

Professional Brief

UW-Extension Dept. of Agriculture and Life Science

Jason Fischbach

Agriculture Agent – Ashland/Bayfield
Food and Energy Woody Crops Specialist

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Faculty Positions

UWEX Food and Energy Woody Crops Specialist (50%), Statewide, Oct. 2013 to present (**Exhibit 1**)

UWEX Agriculture Agent (50%), Ashland/Bayfield Counties, Oct. 2013 to present

UWEX Agriculture Agent (100%), Ashland/Bayfield Counties, Oct. 2006 to Oct 2013 (**Exhibit 2**)

Education

Master of Science, Department of Agronomy and Plant Genetics, University of Minnesota, 2003

Bachelor of Arts, Biology, Carleton College, 1999

Certifications

Certified Farm Succession Coordinator, International Farm Transition Network, Feb 2016

Wisconsin Value-Added Food and Farm Business Consultant, WI DATCP, Jan 2016

Professional Roles and University Contributions

Bayfield County Large-Scale Livestock Study Committee	Member	2015-2016
UW-Extension Innovative Funding Planning Team	Member	2015-present
Wisconsin State Wood Energy Team	Member	2014-present
UW-Extension BioEnergy and BioEconomy Team	Co-Leader	2014-present
Upper Midwest Hazelnut Development Initiative	Co-Leader	2007-present
Department of Agriculture and Life Sciences Scholarship Committee	Member	2006-present
UW-Extension Fruit Team	Co-Leader	2006-2010

Major Program: Agricultural Development and Revitalization

Situation Statement:

Like many Counties in Northern Wisconsin, Ashland and Bayfield Counties saw a significant decline in agriculture during the time of commoditization and consolidation during the second half of the 20th century. In 1970, there were 1,360 farms in Ashland and Bayfield Counties, by 2012, the number had declined to 539. In 1970 there were 9,600 dairy cows and by 2012, only 3,746 (*Source: National Agricultural Statistics Service*). In 2006, I was hired as an Agriculture Agent – Specializing in Horticulture with a clear mandate and expectation from the Counties and area stakeholders to help revitalize the agricultural economy. In addition, with the largely pristine natural resources in the area and a strong conservation ethic in the culture any agricultural revitalization and expansion would have to protect those natural resources. Through a robust needs assessment process it became obvious the region had a vibrant and diversified farm economy with many opportunities for growth and revitalization, particularly in forage-based enterprises, specialty crop production along Lake Superior, and production and sale of source-identified branded food products.

In response, over the last five years I have developed and am implementing a robust multi-faceted research, development, and outreach program focused on new crop development, business and market expansion, and natural resource protection (**Exhibit 3**). To expand my capacity and work on multiple major programs simultaneously, I have been successful in sourcing \$830,000 via 26 funded grant proposals (**Exhibit 4**). This has provided me with the supplies, equipment, and labor to conduct the field research and outreach programming inherent to such long-term development and diversification efforts. In addition, since 2013 I have backfilled my consumer horticulture responsibilities to allow me to focus on development of the components of my program with the most upside potential. My work with woody biomass crops, business and market development, and high tunnels, in particular, has been extensive but for this professional brief I will focus on my work to support the emerging hazelnut industry in the Upper Midwest.

Upper Midwest Hazelnut Development Initiative (UMHDI) - RESEARCH

Hazelnuts are a high-value crop with significant profit potential and present an opportunity for growers in Ashland and Bayfield Counties and throughout Wisconsin. Extensive populations of wild American hazelnut occur throughout Bayfield County and NW Wisconsin, but no commercially viable cultivars are yet available to growers. Recognizing the opportunity for hazelnuts as a new specialty crop for the region and a means to strengthen and diversify the local agricultural economy, I participated in a 2007 strategic planning session for development of a hazelnut industry in the Upper Midwest. Since that time, I have served as Co-Leader of the Upper Midwest Hazelnut Development Initiative, a multi-state and multi-institution collaboration of researchers and growers working to implement the strategic plan with the following main objectives: 1) Develop proven hazelnut germplasm capable of supporting an economically-viable hazelnut industry in the Upper Midwest, 2) Develop propagation protocols necessary to provide clonal material of select genotypes to growers at reasonable cost, 3) Develop appropriately-scaled harvesting and processing capacity tailored to the select germplasm, and 4) Develop an agronomic and production system with a robust outreach education program to support sustainable hazelnut production.

Our approach to developing proven hazelnut genotypes to-date has been a search and screen process using two pools of genetically diverse germplasm. *Corylus americana* (American hazelnut) is native to the Upper Midwest and is most common in the sandy regions in Wisconsin and Minnesota. In Wisconsin there are large populations in the NW Sands region, the Central Sands, and areas in far NE Wisconsin. In 2009, I wrote a grant proposal to the WI Specialty Crop Block Grant (SCBG) program and received \$32,000 of funding to begin the process of screening the wild populations for high performing germplasm. Starting in 2010, I led a team to identify the top 10 performing plants in 45 populations of American hazelnut scattered throughout Wisconsin. The top 10 plants at each of the sites were chosen using a visual scoring of nut cluster density. By 2011 we had identified 450 plants and of these we selected 50 based on measured kernel yields. It is difficult to extrapolate single plant yields in the wild to commercial cultivated plantings, but regardless, the yield densities of the wild plants demonstrated significant potential (**Exhibit 5**). To further explore the potential of the top selections, a portion of the crowns of each of the selections was transplanted to the Bayfield Hazelnut Performance Trial for archiving and evaluation. The top 10 of these selections were also sent to Knight Hollow Nursery in Middleton, WI for propagation for eventual evaluation in replicated trials.

While doing the screenings I partnered with Dr. Mike Demchik at UW-Stevens Point to use molecular markers to determine that clumps of hazelnuts tended to be single genotypes rather than inter-mixed genotypes. This is important as hazelnuts in the wild grow as multi-stemmed shrubs and if vegetative material is harvested from the plants for propagation it is key to harvest material that was selected as high-performing. In 2013, I wrote a grant proposal to the SCBG program and received \$55,000 of funding in part to evaluate the flavor of hazelnuts from the wild populations in comparison to the top European cultivar, Tonda Di Giffoni. We found that some genotypes had flavor profiles as good or better than Tonda Di Giffoni, indicating there was potential to select superior flavor traits from the wild populations.

In addition to evaluating the top American hazelnut plants themselves we have also been working to establish a seedling orchard at the Hayward State Tree Nursery using seed collected from the top plants. We currently have nearly 2000 seedlings representing 42 half-sibling families. The plants are two years old and we will be screening this population for top plants and desirable traits over the coming years for future controlled crosses. The WI DNR anticipates using seed from these top plants for their wildlife shrubs and other conservation plantings.

Ultimately, the goal is to identify top genotypes from the wild populations for commercial production and/or use in a breeding program. There are two exciting reasons for looking at these wild populations: 1) Efforts since the early 1900s to develop hazelnut germplasm in the Eastern U.S. have relied on only a few genotypes of *C. americana* and no one has ever formally explored this tremendous genetic resource in our own backyard until now. 2) Key to any plant breeding program is having adequate genetic diversity with which to work and we have discovered that our populations are extremely diverse (**Exhibit 6**). This genetic diversity analysis was a collaborative project between myself, Dr. Mike Demchik, and Dr. Anthony Kern of Northland College with funding from a 2012 USDA Specialty Crop Research Initiative grant.

The second pool of germplasm we are working with are the on-farm seedling populations of hybrid hazelnuts. These seedlings are from crosses between *C. americana* and *C. avellana* (European hazelnut). Survey work I conducted in 2008 and 2010 identified more than 130 such on-farm experimental plantings with at least 70,000 genetically

Upper Midwest Hazelnut Development Initiative (UMHDI) – RESEARCH (cont.)

unique hybrid seedlings. With funding from the 2009 SCBG award, myself and Dr. Lois Braun at the University of Minnesota launched the Hazelnut Improvement Program (HIP) to enable the growers to help us screen the plantings and identify the highest-performing plants. Through our work we determined that although the average yields of these seedling populations are not high enough to support commercially viable production, there are individual plants with demonstrated yields and attributes capable of supporting commercial production (**Exhibits 7 and 8**). In fact, when extrapolated to a per acre basis, the yields from the top plants would equal or exceed those of commercial orchards in Oregon. To verify the performance of a single plant accession, it is necessary to evaluate its performance in replicate at multiple locations to verify the observed performance is due to genetics rather than just the environment in which the plant was growing. To that end, we established five replicated trials in the Upper Midwest and with funding from the 2009 SCBG award I was able to establish one of the trials in Bayfield, which is home to Bayfield County's fruit production region and a logical first place in Bayfield County for hazelnut production.

In 2010, we began populating these trials with clonal liners from the top plants identified in the on-farm plantings. In 2012, I co-authored a grant proposal to the USDA-Specialty Crop Research Initiative and our team was awarded \$900,000 (\$78,000 to UW-Extension) for a five year project to continue populating the replicated performance trials, evaluate the plant performance, and propagate the highest performing selections for on-farm trial. To date, the Bayfield trial has roughly 3 acres of hazelnuts with more than 150 candidate genotypes. We now have up to four bearing years of yield and performance data on the oldest selections and have selected the top 20 of these genotypes for further evaluation. In 2015, I wrote grant proposals to the UW System Applied Research Grant program (WiSys-ARG) and to the Sustainable Agriculture Research and Education (SARE) Research and Education Grant program and was awarded \$20,000 and \$198,000, respectively, in part for propagation of the top genotypes and establishment of on-farm performance trials. The clonal propagules, when ready in 2017 and 2018, will be provided to the early-adopter growers through our Growers Wanted program. These plantings are a key step in our HIP participatory plant breeding project as we will be returning the very best selections to the same growers that helped us find them. This is an exciting time for the project as we have taken an important step toward releasing commercially-viable germplasm for growers in Bayfield County, Wisconsin, and the Upper Midwest.

In Wisconsin, I am also working with a private hazelnut breeder to evaluate a full-sibling family from a controlled cross between his top two hybrid genotypes. In 2010, I wrote a grant proposal to the SARE Farmer/Rancher Grant program and received \$15,400 to establish four plantings in WI with the full-sibling seedlings. In 2011, I established the trials at four locations: Eagle, Bayfield, Spooner, and Stoughton. The purpose of the trials is to demonstrate hazelnuts to potential growers, determine the economic viability of the full-sibling family itself, and to identify top plants for possible clonal propagation and scale-up. The plants have begun producing nuts and we currently have two years of yield data and will be collecting two more before making definitive conclusions (**Exhibit 9**).

Upper Midwest Hazelnut Development Initiative – OUTREACH EDUCATION AND FACILITATION

In addition to my work to develop hazelnut germplasm, my other primary contribution to the UMHDI has been to coordinate and implement the UMHDI's outreach education and industry development efforts. At the time the strategic plan for hazelnuts was developed in 2007, little was known about the extent of hazelnut production in Wisconsin and what issues the early-adopter growers were facing. In 2008, I partnered with the two primary private breeders in the Upper Midwest and developed and sent a survey to all of the growers in WI to whom they had sold experimental plants. With the results, I published the first ever report on the extent, barriers, and opportunities of the hazelnut industry in WI. A follow-up survey in 2010 expanded our knowledge base and together the two reports have served to guide my outreach education and industry development efforts to meet four primary needs: 1) Develop improved plant material to increase per acre average yields, 2) Provide research-based information and assistance on the establishment and management of hazelnuts, 3) Provide assistance in developing appropriately-scaled hazelnut processing equipment and capacity, 4) Develop a sustained and institutionalized hazelnut development effort for the long-term investment necessary to develop the industry.

The survey results showed that nearly 50% of all hazelnuts planted had died by their second year. The high mortality rate was a combination of factors including grower inexperience, fragile planting stock, and controversial advice from some plant suppliers to intentionally allow for competition from weeds in order to "select" for the most vigorous plants. With funding from the 2010 SARE grant, I included establishment trials in the on-farm full-sibling plantings to evaluate

Upper Midwest Hazelnut Development Initiative – OUTREACH EDUCATION AND FACILITATION (cont.)

and demonstrate the use of tree-tubes to improve plant survival in the years immediately after transplanting. The results were published in a Research Bulletin and presentation of the results made at the Upper Midwest Hazelnut Growers Conference and Wisconsin Hazelnut Field Days. We will be conducting a follow-up survey in 2017 to quantify plant survival in plantings established since our results have been published.

In 2009, I convened and led a Hazelnut Processing Committee of growers to identify and develop appropriately-scaled post-harvest processing equipment. In 2010, I wrote a grant proposal to the WI SCBG program and was awarded \$20,000 of funding to develop a mobile processing unit and to publish a hazelnut processing guide. Through our work on the Committee we identified hazelnut de-husking as the primary bottleneck and instead of a mobile processing unit we designed and built a high-throughput de-husker. Although the husker was important, the most important accomplishment of the project was development of the processing guide and the social network necessary to create the guide. It helped frame the overall processing challenge and has helped structure the efforts to develop the processing capacity. From these efforts, we now have at least 8 individuals in the Upper Midwest working to develop processing equipment and lines and all have contributed to the knowledge base by participating in the processing symposiums held during the annual Upper Midwest Hazelnut Growers Conference.

In 2013, I wrote a grant proposal to the Buy Local, Buy Wisconsin program and was awarded \$31,000 to assist the Committee in establishing a grower-owned processing and marketing company. During 2014, I worked with the Committee and wrote a business plan, operating agreement, and operational policy documents for the company. In the fall of 2014, the American Hazelnut Company, LLC was formally incorporated and began operations at the Kickapoo Culinary Center in Gays Mills, WI. The Company currently has 16 grower-owners and conducts in-shell to kernel processing for its members in addition to producing oil and defatted flour using a blend of member-produced and Oregon-grown hazelnuts. To support the AHC and other growers developing processing lines, I developed a spreadsheet tool that enables growers to determine their processing costs. The tool provides growers with common metrics and methodology to evaluate and compare their processing lines. The AHC is small, but represents an important achievement toward developing processing and marketing capacity. The growth of the AHC and companies like it will ultimately depend on the availability of the improved hazelnut genetics, but the AHC has adopted a realistic R&D and development plan to match the timeline of the germplasm improvement.

A key step in the development of the processing capacity has been my collaboration with Dr. Dave Bohnhoff in the Biological Systems Engineering Department at UW-Madison. Dave and his students have dedicated endless hours and resources in exploring design concepts and fabricating proof-of-concept prototype processing equipment. His work developing the roller-sizer and aspirator machines has been central to the operational capability of the AHC. Our current focus is on the development of post-harvest processing technology and protocols for ensuring a safe and high quality product. Midwest-grown hazelnuts differ from the Oregon and Europe-grown hazelnuts in that the nuts do not fall free from the husk when ripe. This currently requires drying the husk and using mechanical agitation to break the dry husk apart. As such, there are many questions as to optimal drying temperatures and rates and the effect on kernel quality. The 2015 SARE grant included funding for Dave and his students to develop equilibrium moisture curves and drying protocols. To evaluate kernel quality and the impacts of drying methods on quality, the SARE grant includes funding for Dr. Devin Peterson at Ohio State University to develop a chemical fingerprinting methodology to first identify key flavor compounds and then track how those compounds change in response to different post-harvest processing treatments. Although early, the work has potential to change the way hazelnut breeding occurs and to allow us to capitalize on the genetic treasure of our wild American hazelnut populations. By identifying key chemical compounds and then the alleles responsible for difference in those chemicals among hazelnut accessions it will theoretically be possible to use marker-assisted selection to screen hazelnut offspring for flavor at the seedling stage, years before the plants would ever produce nuts.

As Co-Leader of the UMHDI I have focused over the years on developing and implementing a robust grower outreach education program. In 2009, I hosted the first ever Upper Midwest Hazelnut Growers Conference and the first ever Wisconsin Hazelnut Field Day. These events have been held annually ever since. Organization and hosting of the conference alternates between myself and the Iowa Nut Growers Association. I have organized and led each of the WI field days. Average field day attendance has been 45 people. Conference attendance has been growing every year with 125 different people attending our most recent two-day conference in Gays Mills, WI in March 2016. I also manage the UMHDI website www.midwesthazelnuts.org and have made three videos highlighting the work of the UMHDI. Our

Upper Midwest Hazelnut Development Initiative – OUTREACH EDUCATION AND FACILITATION (cont.)

most recent video (www.youtube.com/watch?v=SSEBp2-AJdM) about the UMHDI has been viewed nearly 11,500 times and does a great job explaining the depth and breadth of our research efforts. Post-event surveys consistently show growers gain knowledge and skills from the events and value the opportunities for learning.

Hazelnuts are a long-lived woody crop and it will take a sustained and long-term effort to fully develop the industry. Development of the blueberry and cranberry industries are good examples of the economic benefits of long-term sustained breeding and development and are both models for turning wild native plants into lucrative industries. Thus, in addition to my work developing the industry I have led the effort to develop an institutionalized and robust research and development program that can outlast any single researcher. In 2013, I developed the UMHDI's 10-Year Research and Resource Needs Plan (**Exhibit 10**). The plan outlines the research objectives, budgets, and personnel needs of the UMHDI and has served as our guide ever since. In 2015, I developed and wrote a Memorandum of Understanding between UW-Extension, UW-Stevens Point, and the University of Minnesota that formalizes the UMHDI and provides structure to the collaboration among the many researchers and partners involved. I have also recently completed the Charter Agreement of the Hazelnut Development Fund that will enable the UMHDI to solicit donations from private sources. The Charter Agreement is important as it enables the many partners of the UMHDI to work together to raise private funds rather than compete for those funds.

In 2013, as the potential and workload of the hazelnut project increased, I worked with administrators at UW-Extension to develop a temporary assignment of duties in order to focus on my hazelnut development work and my Lake Superior Woody Biomass Trials. The intent of my 50% Food and Energy Woody Crops Specialist position was both to free up my time to focus on these projects, but also to try a specialization model within UW-Extension to enable Agents to effectively respond to emerging high-need and high-potential opportunities. This specialization model is likely to be incorporated into the staffing model of the nExt Generation of UW-Extension.

Upper Midwest Hazelnut Development Initiative – TEACHING EXAMPLE AND EVALUATION

My primary method for informing hazelnut stakeholders and teaching what we are learning is through the Upper Midwest Hazelnut Growers Conference that I organize, host, and implement every other year. In 2013, I held the event in Eau Claire, WI. The objectives of the 2013 conference were three-fold: 1) Provide instruction on hazelnut production, 2) Provide information on hazelnut enterprise budgeting, and 3) provide research updates on projects happening in the Upper Midwest, Ontario, and the Atlantic seaboard. The conference was held over two days with the Friday session focusing on hazelnut production. To deliver high-quality research-based information I invited a mix of growers and researchers to present. I was also able to find funding to have two of our collaborating researchers flown in from Ontario and New Jersey. On Friday, I gave a presentation titled: "Hazelnut Enterprise Budgeting" which outlined the steps and costs of hazelnut production. I also introduced the Midwest Hazelnut Enterprise Budgeting Tool (**Exhibit 11-digital**) to provide growers with a method for determining enterprise costs. Attendees were asked to rate the overall quality of the presentation, the quality of the information presented, and the usefulness of the information presented with 5 being excellent and 1 being poor (**Exhibit 12**). Overall quality was rated 4.7 (n=18), quality of information was rated 4.6 (n=18), and usefulness of information was rated 4.6 (n=17). Some comments about the presentation included: "This was a fantastic resource for someone considering this as an option! Makes it more doable with budgeting software!!!", "Essential info, very good.", "Very good presentation", "Excellent", "A good presentation of a difficult topic", "I wish the spreadsheet was around when I started". I also gave a presentation titled: "Marketing Your Nuts and Nut Products". Attendees rated the overall quality 4.7 (n=18), quality of information 4.6 (n=18), and usefulness of the information 4.7 (n=18). The focus of the second day of the conference was on research and development updates. I gave a presentation titled: "Hazelnuts in the Upper Midwest" which provided an overview of the challenges and opportunities facing growers in the Upper Midwest along with a summary of the UMHDI and its research projects. Overall quality was rated 4.9 (n=12), quality of information was rated 4.7 (n=12), and usefulness of information was rated 4.7 (n=12).

Evaluating the impact of my work supporting a developing industry can be hard to quantify. Evaluating educational events is straightforward, and post-event evaluations indicate our events are highly effective, but ultimately, our work to develop the industry is far more ambitious than providing effective outreach education events. As such, in time our efforts will need to be evaluated in terms of plant performance, acres planted, hazelnuts sold, jobs created, and other economic, environmental, and social measures of industry sector performance. In the meantime, we are implementing

Upper Midwest Hazelnut Development Initiative – TEACHING EXAMPLE AND EVALUATION (cont.)

our strategic plan and reaching our target benchmarks. We will be releasing improved plant material for grower trial in 2017 and we have greatly increased post-harvest processing technology and capacity. We have also provided research-based agronomic information. Most importantly, we have established a strong research and outreach foundation to support the industry with many of our projects still in progress and results forthcoming.

Perhaps the most important measure of my work at this point is the manner and professionalism in which I have attempted to assist the new industry, particularly as competition and conflict among the stakeholders is starting to emerge, competition that is characteristic of any new crop. My goal has been to serve as an unbiased source of information and assistance and conduct work requested and needed by stakeholders. The report “Developing a Hazelnut Industry for the Upper Midwest” published by Amanda Sames in 2016, a PhD Candidate at the University of Minnesota, utilizes extensive interviews of hazelnut stakeholders throughout the Upper Midwest to identify the barriers and opportunities facing the fledgling hazelnut industry. It was rewarding to see appreciation of my efforts but also good to be reminded of the importance and expectation of impartiality:

“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.”

Internal and External Partnerships

The work of Extension Agents is rooted in partnerships and teamwork and my work is no exception. I coordinate the Upper Midwest Hazelnut Development Initiative which includes early-adopter growers and collaborating researchers with UW-Superior, UW-Stevens Point, UW-Madison (BSE), UW-Madison(CIAS), University of Minnesota, Morningside College, Ohio State University, Guelph University, Rutgers University, Oregon State University. The Lake Superior Woody Biomass Trials includes partnerships with Xcel Energy, the WI Energy Office, the Natural Resources Research Institute, and UW-Madison. My work with nutrient management includes an ongoing partnership with the Land Conservation Departments of Ashland and Bayfield Counties and the local office of the Natural Resource and Conservation Service. My work with Farm-to-School includes collaboration with Extension colleagues in two Counties and staff and administrators with five school districts. I also serve as an advisor to the Boards of the Bayfield Regional Food Producers Cooperative and the American Hazelnut Company, helping grow and develop their organizations. Within Extension I serve on the Fruit and BioEnergy/BioEconomy Teams working with fellow colleagues and external partners to develop and implement educational programming.

Major Presentations /Teaching Events Related to Agricultural Development (2010-present)

Wisconsin Public Radio – Garden Talk (2 times per year since 2010)
UMHDI Performance Trials Report, Upper Midwest Hazelnut Growers Conference (2016)
Silvopasture Course, MOSES Organic Conference Organic University (2016)
Poultry and Hazelnut Silvopasture, MOSES Organic Conference (2016)
Bayfield County Large-Scale Livestock Study Committee Report, Bayfield County Board (2016)
Bayfield County Large-Scale Livestock Study Committee Report, Public Meeting (2015)
Hazelnuts in the Upper Midwest, Wisconsin Public Television Science Night (2015)
First Rotation Hybrid Willow Yields in Northern Wisconsin, AFTA Conference (2015)
Online Marketing Tools for Your Farm, Heart of the Farm Conference (2015)
Nutrient Management in Ashland/Bayfield Counties, Lake Superior Farming Conference (2015)
Hazelnut Industry Development in the Upper Midwest, Ontario Hazelnut Growers Symp. (2014)
UW-Extension and Farm-to-School, USDA Farm-to-School Webinar (2014)
Hazelnuts in the Upper Midwest, Tri-State Forest Stewardship Conference (2014)
Red, White, and Black Currant Production, WI Fresh Fruit and Vegetable Growers Conf. (2014)

Emerald Ash Borer Training and Preparation, EAB Multi-Agency Meeting (2014)
Hazelnuts, Biomass, and Fruit Agritourism, WACEC District Professional Develop. Tour (2013)
The Technology of Food, WI Technology Conference (2013)
Apple Disease Management, Midwest Beginning Apple Growers School (2013)
Marketing Your Hazelnuts and Hazelnut Products, Upper Midwest Hazelnut Growers Conf. (2013)
Season Extension for Commercial Vegetable Growers, Fresh Market Vegetable School (2013)
The Iron is Hot, It's Time to Strike: Making it Happen in the Far North, WI Local Food Summit (2013)
Economic Development Through Local Investing: Using Local Dollars to Grow Local Businesses, League of Women Voters (2013)
Selling Your Farm Products: Rules and Regulations, North Central Small Farms Conference (2012)
Woody Agriculture, WI Forestry Council Site Tour (2012)
Agroforestry and Hazelnuts, Great Lakes Tribal Agriculture Conference (2012)
Pastured Poultry Production: Marketing and Economics, Purdue University Poultry Webinar (2012)
UW-Extension, Food, and Opportunities for Team Based Programming in the Northern District, UW-Extension Northern District In-Service (2011)
Raising Pastured Poultry For Profit, NW Wisconsin Grazing Conference (2011)
Forest Management on Your Lakeshore Property, Wisconsin Lakes Convention (2010)
Starting and Operating a Farm Business with Other People, Lake Superior Farm Conference (2010)
The Many Uses of Winter Rye, Northern Safari of Ag Specialists (2010)

Journal Publications Related to Agricultural Development (2010-Present)

Demchik, J., J. Fischbach, 2016. Phenolics and Antioxidant Activity of American and Hybrid Hazelnuts. *American Journal of Essential Oils and Natural Products* 4(1): 50-52.
Demchik, M., J. Fischbach, A. Kern, K. Turnquist, I. Palmer. 2016. Using microsatellite DNA to determine whether American Hazelnut clumps are multiclonal. *Agroforestry Systems* 90:927.
Demchik, M., J. Fischbach, M.D. Yates. 2016. Physical characteristics and sensory analysis of American hazelnuts in comparison to Tonda di Giffoni. *Agroforestry Systems* 90:918
Demchik, M., Fischbach, J., Kern, A., Lane, J., McCown, B., Zeldin, E., Turnquist, K., 2014. Selection of American hazelnut as a potential oilseed crop. *Agroforestry Systems* 88(3):449-459.

Technical/Outreach Publications Related to Agricultural Development (2010-present)

Fischbach, J. 2017. Hybrid Hazelnut Production Trials: Year 6 Yield and Performance. UW-Extension Research Bulletin #39. Bayfield County, Washburn, WI
Fischbach, J., T. Zuiches. 2017. Optimizing Deep Winter High Tunnel Spinach Production. UW-Extension Research Bulletin #38. Bayfield County, Washburn, WI (**Exhibit 13**)
Fischbach, J. L. Soshnik-Tanquist. 2016. High Tunnel Greenhouses in Ashland/Bayfield Counties: 2016 Survey Report. UW-Extension Research Bulletin #37. Bayfield County, Washburn, WI.
Fischbach, J., K. Tibbals. 2016. Hybrid Hazelnut Performance Trials: Effect of Tree Tubes on Hazelnut Growth and Production. UW-Extension Research Bulletin #36, Bayfield County, Washburn, WI.
Fischbach, J., K. Tibbals. 2016. Hybrid Hazelnut Production Trials: Year 5 Yield and Performance. UW-Extension Research Bulletin #35, Bayfield County, Washburn, WI.
Fischbach, J. K. Tibbals. 2015. Maximizing Whole Kernel Hazelnut Yield from the Drill Cracker®. UW-Extension Research Bulletin #34, Bayfield County, Washburn, WI.
Fischbach, J. 2014. Exploring Raspberry Machine Harvest in Bayfield, WI: 2014 Report. UW-Extension Research Bulletin #32, Bayfield County, Washburn, WI.
Fischbach, J. 2014. Bayfield Sweet Cherry Hardiness Trials – 2014 Report. UW-Extension Research Bulletin #31, Bayfield County, Washburn, WI.
Fischbach, J. 2014. Yield, Fruit Chemistry, and Consumer Preference of Red and White Currants in Bayfield, WI. UW-Extension Research Bulletin #28, Bayfield County, Washburn, WI
Fischbach, J. 2013. Research Plan and Resource Needs for Commercialization of Hazelnuts in the Upper Midwest: 2013-2023. Upper Midwest Hazelnut Development Initiative, Washburn, WI.
Fischbach, J. 2013. Agroforestry Demonstration Planting. UW-Extension Research Bulletin #27, Bayfield County, Washburn, WI

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Food and Energy Woody Crops Specialist

Fischbach, J. 2012. Lake Superior Woody Biomass Trials 2012 Annual Report. Bayfield County UW-Extension, Washburn, WI

Fischbach, J., and Braun, L. 2012. Setting a yield goal for hazelnut breeding in the Upper Midwest. UW-Extension Research Bulletin #23. Bayfield County, Washburn, WI.

Fischbach, J. K. Brasseur. 2012. Processing American and Hybrid Hazelnuts: A Guide for Hazelnut Growers in the Upper Midwest. http://midwesthazelnuts.org/assets/files/Processing%20Guide_Jan%202012.pdf

Fischbach, J., Braun, L., Demchik, M., Wyse, D., 2010. Hazelnut Production Potential in the Upper Midwest: A Report on Hybrid Hazelnut Yields. Bayfield County UW-Extension Research Bulletin #17, Washburn, WI

Fischbach, J., Demchik, M., Brasseur, K., 2010. Screening Wild Populations of American Hazelnut in NW Wisconsin for High Yielding Plants, Bayfield County UW-Extension Research Bulletin #16, Washburn, WI.

Fischbach, J., Brasseur, K., 2010. Stool-Bed Layering as A Means of Vegetative Propagation of American Hazelnut, Bayfield County UW-Extension Research Bulletin #15, Washburn, WI.

Fischbach, J., Brasseur, K., 2010. Evaluation of Select Hazelnut Accessions in Bayfield County, Bayfield County UW-Extension Research Bulletin #14, Washburn, WI.

Fischbach, J., Dale, C., 2010. Perfecting Black Currant Production for Machine Harvest, Bayfield County UW-Extension Research Bulletin #13, Washburn, WI.

Fischbach, J. 2010. The Sweet Cherry UFO Lands in Bayfield, Bayfield County UW-Extension Research Bulletin #12, Washburn, WI.

Professional Development (2013-present)

Foreclosure and Bankruptcy Training (2016)

Midwest Organic and Sustainable Education Service (MOSES) Conference (2016)

Northwest Region All-Colleague Conference (2016)

Upper Midwest Hazelnut Growers Conference (2010-2014, 2016)

Value-Added Food and Farm Business Consultant Training (2015)

Association of Temperate Agroforestry Conference (2015)

Heart of the Farm Training (2015)

Lake Superior Farming Conference (2010, 2015)

Northern Nut Growers Association Annual Meeting and Conference (2015)

International Farm Transition Network Farm Succession Coordinator Training (2015)

Tour of hazelnut processing companies in Oregon (2014)

Fresh Fruit and Vegetable Growers Conference (2014)

Ontario Hazelnut Association Annual Conference (2014)

Heating the Midwest Annual Conference (2014)

ANRE Conference (2010-2014, 2016)

BioEnergy Tour (2014)

National Agroforestry Center Agroforestry Academy (2014)

Tri-State Forest Stewardship Conference (2014)

Green Lands, Blue Waters Conference (2013)

CIAS Apple Growers School (2013)

Plans and Reports

Multi-Year Plan of Work (**Exhibit 3**)

2013 Hazelnut Growers Conference Evaluation Example (**Exhibit 12**)

2015 Impact Indicators, Statistics (**Exhibit 14**) – Available for viewing at the UW-Extension Recording Results Website:

<https://intranet.ces.uwex.edu/tools/accountability/recording/SitePages/Home.aspx>

2015 Success Stories (Annual Accomplishment Report) (**Exhibit 15**)