

# The Risks and Rewards of a Seed-Based Strategy for the Midwest Hazelnut Industry

# Benefits of Growing Seed-Based Plants (Seedlings)

- Relatively cheap and easy to grow in a nursery
- Genetic diversity provides resilience and manages risk
- Saving seed from your “best” plants is empowering
  - Low capital cost
  - No fancy technology or tools required
  - Strong culture of seed-saving

**But Does It Work?**



**Growing plants  
from seeds is  
relatively cheap  
and easy  
compared to  
vegetative  
propagation**



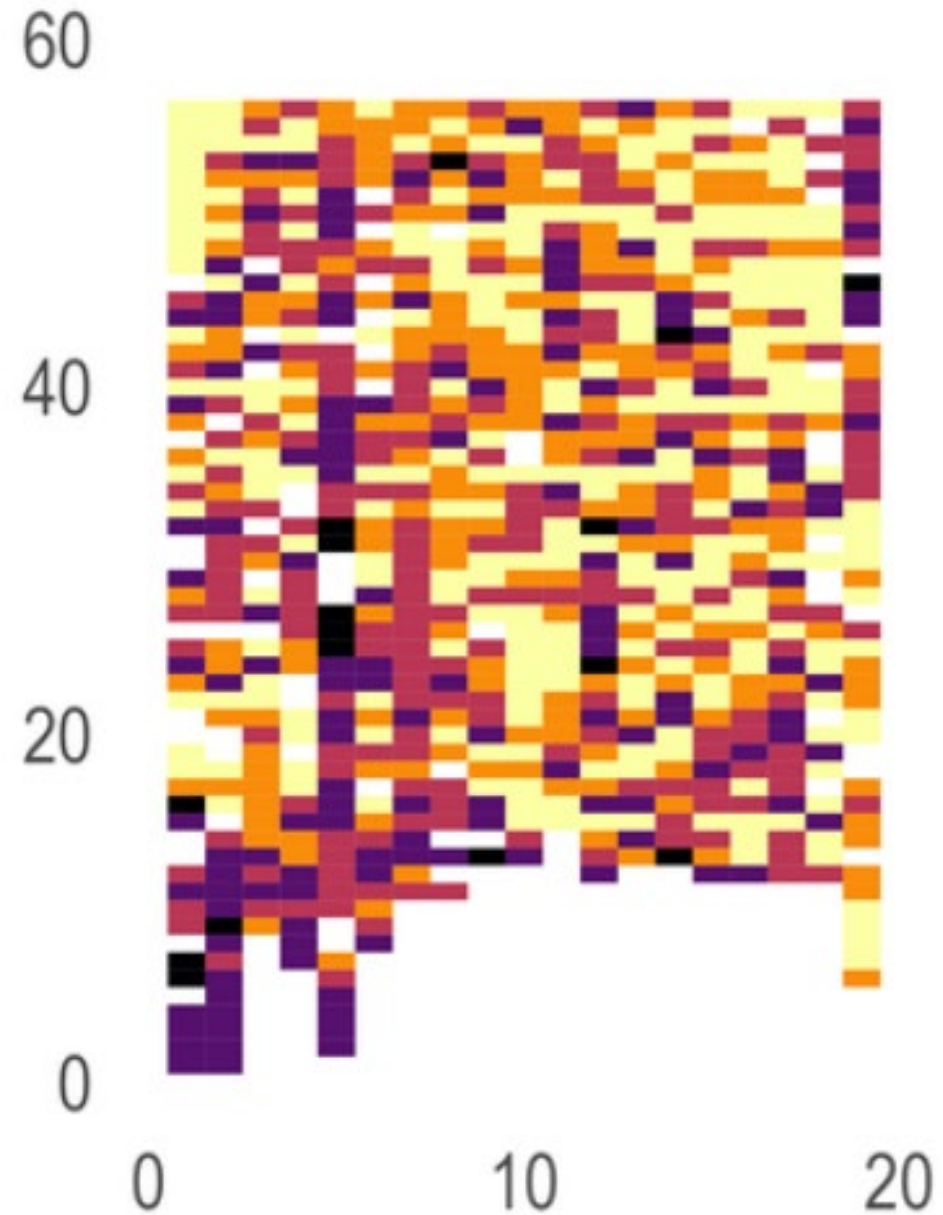
# Genetic diversity provides resilience and manages risk

**The risk of catastrophic loss in genetically identical clonal orchards is real, but “diversity” alone does not provide resilience.**





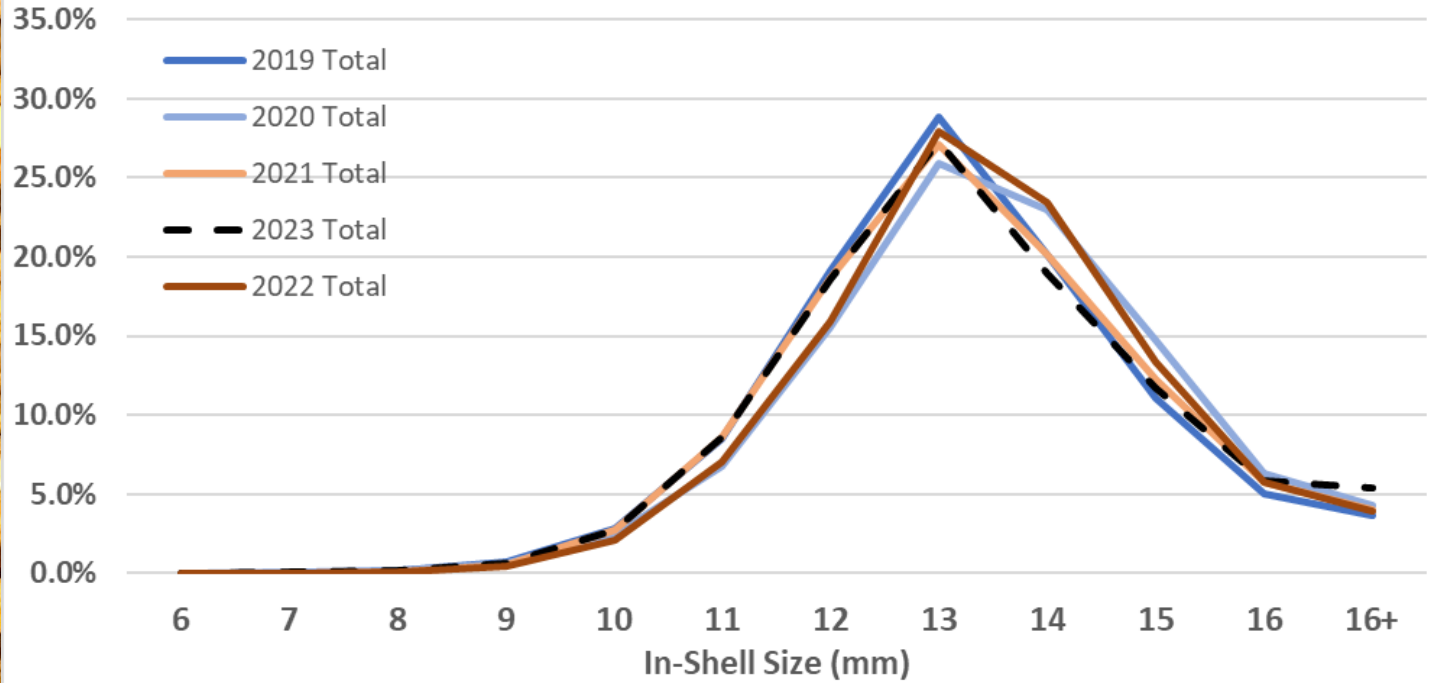
**BBM eliminated nut yield in 2020 in more than 50% of the plants in one of the Midwest's most diverse orchards. In other words, diversity alone isn't enough.**







## In-Shell Nut Size Distribution



	<b>lbs in-shell</b>	<b>in-shell lbs/ac</b>	<b>lbs kernel/ac</b>
LaCrosse `19	535	461	152
LaCrosse `20	810	698	230
LaCrosse `21	1252	1079	356
LaCrosse '22	1050	905	299
LaCrosse '23	1728	1490	492



# The Challenges of A Seed-Based Approach

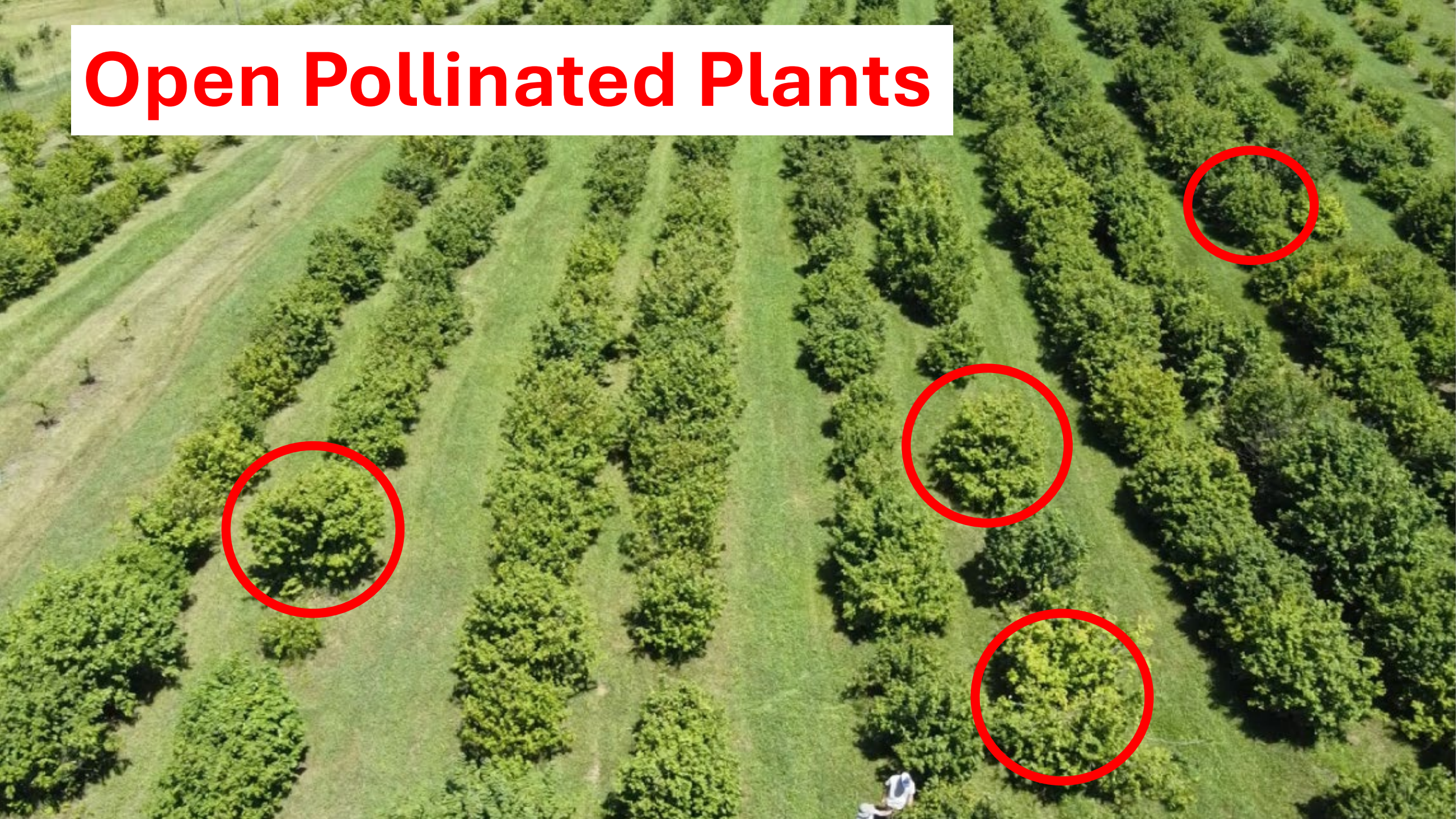
- How do we reach minimum average performance targets?
- What is the maximum amount of variation that is acceptable for given traits?
- What benefit does that variation provide and how do we know it provides it?



An aerial photograph of a vineyard with rows of grapevines. A red circle highlights a single plant in the lower-left quadrant. A white text box with red text is overlaid on the right side of the image.

# Half-Sibling Plants

# Open Pollinated Plants



# Half-Sibling OP Plants - Challenges

- We don't know a plant is "best" unless grown in multiple locations
- We don't know the performance of the offspring from a "best" plant because those plants have never existed before
- Open pollinated half-sibs will be different every year due to different fathers and random chance of recombination
- No way to guarantee minimum performance or maximum variation targets

# Minimize the Pollen Cloud and Test The Progeny



# Full-Sibling Plants



X



# Full-Sibling Plants - Challenges

- We don't know the parents are "best" until they've been grown at multiple locations in replicate (16+ year process)
- No way to guarantee minimum performance or maximum variation targets until the offspring have been grown at multiple locations (add another 8-10 years)
- Tools to aid parent selection (genomic prediction, markers) and minimize numbers of families to evaluate

**No One Can Do This Alone**

# Recommendations - Breeders

- Focus on saving seed from plants validated in replicate at multiple locations
- Utilize controlled crosses (full-sibs) to improve probabilities of reaching offspring targets
- If possible, genotype your plantings
- Continue looking for the top individual plants (a diverse mix of clones may be just as good as a mix of seedlings)



# Recommendations - Growers

- Determine a context and reason for growing your plants
  - Homesteader
  - Land Steward
  - Botanist
  - Commercial Grower
- Grow progeny families to aid breeders in finding seed lines that hit performance targets
- Demand high quality nursery stock

## Seedling-Type Plants

Hazelnut seedlings are, quite simply, plants grown from seed. Check out our [Grower Guide](#) and [Plants](#) pages to learn more about the different types of seedlings and the pros and cons of growing seedlings vs cultivars. Our nursery partners produce these seedlings and ship direct. Once your order is received we will contact you about delivery/pick-up. Delivery fees are charged separately.

Parentage, breeding, and provenance information is included with each plant in a four part code: Breeder-Parents-Breeding ID-Provenance.

**Breeder:** Name of the breeder

**Parent code:** FS=full-sibling, HS=half-sibling, OP=mix of seedlings with unknown parentage

**Breeding ID:** A breeding ID is a unique identifier provided by the breeder and is only included with FS and HS plants

**Provenance:** The geographic location of the seed source

**BUYER BEWARE:** Seedling-type hazelnuts are grown from seed, which means it's impossible to predict with 100% accuracy how any given seedling-type plant will perform. Expect variable yields, kernel quality, disease resistance, maturities, and plant size.

**Seedling-Type Plants Coming Soon**