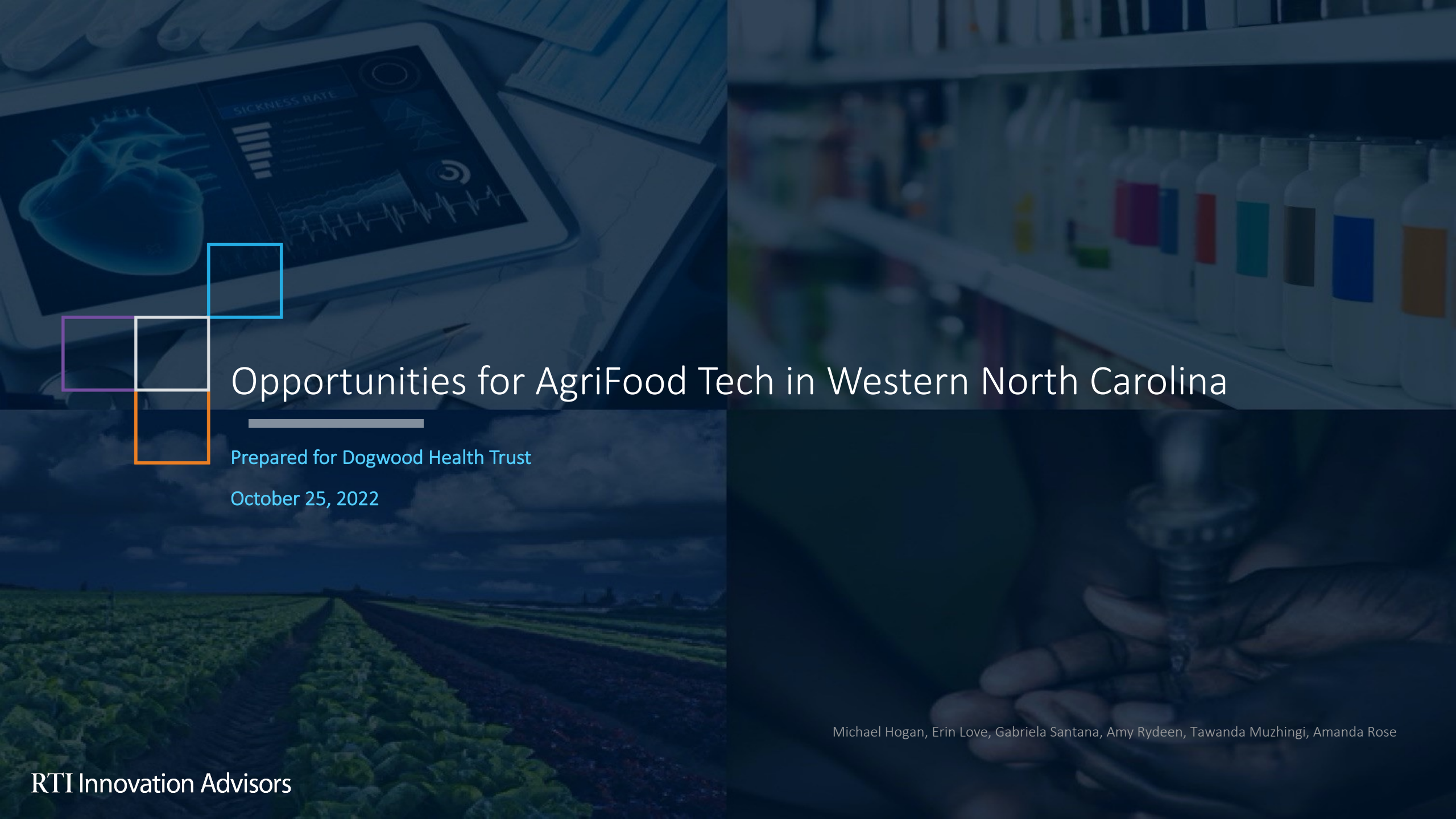




Opportunities for AgriFood Tech in Western North Carolina

Prepared for Dogwood Health Trust

October 25, 2022

Table of Contents

1	Summary and Recommendations
2	Climate Resilient
3	Value Added
4	Closed Loop
5	Appendix: Western North Carolina Agricultural Assets & Differentiators

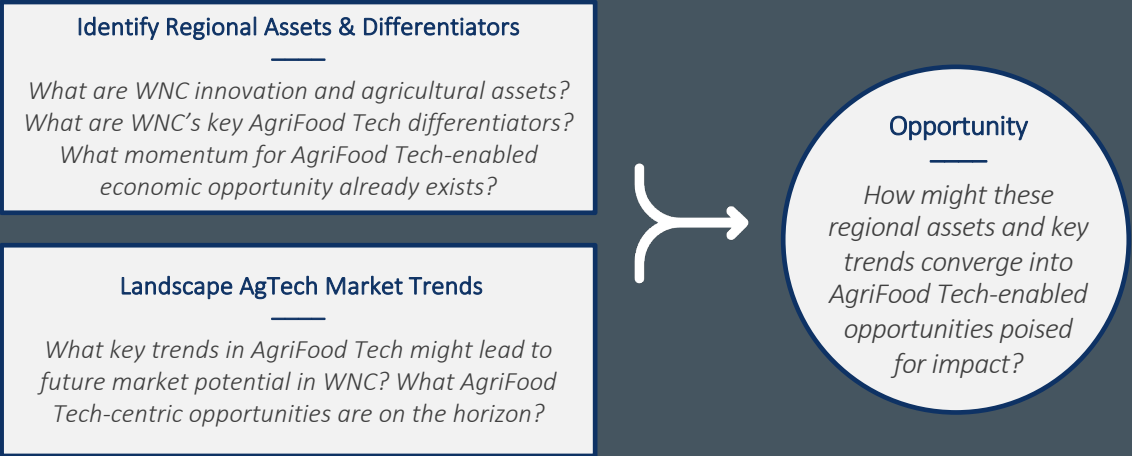
Summary and Recommendations

Focus of this report

This report represents an **agriculture and food technology (AgriFood Tech) opportunity assessment** in the context of exploring new pathways for economic opportunity in Western North Carolina (WNC). The assessment brings forward two key perspectives:

- 1. **AgriFood Tech for new business growth:** Opportunities to create, attract, and grow AgriFood Tech-enabled businesses in WNC, thus creating pathways to new, high-quality jobs and other economic opportunities for the region.
- 2. **AgriFood Tech for on-farm and value-chain gains:** Opportunities to unlock latent productivity, quality, efficiency, safety, and/or other gains on farms and within priority agricultural value chains in WNC, thus creating pathways to build rural wealth.

Report
Methodology:



This report is...

- A good faith effort to identify AgriFood Tech-enabled opportunities that balance *feasibility* and *impact potential*.
- Rooted in stakeholder perspectives.
- A starting point to drive further collective visioning and stakeholder engagement.

This report is not...

- An exhaustive inventory of AgriFood Tech assets and opportunities in WNC.
- A comprehensive assessment of AgriFood Tech systems in WNC.
- A quantitative market sizing or valuation exercise.

Executive Summary



As economic development proponents in WNC eye the future, questions loom large for how to equitably and inclusively foster opportunity in rural communities alongside their urban counterparts. Agriculture — a foundational sector for employment, income generation, and cultural identity in rural communities — stands out as a potential entry point for promoting transformational change in rural WNC. The region's unique agricultural footprint, diverse microclimates, nature-based tourist destination brand, and other assets provide a rich starting point for imagining these agriculture-centric opportunities. Asheville's stature as a tourist destination — attracting approximately 11 million tourists contributing \$2+ billion in sales to the local economy annually¹ — provides the region with a unique, perhaps singular, market context in which to practice value-added agriculture amidst customers who are willing and able to pay higher market prices.²

Additionally, exciting AgriFood Tech innovations and trends provide more options for experimentation and accelerated progress than any other time in history. However, AgriFood Tech investors and entrepreneurs have yet to design an AgriFood technology suite that works for small-scale farmers. With sufficient vision, energy, and resourcing, Western NC is positioned to seize this market leadership position. Three AgriFood Tech-enabled opportunities stand out for WNC:

1. Promoting on-farm climate resiliency to prepare farmers to thrive amidst uncertainty, thus offering a path to on-farm prosperity and rural wealth creation.
2. Diversifying and growing WNC as a recognized leader in natural and other value-added products to build high-quality jobs in food value addition in alignment with the region's broader nature-based economy.
3. Catalyzing WNC as a luminary of circular economic development, anchoring in closed-loop AgriFood and textile sectors.

Each opportunity features multiple technology and complementary levers of change that, when integrated in a holistic fashion, promote rural economic opportunity and wealth creation. Seizing these opportunities, however, requires creativity, optimism, commitment to collective action, and alignment of resources and support toward shared goals. Dogwood Health Trust, a regionally focused philanthropy committed to nurturing generational change for WNC, is ideally positioned as a *convener, network builder, funder, and storyteller* to help WNC fully capture the opportunities.

The Vision

A vibrant and community-led AgriFood Tech system that safeguards the region's natural resources; **reflects community values** of hard work, self-sufficiency, and creativity; and **proves resilient** amid climate change and other disruptions, thus enabling rural communities and farm families to thrive for generations to come.

Three integrated innovation opportunities embody this vision. The opportunities are rooted in regional assets and realities, yet they are purposefully aspirational to spark collective reimagination of the region's AgriFood Tech system future. The three opportunities cover the full AgriFood Tech value chain, from upstream on-farm innovations to midstream value-added products and businesses to downstream waste and resource recovery.

Climate Resilient

Enable farmers to proactively manage risks and grow farm-based income amid the uncertainty of climate change

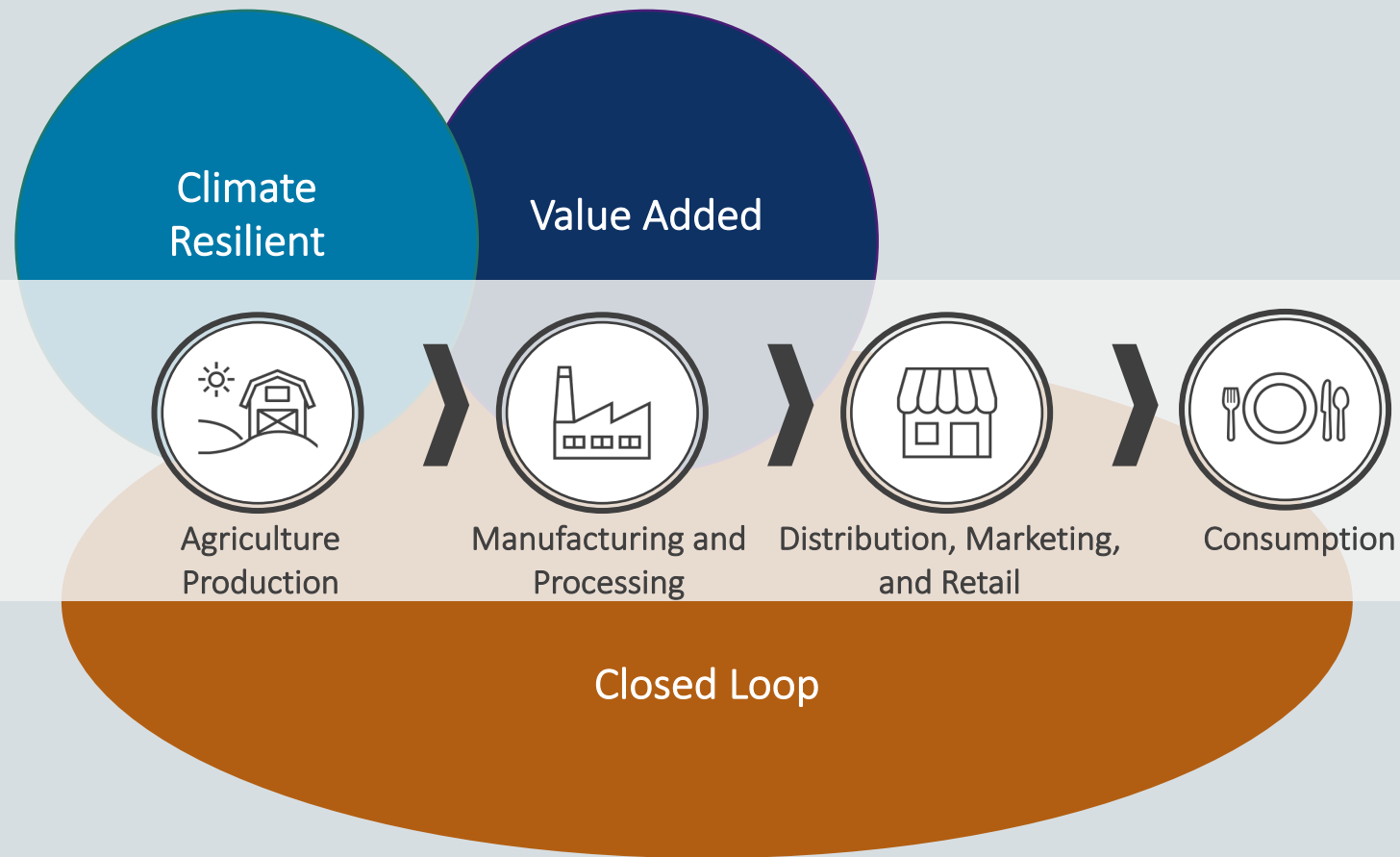
Value Added

Diversify and grow the regional value-added market; build high-quality jobs in food value addition

Closed Loop

Catalyze a regional AgriFood Tech system that models the principles of a circular economy

The three opportunities embody the entire AgriFood Tech value chain to catalyze transformational change in the Dogwood Health region.



Integrated Innovation Opportunities:

Importantly, each of these opportunities represents a bundling of multiple innovations – new AgriFood technologies, business models, collaborative approaches, etc. – that together create potential for thriving businesses and communities. Unlocking this potential requires a multi-faceted approach that resists ‘one-size-fits-all’ and ‘silver bullet’ approaches.

AgriFood Tech investments are not value-neutral. Equity and inclusion must be *designed into* AgriFood Tech investments from the outset.

WNC's agricultural diversity means there are many lenses through which to consider amplifying equity and inclusion, including:

- Distance from urban centers
- Farm size
- Demographics (e.g., age, gender, race, ethnicity, education, veteran status)
- Legacy versus new farmer
- Farm ownership (rent versus own) and income (supplemental versus full)
- Farm employment (e.g., owner/operator, full-time employee, seasonal worker)

There are multiple ways to design for equity and inclusion from the outset of AgriFood Tech investments, especially those that directly engage farmers. These actions include the following:

- **Invest in farmer segmentation** and develop disaggregated datasets to inform investment strategy and technology development efforts.
- **Right-size innovation risk** amid the high risk and uncertainty inherent in agriculture; meet farmers where they are in their ability to take on additional financial and operational risks with AgriFood Tech innovation.
- **Ensure farmers have a voice** in defining innovation priorities, contextualizing their needs and opportunities, and providing feedback.

Efforts to prioritize equitable, inclusive outcomes for BIPOC* and young farmers are underway and ripe for expanded impact.

Examples of ongoing regional initiatives and programs include the following:

- The Center of Environmental Farming Systems (featured on Page 43) manages a Committee on Racial Equity in the Food System focused on building a cohort of racial equity in food systems practitioners, among other priorities.
- [SSAFON](#) (Southeastern African American Farmers' Organic Network) convenes a network of black farmers from across the Southeastern United States, including North Carolina, that upholds sustainable agricultural practices.
 - Its 2021 publication Growing the Legacy: Stewarding a Black Agrarian Revival in the Rural South introduces strategies for disrupting land loss among Black farmers, and other priorities.
- BIPOC-led farms in WNC include Soulfull Simone Farms (Buncombe County), Moon Rabbit Farms (Madison County), and Peace Gardens & Market (Buncombe County).
- The Southern Appalachian Highlands Conservancy runs a [Farmland Program](#) aimed at “helping make farmland more accessible to beginning farmers” among other priorities.

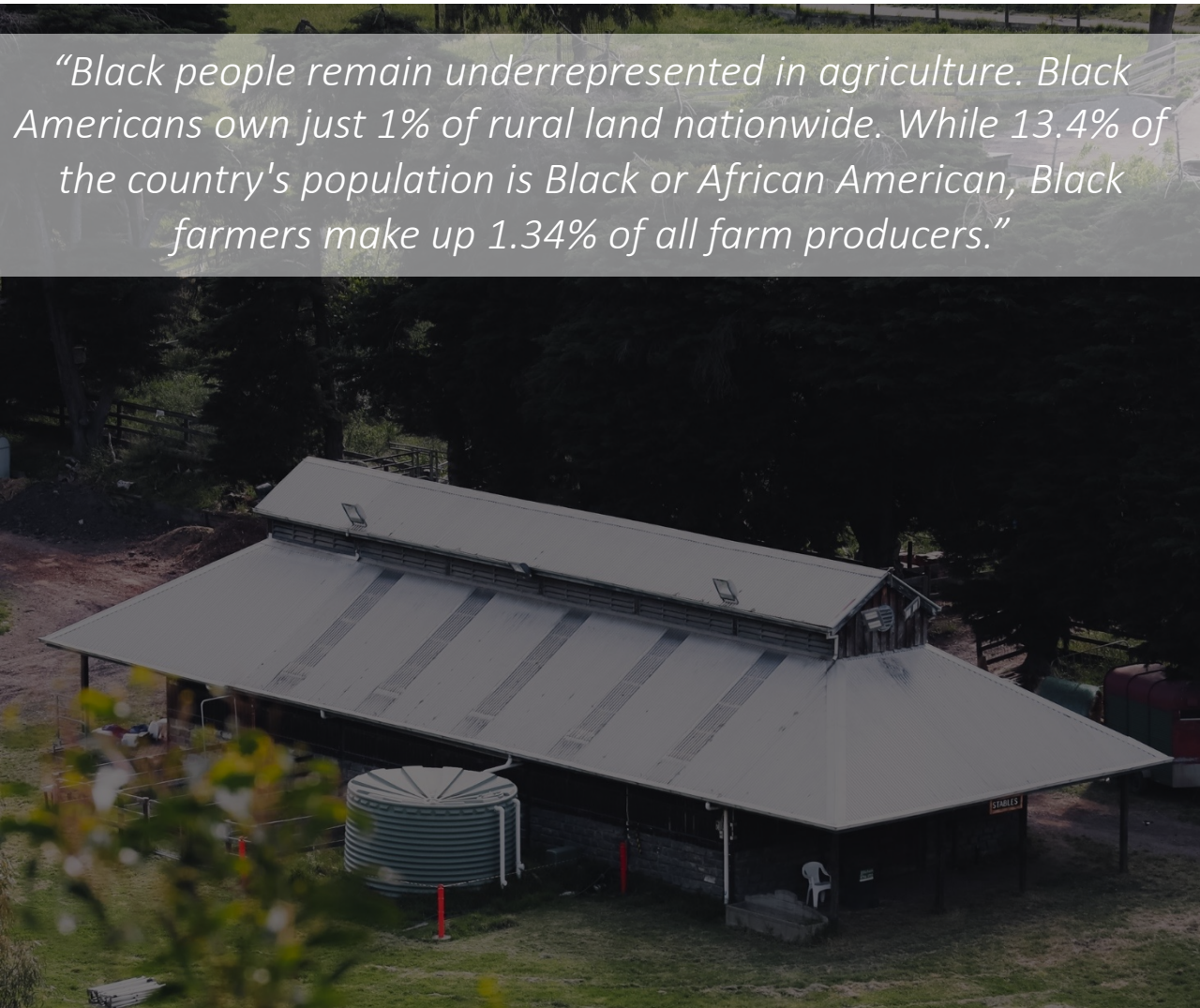
Philanthropic Learning Case:



The W.K. Kellogg Foundation wields its philanthropic resources and voice to promote equitable AgriFood systems and thriving communities. They serve or previously served as a funding partner for CEFS Committee on Racial Equity in the Food System, the Black Farmer Fund, and the NC Association of Black Lawyers Land Loss Prevention Project.

The foundation funded a 5-year NC Farm to Early Care and Education Initiative, leveraging contributions from CEFS and the Appalachian Sustainable Agriculture Project (ASAP - Page 25). Importantly, “connecting local farms with local childcare centers to empower the development of community-based, equitable food systems” served as a goal of this flagship initiative.

AgriFood Tech-enabled opportunities can complement, but not replace, efforts to address structural inequity in rural land ownership.



“Black people remain underrepresented in agriculture. Black Americans own just 1% of rural land nationwide. While 13.4% of the country's population is Black or African American, Black farmers make up 1.34% of all farm producers.”

Efforts to increase BIPOC and other historically excluded groups' participation in agriculture center on holistic **“systems change”** initiatives that prioritize the following:

- Affordable, long-term farmland and equipment financing
- Education and skill building
- Networking
- Market access
- Local, state, and national policy reform

Ideally, efforts to enact **large-scale structural change** gain support and build momentum **in parallel with the targeted Agri-Food Tech opportunities** grounded in regional assets. The combination of which is poised to bring about positive generational change to which Dogwood and others aspire.

Recommendations



Recommendations for the Community



1

Shore up support for region's AgriFood Tech system as an essential lever for rural economic development.

2

Celebrate region's agricultural diversity (commodities, production scales, micro-climates) as a differentiator and built-in enabler of climate resilience.

3

Capitalize on the energy of a lifestyle-driven and ambitious younger generation of farmers eager to preserve and reinvigorate the sector.

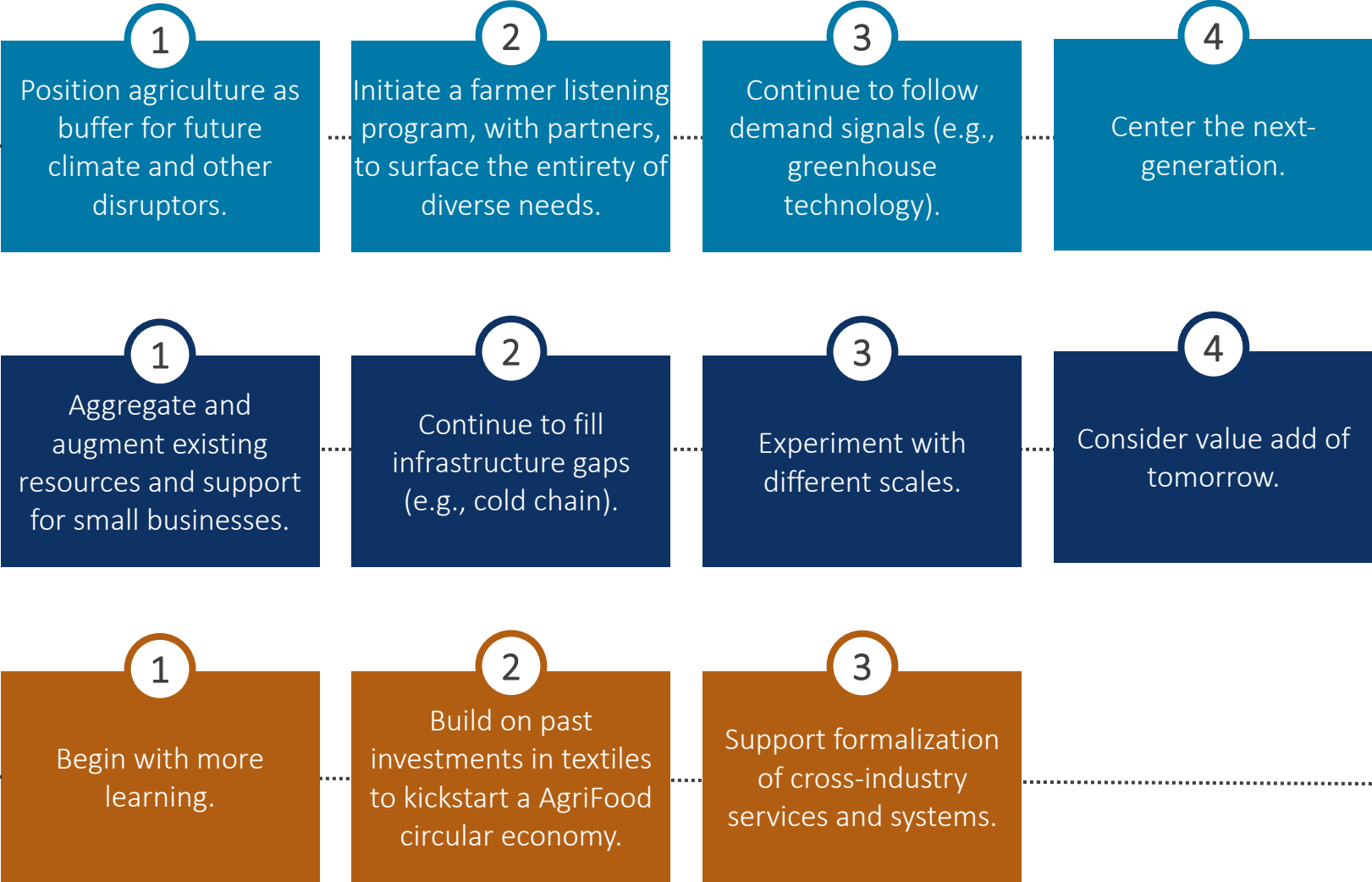
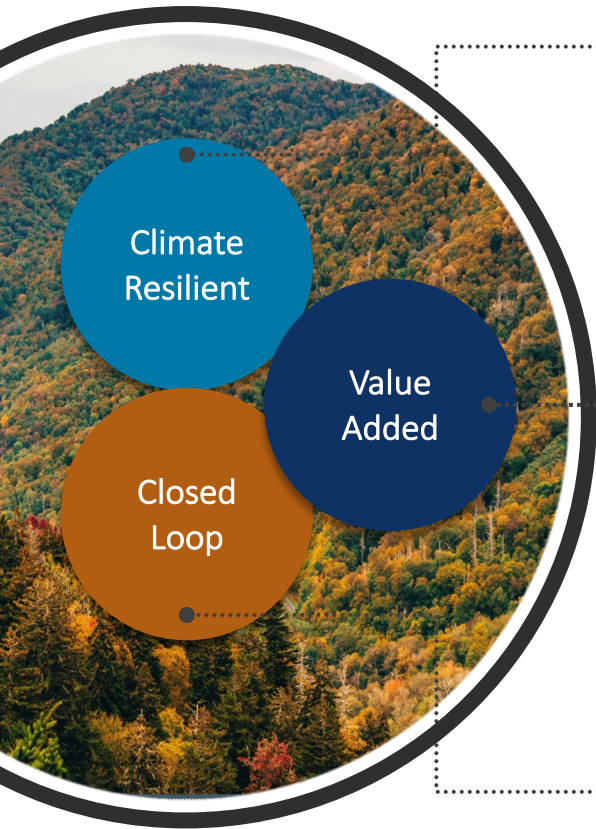
4

Raise awareness of the resources available today. Broaden and expand their reach and impact. Build upon resources highlighted here as a starting point.

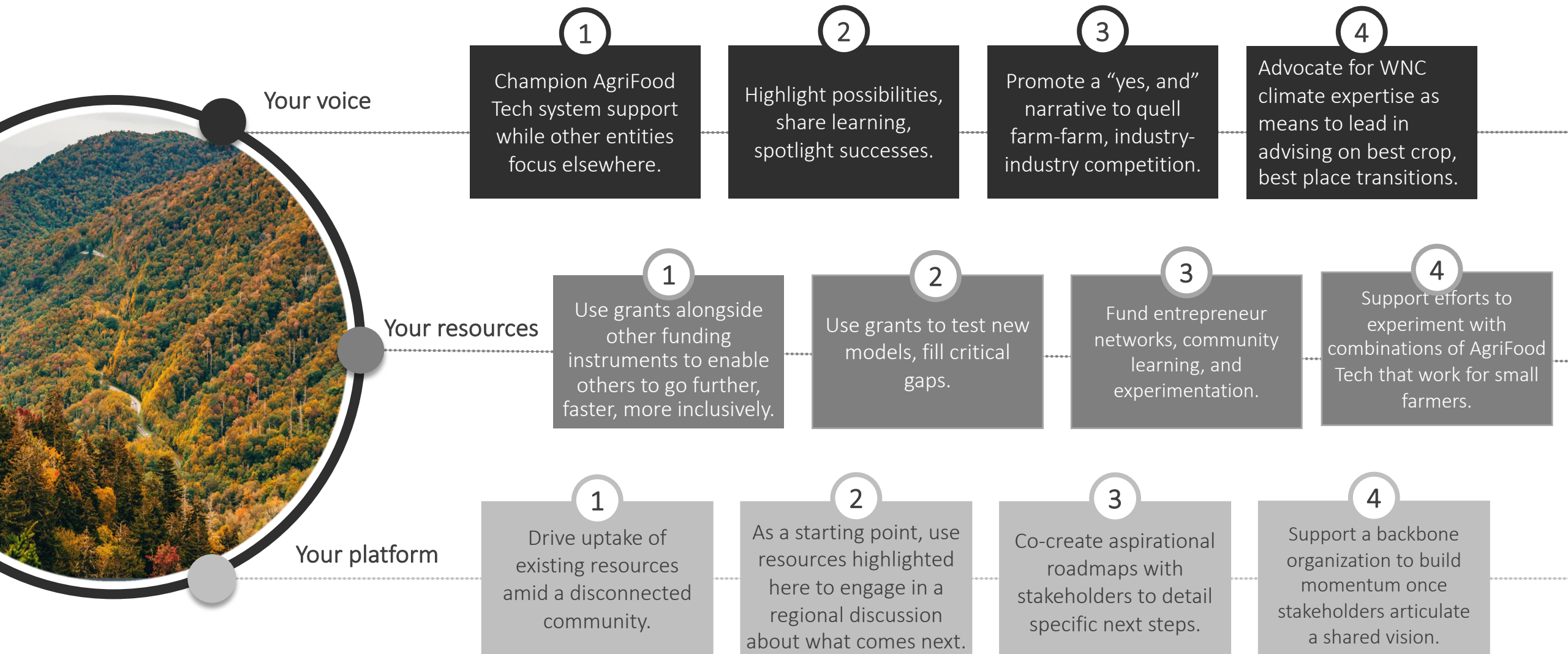
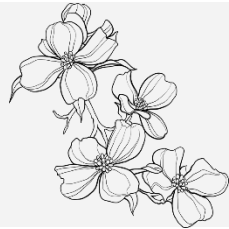
5

Experiment with on- and near-farm education and professional development models that keep farmers (and future farmers) where they are.

Opportunity Specific Recommendations for the Dogwood Health Trust



General Recommendations for the Dogwood Health Trust



AgriFood Tech Opportunities in WNC

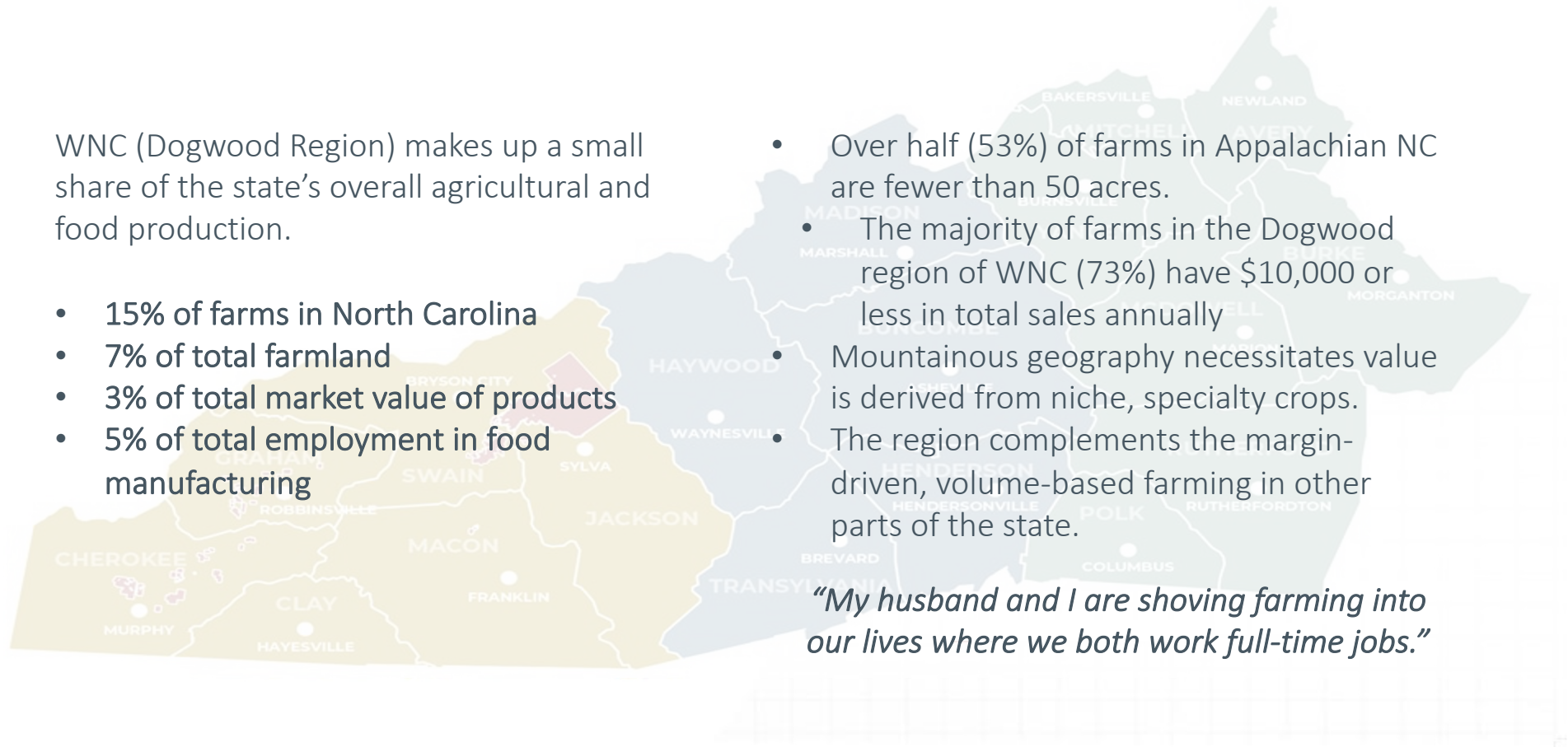
The Dogwood Region of WNC is home to a rich family farming community composed mostly of small farms specialized in high-value crops.

WNC (Dogwood Region) makes up a small share of the state's overall agricultural and food production.

- 15% of farms in North Carolina
- 7% of total farmland
- 3% of total market value of products
- 5% of total employment in food manufacturing

- Over half (53%) of farms in Appalachian NC are fewer than 50 acres.
- The majority of farms in the Dogwood region of WNC (73%) have \$10,000 or less in total sales annually
- Mountainous geography necessitates value is derived from niche, specialty crops.
- The region complements the margin-driven, volume-based farming in other parts of the state.

"My husband and I are shoving farming into our lives where we both work full-time jobs."



WNC is poised to be competitively advantaged in several crop categories including vegetables, fruits, livestock, floriculture, and specialty beverages.

Competitive sub-categories where WNC outperforms compared to its overall contribution to NC agriculture:



Vegetables: Tomatoes (grown in the open), leafy greens, carrots, pumpkins, bell peppers, ginger, garlic, radishes, okra, herbs, sweet corn



Food processing: Beverage products manufacturing (brewing industry)



Greenhouse and floriculture products: Christmas trees, cut flowers and florist greens, nursery crops, vegetable seeds, greenhouse vegetables and herbs



Livestock: Sheep and goats, aquaculture, cattle and calves, dairy, wool, mohair, horses, mules, donkeys (all livestock sub-categories except poultry, eggs, and hogs)



Fruit: Apples, stone fruits, grapes, berries, honeydew melons

WNC agriculture can be defined by the following:

- Large number of **small farms**
- High **direct-to-consumer** sales (13% of farms in WNC have some direct-to-consumer sales vs. 9% statewide)
- Activity in **specialty products** that lend themselves to value-added products manufacturing:
 - Cheese
 - Jams
 - Frozen specialty fruits, vegetables, and meats
 - Fiber products
 - Health and wellness products and supplements
- For most farmers, farming is **not the primary or sole source of income**.
 - Tax benefits of present use valuation
 - Geography and high land costs restrict scale
 - Entrepreneurial culture, many sources of income

This moment in time presents exciting AgriFood Tech innovations and trends that provide additional options for experimentation and accelerated progress in WNC.

Multiple global **AgriFood Tech trends** hold future market potential in WNC when combined with regional assets. These specific AgriFood Tech trends should not be considered in isolation; specific AgriFood technologies reap benefits when integrated with creative business models, good management practices, productive market channels, and other key resources.



Climate-Smart Farming & Forestry: reduced emissions, increased nutrient efficiency and carbon sequestration, building viable carbon markets



Data-enabled Management Suite: integrated software platforms that bundle farmer and forester needs for data-driven decision-making, support, and business management



Controlled-Environment Farming: indoor vertical farming and greenhouse technology to extend growing season, diversify, and increase efficiency



Ag Biotechnology: genetic modification of crops, microorganism-derived sustainable natural fertilizer and other innovations to strengthen food supply



eGrocery, eCommerce: online channels, marketing, and delivery models for the digital shopper including open-source and scalable platforms



Alternative Protein: microbial fermentation of waste feedstocks to manufacturer protein and specialty food ingredients



Robotics and Mechanization: manufacturing and adoption of agriculture and food processing equipment that combat issues of labor shortages



Climate Modeling: Data and analytics to enable future-oriented planning and management (e.g., adjusting crop selection and practices amidst climatic shifts)

The Vision

A vibrant and community-led AgriFood Tech system that safeguards the region's natural resources; **reflects community values** of hard work, self-sufficiency, and creativity; and **proves resilient** amid climate change and other disruptions, thus enabling rural communities and farm families to thrive for generations to come.

Three integrated innovation opportunities embody this vision. The opportunities are rooted in regional assets and realities, yet they are purposefully aspirational to spark collective reimagination of the region's AgriFood Tech system future. The three opportunities cover the full AgriFood Tech value chain, from upstream on-farm innovations to midstream value-added products and businesses to downstream waste and resource recovery.

Climate Resilient

Enable farmers to proactively manage risks and grow farm-based income amid the uncertainty of climate change

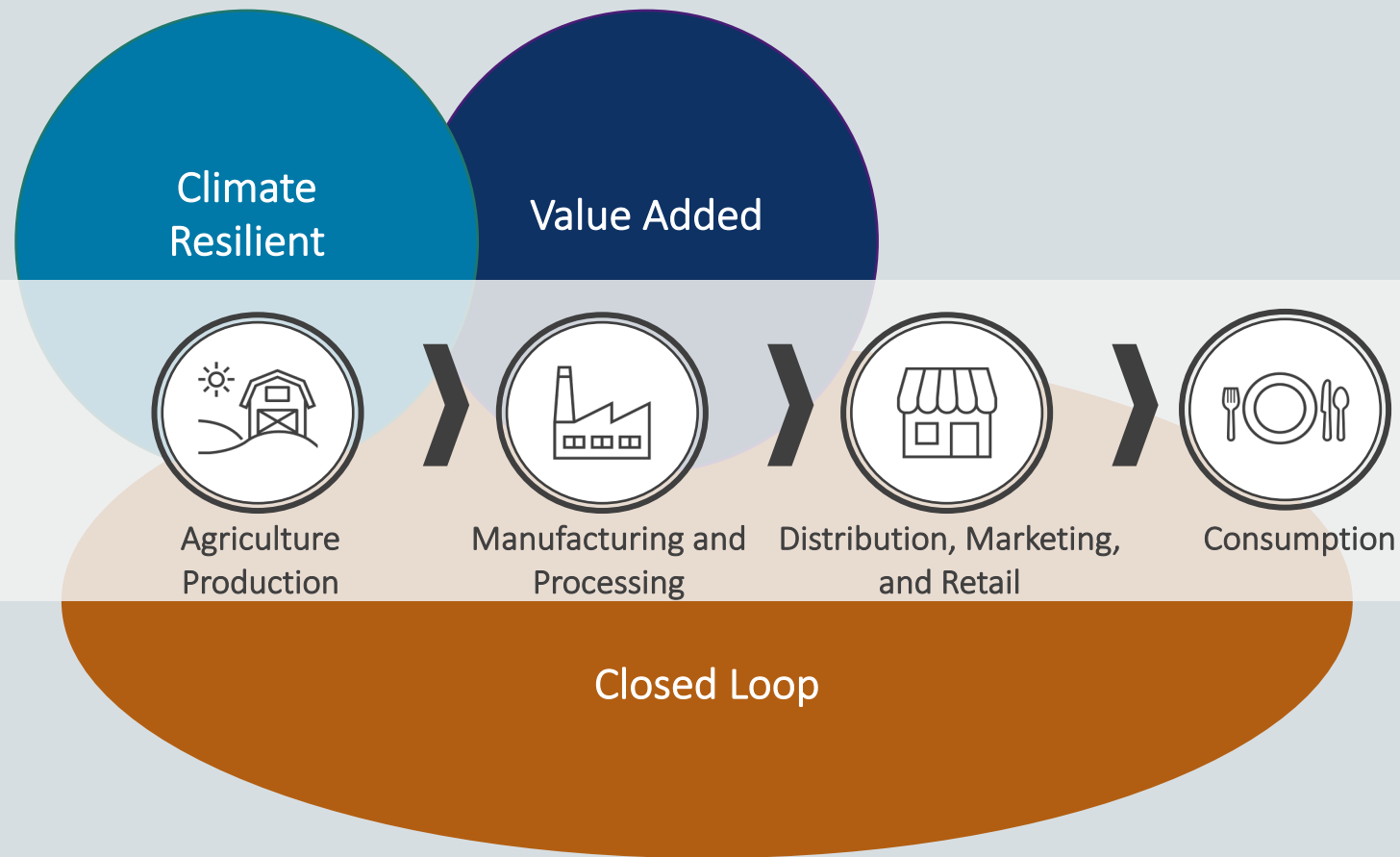
Value Added

Diversify and grow the regional value-added market; build high-quality jobs in food value addition

Closed Loop

Catalyze a regional AgriFood Tech system that models the principles of a circular economy

Three opportunities embody the entire AgriFood Tech value chain to catalyze transformational change in the Dogwood Health region.



Integrated Innovation Opportunities:

Importantly, each of these opportunities represents a bundling of multiple innovations – new AgriFood technologies, business models, collaborative approaches, etc. – that together create potential for thriving businesses and communities. Unlocking this potential requires a multi-faceted approach that resists ‘one-size-fits-all’ and ‘silver bullet’ approaches.

Climate Resilient

Opportunity: Enable farmers to proactively manage risks and grow farm-based income amid the uncertainty of climate change.

Rationale: WNC is home to a widespread network of farms poised to prosper amid uncertainty and to drive economic opportunity in rural regions.

Promoting on-farm climate resiliency enables farmers to prepare for future risks and thrive amid uncertainty, thus offering a path to on-farm prosperity for future generations and a path to rural wealth creation. As farmers experience increasingly variable rainfall, temperature, and other climatic change impacts, there are opportunities to co-create and test technology-based solutions, support climate-resilient businesses, and encourage adoption of climate-smart agricultural practices.

The region has a unique opportunity to capitalize on its high concentration of climate expertise to fully realize this opportunity. Importantly, centering farmers — not only as beneficiaries of these efforts, but also as decision makers and innovators — will be essential.



Global societal and technological trends converge with regional cultural and geographic assets and differentiators to set the stage for realizing this opportunity.

AgriFood Tech Trends

- Growing awareness of the global climate change research and innovation imperative
- Growth in agriculture biotechnology; genome editing, trait selection
- Investment in indoor farming (i.e., green houses, vertical agriculture)
- Movement toward plant-based, whole, and natural foods
- Direct-to-consumer sales
- Investment in e-grocery, online, and omnichannel technologies

Regional Assets and Differentiators

- Microclimates and biodiversity
- Large number of small farms; new generation of farmers looking to work locally and address climate challenges
- Higher direct-to-consumer sales than in the rest of the state and strong “buy local” mentality – groundwork already laid for short supply chains
- Thriving outdoor recreation industry and appreciation for human-nature connection and importance of climate change
- WNC region leads the state in land-protection initiatives



Interviews reveal a local community that recognizes the challenge and is adapting to changes.

The impacts of climate change begin to take hold in the region.



“A huge piece of discussion is how we can support farmers as they adapt to the impacts of climate change.”

“One opportunity is it could be a destination for indoor growing; there is lots of good water. New green house development could be an Ag[riFood] Tech investment, but I'm not sure how scalable it is.”

A nationally recognized climate observation and research community nests in the heart of Asheville in WNC.



“I think WNC is primed for the burgeoning carbon sequestration / climate resiliency industry.”

“The region has huge untapped climate infrastructure. NOAA is here; there is a climate hub positioned in a region that doesn't experience a lot of natural disasters.”

“The region has serious competencies in climate that can that be leveraged into something of value. The climate sector did spawn some local small tech companies that mine climate data for ag consulting purposes.”

A climate-minded generation of young farmers inspires change.



“Every year the average age of farmers in the region is going down”

“Younger farmers are helping older farmers see the benefit of establishing online networks... Online markets saved farmers that may have gone out of business during COVID ... farmers are connecting to the customer with Facebook and Instagram”

“Nothing had changed for many many years; now we are seeing a lot of excitement. There is a trend of younger farmers that want to be here and want to work together to create a vibrant future.”

The region is home to a robust community of climate scientists and professionals in addition to local actors supporting on-farm innovation and connection to local markets.

Ag Launch Engine LLC. is creating new equitable business models and positioning the Appalachian region as a leader in small-scale, high-value agriculture. – Knoxville, TN

The Southern Appalachian Highlands Conservancy's Farmland Program works to preserve agricultural lands and family farms in WNC.

The **Appalachian Sustainable Agriculture Project (ASAP)** facilitates farm-to-market connections, farmer education, and more, across the region.

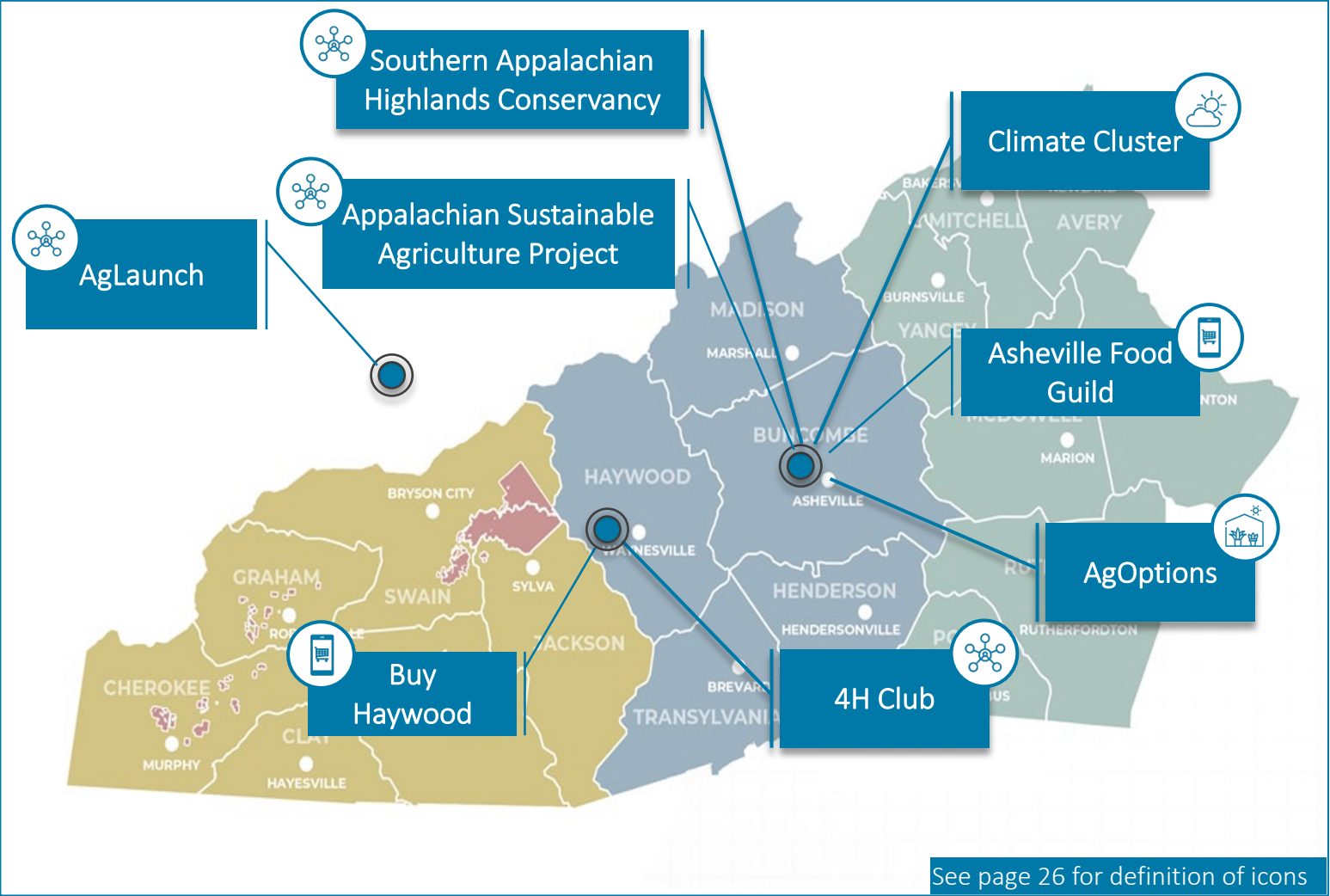
The **USDA's 4H club** provides invaluable education for the next generation of farmers. - Raleigh, NC

Cluster of Climate organizations include the Cooperative Institute for Climate and Satellites, [National Climatic Data Center](#), National Center for Environmental Information, NC Institute for Climate Studies, National Environmental Modeling and Analysis Center, NC Institute for Climate Studies, and World Data Center for Meteorology.

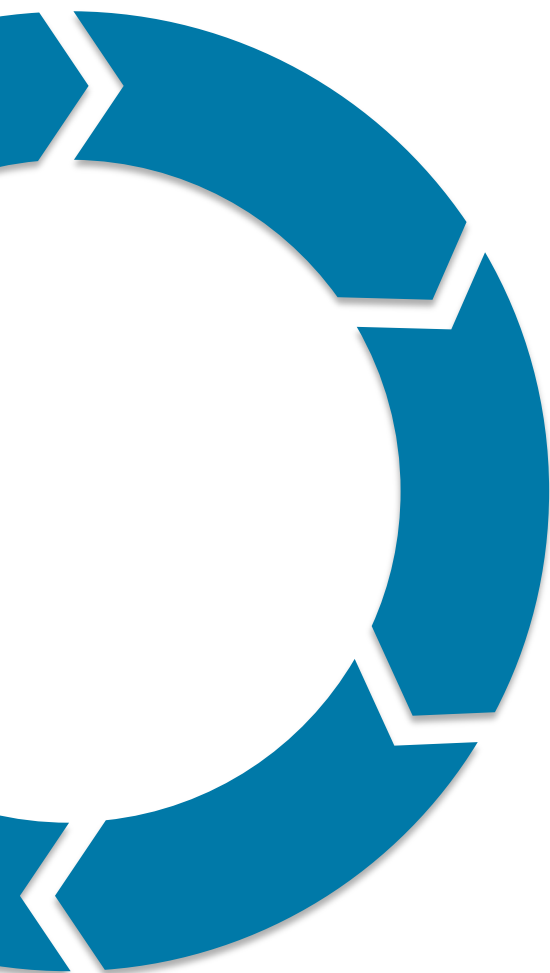
AgOptions de-risks climate-smart technology via small grants.

Buy Haywood of the Haywood Advancement Foundation supports farmers, locally grown produce, and the preservation of agricultural heritage.

Asheville Food Guild connects growers with businesses in the food and beverage sector.



Local and state-wide initiatives and programs are generating on-the-ground momentum and energy for the Dogwood Health Trust to tap into and build upon.



ASAP runs a platform linking restaurants to local farmers. The platform is a success for those involved, but there is an opportunity to expand its coverage to maximize impact.



NC Choices hosts the Meat Suite website, whose goal is to be the "Etsy of Meat." Consumers can view farmer profiles, products, and pricing and can place an order online.



NC A&T State University recently hosted the National Conference on Next Generation Sustainable Technologies for Small-Scale Producers on topics like cover cropping and no-till practices to build climate resiliency.



The EmPOWERing Mountain Food Systems initiative of the Center for Environmental Farming Systems is working to provide business development and training and cultivating local food entrepreneurs.



Henderson County leaders approved \$9.8 million in economic incentives for Project Delta, including an agricultural production facility bringing 220 high-paying jobs. **Carolina Farm Credit** has funded several greenhouse agribusiness operations in WNC.



The local and community-based food movement continues to thrive. The pandemic reawakened the popularity of **community-supported agriculture (CSA)** and the **NC State Farmers Market** brings the largest number of sales in the region.

Potential leverage points highlight where focused energy and resources could help spur progress toward more climate-resilient and profitable farms.

Access to Markets



Supporting online marketing and sales platforms to reach a post-COVID-19 consumer and strengthen localized distribution and supply chains networks. Building farmer awareness of market options available. Promoting ease-of-use for farmers and consumer (e.g., single sign on, synced platforms).

Community-Led Innovation



Enabling peer-based learning and experimentation throughout the farming community. Centering the farmer in technology development and taking a farmer-owned approach to entrepreneurial endeavors.

Regional Climate Expertise



Championing the existing local infrastructure and expertise and attracting climate-minded entrepreneurs and cutting-edge scientists to solidify the region as a climate center of excellence. Promoting novel approaches to ecosystem and watershed management alongside individual farm management.

On-Farm Tech & Practices



De-risking climate-smart technologies and practices to maximize productivity and natural-resource management by adapting farms to the changing growing conditions of today and tomorrow.



Farmer-owned climate-smart agriculture and appropriate regional strategies.

AgLaunch is creating new equitable business models to diversify farmer revenue.

AgLaunch Engine LLC. is a for-profit subsidiary of the AgLaunch nonprofit that centers the farmer in the innovation process. AgLaunch leverages its farmer-centric innovation model with accelerator, field trials, etc. to create appropriately scaled farmer and innovator opportunities that have local impact and global relevance.

AgLaunch has developed an accelerator program, **AgLaunch365**, to support pre-seed AgriFood Tech startups by connecting entrepreneurs to farmers to test pre-commercial technologies. **The farmers gain an ownership stake in the AgriFood Tech companies, providing an additional path to build rural wealth.**

The approach maximizes benefits for both farmers and tech entrepreneurs and importantly, the farmers play an active role in selecting the technology and contributing to its development by providing feedback.

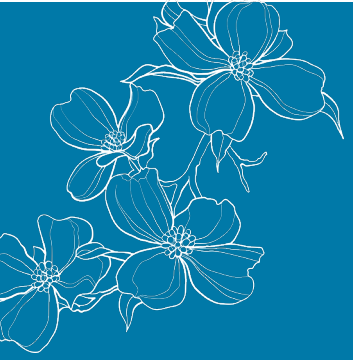
AgLaunch has supported and funded **a full portfolio of Climate Smart startups and projects** including new types of equipment, measurement tools, and biologic-based nutrient delivery - for example - Continuum Ag, a soil health data intelligence company, and SoilMetrix, which develops algorithms for crops, soil, and weather patterns that aid farmers for agriculture production purposes.

Image source: <https://www.pexels.com/photo/green-leafed-plants-2132171/>

Key AgLaunch Programs

- Farmer Network
- Field Trials
- Cultivate Appalachia Bootcamp
- Mentorship Program
- AgLaunch365
- Open-source, [smart contract program](#)
- Angel investor network
- Others





Recommendations

1. Position ag as a buffer against disruptors.

Platform agriculture and local supply chains as the region's preparation for climate variability and shocks.

2. Continue to let signals guide you.

Continue to follow the signals of early demand as DHT has done with cold chain infrastructure. Greenhouse technology is a common demand.

3. Hold space for the diversity.

With partners, initiate a farmer listening program to surface the entirety of diverse needs. Then convene, inclusively reflect, and set collective aspirations before acting.

4. Center the next-generation.

Formal agricultural educational programs are limited, requiring young farmers to leave the region. Consider how DHT and others might help educate and inspire future talent locally.

Value-Added

Opportunity: *Diversify and grow the regional value-added market; build high-quality jobs in food value addition.*

Rationale: WNC, as a recognized leader in natural and other value-added products, is well-aligned with the region's broader nature-based economy. Foundational elements of this opportunity are already in the region; momentum is building. The region is home to self-sufficient, crafty communities; is a magnet for creative minded entrepreneurs; and is proximate to several urban centers, further enabling the region to fully seize this opportunity.

Further efforts to fill critical infrastructure, network, and support gaps can expand the set of high-value, specialty raw inputs and finished products emerging from the region and deepen ties to complementary industries such as AgriFood tourism and the broader nature-based economy.



Value-added products represent a growing market that WNC farmers and food producers are well positioned to meet.

AgriFood Tech Trends

- Global centering of health and nutrition, food as medicine, herbs and spices, and unique products
- Continuation of local foods, small brands movement
- Increasing awareness of consumer exposure to chemicals in food and environment
- Innovation in online channels and e-grocery platforms
- Growing emphasis on sustainability and climate change in public discourse
- Automation and robotics in large-scale food processing

Regional Assets and Differentiators

- Existing assets for direct-to-consumer sales of agricultural products
- Bourgeoning outdoor recreation and tourism industry; complementary with agritourism and specialty products marketing opportunities
- Affordable water and electricity
- Biodiversity and microclimates support unique products
- Existing production of products that lend themselves to value-added and specialty product manufacturing (beer & wine, fruits, specialty vegetables, herbs, dairy)
- A large community of small farms, motivated to explore value-added due to difficulty of competing on production scale



Small-scale producers in WNC benefit from a strong farmers market and direct-to-consumers sales but call for support finding business assistance and learning networks.

Direct-to-consumer channels that are robust and outperforming.



"[The] direct-to-consumer channel is healthiest for small-scale producers but can't crack any major codes to expanding that. [It's] something a lot of groups have tried to figure out. How do we scale the direct-to-consumer type business model [to achieve] greater efficiency without sacrificing the integrity of product?"

"There was a big swell in value added products which have been creating jobs - production lines, folks with expertise that isn't ag-based, but production-based, and food-based."

"Social media helps us connect to customers, but broadband access remains a challenge."

An entrepreneurial community with latent potential calls for added support.



"The trick is creating the link between the right people who are willing to implement new tech and getting the information to them about what options are available."

"It could be helpful to increase education/technical assistance from NC State and Cooperative Extension and strengthen capital resource to help fund new ideas."

"Asheville and WNC [have] latent resources; more leadership is needed in the startup and venture space. Tech is so foreign to the region, we need to connect people to mentors."

Smart funding, leadership, and connection-building opportunities abound.



"[What is needed is] not just money but resources and support to make sure the project successful (network, lessons learned)."

"How do we deepen the connections between 'public-facing' technical support folks and ag tech efforts/possibilities/deeper expertise?"

"Tailored financing applications could support smaller farms and the business models that they are more likely to adopt."

"[It] requires someone that wants to step up and take the helm of that project. We need the families that want to do it but may not have the resources."

Infrastructure is in place from which to grow a value-added foods sector, from commercial kitchen incubators to large-scale food processors and successful value-added businesses.

Center for Agricultural and Food Entrepreneurship (CAFE) provides educational assistance and technical training in the value-added AgriFood production sector.

Blue Ridge Food Ventures is a nonprofit kitchen incubator that offers business support from original recipe to final delivery.

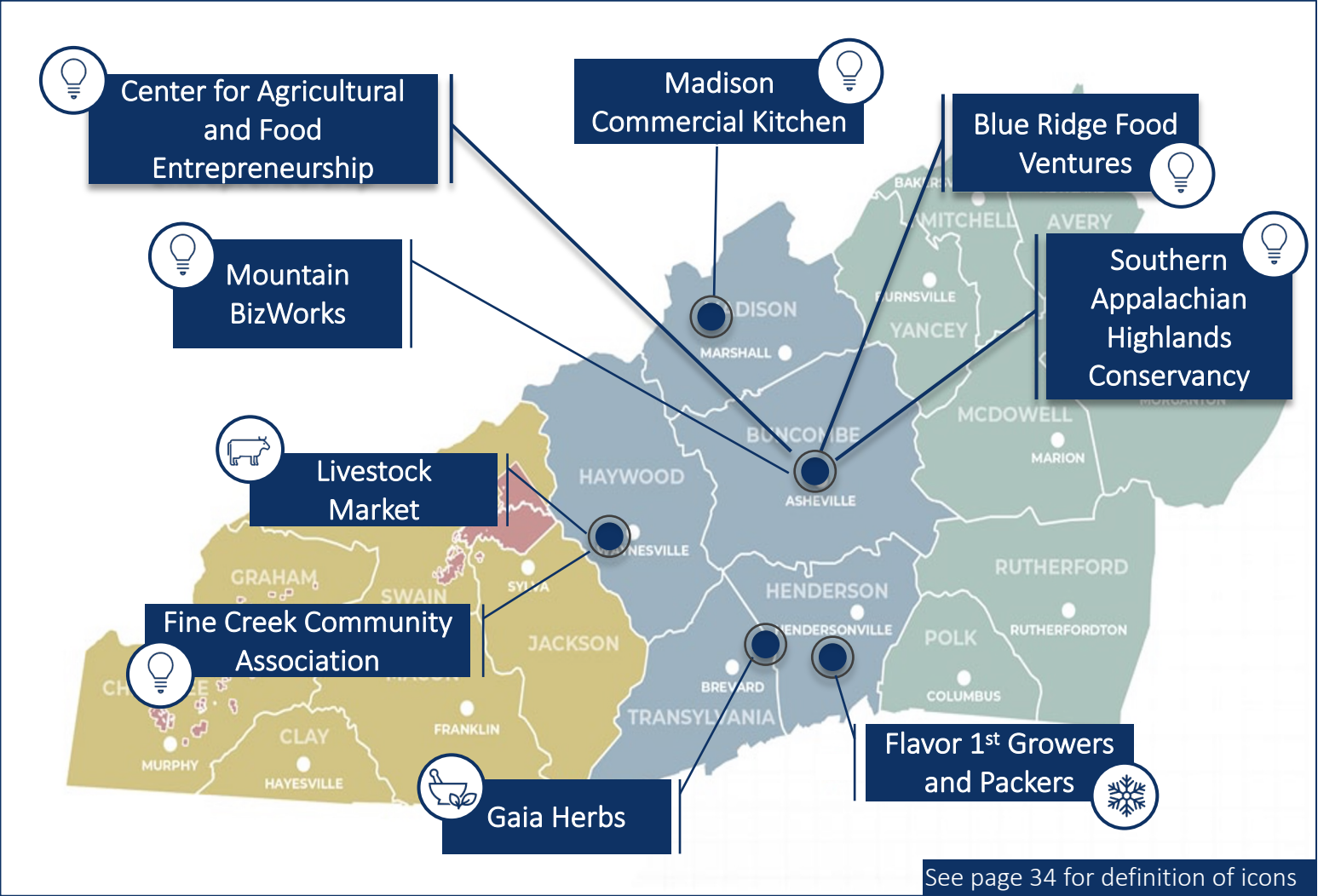
Mountain BizWorks' Appalachian Grown Farm Business Initiative brings together WNC farmers to learn and exchange ideas, including diversifying market shares, financial and supply chain management, record keeping, and more.

Southern Appalachian Highlands Conservancy has a certified commercial-grade kitchen as part of its Farm Incubator Program.

Madison County and the Fine Creek Community Association offer commercial kitchens to develop value-added products.

Gaia Herbs has acreage in Henderson and Transylvania Counties.

Livestock Market in Haywood County promotes the local cattle and calf market.



Numerous signals of value addition were noted in the region – from facility expansions, dedicated conversations, specialty crop research, emerging markets and cultural enablers.



The Eastern Band of Cherokee Indians are expanding their cannery, adding labs and fermentation facilities for larger-scale production, and securing USDA certification.



Dr. Jeanine Davis at NC State is researching value-added agriculture in WNC, such as culinary and medicinal herbs, non-timber forest products, hemp, hops, truffles, and other specialty crops.



A NIFA (USDA) grant hosted by UNC Asheville will bring together lenders and technical assistance providers in the meat-processing space for conversations about how to successfully fund ventures in this space.



Ingles and trending “general stores” dedicate sections for local producers providing a market for value-added products like cheeses, pickled products, corn meal, grits, honey, etc.



Blue Ridge Food Ventures is developing value-added food companies based in WNC – such as Buchi Kombucha, No Evil Foods, Roots Hummus, and Smoking J’s Fiery Foods.



The region is known for breweries, wineries, and specialty producers that drive tourism, outdoor recreation services and value-added opportunities.

Potential leverage points offer ways to build upon existing momentum, assets, and networks already active in WNC.

Cold Chain Infrastructure



Investing in freezing technology and cold storage plays that extend the shelf life of high-value but perishable crops and enable value-added product manufacturing.

AgriFood-Tourism



Continuing the growth of AgriFood tourism as a complement to the strong tourism sector to strengthen rural-urban connections, increase farm incomes, and provide additional marketing opportunities for specialty products.

Entrepreneurial Support Systems



Localizing support networks and providing innovators with services such as food research and development consultation, regulatory education and assistance, marketing, and equipment/machine training.

Bespoke Food Processing



Enabling food- and meat-processing facilities that are strategically tailored to the scale and type of food/livestock production in the region to catalyze agriculture and value-added supply chains in WNC.

Niche & High-Value Markets



Supporting the adoption of small-scale, high-dollar-per-acre specialty crops like medicinal plants, herbs, ginseng, specialty berries, wild greens, mushrooms, ramps, CBD & hemp, and other niche and unique products.



Economic opportunity via niche crops and high-value markets.

The region is home to several small business specialized in value-added products.

Businesses in WNC are producing value-added foods and cultivating high-quality, environmentally friendly specialty crops.

Gaia Farms, based out of Brevard, grows and produces specialty herbs for supplements for immune support, stamina and energy support, heart support, and more. Gaia Farms is a Certified B Corporation, indicating its products meet the highest standards of verified social and environmental performance, public transparency, and legal accountability.

No Evil Foods, based out of Weaverville, sells environmentally sustainable, plant-based meats created from beans, wheatberries, yeast, and organic herbs and spices. Its products are free from cholesterol, saturated fats, genetically-modified organisms, antibiotics, hormones, soy-protein isolates, nitrates, and dairy. The company embraces sustainability by using compostable packaging and focusing on reducing carbon emissions and water consumption.

Key value-added products and events

- Non-GMO Products
- Eco-Friendly Packaging
- No Chemical Fertilizers
- No Pesticides
- Plant-Based Meats
- Organic





A family-owned AgriFood and farm destination.

Riverbend Creamery has integrated value addition across their entire business.

Riverbend Creamery is a family-owned dairy farm recognized for their value-added business model. **They have positioned themselves as an agritourism business, making the farm a destination by offering tours, festivals, and home-made ice cream.**

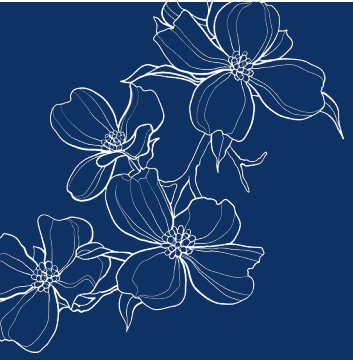
The farm has on-site infrastructure to bottle milk and manufacture over 20 different flavors of ice cream for sale to the public.

The products produced by Riverbend Creamery are high-quality and value-added. The cows are Jersey cows, whose milk has up to 20% more protein, 18% more calcium, and 12% more phosphorous than non-Jersey cows. Additionally, Riverbend Creamery selected its cows to only produce A2 protein, which is more easily digestible. The farm's **grass-fed Jersey Cows, freshly bottled milk, and homemade ice cream combine to generate multiple value-addition pathways on the family farm.**

Key value-added products and events

- Farm Tours
- Ice Cream
- Milk Sold On-Site
- Easily Digestible Milk
- Festivals





Recommendations

1. Emphasize small-business support.

In a disaggregated community, entrepreneurs struggle to access support networks and services they need to make their businesses successful. Opportunities exist to streamline resources and address unmet needs of these entrepreneurs.

3. Continue filling critical gaps.

As with cold chain infrastructure, identify and address other gaps in value-added product testing and production, especially prioritizing businesses that source WNC crops.

2. Play with different scales.

Prior projects to support large food aggregators (e.g., meat-processing facility) have stalled. The region appears ripe for experimentation in smaller-scale aggregation and flexible business models suited to serve the small farmers of WNC.

4. Consider value add of tomorrow.

Expand time horizons to consider which high-value crops might flourish and where demand will be in WNC and the surrounding region in 10–15 years, including for the region's flagship high-value crops.

Closed Loop

Opportunity: *Catalyze a regional AgriFood Tech system that models the principles of a circular economy.*

Rationale: WNC's values of self-sufficiency and waste minimization run deep. The region's success in creating a burgeoning circular textiles industry bode well for efforts to extend circular infrastructure (see [The Industrial Commons](#)), operating models, and lessons learned to a complementary adjacent sector of AgriFood Tech.

Importantly, the circular opportunity can be applied across the full AgriFood Tech value chain: upstream via the application of regenerative agriculture practices; midstream through lifecycle management of processing technology; and downstream via waste recovery and upcycling.



In many ways, the circular and regenerative movement symbolizes a return to traditional AgriFood practices that are cherished by WNC communities young and old.

AgriFood Tech Trends

- Introduction of carbon sequestration and carbon markets
- Return to regenerative agriculture and agroforestry practices
- Emphasis on upcycling, waste valorization
- Promotion of circular economy by Ellen MacArthur foundation
- Trend in alternative and fermentation-derived proteins and specialty food ingredients

Regional Assets and Differentiators

- Limited facilities to handle diverted food waste (NC Food Waste Policy Gap Analysis)
- Affordable water and electricity
- Indigenous cultures that practice regenerative agriculture
- New generation of farmers and producers looking to invest in new forms of farming and address challenges



The region's cultural values and natural geography are conducive to exploring more opportunities for community-driven, circular, and regenerative systems.

Underused pastures and farms from which to derive carbon value



"Farms are one of the few places to sequester carbon in a scalable way. Something a lot of people trying to get on board with. Something to be thinking about, tracking, ways to bring wealth to farmers."

"There is a lot of opportunity in the circular agri-food economy [in the meat processing space]. Most of the processors we work with cannot afford incinerator, so they have to find other ways to dispose of their waste."

A culture that values relationship building and win-win scenarios



"Anything that's going to emerge in Asheville has to fit the culture."

"A lot of building relationships. That's where rural has a true advantage. There's a deep understanding in a rural place about the importance of relationships."

A leader who responded to community needs, worked with the community



"We started by convening small-medium companies to hear the needs. There was limited infrastructure for recycling textile waste and a need for aggregation sites to collect waste. "

The region’s deep seeded culture of learning and entrepreneurialism is already fueling experimentation with waste upcycling, regenerative agriculture and carbon markets.

Accelerating Appalachia is the lead partner on USDA grant that seeks to sequester carbon over thousands of acres of Appalachia.

Appalachian Offsets helps businesses offset their carbon pollution by supporting nonprofits and schools with clean energy projects.

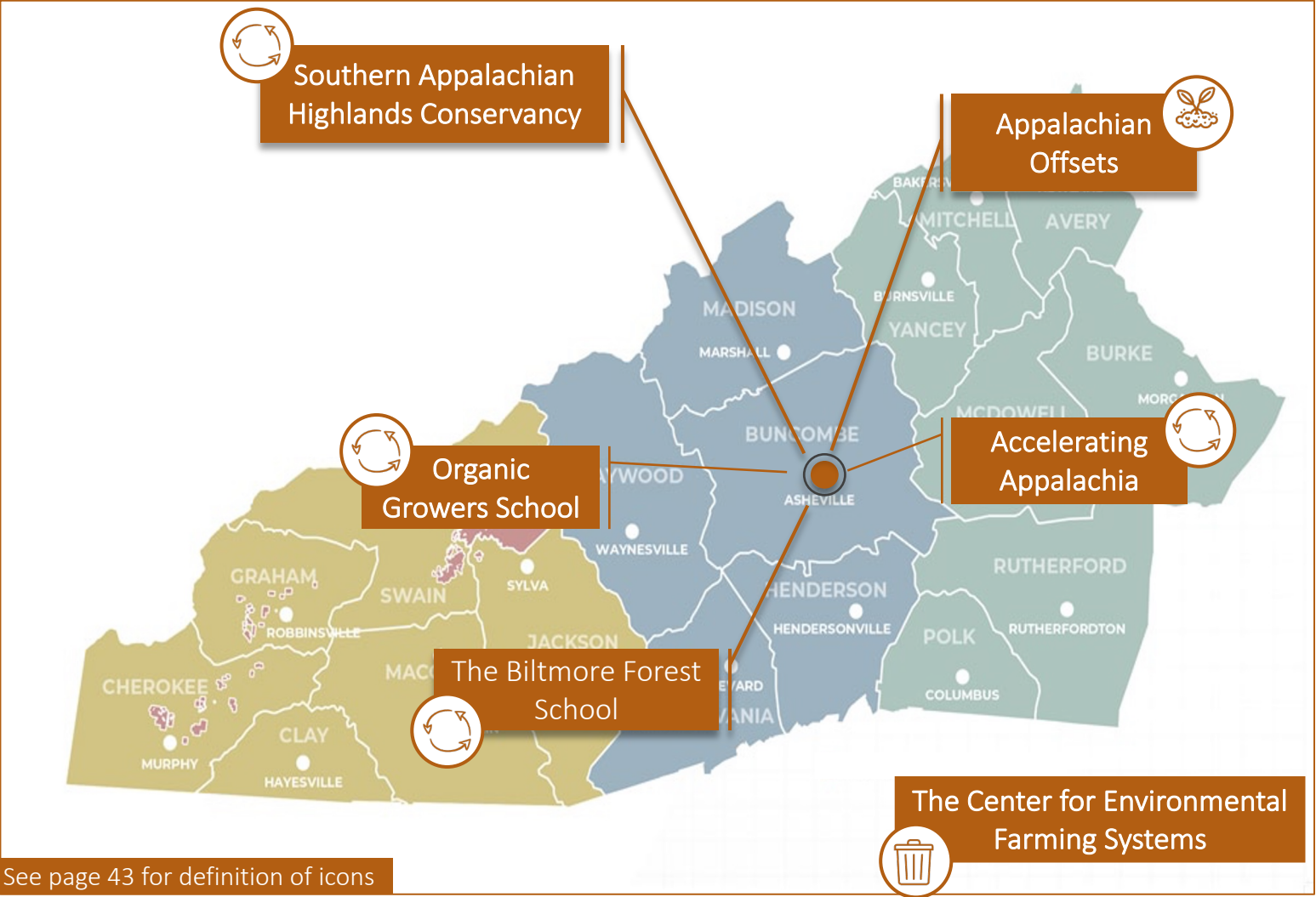
The Southern Appalachian Highlands Conservancy’s Community Farm tests environmentally-friendly land management and agriculture practices.

Organic Growers School provides classes and workshops for farmers on holistic crop management - a system’s theory to resource management.

Located in the Pisgah National Forest, **The Biltmore Forest School** is the first U.S. educational program in forestry.

Indigenous Cherokee tribal leadership is reinvesting in traditional, regenerative farming practices and unique plants and products.

The Center for Environmental Farming Systems (Raleigh) initiates food system projects like “[Whole Crop Harvest](#)” a project to bring edible unharvested product to market to utilize farm production losses.



Closed loop AgriFood systems appears to be a nascent opportunity outside of informal efforts. Leadership by the federal government may trigger more momentum in the future.



White Labs Brewing Co. provides their spent brewery grain to cattle ranchers. Examples of similar, informal arrangements emerged during stakeholder interviews.



Flavor First provides left over bell pepper, zucchini to feed local dairy cows.



The USDA recently invested \$2.8 Billion in 70 projects including projects based in Appalachia such as Accelerating a Regenerative Farming Movement in Appalachia.



The Biden Administration [signed an executive order](#) to advance biomanufacturing - critical for precision fermentation, an emerging food tech that upcycles agro- and industrial waste into protein and other specialty ingredients.

Closed loop opportunities can emphasize the cycling of nutrients and atmospheric gases within the biosphere or the reuse and recycling of man-made material goods.

Waste and Resource Upcycling



Promoting a ‘waste nothing’ mindset that encourages exploration of technologies and markets for the valorization of agro- and industrial waste streams in the region.

Ag for alternative materials



Cultivation of renewable, carbon sequestering grasses, reeds, etc. for the manufacturing of wood-like materials, textiles and other higher value products.

Carbon Market



Staying abreast to global developments towards a functional carbon market (i.e. monitoring, reporting, verification) to trigger regional pathways for uptake, leveraging local climate expertise and sustainability-minded entrepreneurs.

Circular Infrastructure



Standing up the necessary infrastructure to address the pain points in the circular economy writ large (waste aggregation, processing, formalized networks)

Regenerative Ag & Agroforestry



Promoting agricultural and forestry practices that aim to improve biodiversity and soil, water and air quality. Circular opportunities in this domain focus on maximizing biocycle resources (e.g., sequestering carbon within agricultural fields).



An employee-owned circular enterprise that transforms waste into new products.

Emphasizing relationship building to strengthen economic development in rural WNC.

Material Return at the Industrial Commons in Morganton, NC works with local manufacturers and national brands **to transform textile waste into new products**. Their business helps manufacturers and national brands reduce their environmental impacts while creating quality, environmentally sustainable products. Their business is employee-owned and focuses on building relationships within the local community.

Material Return aggregates post-production and post-consumer textile waste and then creates new raw materials from fiber to fabric with their proprietary technology and network of textile experts. They

collaborate with local partners to spin, weave and knit new finished goods. They also create custom circular products for customers.

Material Return at the Industrial Commons focuses on building relationships within the local community and promoting the economic development of rural areas in North Carolina. **Reusing otherwise discarded textile wastes creates quality jobs and strengthens resiliency in the supply chains of local textile companies.**

Key Material Return Outcomes

- Reduced waste
- Quality jobs
- Strengthened resiliency in supply chains
- Environmentally sustainable products





Family-owned regenerative farms from around the world.

Regenerative farming brings diversified revenue streams and increased profitability .

Regenerative farming techniques are currently being used across the world to **protect soil health, increase biodiversity, sequester carbon, and increase profitability.**

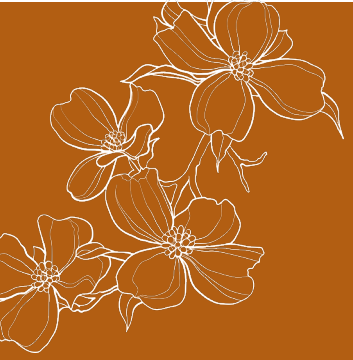
Winona Farm in Australia uses pasture cropping, a technique that **combines livestock grazing and crop-growing** via a three-step cycle. The winter season cereal crops are drilled into perennial pasture grasses. The grains produced are either harvested or used as forage for livestock – and in the summer, the grasses then flourish in the soil enriched by livestock. **This system results in improved farm profitability through weight gain**

in livestock and multiple streams of revenue.

Another example of regenerative farming is One-Acre Farm in Uganda. **This farm uses a mixed-farming system that integrates livestock and plant crops in a symbiotic relationship.** Nutrient-rich ‘wastewater’ from the aquaponic (raising aquatic animals alongside plants) system is used to irrigate tomatoes and other high value fruits and vegetables. Additionally, cattle waste is collected and fed to an anaerobic digester which generates biogas used for cooking fuel as an alternative to firewood.

Key benefits of regenerative farming

- Increased profitability
- Protected soil health
- Increased biodiversity
- Sequestration of carbon



Recommendations

1. Stay curious.

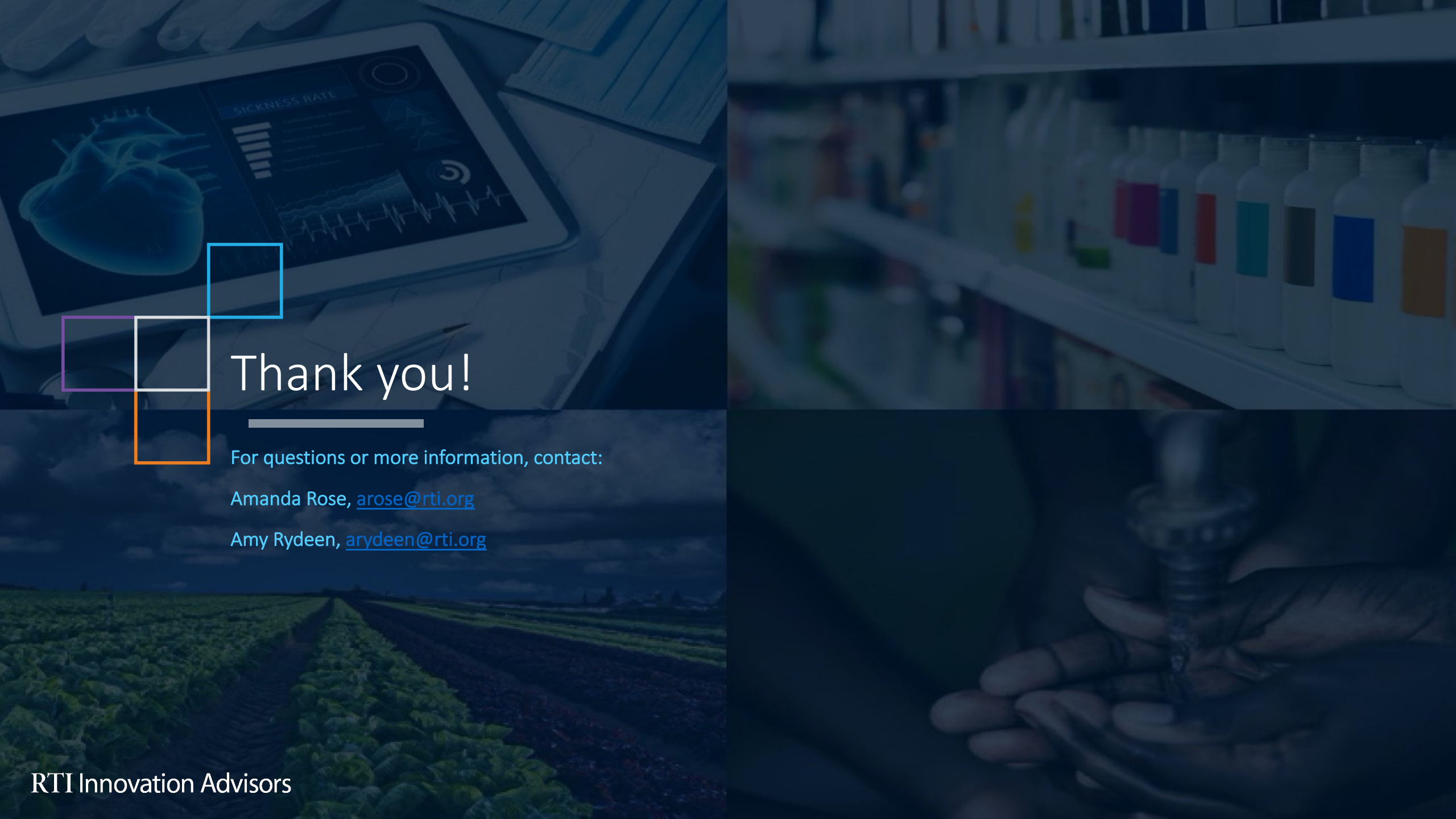
Investigate where circular AgriFood systems (or building blocks of the circular AgriFood system) function today. Focus on how WNC might upcycle and minimize its waste as a starting point.

2. Build on past investments.

Use the Industrial Common's (IC) example to inspire learning and experimentation in an agriculture cohort. Identify and work alongside an anchor partner primed to play a similar role as IC in the AgriFood system.

3. Support system-wide needs.

Look for opportunities to professionalize informal circular networks. Explore multi-sector circular infrastructure and resource needs, such as those shared by the textile and AgriFood sectors. For example, formal tracking and management systems benefiting the entire WNC circular economy.



Thank you!

For questions or more information, contact:

Amanda Rose, arose@rti.org

Amy Rydeen, arydeen@rti.org

The work draws from published reports and conversations with regional stakeholders and agricultural and entrepreneurial leaders.

Organizations Engaged

With gratitude, we acknowledge the contributions of the following companies and organizations:

WNC Communities | Eastern Band of Cherokee Indians | NC Biotech Center | NC IDEA Foundation | Appalachian Sustainable Agriculture Project | NC State Extension | North Carolina Cooperative Extension WNC AgOptions | NC Choices | Blue Ridge Food Ventures | Pappas Capital | Biltmore Farms | PlantD | AgLaunch | The Industrial Commons | Local Farmer

Additional Sources

- AgFunder
- [Agriculture and Local Food Economies in the Appalachian Region \(2022\)](#)
- ASAP Local Food [Research Center](#), ASAP 2021 Appalachian Grown Partner [Survey Highlights](#)
- Bureau of Labor Statistics Quarterly Census of Employment and Wages
- Company Information Sourced from Zoom Info and Pitchbook
- Center for Environmental Farming Systems [Resources](#) and [Publications](#)
- [Explore Asheville Economic Impact Information](#)
- NC AgVentures [Publications and Factsheets](#)
- NCBiotech [Company Directory](#)
- North Carolina Department of Agriculture & Consumer Services
- [North Carolina Innovation Corridor Industry Cluster and Market Analysis](#)
- [Smoky Mountain News](#) and other regional [publications](#)
- [USDA Census of Agriculture, 2017](#)

Appendix

Western North Carolina Agricultural Assets & Differentiators

Overview of Ag Production in Western NC

Western NC (Dogwood Region) makes up a small share of the state's overall agricultural and food production.

15% of farms in North Carolina

7% of total farmland

3% of total market value of products

5% of total employment in food manufacturing

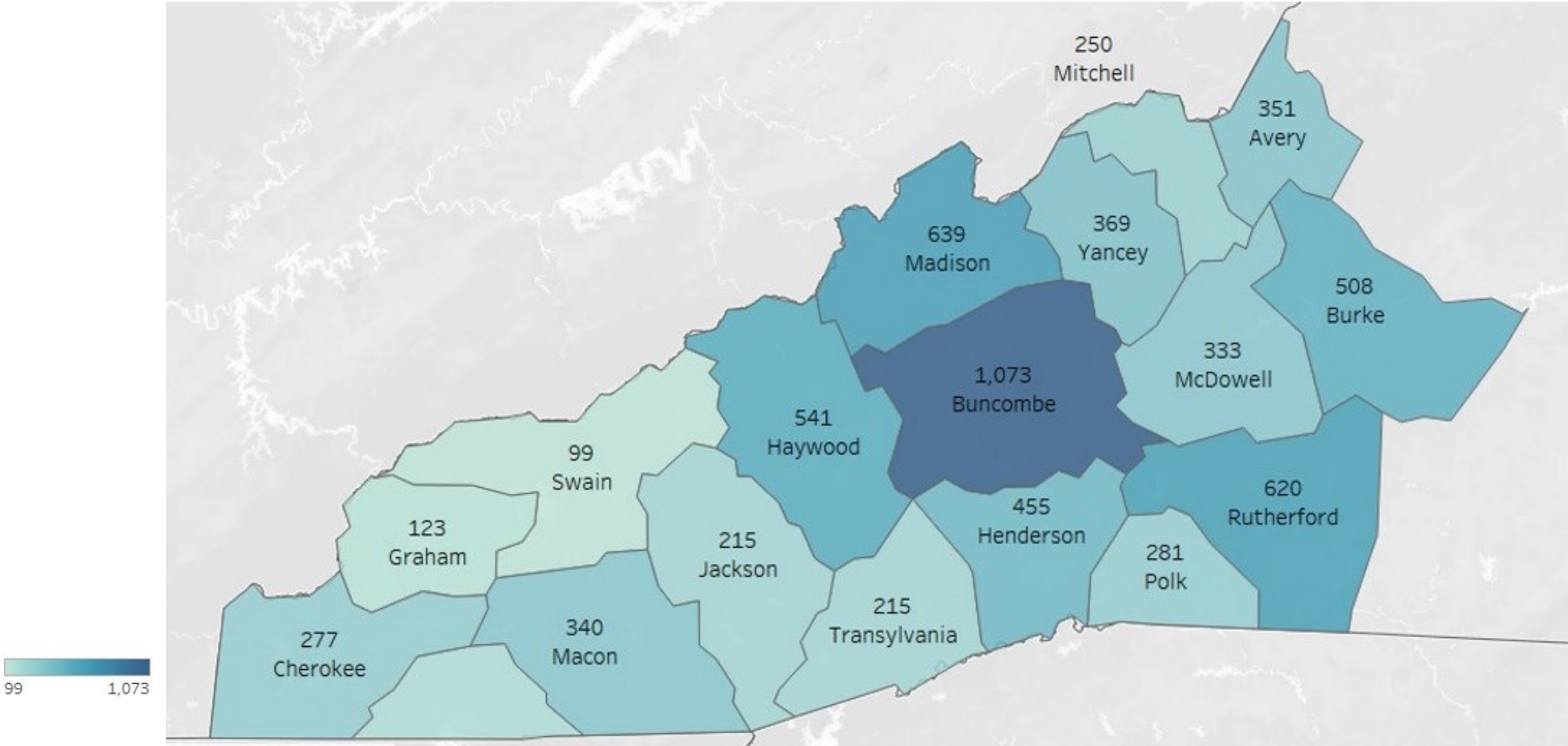
Number of Farms

Number of Farms, by County: 2017
Dogwood Region

Total: 6,853 farms

Concentrated in:

- 1. Buncombe
- 2. Madison
- 3. Rutherford
- 4. Haywood
- 5. Burke



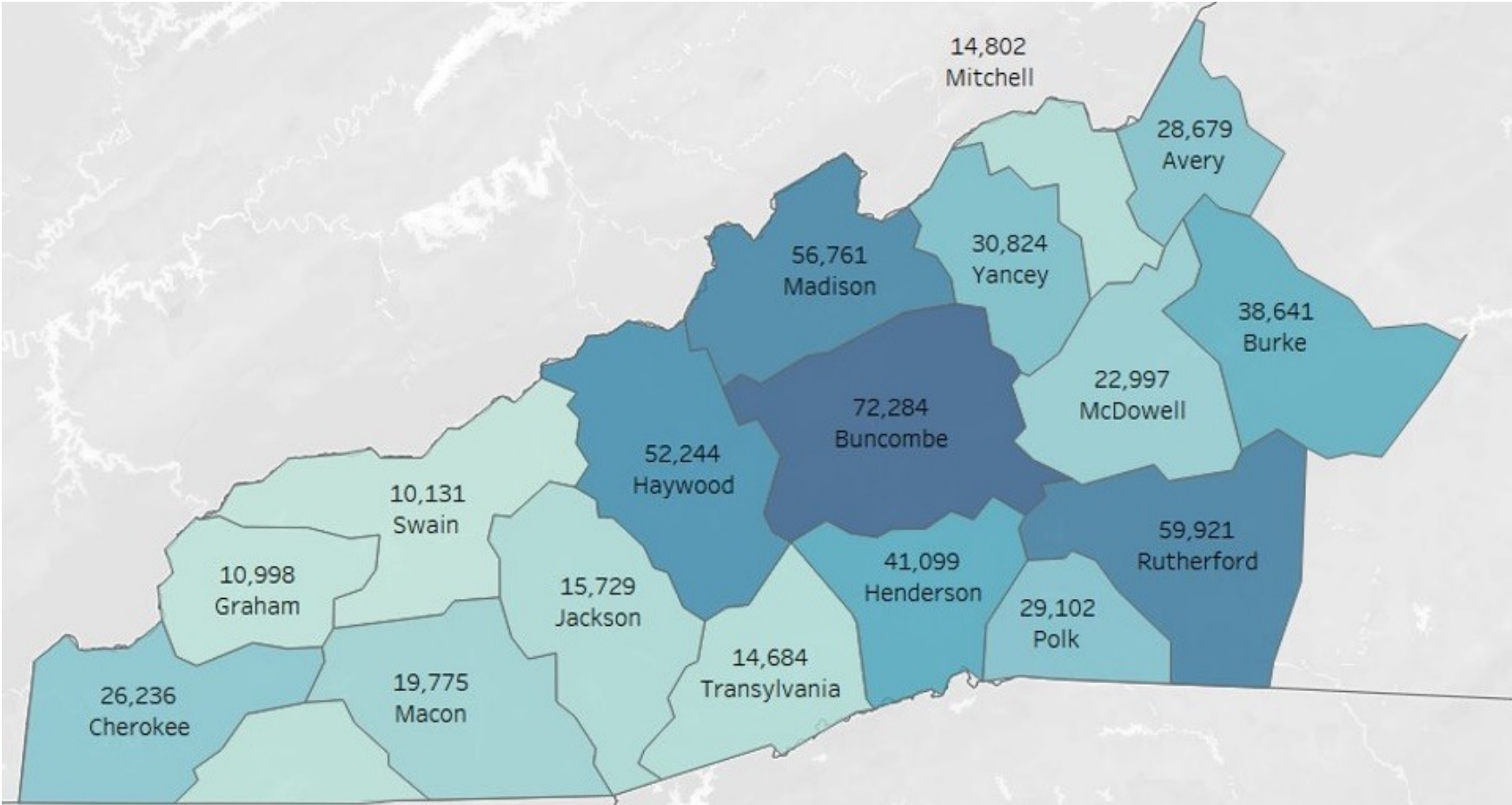
Land in Farms (Acres)

Total: 557,432 acres

Similar concentration:

- 1. Buncombe
- 2. Rutherford
- 3. Madison
- 4. Haywood
- 5. Henderson

Acres of Farmland, by County: 2017
Dogwood Region



Total Market Value of Products Sold (\$)

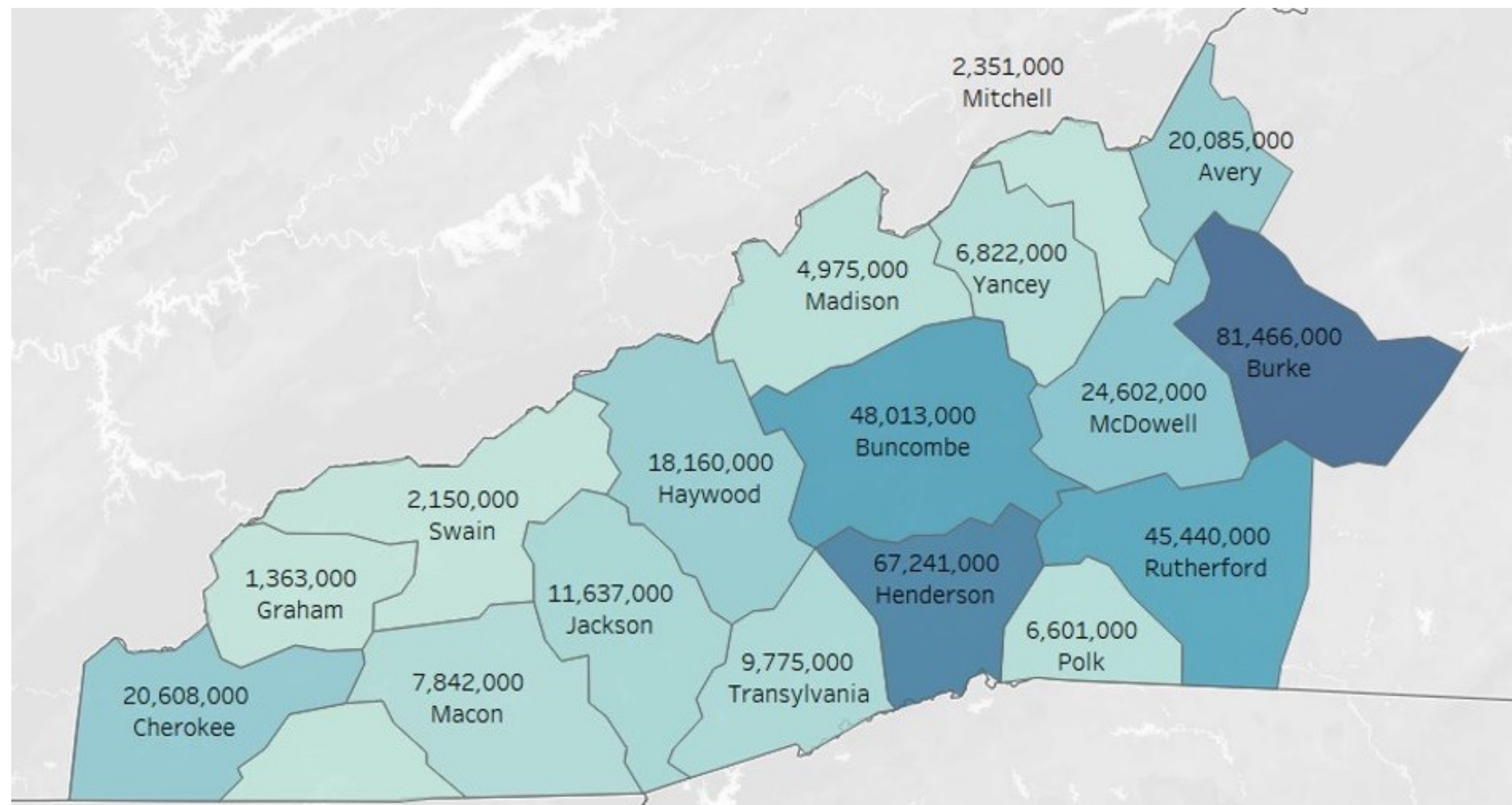
Market Value of Agricultural Products Sold, 2017 *Dogwood Region*

Total: \$382 million

Different concentration:

1. Burke
2. Henderson
3. Buncombe
4. Rutherford
5. McDowell

Implication: Higher value crops
are grown in these counties

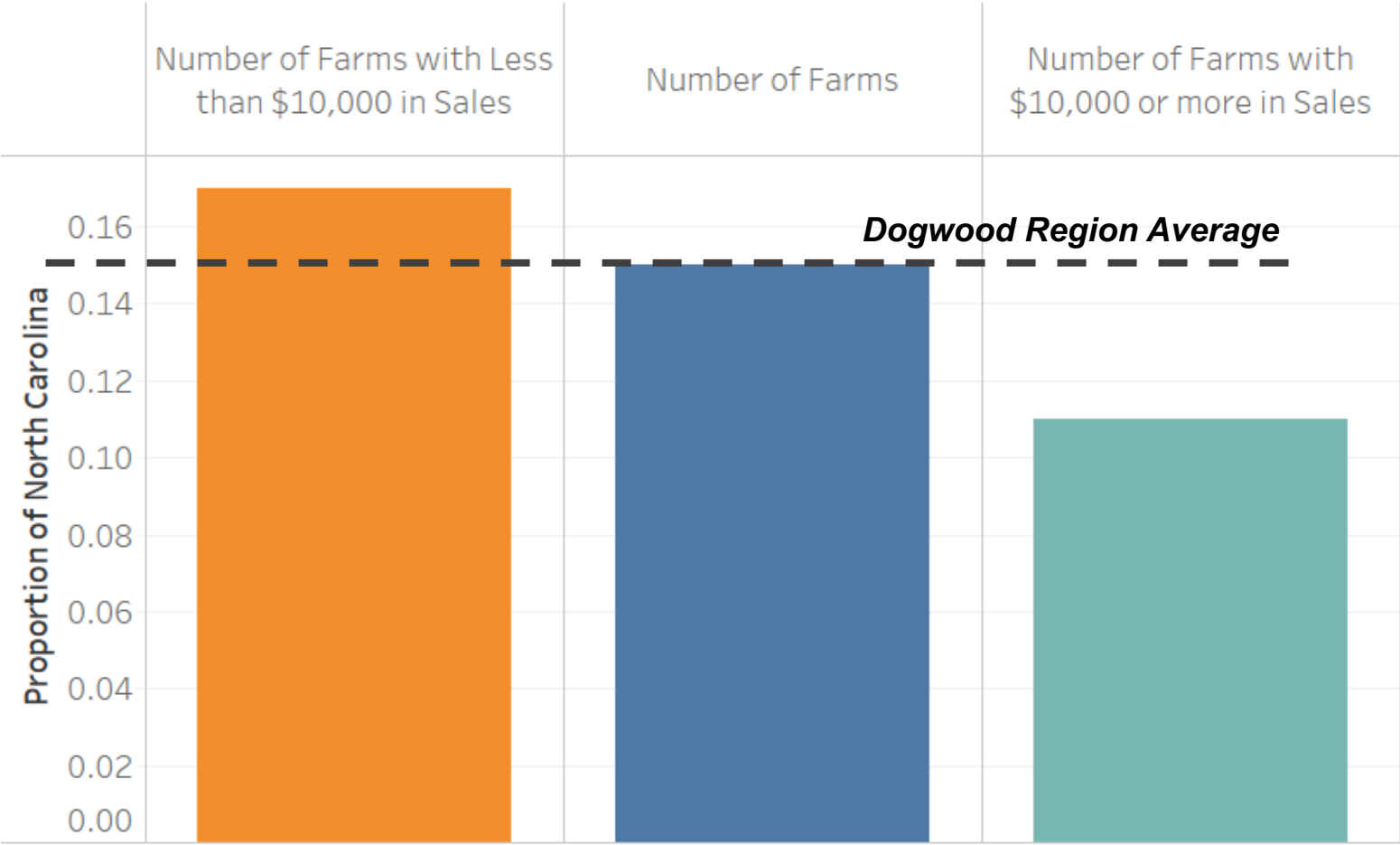


Farm Size

Disproportionately **high**
number of small farms – 17%
compared to 15%.

Disproportionately **low**
number of large farms – 11%
compared to 15%

Farm Size in WNC Region as Proportion of State Total, 2017
Dogwood Region

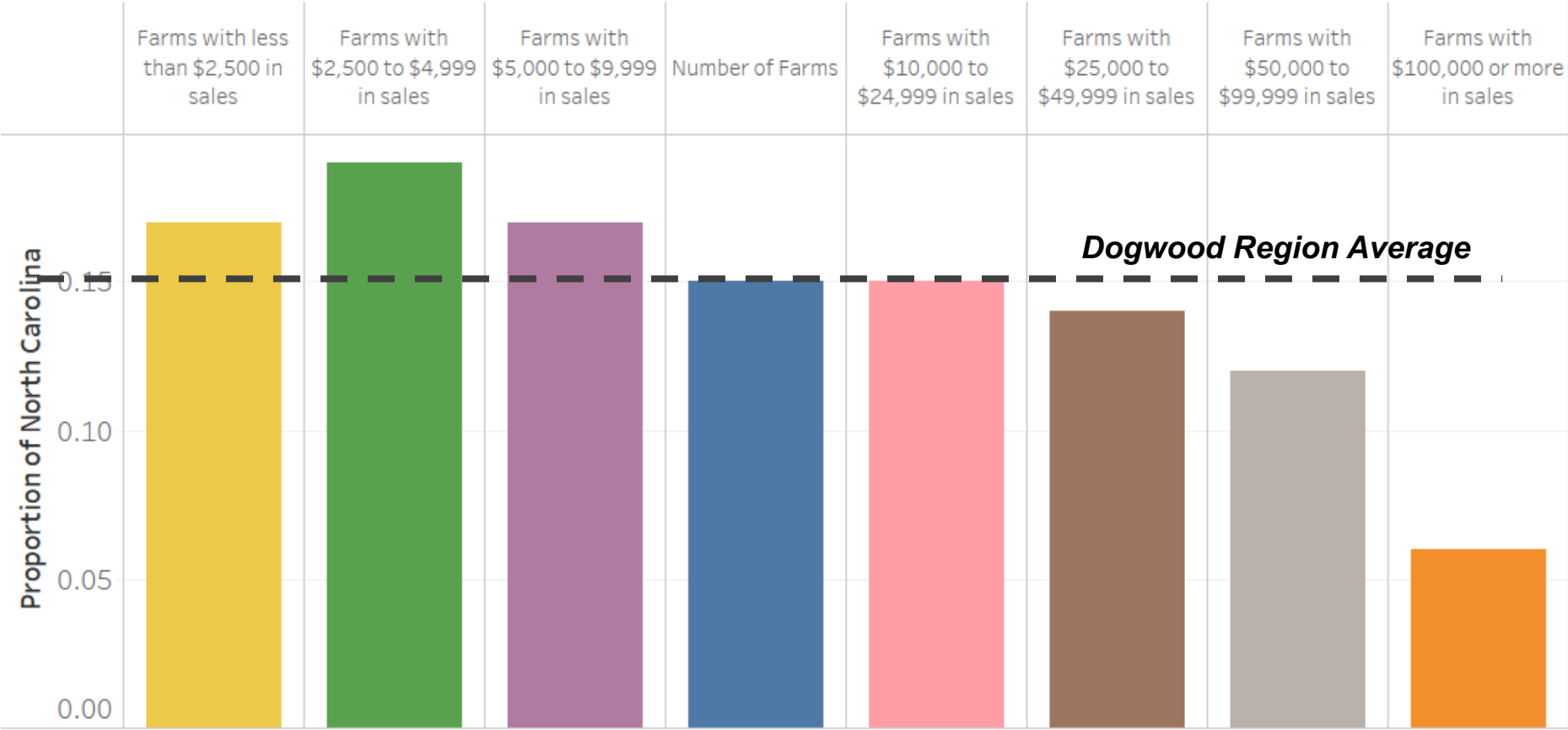


Farm Size (Cont.)

Farm Size in WNC Region as Proportion of State Total, 2017
Dogwood Region

Same information as previous slide, just in greater detail.

Disproportionately **high** number of small farms of all sizes.



Total Livestock Value of Sales (\$1,000)

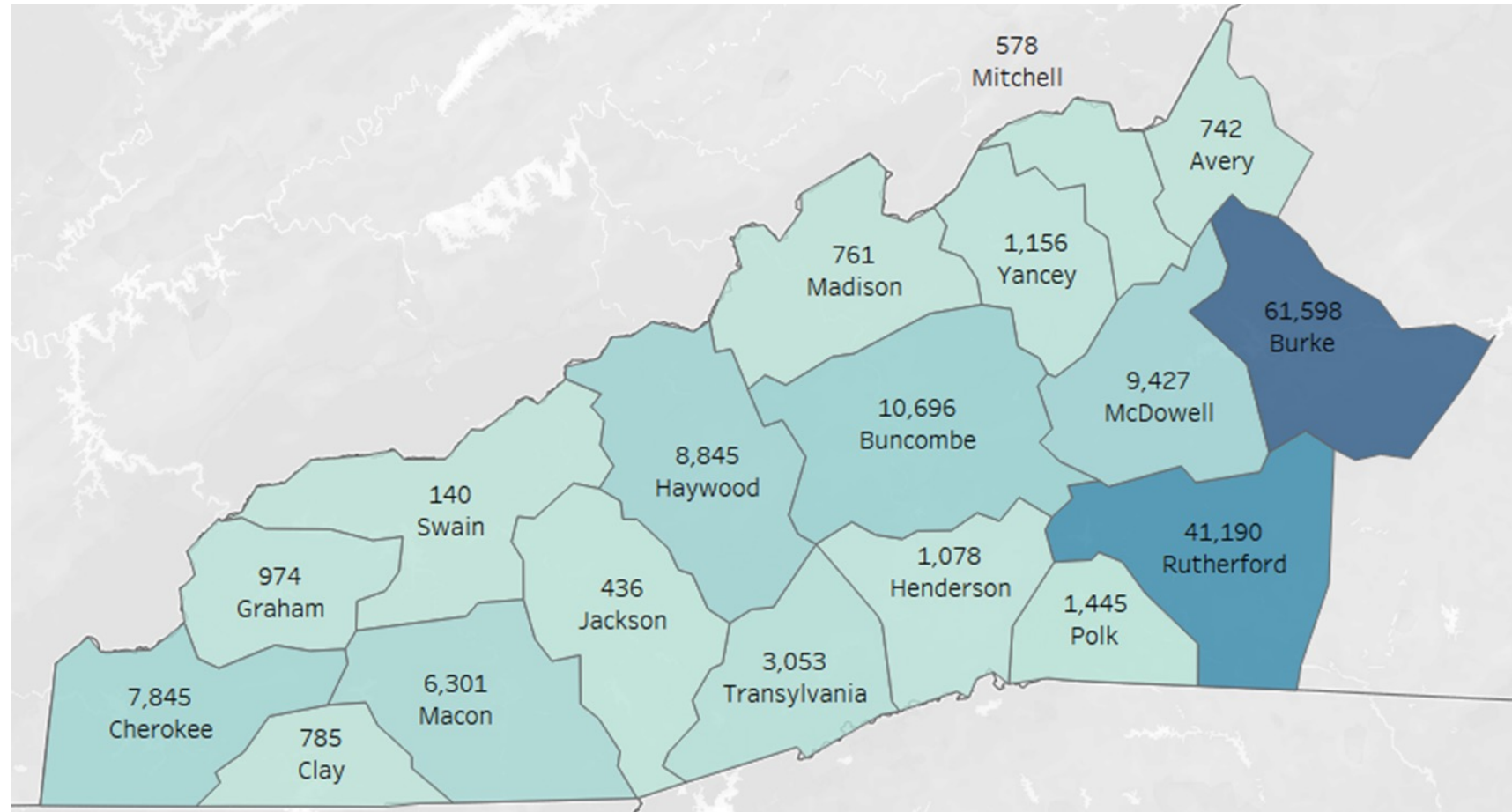
Market Value of Livestock Products Sold, 2017 *Dogwood Region*

2% of NC's market value

Burke county has poultry and egg production – also only 2% of NC's market value

Specialties:

- Sheep, goats, wool, mohair, milk
- Aquaculture
- Cattle and calves



Vegetables, Melons, Potatoes, Sweet Potatoes Market Value of Sales (\$1,000)

Market Value of Vegetables, Melons, Potatoes, and Sweet Potatoes Sold, 2017 *Dogwood Region*

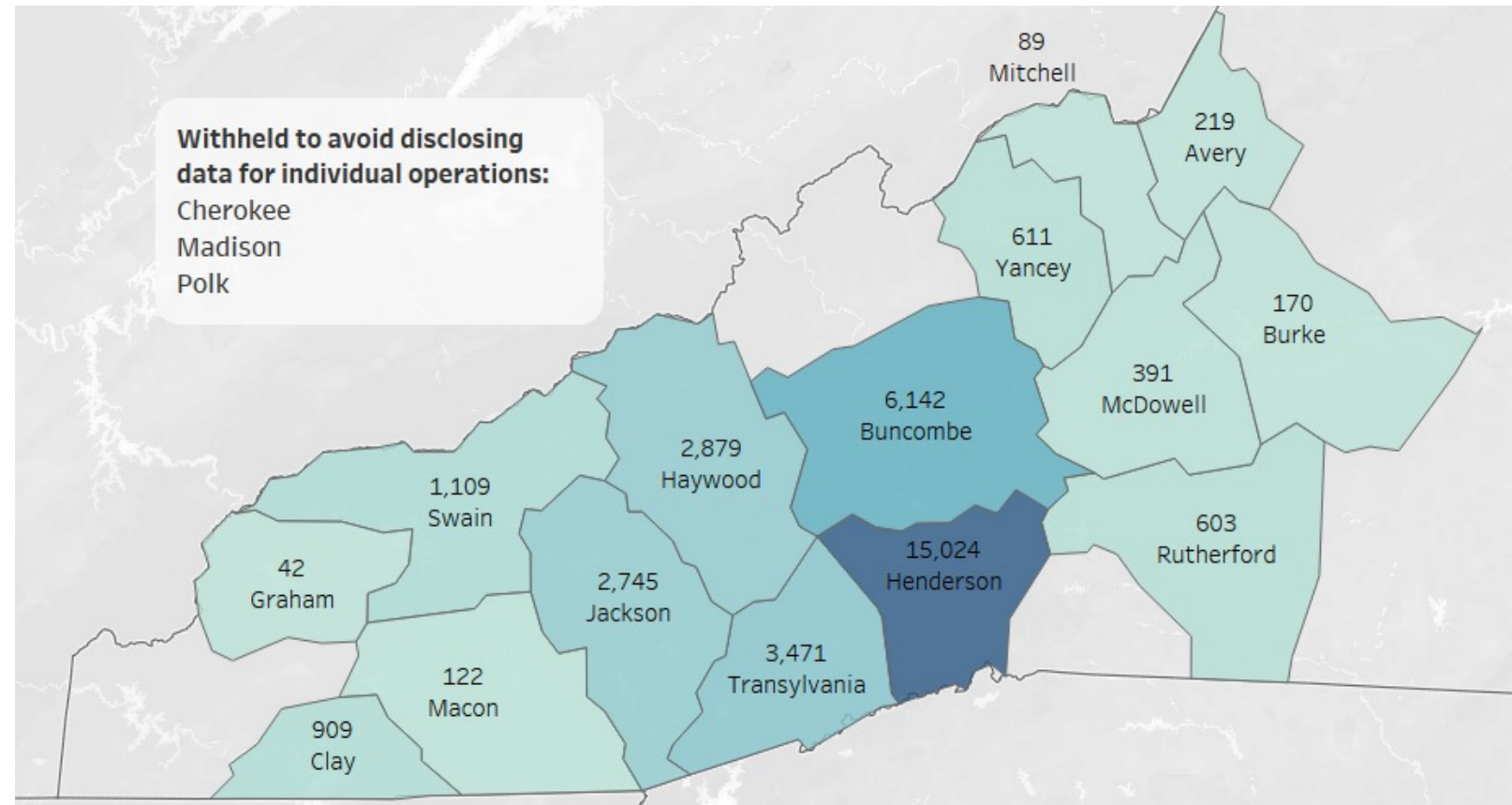
6% of NC's market value

Henderson county has tomatoes
(grown in the open), sweet corn, and
bell pepper

- Only county with geography for
large vegetable farms

Specialties:

- Tomatoes (grown in the open)
- Watercress
- Carrots



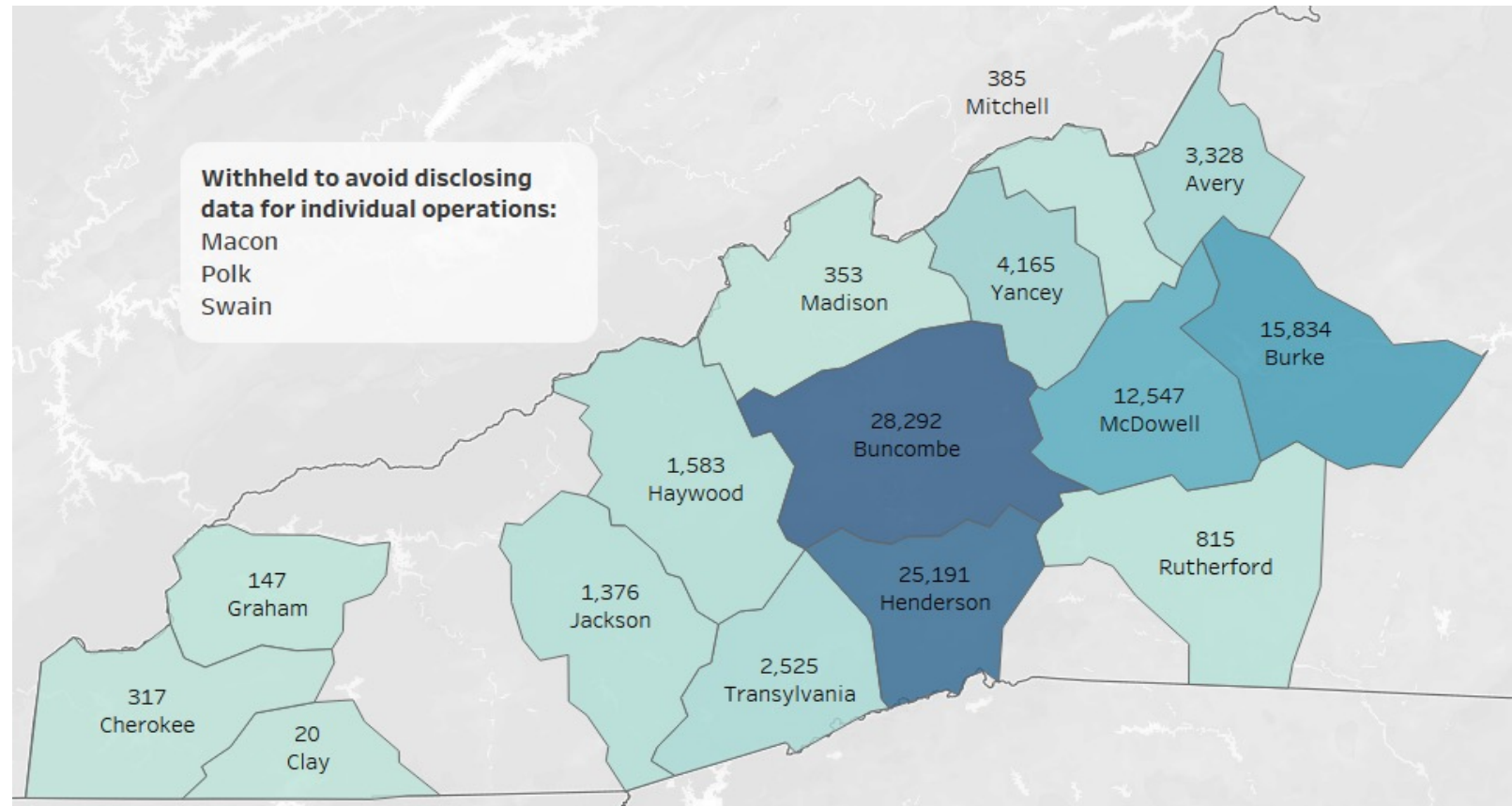
Nursery Greenhouse, Floriculture, Sod Market Value of Sales (\$1,000)

Market Value of Nursery Greenhouse, Floriculture, Sod Sold, 2017 *Dogwood Region*

18% of NC's market value

Specialties:

- Mushrooms
- Vegetable seeds
- Nursery stock crops
- Total greenhouse vegetables and fresh cut herbs
- Sod harvested

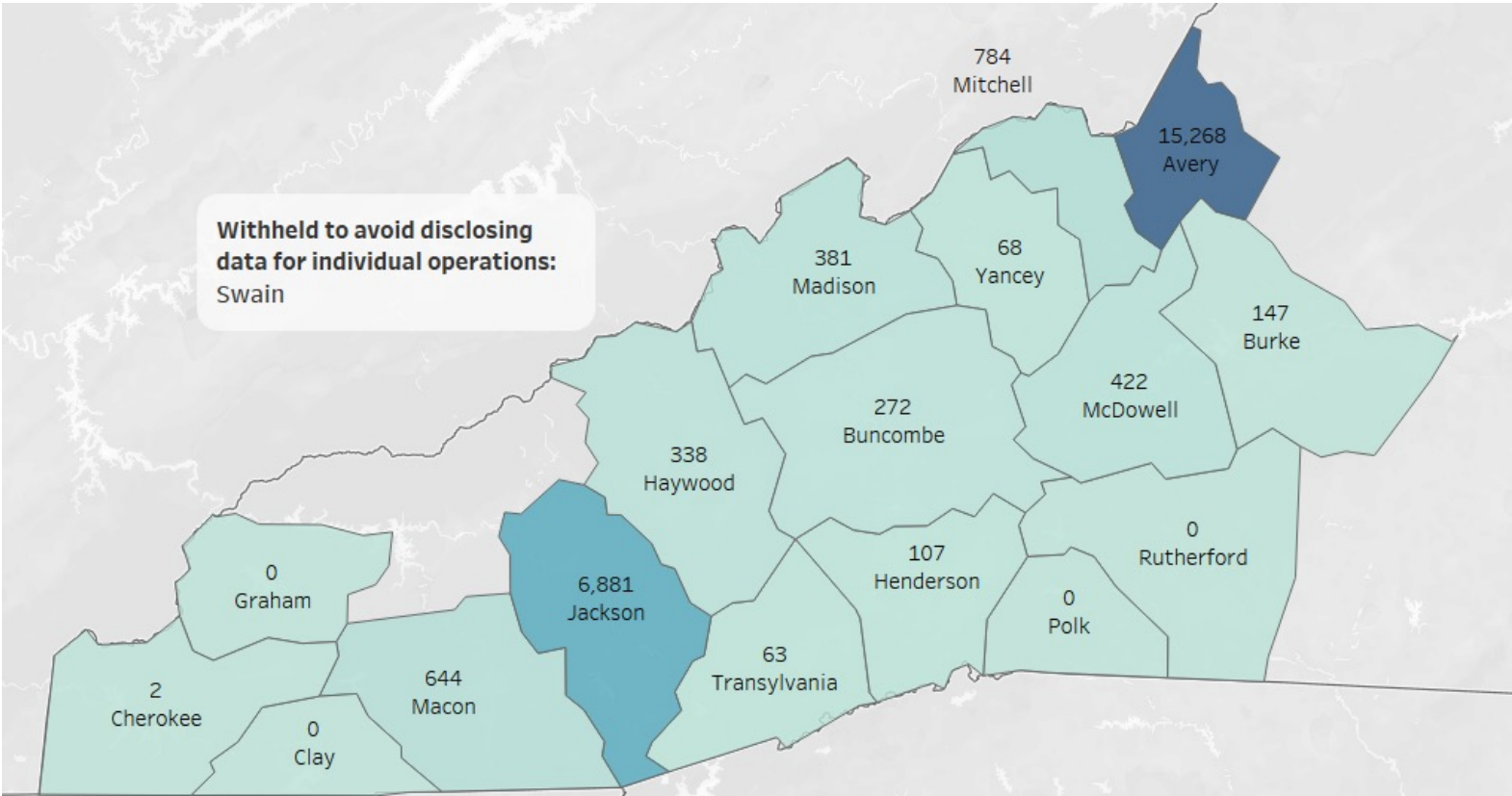


Cultivated Christmas Trees, Short Rotation Woody Crops Market Value of Sales (\$1,000)

29% of NC's market value.

The largest value of Christmas tree production statewide is in adjacent counties east of Avery, just outside of the Dogwood region.

Market Value of Cultivated Christmas Trees, Short Rotation Woody Crops Sold, 2017
Dogwood Region



Fruits, Tree Nuts, Berries Market Value of Sales (\$1,000)

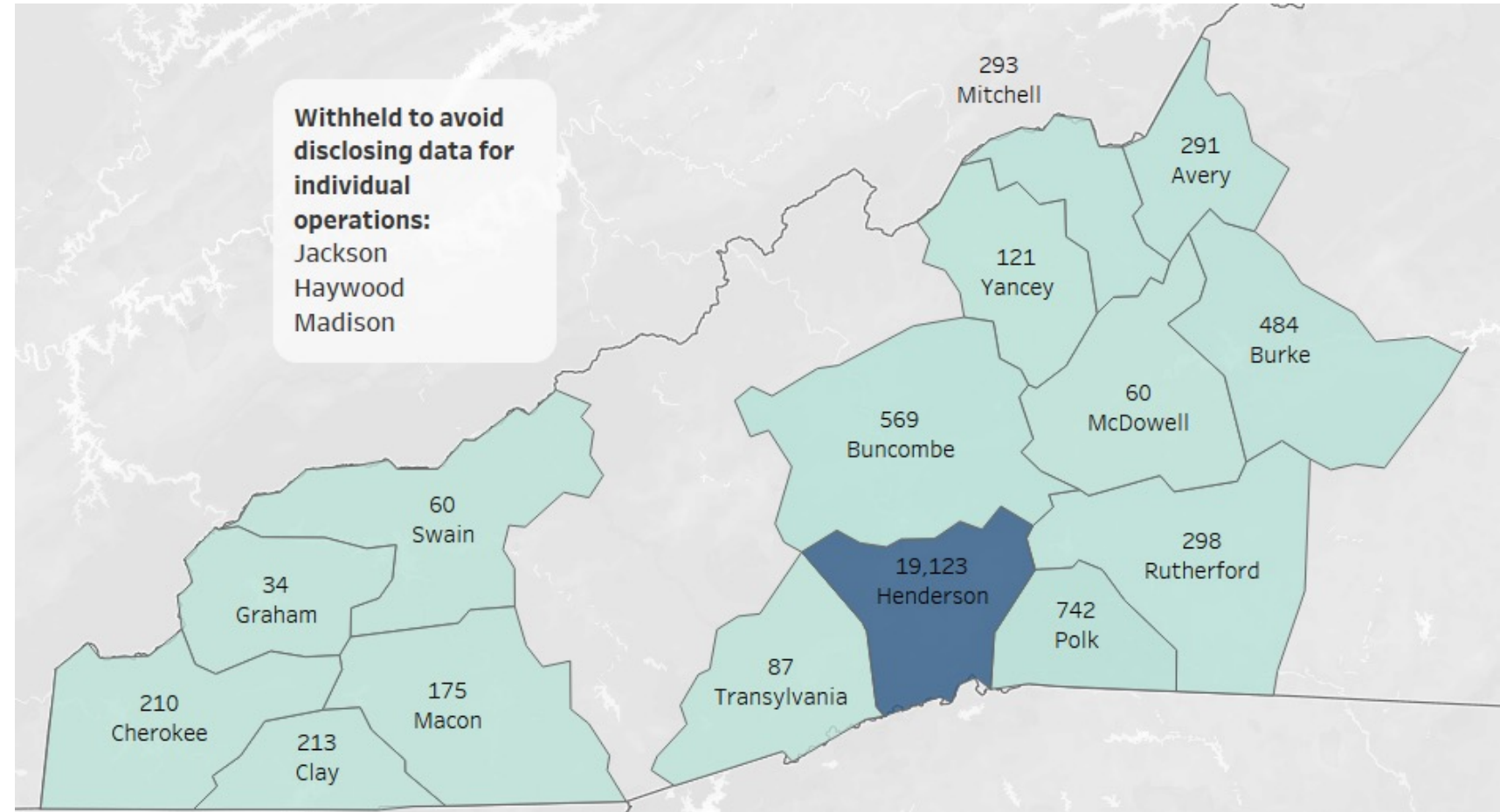
Market Value of Fruits, Tree Nuts, Berries Sold, 2017 *Dogwood Region*

21% of NC's market value

Similarly, Henderson has the largest value of fruits, tree nuts, and berries with the most land suitable for larger scale growing operations.

Specialties:

- Apples
- Elderberries
- Raspberries



Summary: Key Data Takeaways

Western North Carolina has a large share of small farmers

- Largest share of farms earning \$10,000 or less
- Number of farms and acreage not necessarily correlated with value

Competitive sub-categories where Western NC out-performs include:

- Vegetables: Tomatoes (grown in the open), Watercress, Carrots
- Fruit: Apples
- Livestock: Sheep and goats, Aquaculture, Cattle and calves
- Greenhouse and floriculture products, Christmas Trees
- Food processing: Beverage products manufacturing (brewing industry)