



## The Original Colossal Chestnut Tree: The Story of the Mother Colossal

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*Photo Above: A view of the pollinator from the side of the Colossal – more about the house than the tree, but it shows the difference in trunk and branch structure.*

What I came to know as the “mother” Colossal chestnut tree is located on a property in Nevada City, CA. My wife at the time and I purchased the property with what was left of an old Victorian farmhouse in 1981 from a couple that had little interest in the trees or taking care of the land. We had no idea what the trees were, and I was working as a software engineer for Atari R&D in Grass Valley so had little time and of course no internet, to really get involved in the land.

In the Spring of 1982, a crusty old character by the name of Bob Bergantz and his wife Mary drove up and told us they had taken care of the trees for years and would like to continue doing so. Turned out this basically meant them harvesting

the chestnuts and me cleaning up the burrs and leaves and disposing of them. We actually developed a very nice relationship with Bob and Mary over the years, though he was always very secretive about what he did with the chestnuts. He taught us a lot, as there were 20+ very old fruit trees, apples and pears, on the property that we did our best to nurture and keep going. Bob and Mary often arrived with jams or dried fruit and once brought 4 or 5 bags of chestnut flour. We developed a bit of an interest in chestnuts, and Mary brought us a number of great recipes that I still use to this day: roasted chestnut soup, chestnut potato puree (fabulous!), chestnut torte, and others (find these recipes reprinted on page 5).

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# THE CHESTNUT GROWER

Fall 2021

## About Chestnut Growers of America, Inc.

The purpose of Chestnut Growers of America is to promote chestnuts, to disseminate information to growers of chestnuts, to improve communications between growers within the industry, to support research and breeding work, and generally to further the interests and knowledge of chestnut growers. CGA advocates the delivery of only high-quality chestnuts to the marketplace.

CGA began as the Western Chestnut Growers in 1996 in Oregon where about 30 or so chestnut growers understood the need to join forces to promote chestnuts in the U.S. Eventually they realized that they needed to be a national organization and solicited memberships from every grower in the country, which took the membership to over 100. The name of the organization was changed to Chestnut Growers of America, Inc., and it was granted 501(c)(5) status. Annual meetings take place around the country in an effort to make it possible for a maximum number of people to attend. A newsletter, *The Chestnut Grower*, is published quarterly and distributed by mail and/or email. CGA maintains an extensive resource site available only to members containing information helpful in growing and marketing. Visit [chestnutgrowers.org](http://chestnutgrowers.org) for more information.

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## Message from CGA President Roger Blackwell, Chestnut Grower



I hope your chestnut harvest season is going well. I am hearing that our growers are having a good year. We have challenges from pests such as the chestnut weevil, Asian gall wasp, bud rot, brown rot, chestnut blight, and other diseases I failed to mention. Hopefully, our

University associates can help us solve these problems.

In this message, I want to let you know the plans for the next annual meeting. We will be meeting jointly with NNGA and CGA. Our 2022 annual meeting will be in a new location, Penn State Berks Campus, Reading, Pennsylvania. The dates of the meeting are Sunday, August 7, 2022, through Wednesday, August 10, 2022. The changes are due to better prices for hotel rooms and meeting rooms available. This location will allow us to visit chestnut farms in the area. We will have more information in the winter issue for everyone's planning schedules.

In this newsletter is a Colossal story from Neill Allen concerning the history of this chestnut cultivar. We will be reading a portion of a report from the Savanna Institute, which is doing great work about chestnut trees in our environment. The final article in the newsletter is information on the Chestnut Improvement Network from Dr. Ron Revord, University of Missouri.

CGA wants to thank the individuals who have submitted articles for this newsletter, and I encourage others in our organization to provide articles for future newsletters. We are all learning something new each year about growing chestnut trees in orchards throughout the country.

I hope you all have a plentiful harvest in the fall 2021 and a wonderful holiday season.

Best regards,

A handwritten signature in blue ink that reads 'Roger Blackwell'.

Roger

# The Chestnut Improvement Network: A New Decentralized Participatory Breeding Program

By Ron Revord, University of Missouri Center for Agroforestry | [r.revord@missouri.edu](mailto:r.revord@missouri.edu)

The **Chestnut Improvement Network (CIN)** is a research collaboration between University of Missouri Center for Agroforestry (UMCA) and chestnut growers across the eastern and midwestern US. CIN's purpose is to formally represent growers in this collaborative breeding program, where seedlings populations and pedigrees are decentralized to diverse on-farm environments for evaluation and selection.

Over the past half-century, chestnut growers, enthusiasts, and scientists have collected, circulated, and evaluated a genetically diverse array of chestnuts to adapt cultivated forms to their respective environments. Many improved selections have been made from these early works and used to parent the current generation of seedling orchards in the eastern half of the United States. These seedling orchards support successful commercial opportunities and are in cultivation across an increasing number of geographies and climates.

Seedling orchards offer a basis for continued genetic improvement and selection within growers' environments. Over the past 15-years, the University of Missouri Center for Agroforestry

(UMCA) and select growers have made open-pollinated seed from the Center's repository and other elite on-farm selections available to growers – adding valuable structure and diversity to on-farm improvement. We now have an extraordinary opportunity to evaluate and select the next generation's breeding parents, landraces, and scion cultivars from these seedling orchards as they reach mature nut-bearing years.

In 2021, the UMCA and chestnut growers established the CIN to formalize on-farm evaluation and selection efforts as the beginning of a new decentralized, participatory breeding program. The network is designed to advance the next generation of progeny for cultivation in seedling orchards and so that growers are participating throughout the breeding process. Thus far, the network consists of 42 growers representing 11 states. In our first season, evaluations began on 284 elite grower selections for field traits (7), leaf morphology (5), nut quality (16), pests and disease (7). We expect CIN to have over 600 seedling trees under evaluation.

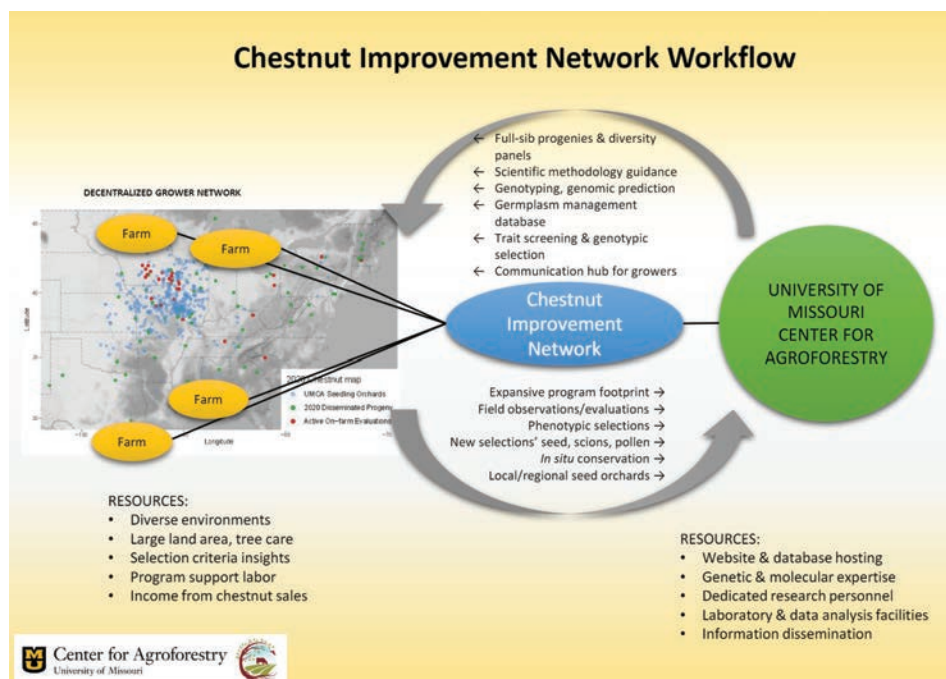
New pedigrees schemes will be designed based on these evaluations, in conjunction with EST-SSR fingerprinting

that resolve selection parentage and complex *Castanea* spp. ancestry. Preferred UMCA repository cultivars will be more systematically utilized based on learned ancestry and combining abilities. On-farm selections will be integrated into pedigrees where they lend themselves as improvements for participants' environments. The resulting offspring will be decentralized to network participants as the next generation's improved seedling orchards.

Starting in 2021, CIN expects to develop around 10,000 full-sibling seedlings annually. Network growers will benefit from early access to advanced selections and new seedling populations, and new plantings will continue to serve the dual purpose of production orchards and breeding populations as we seek to adapt our germplasm to on-farm target environments across this broad geography.

In 2022, CIN will be incorporated as a non-profit and subsequently pursue 501c3 status. CIN will have co-ownership of the plant material as intellectual property with University of Missouri. 🍓

To learn more about how you can be involved as a grower, see our FAQ at [centerforagroforestry.org/chestnut-improvement-network/chestnut-improvement-network-faq/](https://centerforagroforestry.org/chestnut-improvement-network/chestnut-improvement-network-faq/). See flyer on page 10 for PQQ chestnut seedling trees available for fall 2021 planting.



## Mark Your Calendars!

*For the 2022 Annual Meeting, a joint meeting with the Northern Nut Growers Association (NNGA).*

**August 7-10, 2022**

*Penn State Berks Campus, Reading, Pennsylvania*

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After a few years and a few dropped comments, I figured out that Bob was selling the nuts to Dave Wilson nursery. He had no association with either Dave Wilson or Fowlers nurseries as far as I knew but he did sell them the Colossal nuts he gathered – no idea what price he was getting but he was very careful not to tell us much of anything. He even asked us to sign a contract committing to give or sell him the nuts and no one else.

We learned that the two trees, the “Pollinator” as he called it (though he slipped up a few times and called it the “Nevada” tree) and the Colossal were likely planted by Felix Gillett in the late 1800s from the Baron Hill nursery he owned in Nevada City, later renamed the Gillett nursery after his death. The old location is behind the most beautiful Victorian in Nevada City. The home was originally built and owned by Benjamin Tenella, who planted all the fruit trees as well. A few of the very old trees died, as they were barely alive when we got there and likely close to 100 years old. Bob often said he felt the Pollinator was critical to getting a good crop of Colossal nuts, and I wondered if the tree in the pasture, a few hundred feet away, would ever produce a good harvest. Never really got to find out though.

I tried to plant some other trees, and I believe there is one from a Colossal seed still growing in the pasture to the west of the driveway. It was the only one that made it, as I wasn’t much of a farmer, and it takes constant diligence to do it well. I



*Figure 1. This is the mother Colossal; photo taken in probably the late 1990s.*

purchased an old used white rototiller and was attempting to till the fenced garden area, which seemed like a hell of a lot of work. Bob watched what I was doing one day and showed me how to tie bungee cords and a strap to the tiller so I could just lean back and easily control it by leaning back and pulling it into the ground – it worked really well! Though he did mention to wear heavy work boots, which made very good sense when I realized one slip and a foot could go into the tiller since I was somewhat tied into the tiller – never happened. Then one day I measured the



*Figure 2. This is the tree Bob called the Pollinator or sometimes the “Nevada” tree.*

garden area, and it was 80 by 80 so I was working a 1600 sq. ft. garden as a weekend warrior – we ended up with some pretty wonderful harvests some years.

Bob had some health issues in the 90s, so we didn’t see him much after that, and I moved on in 1998. My ex-wife got the property, which she sold in about 2003. We restored the house and cared for the property over those 20 years.

I don’t know that Bob ever planted any trees in the Nevada City area. He was living in Placerville and may have planted some there. By the late 80s, Dave Wilson nursery was propagating their own nuts and didn’t need Bob’s supply anymore. It’s interesting looking online that there is a variety called the Bergantz – he never mentioned planting, hybridizing or doing anything other than just selling the nuts. It’s likely that’s just the nuts from the mother Colossal.

Another local character you might enjoy researching is “Amigo Bob” Cantisano. He was one of the very early proponents of organic farming and created a nursery north of Nevada City that specialized in old varieties of apples and fruit trees, and he actually helped found California Certified Organic Farmers. There is a great story in one of Michael Chiarello’s cookbooks, who is a top chef here in Napa now. He devotes a full page or so about how he and friends in the 70s or 80s were trying to figure out organic farming and natural produce. They found Amigo Bob, and he came down to consult. This long-haired hippy shows up and begins to really educate these guys on how to plant, grow, and produce biodynamic and organic products. Sounds like Amigo Bob taught them a lot! Bob passed away from cancer just a year or two ago, though the nursery still produces catalogs. There’s a lot online about him.

These pictures are the best I have, and I hope you can at least get a feel for the leaf structure and trees. My ex-wife sent me a picture of the Nevada tree, now just a stump, which was, even after 20 years gone, a real gut-punch. Having spent thousands of hours caring for the yard and trees, restoring the house to better than old glory, gathering chestnuts each year, the Bartlett pears throwing so much fruit we had to call the gleaners (yes, there were still gleaners in Nevada City), it’s very painful to see it all ignored, some trees



Figure 3. This is a view from the porch of both trees, the pollinator on the left and the Colossal on the right.



Figure 4. A view of the interior of the Victorian.



Figure 5. The end...

dying, some dead. Nothing lasts forever, and no one will ever care for the trees as we do, so revel in those moments in the orchard, a few minutes of time with trees, a sunrise or sunset with the quiet. There are shoots coming from the stump of the Nevada tree, so maybe, just maybe, it too will come back someday. 🍷

Enjoy these recipes from Mary Bergantz. As with all recipes one must adjust to their liking and taste. I make the soup often and the chestnut potato puree was a HUGE hit last fall. And just to give it a bit of true Napa style humor, they could be paired with an Italian Quintarelli Amarone or one of my favorite Blue Farm Pinot Noirs :-)-Neill

## Roasted Chestnut Soup

- 1 lb raw chestnuts in shells
- 4 Tbsp unsalted butter
- 3 Tbsp chopped bacon
- 3 Tbsp chopped prosciutto
- 1 large yellow onion, chopped
- 1 carrot, peeled and chopped
- 3 ribs celery, chopped
- 1 tsp dried thyme
- 1 tsp dried chervil
- Salt & pepper
- 1 c dry white wine
- 6 c chicken broth, preferably homemade
- 1 c milk
- 1 c heavy cream
- ½ c brandy

1. Preheat oven to 400° F. Cut slashes on the flat side of each chestnut. Roast until both outer shell and inner skin can be removed easily. Let nuts cool, then shell with paring knife.
2. Melt butter in a large pot over medium heat. Add the bacon, prosciutto, onion, carrot, celery, thyme, chervil, and salt and pepper to taste. Saute until the vegetables begin to soften, about 10 minutes.
3. Add the wine and stock. Stir in the chestnuts. Heat to boiling. Reduce heat and simmer uncovered 45 minutes. Remove from heat and stir in milk, cream, and brandy.
4. Puree the soup in batches, processing in a blender until very smooth.
5. Pour into a clean pot, taste, adjust seasonings, and gently heat soup until it is hot. Do not boil.
6. Ladle into small bowls and garnish. Serve immediately.

## Chestnut & Potato Puree

- 2 lbs chestnuts
- 2 c potatoes, peeled and diced
- 12 Tbsp sweet butter
- 1/3 c crème fraiche or sour cream
- 1 egg
- 1 egg yolk
- 4 Tbsp Calvados (apple brandy)
- 1 tsp ground cardamom
- Salt
- Pinch of cayenne pepper

*This dish can be made ahead and refrigerated, and then baked before serving. Serve with beef, pork, or game.*

1. Roast or microwave chestnuts. Peel outside and skins off nuts and place in pot. Cover with water or chicken broth and boil until very tender.
2. Puree chestnuts with a small amount of the broth used for cooking in a food processor until a smooth puree. Transfer to a mixing bowl.
3. Cover potatoes with salted water and cook until tender. Drain well.
4. Mash the drained potatoes until smooth with 8 Tbsp butter. Transfer to the bowl with the chestnut puree.
5. Whisk in crème fraiche or sour cream, the whole egg and yolk, the Calvados, cardamom, 1 ½ tsp salt, and some cayenne pepper.
6. Smear a 1 ½ qt souffle dish with some of the remaining 4 Tbsp butter and spoon puree into it. Dot top with remaining butter and bake in a preheated 350°F oven for 25 minutes before serving.

## Fresh Chestnut Torte (“Torta di Castagne”)

*An old Italian recipe, according to Italian cookbook author Giuliano Bugialli. One of the dishes of the more than thousand-year tradition of Italy’s Jewish communities, in continuous existence since Roman times. This is a very delicate, rich, and unusual torte for dessert or coffee.*

- 2 lb fresh chestnuts
- Salt
- ½ tsp fennel seeds
- 3 Tbsp sweet butter
- 7 eggs
- ½ lb granulated sugar
- 3 Tbsp powdered sugar

1. Soak chestnuts overnight in a large bowl of cold water, then drain. Bring a large stockpot of salted water to a boil, then add
2. Melt the butter in the top of a double boiler over hot water and let cool for about 10 minutes. Add the cooled butter to chestnut puree and mix well.
3. Separate 4 of the eggs, placing the whites in a copper bowl and the yolks in a large crockery or glass bowl. Add the remaining 3 whole eggs to the yolks along with the granulated sugar. Still well until all the sugar is incorporated and the eggs turn a lighter color. Add the egg-sugar mixture to the chestnuts and mix thoroughly.
4. Butter a 12-inch layer cake pan. Beat the egg whites until stiff. Gently fold the stiff egg whites into the chestnut mixture and transfer to prepared pan. Bake in a preheated 375°F oven about 1 hour. Transfer the torte to a rack and cool completely.
5. Sprinkle torte with powdered sugar. Serve cooled at room temperature. Add a dollop of whipped cream if desired.

# Bottlenecks Limiting Eastern US Chestnuts and Priority Strategies to Overcome Them: Scaling Up the Supply Chain

By Bill Davison, Kevin Wolz, Keefe Keeley, and Patrick Michaels, the Savanna Institute, Madison, WI

This article is excerpted with permission from the report *Overcoming Bottlenecks in the Eastern US Chestnut Industry*, published by the [Savanna Institute](http://www.savannainstitute.org/wp-content/uploads/2021/06/2021-SI-Chestnut-report.pdf). The full report can be found at [www.savannainstitute.org/wp-content/uploads/2021/06/2021-SI-Chestnut-report.pdf](http://www.savannainstitute.org/wp-content/uploads/2021/06/2021-SI-Chestnut-report.pdf).

Profitable commercial chestnut production is possible now with existing cultivars and management protocols. However, significant barriers exist to scaling up chestnut production across the region. These barriers include:

1. Scaling up the supply chain
2. Variety development
3. Research & development

This article will address barrier #1, *scaling up the supply chain*.

## Part 1: Investment Capital for New Chestnut Farms

**Key Need:** *Securing investments that are tailored to perennial cropping systems to facilitate transitioning the industry to professional management.*

Family farms in the Midwest that contain soils suitable for chestnuts provide an opportunity to introduce agroforestry and diversified production to current landowners. Perennial, permanent crops typically present significantly higher income to farmers and investors than row crop systems. From 2003 to 2013, for instance, permanent crop income in the U.S. averaged an annualized return of 12.2%, compared to just 4.5% for annual crops. However, permanent crops also present risks associated with the multi-year lag between establishment and the break-even point. These risks have limited investments and led to a fragmented and inefficient perennial crop food system that is poised for growth. An expanding middle class and strong demand for healthy foods is driving sales of tree crops, and this presents an opportunity for transitioning an inefficient market to professional management across the value chain.

One acre of chestnuts is estimated to cost ~\$2,500 to establish in year 1. The total cost over the first five years is ~\$5,000 per acre. An acre of chestnuts will ultimately generate an average annual net income of ~\$2,000-\$10,000. Small scale farms that have u-pick operations near urban centers and sell direct to consumer can



realize higher returns, while larger scale commercial production tends to achieve lower net returns per acre. With this level of profitability, a ten-acre chestnut orchard can support a family and provide a middle-class income. Chestnut orchards can also diversify income streams as part of larger farm operations that have other established enterprises. While production starts around year 6, farmers will have incurred substantial costs by that time and will not break even on their investment until at least years 10-12. Such an investment could provide a 20% IRR over 30 years. However, the initial capital outlay and revenue lag is prohibitive for most farmers and landowners.

Few existing mechanisms in the Midwest farm credit system can truly help farmers overcome this hurdle at scale. Although revolving loans exist, the current regulatory environment requires an annual principal repayment. “Evergreen” loans have been offered in the past, allowing for an interest-only feature up to three years, but not beyond this.

Consequently, farmers looking to switch from row crops to perennial crops have opted to do it gradually over many years.

A gradual transition, however, does not benefit from any economies of scale and can actually result in the farmer incurring much higher expenses compared to transitioning all at once.

New funding mechanisms are needed that allow farmers to take on more risk and convert a larger amount of their land to perennial crops at once. These funding mechanisms should:

- Provide enough funding to cover capital and operating expenses during years 1-5
- Provide livelihood support to farmers during the same period if needed
- Not require principal payments until cash flows can finally be generated

Given that these new funding mechanisms would transfer some of the execution risk away from farmers, an equity funding mechanism would likely be more appropriate than a debt funding mechanism. Equity funding means each stakeholder that onboards additional risk would be compensated by owning a portion of the investment. In contrast, debt funding puts the majority of risk onto the borrower and not the lenders.

Farmstart LLP, a spin-off partnership between several farm credit agencies, is attempting something close to this, although at a relatively small scale (<\$50,000). Capital is provided to beginning farmers up front and is expected to be repaid in year 5—whether through cash flows or via rolling over into a regular loan. The mechanism is similar to an operating line of credit.

In the Oregon hazelnut industry, another fairly common approach is for investors to buy land and fund orchard establishment and maintenance until yield begins. Then, investors recoup the initial investment by selling the farm to hazelnut farmers. This allows farmers to enter the equation once the yield lag and high-risk period has ended.

For Midwest chestnuts, a dedicated private equity vehicle following a “buy-develop-sell” business model similar to the Oregon hazelnut industry could effectively expand planted chestnut acreage. In contrast to single-property development efforts by independent investors, a coordinated private equity strategy would enable greater economies of scale – both in farm operations and markets – and would help diversify execution and geographic risk. Farmers purchasing mature chestnut operations would benefit from reduced risk and immediate ongoing cash flows. Given the early stage of the U.S. chestnut industry, the most likely sources of capital for such a private equity vehicle would be impact investors and other forms of patient capital.

Revenue-based loans could also help bridge the farmer’s financing gaps. In this instance, investors would make a loan to the farmer with a repayment schedule tied to the borrower’s revenue. The loan is fully repaid when cumulative payments reach an amount equal to the capital contributed, plus accrued interests. This instrument would include a maturity date that allows time to make the transition to perennials. Investors often get a security interest in the borrower’s assets. However, unlike traditional loans, that security interest might consist primarily of intangible assets (e.g., accounts receivable), and there may be no requirement for a personal guarantee.

In the case of eastern U.S. chestnuts, if an entity were to finance 80% of capital needs via a revenue-based loan with a 10% interest rate, and assuming 75% of cash flow as a repayment rate, such a loan would take 14 years to be repaid. That said, it is possible that traditional lending mechanisms would become available as cash flows start to be generated by the enterprise in year 6. Traditional loans could then be provided with terms up to seven years and interest rates at 6.0-6.5%. The biggest variable of such loans would then be in the loan to value ratio (LTV) that the regional bank would be willing to provide. For high certainty cash flows, farmers could be offered an LTV as high as 80%, while for crops with lower market certainty, LTVs in the vicinity of 50% would be more likely.

## **Part 2: Nursery Infrastructure**

**Key Need:** *Develop a network of regional*

*nurseries, brokers, and cooperatives to foster growth and development of the chestnut industry.*

The largest tree nurseries selling known cultivars of chestnuts that serve the Midwest include: Forrest Keeling Nursery, Stark Bros Nursery, Red Fern Farm, Empire Chestnuts, Oklahoma Chestnut, and Chestnut Hill Nursery. These nurseries supply the majority of chestnut trees planted in commercial orchards in the Midwest. The state of Michigan is unique in that they are under quarantine to prevent gall wasp importation, and they focus on growing grafted Japanese/European hybrid chestnuts. Farmers in Michigan purchase trees from Forrest Keeling and nurseries on the west coast. These include Washington Chestnut Company and Burnt Ridge Nursery. There are also large wholesale nurseries and smaller scale regional nurseries supplying farms in the Midwest and on the East Coast.

Each of the primary nurseries serving the Midwest faces a variety of challenges meeting existing demand and planning for future growth. Challenges impacting all nurseries include a limited supply of high-quality seed and underdeveloped infrastructure that leads to difficulties generating a profit from the sale of trees. In addition, many nursery owners are at or near retirement age, and some do not have a clear succession plan. Forrest Keeling is one of the largest nurseries selling chestnut trees, but they are primarily a native plant nursery, and 99% of their business is based on selling native plants. The state of Missouri recently categorized Chinese chestnuts as an invasive species, and this change could potentially impact their decision to continue to produce Chinese chestnut trees. Chestnut Hill Nursery is based in the South, and they produce Dunstan chestnuts, which are not well adapted to northern states. In addition, many of their trees are planted by hunters that use them as food plots for deer.

Nursery owners have reported strong demand for their trees and Forrest Keeling Nursery sells out of trees before they start grafting, and they have to turn down a lot of orders. The estimated total number of trees produced by the primary nurseries serving the Midwest is 40,000. This represents a combination of potted and bare root trees. It takes between 50 and 220 trees to plant an acre depending on

the tree spacing and whether the trees are overplanted to allow for thinning or planted at their final spacing. Consequently, the 40,000 chestnut trees produced annually can plant between 180-800 acres.

If 20-foot by 20-foot spacing is used as an approximate midpoint and reasonable scenario, this leads to 40,000 chestnut trees being planted on 367 acres. An additional point to consider is that there are a variety of complex biological and social factors that contribute to tree mortality or trees being used for personal use. This means that it is highly likely that the number of acres of chestnuts that are planted annually that will end up as commercially viable orchards is less than 367 acres. When you account for all the stressors on trees and farmers and mistakes made in planting and managing trees, it is reasonable to conclude that the initial plantings shrink over time due to these factors.

This leads to an estimated 200 acres of chestnut trees that are planted annually in the Midwest that end up as commercially viable orchards. These 200 acres are being added annually to the existing 4,000 acres of chestnut orchards in the U.S.

Scaling up nursery capacity can be accomplished in several ways, including: (1) increasing production at existing nurseries by providing loans and investments, (2) developing new nurseries, and (3) developing partnerships and contracts with existing tree nurseries that currently do not sell commercial cultivars of chestnuts. Many large-scale wholesale nurseries exist that own hundreds of acres of land and have the infrastructure and expertise to grow trees. These companies could grow under contract and produce chestnut trees for commercial production. One example of a candidate for this is Cold Stream Farm in Michigan. They are a wholesale tree nursery that currently produces Chinese chestnut trees.

## **Part 3: Seed Production Orchards**

**Key Need:** *Produce large quantities of high-quality full sibling seeds from the best combinations of parent trees.*

Seed production orchards composed of carefully selected grafted trees are needed to produce large quantities of high-quality seeds. The current supply of high-quality chestnut seeds is largely produced at the University of Missouri’s Horticulture and

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Agriculture Research Center (HARC) outside of Columbia, Missouri. Their seeds are produced by grafted trees of known cultivars that have been trialed and evaluated for commercial viability. However, their seeds are the product of open pollination, and the pollen parent is not known.

Depending on this single source for quality seed is a major bottleneck for scaling up the industry. Demand for these seeds exceeds the supply, and weather stress and limited staffing have reduced availability and quality in some years.

High-quality seeds with known parentage will allow breeders and farmers to learn which crosses make the most valuable and productive offspring. This work will complement the genetic analyses that are ongoing and provide a better understanding of how each species and cultivar interacts with other species and cultivars. These orchards would be dedicated to seed production, and they would have a roughly twenty-year lifespan. Ideally, they would be planted on well drained acidic soils in zone 6 or 7 and would be well-managed to ensure they meet the goals of producing high quality seeds. Many experts consider Missouri to be the best location for seed production orchards. Controlled crossing would be achieved through orchard design and layout and the resulting seeds would have a known parentage from parents with valuable traits. These seeds would then be used to establish orchards with improved seedling trees.

This bottleneck can be overcome by investing in people and infrastructure to establish well managed seed production orchards. Investments in the existing HARC orchard and the Center for Agroforestry is one option along with creating a new business that is focused on this important work.

#### **Part 4: Post-harvest Infrastructure**

**Key need:** *Develop a network of chestnut aggregators and associated supply chain infrastructure to support growth in the industry.*

Post-harvest infrastructure has proven to be a key asset that has helped stimulate growth in the chestnut industry. Most farmers are used to growing and selling commodities that they deliver to a central buyer. Providing this same service for

chestnuts facilitates more farmers planting chestnut orchards.

There are existing chestnut aggregators in Ohio (Route 9 Cooperative), Michigan (Chestnuts Growers, Inc.), and Iowa (Prairie Grove Chestnut Growers). Collectively, they currently work with 104 farmers and sold 342,590 pounds of fresh chestnuts in 2018, 188,454 pounds in 2017, and 322,473 pounds in 2016. Assuming an average yield of 2,000 pounds per acre, the 342,000 pounds sold in 2016 could be produced on 171 acres.

Investing in chestnut supply chains and producing value-added products that appeal to U.S. consumers could support the development of new potential markets. This level of production would require a dramatic increase in the scale and sophistication of infrastructure to handle the increased capacity and diversity of products.

Developing robust regional food system infrastructure in areas well-suited to growing chestnuts would help drive growth in the industry. This infrastructure would ideally develop in tandem with increased production. Expanding existing infrastructure can work as a near-term approach to scaling up production. Loans and investments in existing businesses can increase their capacity, but investments in new businesses will be required to supply the quantities needed to meet existing U.S. demand for chestnuts. Once a certain level of production is reached, the mid-stream infrastructure can become more sophisticated and diversified and capture more value by targeting new markets and developing new products that align with modern consumer trends for healthy convenience foods.

#### **Part 5: Farmer Training**

**Key Need:** *Highly skilled chestnut growers using professional management at scale to create profitable businesses.*

A deficit of skilled farmers trained in tree crop establishment and management is a core bottleneck holding back the widespread adoption of tree crops in general. This problem is further compounded for emerging crops like chestnuts, where unfamiliarity increases farmer hesitation. Professional management applied at scale is a key need to realize the higher returns perennial crops are capable of delivering.

Michigan, the leading producer of chestnuts in the U.S., was able to increase production quickly due to the existing population of highly skilled farmers that have been managing orchards across the state for generations. These farmers were already working closely with Michigan State University and the Extension Service and when MSU started providing training and support for chestnut growers. That support was key in catalyzing the industry.

However, even under these promising conditions, there are growing pains and challenges with chestnut production in Michigan. Lessons learned in Michigan can help inform a broader effort to train farmers across the Eastern U.S. in efficient and profitable chestnut production. Combining best practices from chestnut producing regions around the world with the diverse management approaches developed at the University of Missouri's Center for Agroforestry, Red Fern Farm in Iowa, and Route 9 Cooperative in Ohio would provide a solid template for farmer training and development.

While farmer training programs are common for annual vegetable production, they are nearly non-existent for tree crops and other perennials. The Savanna Institute piloted a farmer training and apprenticeship program during 2019 and 2020 focused on agroforestry and tree crops – the first of its kind. In subsequent years, a chestnut-focused version of the program should be established.

#### **Priority Strategies to Overcome Bottlenecks Related to Scaling Up the Supply Chain**

**Strategy 1:** *Private Equity Vehicle for Investment in Chestnut Farms*

The small scale of existing chestnut operations – typically less than 10 acres – limits the perceived viability of chestnuts as a commercial crop. A private equity vehicle would be able to establish commercial chestnut operations at a larger scale. The establishment of 50-acre chestnut farms in key geographies across the Midwest would send important market signals to farmers, lenders, and food product companies, while generating a fair return for investors. By deploying this capital in partnership with diversified family farms, through a structure such as “equity in trees” or other creative financing opportunities, such an investment vehicle would be able to leverage farmer networks



to augment its impact while setting up a future exit opportunity on a shorter time scale than the productive life of the trees.

Establishing 50 such operations across the Midwest on this model would plant 2,500 acres of chestnuts and would require \$12,500,000 in capital – a mix of equity and debt – over seven years. An investment term of 10-15 years would be sufficient to bring the trees to maturity, begin to generate returns from the crop, and execute on a structured exit to the diversified family farm partner. Further partnerships between impact investors and agricultural lenders could leverage a large conventional capital base with innovative mechanisms. For example, conventional lenders may be willing to offer long-term or revenue-based loans to a well-capitalized investment vehicle, allowing these lenders to get comfortable with these crops and time scales at reduced risk, enabling a broader base of farmers to access these financial products in the future.

### **Strategy 2: Scale Up Nursery Production**

Scaling up nursery production is dependent upon increasing the scale of chestnut seed production. Scaling up nursery production from the existing ~40,000 trees produced annually to the needed 9.6 million trees needed to satisfy potential domestic markets will require a multi-pronged approach to both (1) scale up existing chestnut nurseries (e.g., Empire Chestnut, Forrest Keeling Nursery) and (2) encourage new wholesale nurseries (e.g., Warren County Nursery) to start producing chestnut seedlings.

The nature of the business requires that nurseries take enormous risk by allocating/expanding infrastructure and planting out seeds 1-2 years in advance of sales, without certain knowledge of actual demand. Private investment and/or debt to expand nursery infrastructure and cushion nurseries during sporadic transition years will be key to enabling the industry to scale up plant availability. Transition debt could be relatively short-term, with expanded nursery profits over 3-7 years enabling repayment.

### **Strategy 3: Establish Seed Production Orchards**

There are not enough seeds from top parent trees to supply nurseries as they scale to produce the needed 9.6 million trees over the next decade. These seeds

should be produced by vetted high-quality grafted parent trees. New grafted-tree orchards need to be established to produce this high-quality seed.

Because the produced seed will also be of high genetic value in developing the next generation of top cultivars, routing this investment through the Savanna Institute as a recoverable grant will allow the genetic IP to remain protected in public trust and, ultimately, potentially fund long-term breeding in the public sector.

The investment should be distributed across several orchards to hedge risk associated with climate and disease. Furthermore, due to the sensitive nature of the genetic IP, the orchards should be established on owned land. Due to the temperamental nature of grafted Chinese chestnut trees in northern climates, these seed production orchards should be established no further north than St. Louis, Missouri.

### **Strategy 4: Nut Aggregation, Processing and Marketing**

Modern, efficient, and high-functioning infrastructure is needed to support the development of a viable commercial industry for chestnuts. Ideally, this infrastructure would be based on cooperative business models capable of supporting small-scale farms. Efficient post-harvest infrastructure is needed to produce peeled and frozen chestnuts, dried chestnuts, and chestnut flour. These products are necessary to reach mainstream American consumers whose diet is largely composed of processed foods. Investment can be made into existing entities (e.g., Route 9 Coop, Chestnut Growers Inc., Prairie Grove Chestnut Growers) or via a new entity. Recent conversations with the largest natural cracker and baking mix company in Chicago have prompted the Savanna Institute to outline different scenarios for supplying them with chestnut flour and peeled and frozen chestnuts. This company plans to release products made with imported chestnut flour in 2021 and they intend to source local chestnut flour in the future.

A chestnut processing and marketing company could operate initially by purchasing imported chestnuts and processing them for buyers. The presence of this company would confer legitimacy on the chestnut industry and stimulate

production. This would lead to a larger domestic supply. Approximately 25% of annual harvests in the Midwest are composed of small chestnuts. These have limited value in the current marketplace and sell for approximately \$1.30 per pound. These small chestnuts could be used as an initial source for local chestnuts for processing.

### **Strategy 5: Take Over for Retiring Farmers of Mature Chestnut Farms**

Like most farms, existing chestnut orchards are owned by an aging population. Many chestnut orchard owners are at or near retirement age. This presents an opportunity to build upon their work and to facilitate a transition to the next generation of chestnut growers. A typical mature chestnut orchard is 10 - 30 acres with a combined value of the land and trees of \$10,000 - \$15,000 per acre. Thus, each chestnut operation could be acquired for \$100,000 - \$450,000 if the chestnut orchard was purchased separately from the broader farming operation of which it is a part. Additional acreage could be used for further chestnut expansion or incorporated into a diversified farming operation. This transition can be accomplished by working with an existing real estate vehicle like SILT or Iroquois Valley Farmland to buy the orchards. There are an estimated 10 -20 mature chestnut farms whose owners will retire in the coming years, providing an investment opportunity of roughly \$3,500,000.

### **Strategy 6: Farmer Training**

A key bottleneck limiting chestnut production is the lack of high functioning teams of people capable of professionally managing large chestnut orchards. Professional management applied at scale is key to moving the industry forward and transitioning chestnuts from a specialty crop to a staple crop. In order to effectively train these teams, investments are needed to create and disseminate information through field days and existing venues like conferences and winter seminars for groups like Certified Crop Advisors. In addition, new partnerships should be developed between the business community and farms to ensure that farms operate as viable businesses. Training and recruitment should put a priority on new farmers and provide them with comprehensive support to overcome social, financial, and agronomic challenges. ●

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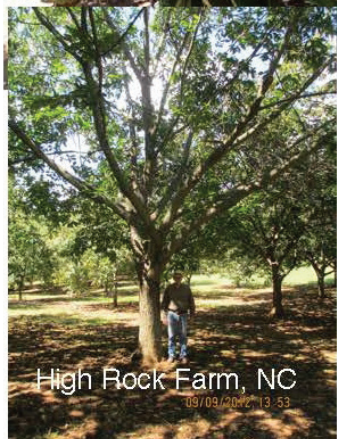
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