American Farmland Trust
SAVING THE LAND THAT SUSTAINS US

Who's Using BIOCHAR in U.S. Agriculture?

INSIGHTS FROM A 2025 NATIONAL SURVEY OF FARMERS USING OR INTERESTED IN BIOCHAR

American Biochar Institute

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WHY THIS SURVEY MATTERS

INTEREST IN BIOCHAR AS A SOIL AMENDMENT is growing quickly. Sustainably produced biochar has the potential to contribute to solving societal challenges such as soil health challenges, climate mitigation, water and air quality challenges, organic waste management, wildfire risk reduction, and renewable energy production. For farmers and ranchers, when the right biochar type, rate, and application approach are matched to soil characteristics and agricultural production systems, biochar can help build soil health, improve water infiltration and storage, retain plant-available nutrients, and support crop productivity and agriculture resilience (Joseph et al. 2021; Thomas et al. 2026; Wu et al. 2022).

The 2025 U.S. Biochar Market report, led by the American Biochar Institute, identified agriculture as the largest market for biochar (Gray et al. 2026). However, the 444 survey responses behind that finding came from across the biochar industry, and only 20 were from agricultural users. Very little is known about the farmers and ranchers who are integrating biochar into their soil management across the country: who and where they are, why they use it, how they apply it, and what results they see.

To begin answering these questions, American Farmland Trust (AFT) and partners surveyed farmers applying or interested in biochar across the U.S. to better understand current biochar use, experiences, information needs, and opportunities to accelerate successful adoption. The survey, conducted in early 2025, received 367 complete survey responses from farmers across 45 states, 149 of whom had applied biochar. Here, we share results from this first-of-its-kind national survey of farmers using or interested in biochar. These results establish a 2025 baseline for a planned survey series tracking biochar use, outcomes, and needs among farmers and ranchers as supply and support grow. We hope these findings can serve farmers and ranchers weighing whether to try biochar, and the advisors they turn to, to see what others are experiencing; and serve producers, suppliers, researchers, industry partners, and funders to see where support is most needed to scale biochar use across U.S. working lands.



Mixing compost with biochar prior to application for an AFT demonstration trial on a farm in California.

KEY TAKEAWAYS

Application Approach: Biochar users primarily broadcast less than one ton/acre of farmer-produced, wood-based biochar blended with compost on specialty crops and on select acres one to three times per 10 years..

Motivations: Farmers were motivated to use biochar to improve soil health, increase yields, and build drought resilience. Only a small percentage of respondents were motivated by carbon markets, suggesting that soil health, resilience, and economic viability may resonate more with most farmers and ranchers than carbon market framing.

Benefits: Observed benefits largely matched motivations, with better soil water-holding capacity, more soil biological activity, and higher crop yields identified as the most commonly observed benefits.

Challenges: Biochar availability and cost remain key barriers to biochar adoption, but access to technical support may also be a major barrier. Farmers interested in biochar but not yet using it reported difficulty accessing technical assistance nearly twice as often as biochar users, highlighting a potential opportunity to support broader adoption via improved education and technical assistance.

Farmers using biochar (biochar users) versus farmers interested in but not yet using biochar (non-users) did not differ significantly in geographic distribution, production types, organic certification, or conservation practices, and represented a diverse range of agricultural operations. Thus, outreach and promotion of biochar use shouldn't necessarily be targeted based on these farm characteristics.

Farm size: Biochar users tended to operate smaller farms (less than 50 acres) than non-users. This points to a need to better understand and address barriers to adopting biochar at larger operational scales.

Education: Respondents overall were highly educated (77% held a degree beyond high school), with no difference between biochar users and non-users. This points to a need to make biochar information practical, accessible, and easy-to-evaluate to reach farmers and ranchers of all educational backgrounds.

Peer-to-Peer Learning was the most reported source of biochar information among users (44%). This finding highlights the value of accessible, farmer-led outreach—including farmer networks and demonstrations—to expand awareness and knowledge of biochar.

Continuing Use: Four in five biochar users (80%) are likely or very likely to keep applying biochar, signaling sustained interest and success despite current challenges.

SURVEY DESIGN

AFT's Climate and Soil Health Team and Social Science Team designed the 2025 National Biochar Adopter Survey in collaboration with Cornell University, USDA-NRCS, American Biochar Institute, and University of Nebraska-Lincoln. The online survey of farmers and ranchers using biochar or interested in using biochar, herein referred to as biochar users and non-users, was open from January 8 to April 4, 2025. It included up to 35 questions, with most questions multiple-choice or select-all-that-apply, with some open-ended questions. All respondents answered questions about farm size, production, organic certification, and conservation practices, followed by optional demographic questions. Branching logic then directed biochar users to an extended survey with additional questions about their motivations and use (where they apply biochar, biochar source, type, cost, application rates, methods, and frequency), as well as observed benefits, challenges, information sources, and resource needs. Respondents who were interested in biochar but had not applied it (non-users) were asked what had prevented them from applying biochar. The survey was distributed through AFT and partner email lists, social media platforms, and networks.


Biochar, penny for scale

SURVEY RESULTS

We received 367 complete survey responses from farmers and ranchers, of which 149 (41%) had applied biochar (biochar users), while the remaining 218 (59%) respondents were interested but had not yet applied biochar (non-users).

As with any voluntary, convenience survey sample, the respondent pool is not random and should not be treated as representative of the U.S. farming population. For this report, we focus primarily on biochar user responses at the national level. Unless otherwise stated, results did not differ significantly between biochar user and non-user sub-groups, nor between geographic regions. Differences are described as significant when $p < 0.05$. We compared biochar users and non-users using logistic regression, controlling for age, farm size, and education, and compared sub-groups and regions using chi-square or Fisher's exact tests. Full methods and results will appear in a forthcoming peer-reviewed article. Because not every respondent answered every survey question, we report all results as valid percentages calculated from the number of respondents who answered each question (n) rather than the total sample size (N).

Who uses biochar in agriculture?

LOCATION: We received survey responses from farmers using biochar across 40 U.S. states. Most biochar user responses were in Washington (n=18), Massachusetts (n=12) and Oregon (n=11), while thirty states had only one to four biochar user responses. Given the small number of responses from most states, we grouped responses by region to better understand the geographic spread of biochar users (Figure 1). The Northeast (n=41) and Pacific (n=40) had highest number of biochar user survey responses, followed by the Southeast (n=29), Midwest (n=23), and Intermountain West-Great Plains (IWGP; n=16). Non-users were most heavily concentrated in the Northeast (n=94), followed by the Pacific (n=35) and Midwest (n=35), the Southeast (n=30), and the IWGP (n=24) (Figure 2). The Pacific was the only region where biochar users outnumbered non-users. This geographic distribution may be more representative of where American Farmland Trust has staff and projects than a reflection of biochar activity. However, these results do support findings from the 2025 biochar industry survey led by American Biochar Institute, which received the most survey participation along the West Coast,

Figure 1

Biochar user survey response count by region (n=149)

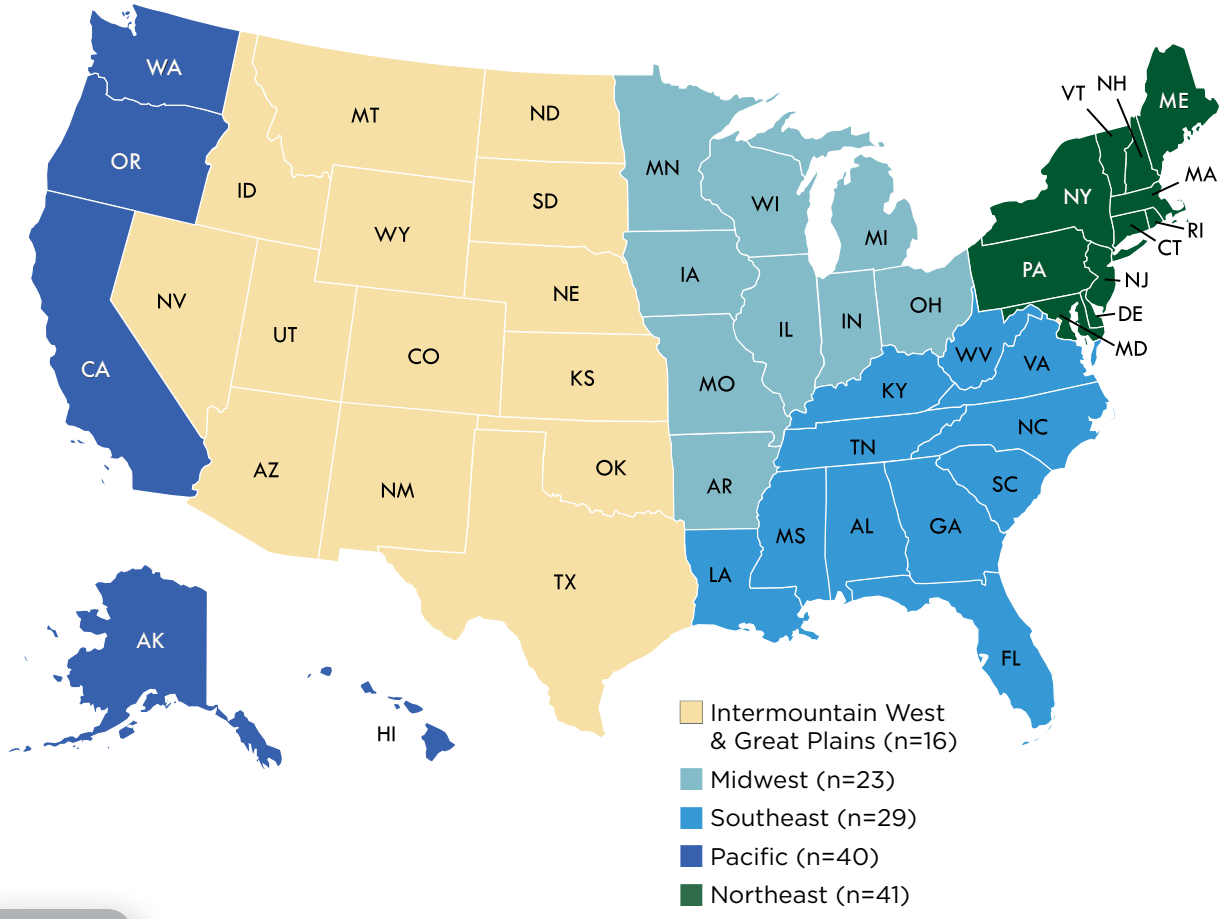
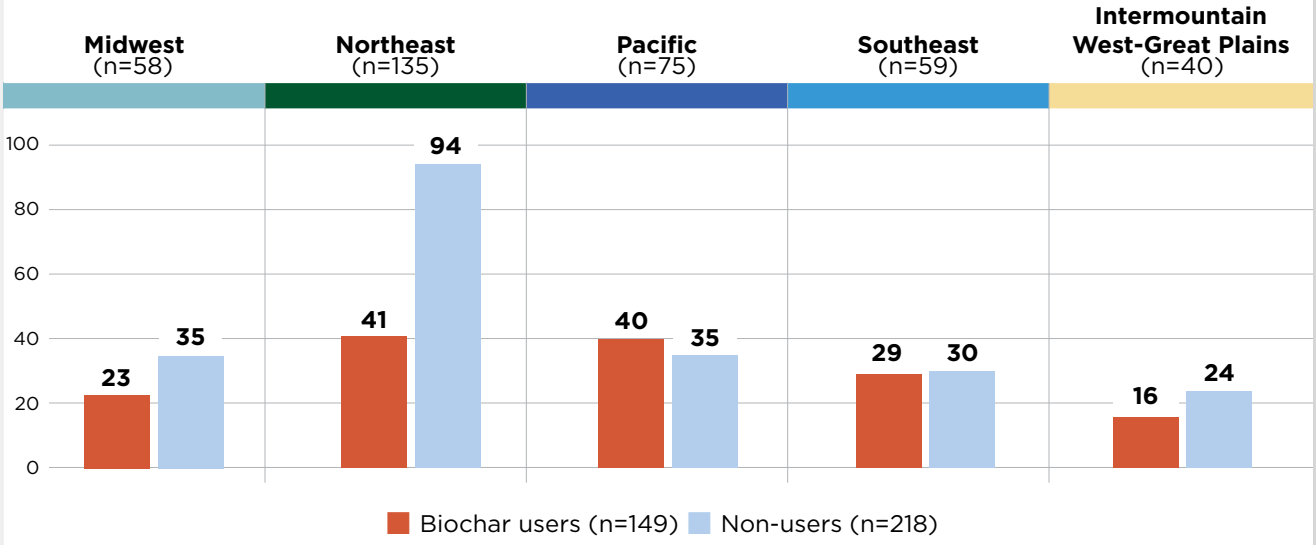


Figure 2

Biochar users and non-users survey response count by region (N=367)



Southeast, and Northeast (Gray et al. 2026). The large geographic scope of survey respondents reflects the wide range of feedstocks, production systems, and market drivers shaping the U.S. biochar industry.

DEMOGRAPHICS

Across all regions, most biochar user survey respondents were male (63%; n=52), white (83%; n=70), and between 35 and 65 years old (74%; n=61).[1] According to the 2022 USDA Census of Agriculture, U.S. producers were 64% male, 95% white, and 53% 35-64 years old (USDA NASS, 2024). Compared with national producer demographics, the survey sample had a similar proportion of male respondents (63% vs. 64%), a lower proportion identifying as white (83% vs. 95%), and a higher proportion of respondents aged 35–65 (74% vs. 53%).

Among biochar user survey respondents, 76% (n=64) reported education beyond high school. This is consistent with other research linking education positively to agricultural technology adoption (Prokopy et al., 2019; Ruzzante et al., 2021). This finding points to an important outreach opportunity: making biochar information practical, accessible, and easy to evaluate may help farmers with a broader range of educational backgrounds.

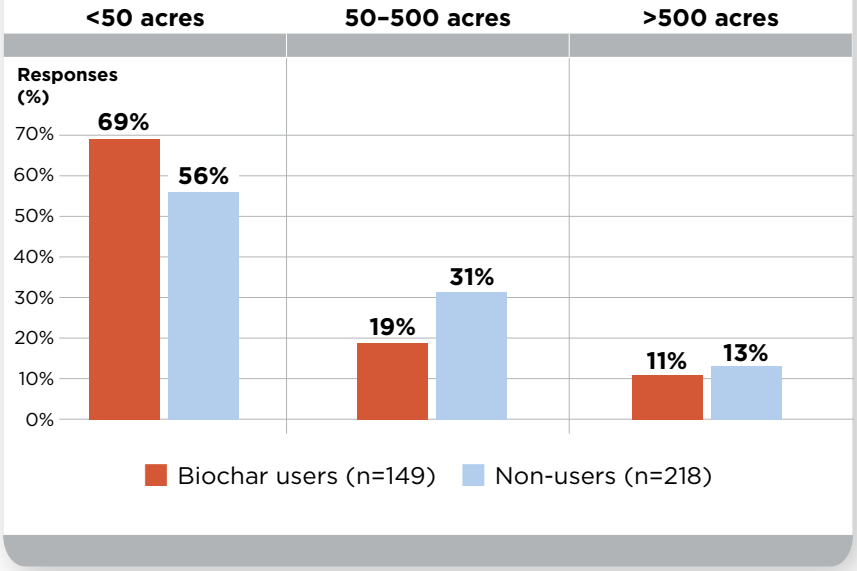
Beginning farmers were disproportionately represented among all respondents: 52% (n=137) had farmed for ten years or less, compared with approximately 30% of U.S. producers nationally (USDA NASS, 2024). This suggests beginning farmers may be an important audience for biochar education, demonstrations, and technical and financial assistance.

What kinds of farms use biochar?

FARM SIZE: Biochar users primarily operated smaller farms, with 13% (n=19) farming less than 1 acre, 36% (n=54) farming 1–10 acres, and 20% (n=30) farming 11–50 acres. Farm size distribution tended to differ significantly between biochar users and non-users, with 69% of biochar users tending to operate smaller farms (Figure 3). Farm size also varied regionally, with a greater proportion of biochar users in the Midwest and Intermountain West–Great Plains operating farms larger than 500 acres compared to other regions.

Figure 3

Biochar user and non-user farm size distribution (N=367)



1 See Appendix A for detailed demographic and geographic results.

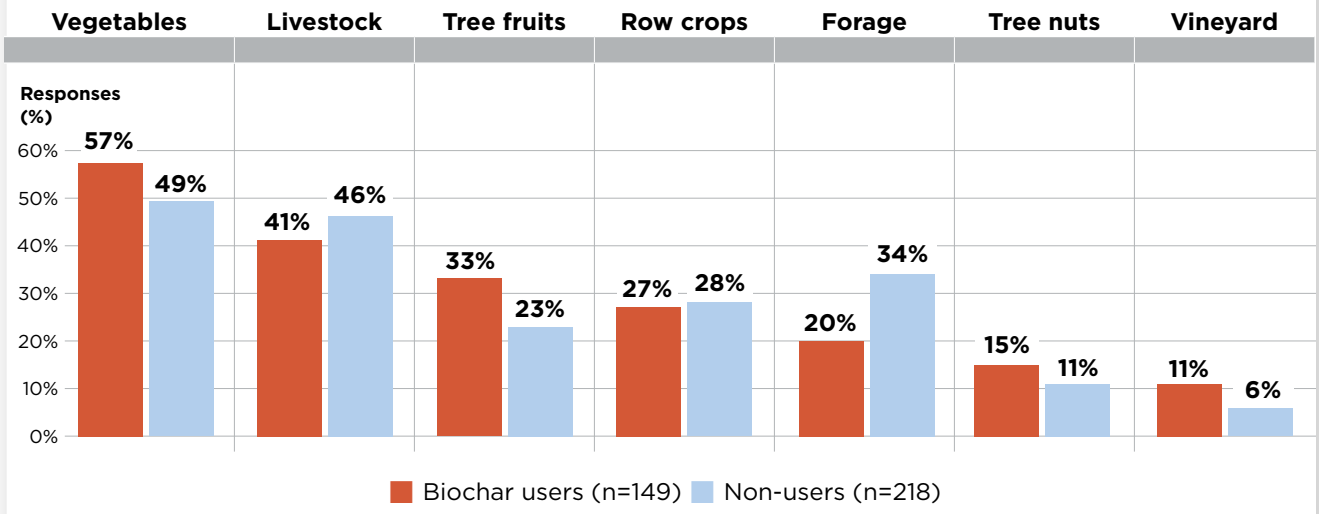
PRODUCTION: Biochar users and non-users represented diverse agricultural operations, with vegetables and livestock the most commonly reported production systems in both groups (Figure 4). No production categories differed significantly between groups. Descriptively, biochar users more frequently reported growing specialty crops, particularly vegetables, tree fruits, tree nuts, and wine grapes, while non-users more frequently reported forage and livestock (Figure 4). This may indicate an opportunity to further explore barriers to biochar adoption among livestock and forage producers. Overall, these findings suggest that opportunities to expand biochar adoption are not limited to a particular production system. Outreach and research could support producers across these systems by addressing the practical and economic barriers to biochar adoption specific to different production systems.



Biochar applied to beds for an AFT demonstration trial on a farm in Maine.

Figure 4

Production types reported by biochar users and non-users (N=367); presented as percent of sub-group; respondents could select more than one production system





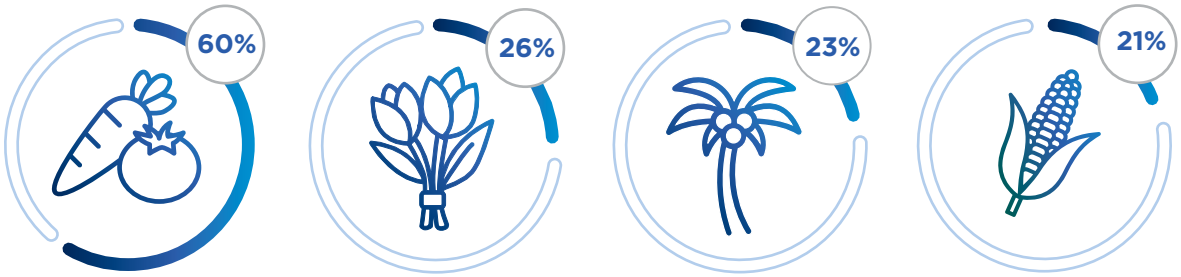
Applying biochar for an AFT demonstration trial on a farm in Washington.

However, most biochar users applied biochar to select acres of their operations (70%; n=79) rather than to all acres (30%; n=34). Vegetables were the most common crop type that biochar users are applying biochar to, followed by other specialty crops such as flowers, herbs, timber, etc., tree fruits, and row crops (Figure 5). These findings indicate biochar may be most viable in high-value crop production systems.

OTHER PRACTICES: Certified organic operations were overrepresented in our sample relative to national figures. Nineteen percent of biochar users and 11% of non-users reported being certified organic (22% and 14%,

Figure 5

Crops identified where biochar users are applying biochar (n=114); respondents could select more than one crop



Vegetables

Other specialty crops (flowers, herbs, trees, fruit)

Tree fruits

Row crops

Forage crops 18% **Tree nuts** 11% **Vineyard** 6%

respectively, when including operations with a portion certified), compared with roughly one-percent of U.S. farmland (USDA NASS, 2024). An additional 13% of biochar users and 9% of non-users were transitioning to organic. These results suggest an existing audience for biochar among organic producers, alongside opportunities to expand outreach to non-organic operations. See Appendix B for detailed results.

Biochar users and non-users commonly reported similar soil health practices that they implement, particularly cover crops, soil testing, and reduced or no tillage (Table 1). Organic amendment use showed the largest difference between groups (70% biochar users vs. 58% non-users), which may reflect co-application of biochar with compost or manure. Overall, all survey respondents have adopted many of these other practices shown in Table 1, which suggests there is an opportunity to introduce biochar through existing conservation programs and networks.

Certified organic operations were well represented among biochar users (22%; n=32).

> *"I built my first retort [equipment to produce biochar] 20 years ago. I have been working very hard to improve my soil [with biochar] along with my compost production. We are dedicated to improving our soil health."*
>
> **— Oregon vegetable farmer**

Table 1

Soil health practices implemented by biochar users (n=148) and non-users (n=215); sorted in descending order of share of biochar user responses; respondents could select more than one practice.

Practices	Non-Users (n=215)	Biochar Users (n=148)	Difference (%)
Organic Amendments	58%	70%	+12%
Cover Crops	65%	64%	-1%
Soil Health & Nutrient Testing	64%	64%	0%
Reduced/No Tillage	60%	61%	+1%
Conservation Crop Rotation	42%	50%	+8%
Nutrient Management	53%	46%	-7%
Integrated Water Management	28%	34%	+6%
Livestock Integration	34%	32%	-2%
Agroforestry	23%	32%	+9%
Prescribed Grazing	29%	32%	+3%
Other Practice	5%	8%	+3%
None	2%	3%	+1%

How are farmers sourcing and applying biochar?

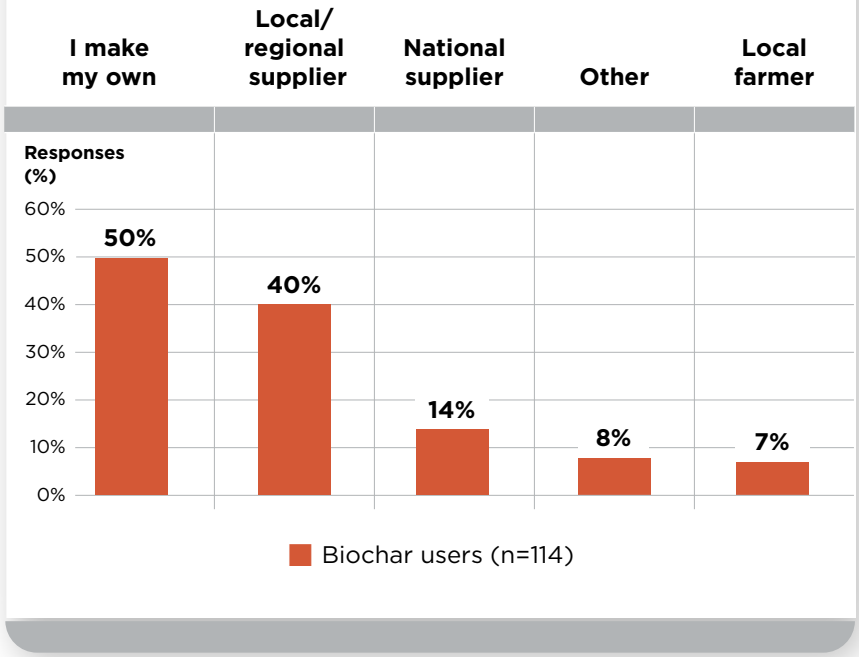
BIOCHAR SOURCE: Half of biochar users made their own biochar (50%; n=57), while 40% (n=46) purchased it from local or regional suppliers (Figure 6). Among those who made their own biochar, most were located in the Southeast (n=17), Pacific (n=16), and Northeast (n=15), and the smallest share was in the Intermountain West & Great Plains (n=2) with the remaining located in the Midwest (n=7). Respondents purchasing from local or regional suppliers were concentrated in the Pacific (n=17), Northeast (n=10), and Southeast (n=9); 65% sourced biochar within 100 miles. The Pacific has historically, and currently, been the region with the best commercial biochar availability.

Sourcing methods differed significantly across the five regions. These differences highlight the value of tailoring support to regional sourcing needs, including guidance for on-farm production and connections to nearby suppliers.

BIOCHAR COST: The most frequently selected cost range was less than $250/ton or $50/cubic yard (44%; n=26). However, reported costs varied widely, ranging from less than $250 to more than $1,000 per ton and from less than $50 to more than $200 per cubic yard. There was no significant difference in cost between regions. Reported costs should be interpreted cautiously given the limited sample and variation in sourcing circumstances. See Appendix C for detailed biochar cost results.

Figure 6

Biochar users selected sources of biochar (n=114); respondents could select more than one source





From left to right: softwood biochar, high carbon wood ash, hardwood biochar. All three were used on an AFT demonstration trial on a farm in Maine.

BIOCHAR TYPE & BLEND: Wood-based biochar was most used (90%; n=103), followed by biochar derived from agricultural materials such as straw (12%; n=14) and manure (11%; n=12). One biochar user in Washington growing tree fruits described making biochar from tree prunings as *"very satisfying work"* and added that *"more people should know how."* See Appendix F for detailed results.

> *"I have only used biochar for three years, but I have seen a great improvement to the land where I apply. Half our land is in orchards so I use our apricot prunings. I wish I could apply more!"*
>
> **— Washington biochar user**

Most users (84%) applied biochar alongside another soil amendment (Appendix F). Compost was the most common accompanying amendment (59%), followed by manure (27%) and other organic amendments (17%). It is generally recommended by biochar suppliers and professionals to blend biochar with other materials.

APPLICATION FREQUENCY, METHODS, AND RATES: As shown in Table 2, most users (64%) reported applying biochar one to three times within the past 10 years, followed by four to six times (18%) and seven to 10 times (15%). An additional 3% last applied biochar more than 10 years ago. Application frequency did not differ significantly across regions, but farmers who made their own biochar applied it significantly more frequently than those who purchased it.

Application frequency did not differ significantly across regions, but farmers who made their own biochar applied it significantly more frequently than those who purchased it.

Broadcasting with incorporation was the most common application method (43%; n=48), followed by broadcasting without incorporation (28%; n=31) (Appendix F). More than half of biochar users (61%; n=64) reported average application rates below one ton or five cubic yards per acre. See Appendix C for detailed biochar application rates results. Neither application method nor rate differed significantly by sourcing method or region.

The association between on-farm biochar production and more frequent application, but not higher application rates, warrants further investigation. On-farm production may reduce some of the costs or access barriers associated with biochar applications, potentially making more frequent applications feasible. This pattern

Table 2

Biochar application frequency within the past ten years reported by biochar users (n=114)

Application frequency (# biochar applications in past 10 years)	**Biochar Users** (n=114)
1–3	64%
4–6	18%
7–10	15%
More than 10 years ago	3%

also suggests that these farmers add biochar to their soil in small, regular doses rather than in big, occasional ones. Practical guidance on production and application could help farmers to evaluate options that are better suited to their operations.

> *"Biochar has helped build soil health resulting in plants better resisting soil borne diseases and pathogens [on my farm]."*
>
> **— North Carolina vegetable farmer**

Why do farmers use biochar, and what results do they see?

MOTIVATIONS & BENEFITS: Respondents were motivated to adopt biochar to improve overall soil health or specific soil properties (78%, n=89), increase crop yields (42%, n=48), and enhance drought resilience (35%, n=40). Reported benefits aligned with these motivations: 41% (n=47) improved soil water-holding capacity, 26% (n=30) increased biological activity, and 25% (n=28) higher crop yields. See Appendix D for motivations and benefits full results. As one biochar user respondent from Washington noted, "*The plants were bigger, and fruits were larger.*"

What holds farmers back, and what do they need?

BARRIERS & CHALLENGES: Farmers and ranchers who were interested in biochar but had not yet applied it (non-users) identified inadequate biochar availability (53%; n=107) and cost (45%; n=91) as the most common barriers to biochar use, followed by difficulty accessing financial assistance (29%; n=58) and technical assistance (25%; n=50) (Figure 7). Availability and cost were also the leading challenges among biochar users (39% each; n=45), although fewer users reported difficulty accessing financial assistance (16%; n=18) or technical assistance (10%; n=11) (Figure 7). These findings highlight opportunities to improve biochar supply and access to financial and technical support. Because fewer biochar users reported problems getting financial and technical support, connecting interested farmers and ranchers with service providers and decision support tools may be one of the most direct ways to help non-users get started.

Half of biochar users reported making their own biochar, suggesting on-farm production may offer a way to address availability and cost barriers. However, on-farm producers still ranked availability as a top concern, followed by no challenges and cost of both biochar and application. Future research could compare the parameters, benefits, scale, and costs of on-farm production—including considerations of equipment, labor, materials, waste stream, pest management, heat and energy generation, or wildfire suppression—with purchasing biochar.

> *"I have not applied it in several years due to cost and the way to apply. Wish it was easier, as I saw an incredible difference."*
>
> **— Massachusetts vegetable/fruit/forage farmer**

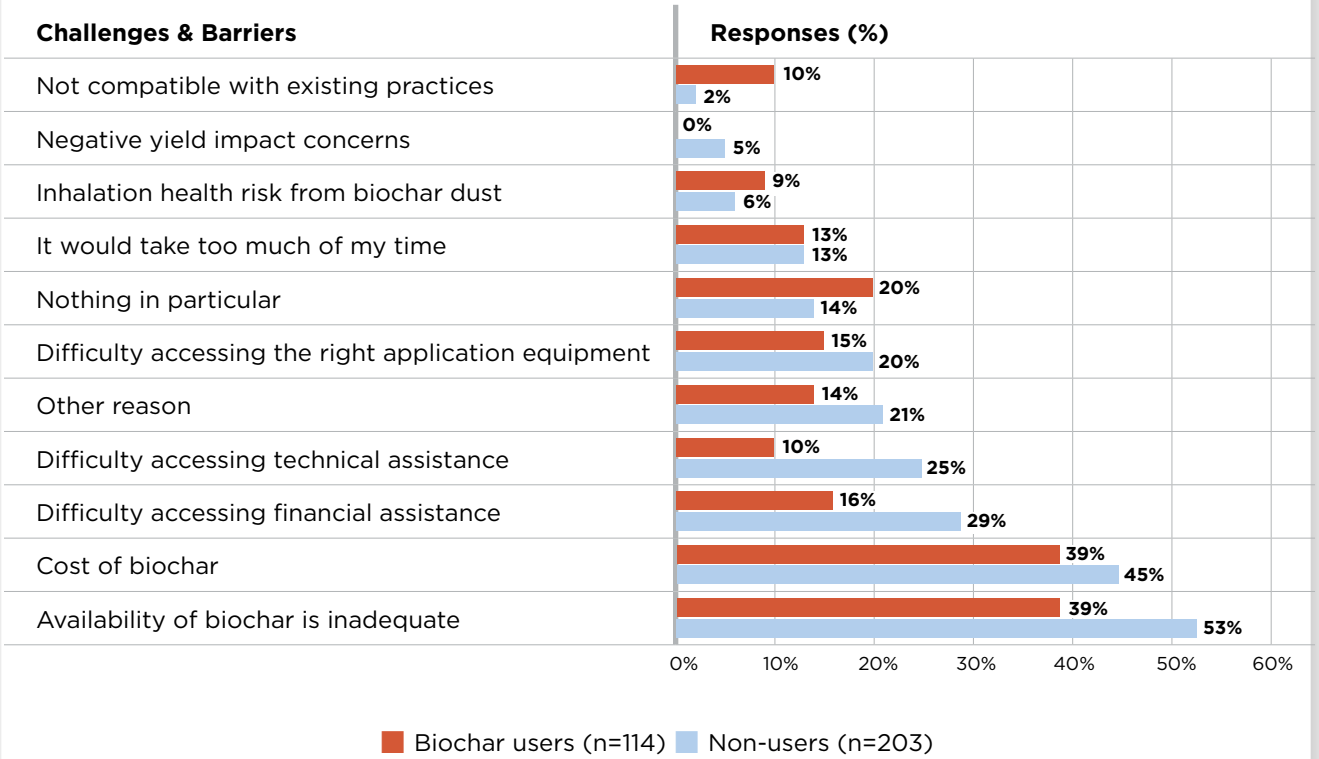
> *"We would like to see how biochar is being used in our region, especially with livestock operations."*
>
> **— New York horticulturist biochar user**



Applying biochar for an AFT demonstration trial on a farm in Maine.

Figure 7

Biochar users' (n=114) and non-users' (n=203) challenges and barriers to biochar adoption presented as percent of sub-group; respondents could select more than one answer



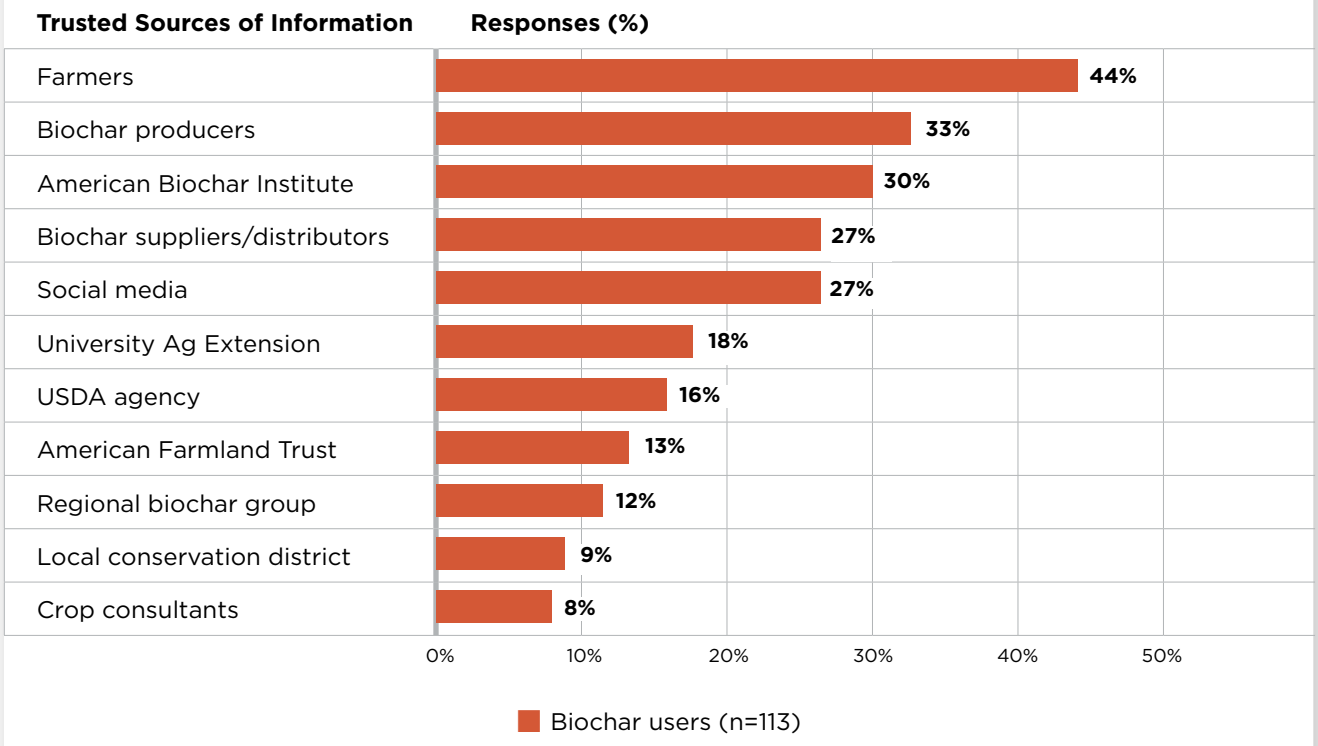
To support continued application beyond financial assistance and lowering costs, biochar users requested agronomic guidance (32%; n=36), demonstration trials (21%; n=24), and economic information and decision-support tools (19%; n=22). See Appendix E for full resource needs results. These resources could help farmers refine application practices and evaluate whether biochar's benefits justify its costs. As one biochar respondent from Massachusetts (flower/vegetable farmer) explained: *"I would like to continue to apply because in theory I know it is beneficial, but I would also like to better understand its benefits to justify the costs."*

> *"It can be hard to tease effects of biochar from other practices such as compost applications and cover cropping. On-farm trials are really needed to test this."*
>
> **— Connecticut fruit & vegetable farmer**

SOURCES OF INFORMATION: The most common source of information and resources used by biochar users comes from other farmers (44%; n=50) via word of mouth or other networks (Figure 8; Appendix E). This points to the value of targeted educational programming that includes coordinating peer and mentor networks and providing training and resources to farmers interested in teaching others about biochar. Notably, respondents relied more on social media (the fifth most common source of biochar information) than on extension, consultants, or other

Figure 8

Biochar users' sources of information on biochar (n=113); respondents could select more than one source



trusted organizations. Social media could be a strategic way to guide farmer-to-farmer learning.

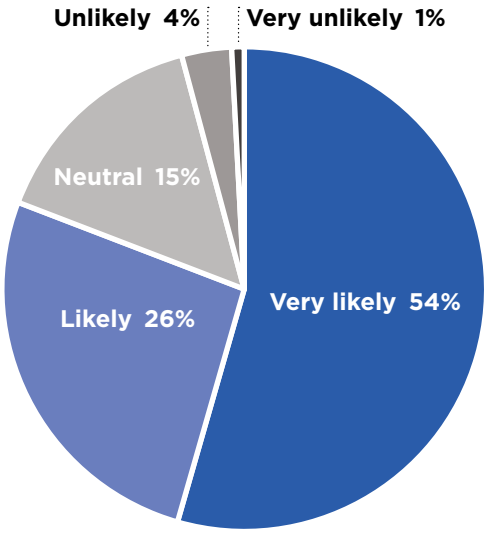
> *"Biochar is an incredible resource. We love making it, using it, and sharing with others about it!"*
>
> **— North Carolina farmer of small, diversified operation**

How likely are biochar users to continue applying biochar?

Despite the challenges described in this report, most users envision biochar remaining part of their farming practices. Four in five biochar users were likely or very likely to continue applying biochar (80%; n=92), with more than half (54%; n=62) very likely (Figure 9). When comparing those who make biochar on-farm versus purchase, 77% (n=57) of on-farm producers selected very likely to continue applying biochar versus 43% on average of those purchasing biochar from local, regional, and/or national sources.

Figure 9

Likelihood of biochar users to continue applying biochar (n=114)



Applying biochar for an AFT demonstration trial on a farm in Washington.

WHAT IS NEEDED?

The survey results point to practical ways to help farmers and ranchers try out and succeed with using biochar. Each piece of advice below is based on what respondents shared.

> *"Need better guidance and scientific research about the pros and cons of incorporating it into the soil via tillage since we are trying to till as little as possible. Also need more trainings for local ag professionals on biochar so they can teach us."*
>
> **— Virginia row crop farmer & biochar user**

- **FARMERS AND RANCHERS:** Support each other. The survey revealed 44% of biochar users learned about biochar from other farmers and half of biochar users made their own biochar (Figure 8). These results indicate that farmer networks, field days, mentorships, and on-farm demonstrations may be some of the best ways to support farmers and ranchers to adopt biochar and adapt their practices over time.

- **AGRICULTURAL ADVISORS AND TECHNICAL ASSISTANCE PROVIDERS:** Be ready for practical questions. Agronomic guidance was biochar users' top need (32%), and non-users reported difficulty finding technical assistance more than twice as often as users (25% vs. 10%). Training for advisors on finding sustainable sources, choosing a biochar type, deciding on rates, blending with other amendments, safe handling, and successful integration approaches with other soil health practices would help close the information gap for users and non-users alike.

- **BIOCHAR SUPPLIERS:** Work with non-profits and local communities to make local, standardized biochar easier to find and products easier to compare for farmers and ranchers. Availability was the top barrier for non-users (53%) and a leading challenge for users (39%), and most users who purchase biochar buy it within 100 miles. Clear product information and test results would further help farmers choose biochar that addresses operational needs more easily, reducing purchasing burden and overcoming technical assistance challenges.

- **RESEARCHERS:** Work with farmers and organizations working closely with farmers to address practical gaps. Some farmers (18%; n=21) indicated they had not yet seen a benefit to biochar use. On-farm research should strive to measure the soil and economic impact of what farmers are doing, ideally in long-term studies. Studies should include a variety of production systems, and ensure questions farmers are asking are addressed, including how to understand biochar's effects in the context of using blends and other soil health practices.

- **FUNDERS AND PROGRAM DESIGNERS:** Lower cost and technical barriers, broaden reach, and address return on investment questions. Cost was a leading barrier for both groups, and non-users reported difficulty accessing financial assistance nearly twice as often as users (29% vs. 16%). Financial assistance, cost-benefit tools, and support for small-scale, on-farm production of biochar that addresses additional on-farm needs could help more farmers and ranchers get started. More work is also needed to understand barriers on larger farms, where biochar use was found to be less common based on this survey sample.

NEXT STEPS AT AFT

Based on the key findings from the survey, AFT and partners are taking essential next steps at this time to both address barriers and foster biochar adoption. These include:

- Creating a Biochar Application Rate and Economic Cost Calculator, a Biochar Supplier Map, and other resources available in the Biochar in Agriculture Toolkit, to address gaps in access and in technical and economic guidance.
- Creating a Virtual Peer Network to foster a space for biochar users and non-users to engage and learn from one another, reflecting the preference for farmer-to-farmer support and learning.
- Partnering with the American Biochar Institute to host Growing with Biochar trainings, designed for agricultural service providers, researchers, farmers, biochar producers, and conservation planners to provide foundational knowledge on the science and field use of biochar and biochar-based blends, increasing the availability of regionally specific technical guidance.
- Hosting a Practical Biochar Implementation Webinar Series designed to provide an extensive online resource of practical information and training to biochar users, those interested in using biochar, biochar producers, and other stakeholders.
- Expanding our Biochar On-Farm Demonstration Trial Network into a national Soil Health Management Systems Network that integrates biochar with complementary practices across the U.S. to break down regional and national barriers to biochar and other soil health management system adoption, through access to financial and technical assistance, improved decision support tools, peer-to-peer networks, and source market connections.
- Conducting a follow-up National Biochar Survey to track how biochar use, results, and needs change from this 2025 baseline. Farmers, ranchers, and others who want to receive updates, including when the next survey opens, can sign up for email updates at farmland.org/biochar.

CONCLUSION

This first national look at how U.S. farmers and ranchers use biochar provides insights on the experiences of a group of early adopters, mostly on small, diversified farms, who use biochar to build soil health, who often see the benefits they hoped for, and who largely plan to keep using it. It also shows that interest outpaces access: availability, cost, and limited financial and technical assistance hold back both biochar users and the farmers and ranchers who have not yet tried it, but were interested enough to engage in this survey. Because users generally first turn to other farmers for information, emphasizing peer networks, demonstrations, and practice guidance could build valuable connections between early adopters and other farmers and ranchers. Repeating this survey in future years is anticipated to show how biochar use, results, and needs change as supply, tools, and support grow.

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Preparing to apply biochar for an AFT demonstration trial on a farm in Illinois.

APPENDIX

Appendix A. Location and demographics of survey respondents

Table A1. Summary statistics for geographic location and biochar usage of survey respondents (N=367)

		Total		Biochar Users		Non-Users	
Variable	**Category**	**n**	**%**	**n**	**%**	**n**	**%**
Biochar use	Survey Responses, All (N)	367	—	149	41%	218	59%
Regions	East	252	69%	93	37%	159	63%
	West	115	31%	56	49%	59	51%
Sub-Regions	Intermountain West-Great Plains	40	11%	16	40%	24	60%
	Midwest	58	16%	23	40%	35	60%
	Northeast	135	37%	41	30%	94	70%
	Pacific	75	20%	40	53%	35	47%
	Southeast	59	16%	29	49%	30	51%



Biochar pile in the winter on a New York farm participating in AFT's demonstration trial.

Table A2. Survey Respondents Gender, Race, Age & Education Demographics

Variable	Category	Total		Biochar Users		Non-Users	
		n	%	n	%	n	%
Gender Identity	Man	154	60%	52	63%	102	59%
	Woman	98	38%	29	35%	69	40%
	Trans	2	1%	1	1%	1	1%
	Non-binary	2	1%	0	0%	2	1%
Age	Under 35	24	9%	7	8%	17	9%
	35–65	188	71%	61	74%	127	70%
	65 and Over	52	20%	15	18%	37	20%
Education	Higher	203	77%	64	76%	139	78%
	Lower	60	23%	20	24%	40	22%
Beginning Farmer	Yes	137	52%	41	49%	96	53%
Race/ Ethnicity	American Indian or Alaska Native	18	7%	7	8%	11	6%
	Asian or Asian American	11	4%	3	4%	8	4%
	Black or African American	15	6%	3	4%	12	7%
	Hispanic or Latino	13	5%	4	5%	9	5%
	Middle Eastern or North African	1	0%	0	0%	1	1%
	Native Hawaiian or Other Pacific Islander	2	1%	1	1%	1	1%
	White or European	218	82%	70	83%	148	81%
	Don't Know	1	0%	0	0%	1	1%
	Other	9	3%	3	4%	6	3%

Appendix B

Organic status of all survey respondents

Organic Certification	**Biochar Users** (n=149)	**Non-Users** (n=218)
Yes	19%	11%
No	62%	74%
A portion	3%	3%
Transitioning to organic	13%	9%
Prefer not to answer	3%	3%

Appendix C

Biochar users' reported average costs (n=59) and application rates (n=105) per ton and per cubic yard

Units	Biochar Cost Per Acre	%	n
$/ton	<$250	34%	20
	$250–$500	15%	9
	$500–$750	5%	3
	$750–$1,000	8%	5
	> $1,000	3%	2
$/cubic-yard	<$50	10%	6
	$50–$100	8%	5
	$100–$150	3%	2
	$150–$200	5%	3
	> $200	7%	4

Units	Application Rate Per Acre	%	n
tons/acre	< 1 ton	50%	52
	1–5 tons	25%	26
	5–10 tons	2%	2
	> 10 tons	1%	1
cubic-yards/acre	< 5 cu-yds	12%	13
	5–10 cu-yds	8%	8
	10–15 cu-yds	1%	1
	> 15 cu-yds	2%	2

Appendix D

Biochar users' motivations and observed benefits (n=114); sorted in descending order of share of respondents; respondents could select multiple answers

Motivations (select all that apply)	Biochar Users n	Biochar Users %
Increase soil health generally &/or specific aspects of the soil	89	78%
Increase crop yields	48	42%
Increase resilience to drought	40	35%
Reduce input costs (e.g., fertilizer, fuel, water)	33	29%
Help sequester carbon and mitigate climate change	26	23%
Use/manage waste biomass on my farm specifically for biochar production	16	14%
Other	16	14%
Increase resilience to excess precipitation events	14	12%
Remediate my soil due to contamination (e.g., heavy metals, PFAS)	7	6%
Receive incentive payments through a cost-share program or demonstration pilot program	7	6%
Reduce negative water quality impacts from my farm	5	4%
Participate in carbon markets	4	4%

Benefits Observed (select top 3)	Biochar Users n	Biochar Users %
Improved soil water-holding capacity	47	41%
More biological activity	30	26%
Increased crop yields	28	25%
Improved resilience (e.g. yield consistency in extreme weather conditions)	25	22%
Increased plant-available soil nutrients	22	19%
No observed benefit(s)	21	18%
Other	19	17%
Improved water infiltration	17	15%
Less compaction	16	14%
Used/managed waste biomass on my farm for biochar production	14	12%
Saved money by reducing input costs overall	13	11%
Reduced fertilizer applications	7	6%
Remediation of soil contamination	3	3%
Reduced erosion	3	3%

Appendix E

Biochar users' sources of information on biochar (n=113); sorted in descending order of share of respondents; respondents could select multiple answers

Sources of Info/Resources (select all that apply)	n	%
Farmers	50	44%
Biochar producers	37	33%
American Biochar Institute (formerly U.S. Biochar Initiative)	34	30%
Biochar suppliers/distributors	30	27%
Social media	30	27%
University Ag Extension	20	18%
USDA agency	18	16%
American Farmland Trust	15	13%
Regional biochar group	13	12%
Local conservation district	10	9%
Crop consultants	9	8%
Farmer network, formal	8	7%
Climate-smart commodities grants	4	4%
Local land trust or non-profit	4	4%
Commodity group (e.g., National Corn Growers Association)	3	3%
State agency	2	2%
Other	29	26%

Resource Needs (select all that apply)	n	%	Resource Type
Agronomic guidance	36	32%	Technical
Financial assistance	34	30%	Financial
Lower cost for biochar	28	25%	Financial
Demonstration trials	24	21%	Technical
Economic and financial data, including decision support tools and/or case studies, to better understand market and non-market costs and benefits	22	19%	Financial
Technical assistance	22	19%	Technical
Lower transportation costs for biochar	20	18%	Financial
Connection to a biochar dealer	17	15%	Technical
Farmer peer network, formal	15	13%	Technical
No additional support needed	14	12%	NA
Not sure	11	10%	NA
Other	11	10%	NA

Appendix F. Other biochar user-specific data

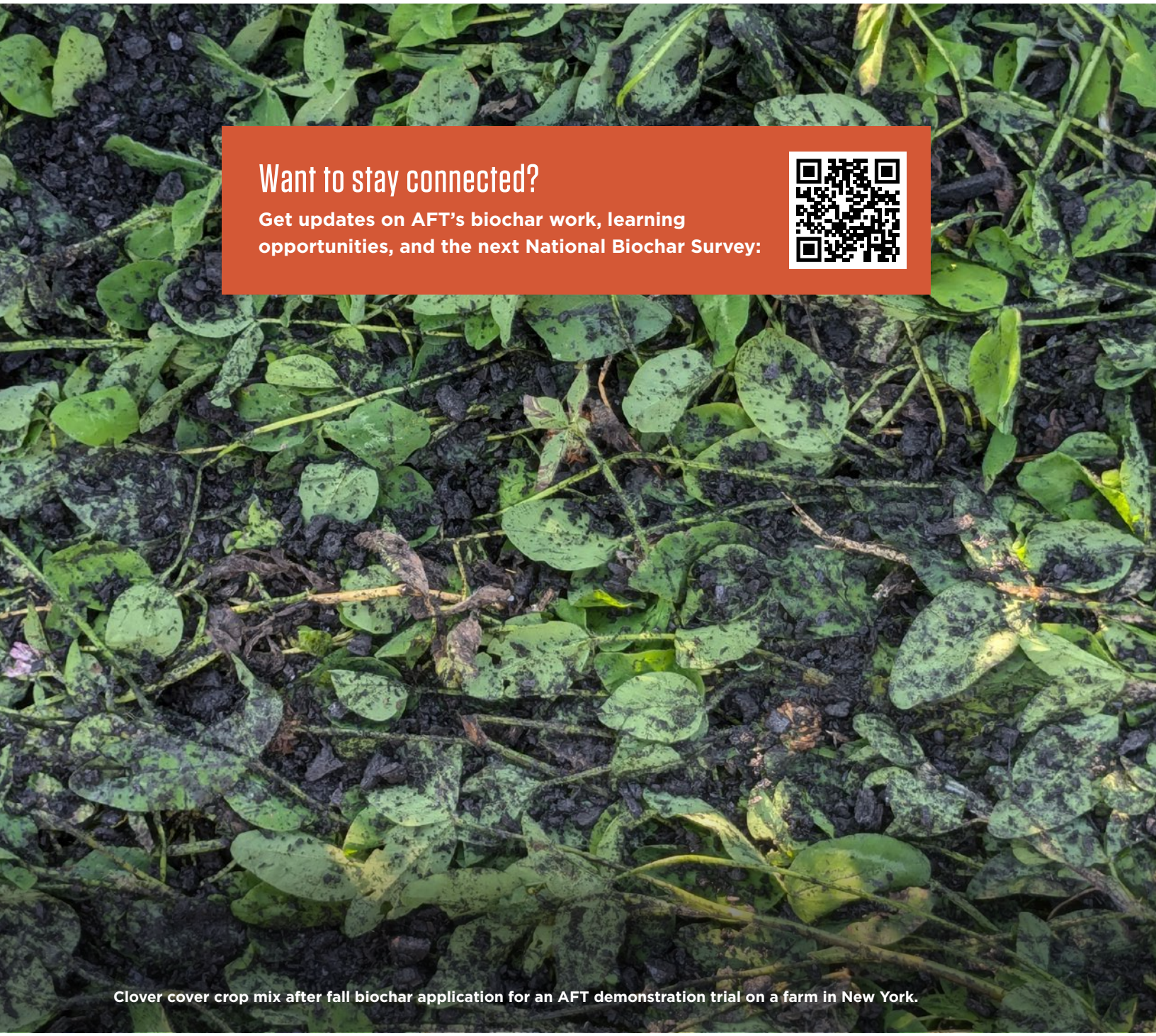
On what land do you apply biochar?	Biochar Users (n=113)	
Acres Applied	**%**	**n**
Select acres	70%	79
All acres	30%	34

Biochar type (select all that apply)	Biochar Users (n=114)	
	%	**n**
Wood-based	90%	103
Ag Residue-based (e.g., straw)	12%	14
Manure-based (e.g., cow, poultry)	11%	12
Other organic residue (e.g., food/yard waste)	4%	4
Pelleted biochar	6%	7
Prilled biochar	2%	2
Liquid biochar	5%	6
Biochar-based fertilizer	5%	6
I'm not sure	4%	4
Other	5%	6

Application method	Biochar Users (n=111)	
	%	**n**
Broadcast with incorporation	43%	48
Broadcast without incorporation	28%	31
Drilling	1%	1
Liquid injection/fertigation	1%	1
No-till drill	3%	3
Trenching	4%	4
Other (please specify):	21%	23

Biochar Blend (select all that apply)	Biochar Users (n=114)	
	%	**n**
No	16%	18
Yes—blended with compost	59%	67
Yes—blended with manure	27%	31
Yes—blended with other organic amendment	17%	19
Yes—blended with synthetic fertilizer	5%	6
Yes—other	14%	16

Average distance from biochar source	Biochar Users (n=114)	
	%	**n**
< 50 miles	20%	23
50–100 miles	13%	15
100–300 miles	9%	10
300–500 miles	4%	5
500–1,000 miles	3%	3
> 1,000 miles	2%	2
I'm not sure	11%	12



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Clover cover crop mix after fall biochar application for an AFT demonstration trial on a farm in New York.

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