing is not as urgent. However, it may also be low hanging fruit that current growers and the AHC could improve with comparatively minimal time and expense.

Rethink collaboration

For years, growers and NGOs have been asked to participate in hazelnut research, primarily through data and information sharing. A recently rejected grant application to support hazelnut development efforts included NGOs as research partners and proposed working with clusters of growers to conduct research trials. However, the proposal was put together by researcher too late for the NGO partners to provide much substantial feedback. Several participants affiliated with NGOs were happy to be involved, but expressed a desire to be engaged much earlier in the process. One participant described the grant application as a *"rush job,"* and *"hopes there will be an opportunity for partners to be at the table to help shape the next proposal."* Another echoed the same feelings, wondering whether it would be possible to have a discussion about when and how to best involve NGOs in developing research proposals and even *"setting the research agenda."*

These comments present a challenge for researchers who in the past have been able to set their own research agenda, often with an eye to designing projects that will be relevant for growers, and then to reach out to potential partners and growers. Although never an easy process, engaging potential partners earlier in grant development efforts might help ensure that the research projects will feel relevant to more growers. Yet, this approach may not be appropriate for all grant applications. To that end, hosting a conversation about how and when partner organizations can and should be involved in the grant writing and research process might prove fruitful.

Stronger collaboration with other regions in North America

Currently, most hazelnuts produced in the US are grown in Oregon. They are able to grow European Hazels which lack the cold hardiness and disease resistance of hybrid and American hazelnuts. At Rutgers University in New Jersey, there are long-running disease resistance trials. Growers in Ontario are experimenting with European hazelnuts and hybrids in their relatively mild climate as well. In Nebraska, between the Arbor Day Foundation, Nebraska Forest Service and University of Nebraska, there are several ongoing trials for hybrid hazelnuts that tend to lean more strongly toward the European genetics than the upper Midwest hybrids. Researchers from Oregon, New Jersey and Nebraska have gotten together to form the Hybrid Hazelnut Consortium (HHC). While there is communication between the HHC researchers and researchers affiliated with UMHDI, there has not been quite as much collaboration as some interview participant would like to see. One participant described the situation as one in which

several HHC researchers have important, but challenging “*critiques of the hazelnut industry in the upper Midwest.*”

Though the feedback may be challenging, or at times even discouraging, several participants saw wisdom in reaching out to other North American growers in order to “*avoid recreating the wheel,*” and because “*we obviously have things to learn and if they don’t think we’re doing a very good job, then we listen to that and take their concerns seriously.*” As with NGO partnerships, working together with other research universities may help create more funding opportunities, and in this case bring in critical voices that challenge us to continue to improve in the upper Midwest.

Partners in harvest and processing

The challenges of harvesting and processing hazelnuts are daunting, especially when growers feel they must tackle them alone. Despite the lackluster response to the suggestion at the Hazelnut Grower’s Conference, interviews with growers who do not currently harvest their hazelnuts indicated that there may be some interest in establishing a hazelnut harvesting network. A few of these participants said they would allow someone to harvest their nuts in exchange for “*some token payment*” or “*some shelled nuts.*”

If the AHC is truly in need of more nuts for processing, it may be worth considering offering a harvesting service for those who don’t currently harvest, or a pick-up service for those who harvest but don’t want to transport their nuts. Careful assessment of finances involved would be important to make sure the company did not lose money. But with the AHC in need of nuts and several growers disinterested in harvesting, it seems worth trying to find an agreement that would work well for both parties.

Alternatively, some NGOs like Land Stewardship Project, have programs to connect farmers looking to retire with new farmers looking for land. It may be possible to establish a similar system for hazelnuts, connecting growers who don’t harvest, with those who are interested in eventually growing hazelnuts.

There is also the possibility of developing equipment sharing cooperatives. Like the 3 growers in southern Minnesota who invested together in a blueberry harvester that they share, other growers may be able to create similar arrangements. This is most likely to work in areas where growers are not too spread out, and for small numbers of growers. A large group sharing a single harvester might struggle to harvest each farm at the right time.

Lessons can also be drawn from approaches used for other local food system development efforts. Mobile processing units, or regional processing kitchens, might ease the investment burden for individual growers who want to be able to process their own nuts. Instead of investing in privately owned equipment, growers might buy a share of a processing facility with designated use times. If these facilities are certified kitchens, growers would then have greater opportunities for selling their nuts to buyers outside of farmers markets.

Conclusion

This report does not exhaustively cover all possible barriers and opportunities for hazelnut industry expansion in the upper Midwest, but it does capture those topics which most frequently arose in interviews with a wide range of participants and were the subject of repeated discussion at conferences. The goal is not to point fingers of blame for any of the challenges listed, but to raise several topics for potential discussion, reflection and collaboration as well as identify some reasons for optimism.

It is important to remember that the ultimate goal of establishing an industry likely rests on establishing improved propagation techniques and cultivars. At the same time, however, pursuing intermediate approaches while micropropagation and cultivars are in development may be an important way to keep the hazelnut industry moving forward. Current growers recognize that they do not have perfect plants, yet they still have nuts to sell and a desire to see an industry develop. A few simple investments of time, money, effort or expertise could have a more immediate impact on those growers and position the industry to take maximum advantage of improved plant when they do become available.

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Appendix A: Interview Guide

Examining community capacity for sustainable agriculture: Exploring support for and adoption of Minnesota hazelnuts

Interview Guide

9/21/15

First, I have some general questions about you and your connection to Minnesota hazelnuts.

1. **How would you describe your current connection to Minnesota hazelnuts**
 - a. What does your work with hazelnuts involve?
 - b. How did you become involved in that work?
 - c. How long have you been involved?
 - d. What have been some of the most rewarding things about working [or trying to work] with hazelnuts here?
 - e. What have been some of the most challenging things about working [or trying to work] with hazelnuts here?
2. Are you currently growing hazelnuts?
3. What interests you about Minnesota hazelnuts?
 - a. What do you like about them?

Next, I have some general questions about the broader community of folks currently working with Minnesota hazelnuts.

4. **Do you know of other individuals who are involved with Minnesota hazelnuts?** [These may include growers, researchers, buyers, natural resource managers or others]
 - a. If so, can you describe the roles they play?
 - b. What assets do they bring to the overall effort to develop a hazelnut industry here?
5. **What institutions or organizations are involved with Minnesota hazelnuts?**
 - a. How do they contribute to promoting or developing hazelnuts for Minnesota?
6. **Are there any people or groups you believe should be involved in working on Minnesota hazelnuts but who, to your knowledge, are not yet involved?**
 - a. What would they be able to contribute?
 - b. Have you or anyone you know tried to reach out to them?
7. **Do you have any concerns about the work currently being done on or with Minnesota hazelnuts?**
 - a. Can you explain those concerns?

Now, I have some specific questions about learning and information sharing as it relates to Minnesota hazelnuts.

- 8. How did you first hear about hazelnut production in Minnesota?**
9. Where do you go to find information to support your own work with Minnesota hazelnuts?
 - a. To find out about the work other people are doing?
10. How do you share information about your own experiences with Minnesota hazelnuts?
- 11. Do you have any unanswered questions about Minnesota hazelnuts, or issues you are curious to learn more about?**
 - a. Do you know where to find this information, or who to talk with to learn more?
 - b. What resources would be needed to provide answers to your questions?
 - c. What constraints would need to be overcome?
- 12. What do you believe are the most pressing issues facing the establishment of Minnesota hazelnuts as an *economically viable* crop in Minnesota?**
 - a. What makes these problems significant?
 - b. Who should be responsible for addressing these issues?
 - c. What resources would be needed?

These next questions are about developing a hazelnut industry in Minnesota.

13. What makes hazelnuts a good crop for Minnesota?
- 14. What kind of future do you envision for Minnesota hazelnuts as a crop here?**
 - a. What kind of resources would be needed to make this happen?
 - b. Who would need to be involved?
 - c. What are the barriers?
15. What kinds of hazelnut products would you most like to see develop into an industry for the state?
- 16. Do you have any concerns about developing a hazelnut industry here?**
 - a. Can you explain these concerns?
- 17. Would the general public benefit from having more hazelnuts on the landscape in agricultural areas?**
 - a. Can you describe those benefits?
18. Are there any ways that public institutions or agencies could help support work on the development of a hazelnut industry for Minnesota?
 - a. Private institutions or organizations?
 - b. Individual members of the public?

Finally, I would like to get some recommendations from you regarding hazelnuts in Minnesota.

19. Do you believe hazelnuts should be promoted as a crop for Minnesota?
 - a. What makes you say so?
 - b. Who would benefit from establishing a larger hazelnut industry in Minnesota?
 - c. Would anyone suffer as a result of expanding hazelnut production?
20. What do you think would need to happen in order to make hazelnuts an appealing crop to a wider range of farmers and landowners?
21. If you were in charge, how would you direct current and future hazelnut research efforts in Minnesota?
 - a. What makes these directions for hazelnut research important?

Additional questions for growers:

1. What is the approximate size of your hazelnut planting?
2. When did you first plant your hazelnuts?
3. When did they produce the first crop?
4. What has been your average annual yield?
 - a. How does that compare with this year's yield?
5. What prompted you to begin growing hazelnuts?
6. Where did you get your initial planting material?
7. Where do you sell your hazelnuts?
8. What do you charge for your final products?
9. Have you benefitted from growing hazelnuts?
 - a. If so, please describe how you have benefited.
10. Have you faced any challenges or setbacks as a grower?
 - a. If so, how have you dealt with them?
 - b. Have they affected your view of hazelnuts as a crop for your land?

Additional questions for potential growers:

1. What makes you interested in growing hazelnuts?
2. What has prevented you from planting hazelnuts yet?
 - a. Are there any resources or connections that could help you overcome these barriers?
3. What end products are you interested in producing?
4. Approximately how many hazelnuts would you be interested in planting if you decided to become a grower?
5. Who, if anyone, would you work with to establish your hazelnut planting?

Additional questions for buyers/potential buyers:

1. Do you currently use any hazelnuts or hazelnut products here?
 - a. Can you describe what you use?
 - b. How much would you estimate you use per week?
2. Have you used any [others] in the past?
 - a. Why did you stop using them?

- b. How much were you using per week?
3. Have you ever considered using hazelnuts or hazelnut products here [in addition to those you mentioned previously]?
 - a. Why or why not?
4. If you were to incorporate any hazelnuts or hazelnut products into your cooking here, what do you think you would be most likely to use?
 - a. Can you explain why?
 - b. Are there any hazelnut products you would not consider using?
 - c. How much do you think you would use per week?
 - d. What would you expect to pay for high quality [nuts/pieces/oil/meal/etc]?
5. How important would it be for you to get hazelnut products from a local source?
restaurant?