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Stephen Censky
Deputy Secretary of Agriculture
U.S. Department of Agriculture
1400 Jefferson Dr S.W.
Washington, D.C. 20250

Docket No. USDA–2020–0003:
Solicitation of Input from Stakeholders on Agricultural Innovation Agenda: Research, Education, and Economics, USDA, 85 Fed. Reg. 18185 (April 1, 2020)

Dear Deputy Secretary Censky,

The National Association of State Foresters (NASF) represents the directors of the state forestry agencies in all 50 states, eight U.S. territories, and the District of Columbia. State Foresters deliver technical and financial assistance to private land owners, along with protection of forest health, water and wildfire for more than two-thirds of the nation's forests, as well as partner with federal agencies through authorities like Good Neighbor Authority in managing and protecting the nation's federal forests. NASF is pleased to provide comments on the Agriculture Innovation Agenda and the role of forestry in bringing transformational innovation for the next era of American agriculture productivity and environmental conservation.

Forestry offers many opportunities for innovative applications which have a direct benefit to agriculture. Additionally, forestry practices can help in achieving environmental benefits, and reducing environmental impacts associated with increased agricultural production. For this reason, forestry should play a prominent role in the United States Department of Agriculture's (USDA) Agriculture Innovation Agenda (AIA), serving to provide a proven and measurable environmental "offset" in achieving the goal of increasing conservation and reducing environmental impacts while increasing agriculture production to meet the increasing demands for food and fiber.

Some forestry practices, although innovative, are not new yet are seldom discussed in the context of agricultural impact. Linkages exist between these practices and improved agriculture production, including environmental benefits for agricultural production, and environmentally sustainable economic opportunities for both private forest landowners and agriculture producers. Agroforestry practices, including but not limited to windbreaks, multi-cropping, shelterbelts and particularly, stream restoration and enhancement done in proximity to agricultural areas serve to enhance agricultural production. However, many of these types of forestry practices are not measured or reported as agricultural improvements. Further measurement and reporting of these forestry practices with linkages to

agricultural production could help advance the goals of this agenda. As research priorities and policy recommendations are identified for this initiative, we offer the following recommendations.

Increase Interagency Collaboration

National Agroforestry Center

The National Agroforestry Center in Lincoln, Nebraska represents a collaborative inter-agency partnership between USDA Forest Service Research and Development, State and Private Forestry, and the Natural Resources Conservation Service that is well positioned to play a prominent role in advancing the objectives of the AIA through further integration of forestry as a core function of the initiative. Through tree planting and incorporating agroforestry practices into their operations, agriculture producers can diversify their production systems and sources of revenue, enhance agriculture production, and sequester carbon while providing numerous environmental benefits including clean air, enhanced water quality and quantity, and improved wildlife habitat.

Windbreaks and shelterbelts are examples of agroforestry practices that utilize linear planting of trees to provide economic and environmental benefits for agricultural producers by mitigating the effects of winds while improving conditions for soils, crops, livestock, wildlife, and communities. Windbreaks help protect crops from damaging winds, prevent soil erosion, increase crop yields and pollinator habitat, and provide relief for livestock from harsh weather conditions that can affect animal productivity due to increased stress and mortality rates.

Data and metrics are key to accurately measuring the benefits forestry practices provide to agricultural production. Unfortunately, coordinated reporting and monitoring of tree inventories on agricultural lands and agroforestry practices is lacking between state and federal agencies. The benefits these trees provide could be used to measure performance and success for the AIA. Increased collaboration between state forestry agencies, The National Agroforestry Center, Universities, and the USDA Forest Service, Forest Inventory and Analysis (FIA) program, would help advance the goals of the AIA. Establishing a baseline inventory from which to measure future agroforestry improvements, would provide a means to accurately monitor and report achievements made toward meeting the goals of this initiative.

Linking Stream Restoration and Enhancement to Agriculture Improvements within the AIA

Riparian forests provide a wide range of benefits to the environment, as well as landowners – benefits that include water quality and quantity enhancement, stream bank stabilization, wildlife habitat, as well as providing landowners and producers an environmentally sustainable source of income.

In the absence of forest streamside buffers agricultural producers lose acres of farmland annually. Riparian forests also act to preserve and enhance water quality, filtering and absorbing pesticides, bacteria, and sediment and curbing other pollution such as nitrate stemming from agriculture production.

In addition to improving water quality, riparian forests play a significant role in the regulation of water quantity, a critical component for increasing agricultural production. Riparian forests allow precipitation to be absorbed and released slowly into rivers and streams overtime, reducing erratic flows that contribute to down-stream flooding. During flood events, buffers reduce the velocity of water, allowing more water to infiltrate into the soil and recharge groundwater.

Riparian forests are essential for stream bank stabilization along waterways which are critical for agricultural production. Trees grow extensive root systems that stabilize soil, and prevent stream bank erosion, while reducing downstream sediment. In addition to enhancing stream bank stability, trees also mitigate flood debris from entering agricultural fields.

Increased coordination between federal and state forestry agencies to collaboratively and accurately measure and report on stream restoration and enhancement projects conducted by federal and state forestry agencies in cooperation with private landowners would help meet the goals of this initiative.

The Joint Forestry Team

The Joint Forestry Team (JFT), comprised of The National Association of State Foresters, The National Association of Conservation Districts, USDA Forest Service and Natural Resources Conservation Service was established in 2007 to improve coordination on areas of interest between the four organizations.

The parties recognize that healthy forests are a critical component of our Nation's landscape. Forest lands, as well as trees and forests on other working lands, provide clean air, carbon sequestration, climate change mitigation, flood protection, wildlife habitat, and recreation and aesthetic enjoyment. The parties signed a new Memorandum of Understanding in 2019 to continue valuable cooperation among the parties, resulting in coordinated interagency delivery of forestry-related conservation assistance to private landowners in order to enhance, protect, and conserve America's private working lands—forest land, cropland, pasture, and rangeland. The parties have a long-term commitment to the conservation and stewardship of the Nation's natural resources.

The JFT is well positioned to take on an elevated role in coordinating and identifying opportunities for Shared Stewardship in meeting the goals of the AIA. Collaboration between the JFT, the National Agroforestry Center, and USDA leadership would be useful in advancing our shared priorities.

Research Opportunities

Forest Carbon

Focusing research efforts toward exploring the best applications and utilization of remote sensing technologies within the Forest Inventory and Analysis (FIA) program could help create efficiencies and enhancement within the program and provide user groups within the forestry sector enhanced program delivery, more accurate and reliable data for carbon and biomass accounting, and make FIA statistically reliable at smaller scales.

The FIA program has tracked carbon stocks since the early 1990s. This is essential data for understanding to what extent forests can offset carbon emissions through sequestration. In addition, inventories look at all ecosystems and can provide early detection in order to implement adaption strategies. There is also a need for more research to identify the best ways to manage forests for greater resilience and a need to conserve genotypes as ecosystems change in ways that cannot yet be predicted.

More research is needed to better analyze the calculation of the carbon benefits of forest management practices. The AIA would benefit from the Department establishing a forest carbon credit accounting system for forestry practices to monitor forest carbon and climate related improvements achieved through forestry practices that benefit agriculture production. Forestry practices that directly benefit agriculture production and mitigate climate change should be accounted for as a way to measure progress in achieving the goals of this initiative.

We have in place examples and processes for monetizing the value of carbon stored in forests, but markets for selling this value are limited. The development of this income opportunity for landowners, as well as market opportunities for other ecosystem services such as water quality protection, would make ownership of forests more attractive and retention of forests more likely, as well as increase the storage of carbon thereby mitigating carbon emissions. Research efforts at USDA focused on improving the ability to measure forest and soil carbon, and further utilizing or improving existing remote sensing technologies for these purposes could benefit forest landowners by providing more opportunities to participate in emerging carbon markets.

Forest Products

The USDA Forest Service supports several efforts that promote wood utilization including the Forest Products Research Lab, the Wood Education and Research Center, Wood Innovation Grants, and the Mass Timber University Grant Program. These are all valuable efforts that should be retained and built upon. These programs promote economically viable wood energy uses and also play a beneficial role in expanding forest product and bio-energy opportunities through research and extension. Strengthening their contributions will support climate change mitigation.

A number of universities around the country include forest products technical assistance within their extension programs. These are partially funded by the National Institute of Food and Agriculture under the Renewable Resources Extension Act Program. Continued funding of this program will also ensure that information gained through forest product research and development efforts is effectively transferred to end users.

Trees and Carbon Sequestration

Trees absorb carbon dioxide from the air, convert it to wood, and release oxygen in the process. The carbon stored in wood represents carbon that does not enter the atmosphere where it would contribute to a “greenhouse effect” that warms the earth. It is estimated that fourteen to fifteen percent of the nation’s annual carbon emissions are offset by the additional carbon stored in US forests and wood

products each year.[1] Carbon remains stored in wood until it deteriorates, whether it breaks down within a dying tree, a piece of lumber or a piece of paper. Programs that increase the extent of forests and tree growth, and promote greater use of wood products, ultimately lead to increased carbon storage.

Forest Management and Markets

Keeping forestland as working forests is paramount to the ability of our forests to provide the economic, environmental, and social benefits that are essential to society. In order to retain and properly care for their forests, landowners need sources of revenue. Though forests can provide other forms of economic return - such as from recreation, appreciated land values and ecosystem services - harvesting trees for wood products is the predominate source of revenue for forest owners. This has the added benefit of generating economic opportunities for businesses, whose earnings are often re-invested in the forest. For this reason, NASF believes it is important to support the research and development of new markets for wood fiber. Having highly diverse markets increases the options for management by allowing the landowner to remove those trees of a certain size and/or species under plans that are more likely to result in improved health and vigor.

NASF ascribes to the view that benefitting from the economic value of forests does not threaten environmental and social values as much as it is key to supporting the delivery of environmental and social benefits. Within this view, NASF also believes that the institutions and enterprises that provide forest management expertise are equally critical to ensuring sustainability. Wood should be harvested in a carefully planned manner using best management practices that embody sound science, represent community values, continue to provide important environmental benefits, and reflect responsible economics. Research and teaching institutions, private landowners, natural resource agencies, consulting foresters, forest owning/managing businesses, natural resource related non-profits, and certification bodies all play an important role that must evolve and grow as demand for wood may well increase when new uses emerge.

Demand for these new products is driven by a number of factors that likely will become even more prominent in the future. These include:

- Subsidized power production in Europe where government policy is focused on eliminating coal-fired operations over a period of time;
- Environmental concerns over the longevity of plastics and their continued accumulation in oceans and landfills;
- A desire for building materials that effectively sequester carbon and often generate a smaller carbon footprint during manufacture and use; and
- Desires to reduce dependence on fossil fuels in favor of renewable sources to meet transportation needs.

A number of new uses are being pursued and NASF is encouraged that they have the potential to increase wood demand and thereby increase the options for active forest management. Though most are not

1 US Environmental Protection Agency. 2013. *Inventory of US greenhouse gas emissions and sinks: 1990 – 2011.* EPA 430-R-13-001, Washington, DC.

currently being produced by "production-level" operations, these new uses can, at some point, be scaled up to an industrial level that generates consistent and substantial wood fiber markets.

Innovative Uses of Wood Products

Biochar Applications for Agriculture

A by-product from the production of biofuels manufactured through pyrolysis, biochar is a very fine charcoal-like material used to improve soil characteristics. Pyrolysis involves heating wood to extremely high temperatures without oxygen, as the presence of oxygen would cause wood to burn. In this instance it converts into mostly pure carbon. The best biochar is produced at temperatures above 350 degrees centigrade. As a soil amendment it lowers acidity and tightly binds undesirable metals so that they are not taken up by plants or leached from the soil. It can also increase soil porosity in tight clays or reduce porosity in soils that drain too quickly such as sand. It creates a favorable medium for the production of micro-organisms that are beneficial to trees.

Importantly, biochar is principally carbon that is near permanently stored. As such its greatest potential may be its use for long term carbon sequestration.[2] By working biochar into the soil, a source of nearly pure carbon is being incorporated that is not subject to micro-biological activity. When, for example, wood or some other organic material is incorporated into the soil micro-organisms will eventually break that material down into other compounds, including carbon dioxide which can be released back into the air during soil disturbance.

Where readily available, it has developed market value. Reclamation of oil drilling sites and as a soil amendment for high value crop operations are common uses.

The Great Plains Biochar Initiative (GPBI)

Through a grant funded by the USDA Forest Service in partnership with the Nebraska Forest Service, Kansas Forest Service, Wilson Biochar Associates, and High Plains Biochar, LLC, the GPBI aims to improve awareness and market development of biochar in the Great Plains. The Nebraska Forest Service is conducting a pilot study to examine potential benefits of providing biochar as a feed supplement to cattle to achieve reduced methane emissions and increased animal productivity. This pilot has huge potential for the greater agriculture community.

Preliminary Results of Nebraska Biochar Pilot Study (See Attached Nebraska Beef Cattle Report)

Two metabolism studies were conducted to evaluate the effects of biochar (0, 0.8, or 3% of diet dry matter) on digestibility and methane production in growing and finishing diets for beef cattle. Intake was not affected by biochar inclusion in the growing diet and increased with 0.8% biochar inclusion in the finishing study. Digestibility tended to increase quadratically with biochar inclusion in the growing study while digestibility tended to linearly decrease with biochar inclusion in the finishing study. Methane

2 Biochar: A Home Gardener's Primer. Washington State University Extension Fact Sheet FS147E

production (g/d) decreased 10.7% in the growing study and 9.9% in the finishing study with 0.8% biochar compared to no biochar. Methane production was reduced 10.6% and 18.4% in the growing and finishing studies, respectively, when measured as g/lb of intake. Although biochar has not yet approved by the Food and Drug Administration (FDA) for animal feeding, the initial research shows potential as a methane mitigation strategy in both growing and finishing diets. This study demonstrates an example of an innovative use of a forest product that has huge potential benefits to agriculture, particularly cattle producers. Biochar has shown to be beneficial in many areas of agriculture, including nutrient capture in livestock manure.

Another study by the Nebraska State Forest Service in cooperation with the University of Nebraska, Lincoln, is being proposed to evaluate the effects of biochar as a cattle feedlot pen amendment to determine its impact on reducing Nitrogen loss from the manure. To our knowledge a large-scale open feedlot pen study has not been completed with biochar as a manure amendment.

NASF would appreciate continuing discussions with USDA on these promising applications for biochar.

Torrefaction

Torrefaction is also a pyrolysis process, conducted at lower temperatures than for biochar, that yields a product similar to coal. It makes wood a more practical substitute for coal by being easier to grind, simplifying storage and eliminating moisture uptake issues. Though the weight loss in the process is 30%, the energy loss is only 10%. Its energy profile is improved by the fact that torrefaction generates a combustible gas that can be recirculated back into the system and burned to provide heat.[3]

It has the potential to produce a renewable source of fuel for gasification processes used to make biofuels. Analysis has shown that it could also be a more economical alternative for the densified pellet market in places where that market is still developing.[4]

Cellulosic Biofuels

The US uses over 133 billion gallons of gasoline, 42 billion gallons of diesel and 22 billion gallons of jet fuel every year. Though gasoline consumption is expected to decline over time because of the increasing presence of electric vehicles, the demand for jet fuel is expected to increase and the demand for diesel is projected to remain somewhat constant because of its use in trains and large vehicles. It has been estimated that, potentially, 1 billion tons of sustainably grown biomass could produce enough fuel to replace 25% to 30% of US demand.

Currently, cellulosic biomass feedstock costs outcompete average crude oil costs, but refining costs are substantially higher. As a result, there are only a limited number of operational facilities as research continues on processes that economically refine cellulose, hemicellulose and lignin into fuel. It is presumed at this point that successful wood-based processes will focus on jet fuels and the incidental

3 Biomass Technology Group website www.btgworld.com

4 Renewable and Sustainable Energy Reviews. W. Chen et. al. Volume 44, pp847 – 866. February 2015.

production of marketable by-product chemicals.[5]

Mass Timber

Mass timber is a category of mostly engineered wood building materials that are structural and can be used as floors, walls, ceilings, and beams. These products include LVL, Glulam, NailLam, Mass Plywood Panels (MPP) and Cross Laminated Timber (CLT). CLT is produced in large panels by assembling successive layers of boards perpendicular to one another. The result is a product that rivals steel in strength and fire resistance. It is lighter in weight than concrete. As such, CLT and other mass timber products can replace concrete and steel in tall structures.[6] Additional benefits include carbon storage and reduced CO2 emissions during construction. Though more commonly produced and utilized in Europe since the late 1990's it has recently gained traction in the US wood products industry with manufacturing facilities in the Pacific Northwest and a new one starting up in Alabama. Building codes across the US are being updated to handle mass timber buildings, small changes were made in 2015 and 2018 and revisions proposed for 2021 will allow for buildings taller than 85 feet.

While widespread use of mass timber is good news for the economies in timber producing regions of the country, it also promises some distinctive benefits for builders, communities and the environment. Builders, pressured by persistent labor shortages, are finding a wider pool or workers able to safely install mass timber panels. They also report significant labor savings and more efficient and safe job sites. Construction times are reduced by "just-in-time" delivery to job sites and quick installation of panels.

Of course, communities experience less noise and dislocation during construction and, by avoiding the usual stockpile of dimension lumber on site, fire risks are reduced. The positive environmental attributes of mass timber buildings include a low energy intensity during manufacturing, superior energy efficiency in mass timber structures, and better management of a renewable resource.

Nanotechnology

There are two different categories of cellulose nanomaterials; cellulose nanocrystals and cellulose nanofibrils, that are produced through different processes. The processes produce microscopically small particles that can be assembled into materials with highly desirable properties. They are lightweight, strong, stable and stiff. Potential applications include use as a material in paint, coatings, adhesives, a cement additive, lightweight packaging, cell phones manufacturing, composites that can replace plastics in many uses, wound covering hydrogels and others.[7] Adding nanocrystals to concrete mixes can reduce the volume of cement needed by 15% because of the final material's added strength.

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5 Presentation by Josh Schaidle, National Renewable Energy Laboratory, to NASF. February 2017.

6 Advanced Wood Products Manufacturing Study for Cross-laminated Timber Acceleration in Oregon and Southwest Washington. Pacific Northwest Manufacturing Partnership. 2017

7 Cellulose Nanomaterials – A Path Towards Commercialization Workshop Report. USDA Forest Service. August 2104.

Wood Pellets Production

The production of densified wood pellets, particularly for energy generation, has grown dramatically in response to public policy objectives to lower dependence on fossil fuels. A small percentage of pellets are used for wood fired heating. Currently there are 87 operating manufacturing facilities in the U.S. with at least a few more under construction. Annual production capacity is just short of 12 million tons. In February of 2018 facilities purchased about 1 million tons of feed stock. About 18% of the feedstock would be characterized as pulpwood or roundwood and the remaining represented some form of residual material, for example sawdust from a sawmill. About 80% of the pellet production is exported.[8] This is an increase from very negligible production perhaps 15 years ago and projections suggest continued expansion.

Theoretically, if feedstock purchases were in the neighborhood of 15 million tons per year that would be the equivalent wood usage of approximately 10 large capacity papermills. Unfortunately, between 2005 and 2012 the U.S. lost 15 pulp mills.[9]

Conclusion

Markets for wood are critical to maintaining the health and sustainability of forests in the United States. They enable the economic, carefully planned harvest of trees to control stand density and create forests that have a more balanced diversity of age classes, which is important to wildlife habitat diversity, forest resilience, and providing a more even flow of sustainable wood fiber for harvesting. As harvest levels continue to decline nationally and the resultant increased volumes pose forest health problems, it is important to support the research and development of emerging wood markets, accompanied by growth and evolution of institutions that support science-based sustainable management. Healthy forests need healthy markets, and healthy markets need healthy forests. Healthy and diverse forest products markets allow and incentivize forest landowners to actively manage their forests for resilience.

Central to the role of state forestry agencies' missions, is being active stewards of America's forests. The efficacy of forests, forest products, and woody biomass in addressing climate change depends on forest sustainability. Without active management, forests are less resilient to climate change and less effective at sequestering carbon.

Any of these efforts can only be effective where there are structures in place and a wiliness on the part of multiple collaborators to ensure careful coordination among all, with a goal of maximizing synergizes and efficiencies.

We thank USDA for soliciting comments for the Agriculture Innovation Agenda and have appreciated the

8 Monthly Densified Biomass Fuels Report. U.S. Energy Information Administration. May 2018.
9 The Forestry Source. Society of American Foresters. Smith & Guldin. January 2012.

stakeholder engagement and outreach from the Department's leadership. Most of all, we thank you for recognizing and including the role of forest management in bringing transformational innovation for the next era of American agriculture productivity and environmental conservation.

Sincerely,

Greg Josten
NASF President
South Dakota State Forester