Request for Information on Landscape Design for Sustainable Bioenergy Systems

DATE: August 18, 2014

SUBJECT: Request for Information (RFI) on methods and approaches for testing the landscape design approach for sustainable bioenergy systems at the watershed or comparable scale.

DESCRIPTION: The United States (U.S.) Department of Energy (DOE) Bioenergy Technologies Office (BETO) plans to support the continued increase of sustainably produced domestic bioenergy from renewable cellulosic feedstocks, such as agricultural residues, annual and perennial dedicated energy crops, and forest resources. DOE is seeking input from producers, industry, academia, research laboratories, government agencies, non-governmental organizations, environmental groups, and other bioenergy stakeholders regarding landscape design approaches that integrate cellulosic feedstock production into existing agricultural and forestry systems while maintaining or enhancing environmental and socio-economic sustainability including ecosystem services and food, feed, and fiber production.

DOE is aware of promising advancements that support the objective of designing sustainable, multi-functional landscapes that supply cellulosic bioenergy feedstocks while maintaining or enhancing environmental sustainability. These advancements include the development of relevant spatial models and decision-support tools, modeling studies that demonstrate potential environmental improvements from biomass production, generation of field data on bioenergy crop and residue recovery performance and sustainability, and development of management practices for bioenergy crop and residue production. However, DOE is not aware of many initiatives that apply the current set of tools and knowledge to proactively design these multi-functional landscapes for increased cellulosic feedstock production, validate the environmental and social sustainability impacts at a watershed or comparable scale, and assess the feedstock characteristics and logistics systems (e.g., harvesting, preprocessing, and transport) associated with those landscape designs. DOE is seeking information on cost-effective, feasible approaches for testing the landscape design approach for increasing cellulosic feedstock production at a watershed, multi-landowner, or comparable spatial scale through a combination of modeling, data collection, field research, and engagement with landowners and other relevant stakeholders.

Information submitted in response to this RFI will be used by DOE for internal planning and decision making purposes relative to directing DOE funding to support the design and implementation of sustainable feedstock production systems.

BACKGROUND: For the purposes of this RFI, "landscape" refers to a unit of land with heterogeneous traits—such as land cover, topography, climate, and ecology—that serves multiple social and environmental functions including provision of food, feed, fiber, and ecosystem services. The term "landscape" does not denote a specific scale; a landscape can refer to a single field or thousands of acres. "Landscape design" refers to a spatially explicit plan for resource allocation and management that meets multiple desired objectives including

environmental (maintains or enhances ecosystem services), social (is acceptable to relevant stakeholders), and economic (maintains or improves livelihoods and landowner profitability). This RFI is directed at landscape design approaches that integrate cellulosic bioenergy feedstock production into existing agricultural and forestry systems in a way that maintains or improves environmental sustainability – specifically, greenhouse gas mitigation, water quality, water quantity, soil quality, air quality, and biodiversity. Cellulosic bioenergy feedstocks refer to dedicated energy crops, agricultural residues, and forest resources that can be converted to biofuels, bioproducts, and biopower. For the purposes of this RFI, of primary interest is the integration of landscape scales from sub-field to sub-watershed scale to full watershed.

For the purposes of this RFI, assessing the environmental sustainability of bioenergy systems includes a consideration of productivity, greenhouse gas emissions, soil quality, water quality, water quantity, air quality, and biodiversity. For more information on environmental sustainability indicators for bioenergy, see McBride et al. 2011.[1] For more information on landscape design for bioenergy production systems, see materials from two recent workshops hosted by BETO on "Integrating Bioenergy into Sustainable Landscape Designs" at https://bioenergykdf.net/content/incorporating-bioenergy-sustainable-landscape-designs-workshop.

In 2010, DOE made awards to three projects under a Funding Opportunity Announcement (FOA) entitled, "Development of Methodologies for Determining Preferred Landscape Designs for Sustainable Bioenergy Feedstock Production Systems at a Watershed Scale." Along with work funded by others, these projects have gathered field-level and select watershed-scale data on bioenergy crop production, developed or enhanced watershed models, such as the Soil and Water Assessment Tool (SWAT), and demonstrated the potential for improved environmental outcomes—particularly water quality improvements—through spatially explicit planning of bioenergy feedstock production. These and other projects have also revealed current knowledge gaps and barriers to developing, deploying, and monitoring preferred landscape designs for bioenergy feedstock production at scales larger than the plot and field level. These gaps include insufficient empirical data that represent the spatial and temporal variability of landscapes at the watershed or comparable scale; lack of well calibrated models to estimate current and potential impacts of bioenergy production systems to aid in landscape planning and monitoring; the need for local multi-disciplinary planning processes and landowner adoption of new practices; and lack of techno-economic and operational data on the feedstock logistics systems needed to develop these landscape designs into commercially viable bioenergy supply chains.

PURPOSE: The purpose of this RFI is to elicit constructive input from producers, industry, academia, research laboratories, government agencies, non-governmental organizations, environmental groups, and other bioenergy stakeholders on issues related to developing and validating landscape design approaches that promote environmental and socio-economic sustainability of feedstock production systems at a watershed, multi-landowner, or comparable

[11] McBride A, VH Dale, L Baskaran, M Downing, L Eaton, RA Efroymson, C Garten, KL Kline, H Jager, P Mulholland, E Parish, P Schweizer, J Storey. 2011. Indicators to support environmental sustainability of bioenergy systems. Ecological Indicators 11:1277-1289.

scale. EERE is specifically interested in information on appropriate experimental designs for assessing comprehensive environmental sustainability indicators, potential barriers to implementing landscape design, approaches for assessing needed feedstock logistic systems, and possible projects to test landscape design approaches for cellulosic bioenergy systems on the landscape. This is solely a request for information and not a Funding Opportunity Announcement (FOA). EERE is not accepting applications for funding project proposals.

DISCLAIMER AND IMPORTANT NOTES: This RFI is not a Funding Opportunity Announcement (FOA); therefore, EERE is not accepting applications at this time. EERE may issue a FOA in the future based on or related to the content and responses to this RFI; however, EERE may also elect not to issue a FOA. There is no guarantee that a FOA will be issued as a result of this RFI. Responding to this RFI does not provide any advantage or disadvantage to potential applicants if EERE chooses to issue a FOA regarding the subject matter. Final details, including the anticipated award size, quantity, and timing of EERE funded awards, will be subject to Congressional appropriations and direction.

Any information obtained as a result of this RFI is intended to be used by the Government on a non-attribution basis for planning and strategy development; this RFI does not constitute a formal solicitation for proposals or abstracts. Your response to this notice will be treated as information only. EERE will review and consider all responses in its formulation of program strategies for the identified materials of interest that are the subject of this request. EERE will not provide reimbursement for costs incurred in responding to this RFI. Respondents are advised that EERE is under no obligation to acknowledge receipt of the information received or provide feedback to respondents with respect to any information submitted under this RFI. Responses to this RFI do not bind EERE to any further actions related to this topic.

PROPRIETARY INFORMATION: Because information received in response to this RFI may be used to structure future programs and FOAs and/or otherwise be made available to the public, **respondents are strongly advised to NOT include any information in their responses that might be considered business sensitive, proprietary, or otherwise confidential.** If, however, a respondent chooses to submit business sensitive, proprietary, or otherwise confidential information, it must be clearly and conspicuously marked as such in the response.

Responses containing confidential, proprietary, or privileged information must be conspicuously marked as described below. Failure to comply with these marking requirements may result in the disclosure of the unmarked information under the Freedom of Information Act or otherwise. The U.S. Federal Government is not liable for the disclosure or use of unmarked information, and may use or disclose such information for any purpose.

If your response contains confidential, proprietary, or privileged information, you must include a cover sheet marked as follows identifying the specific pages containing confidential, proprietary, or privileged information:

Notice of Restriction on Disclosure and Use of Data:

> Pages [list applicable pages] of this response may contain confidential, proprietary, or privileged information that is exempt from public disclosure. Such information shall be used or disclosed only for the purposes described in this RFI, DE-FOA-0001178. The Government may use or disclose any information that is not appropriately marked or otherwise restricted, regardless of source.

In addition, (1) the header and footer of every page that contains confidential, proprietary, or privileged information must be marked as follows: "Contains Confidential, Proprietary, or Privileged Information Exempt from Public Disclosure" and (2) every line and paragraph containing proprietary, privileged, or trade secret information must be clearly marked with double brackets or highlighting.

EVALUATION AND ADMINISTRATION BY FEDERAL AND NON-FEDERAL PERSONNEL: Federal employees are subject to the non-disclosure requirements of a criminal statute, the Trade Secrets Act, 18 USC 1905. The Government may seek the advice of qualified non-Federal personnel. The Government may also use non-Federal personnel to conduct routine, nondiscretionary administrative activities. The respondents, by submitting their response, consent to EERE providing their response to non-Federal parties. Non-Federal parties given access to responses must be subject to an appropriate obligation of confidentiality prior to being given the access. Submissions may be reviewed by support contractors and private consultants.

REQUEST FOR INFORMATION CATEGORIES AND QUESTIONS:

CATEGORY 1: Approaches for Integrating Cellulosic Bioenergy Feedstocks into Existing Agricultural and Forestry Systems

A. What are the available tools, models, or other frameworks that can be used to develop a spatially explicit plan for integrating cellulosic feedstock production into existing agricultural and forestry systems? To what degree have these been validated and at what scale? What are the limitations of the available tools, models, or other frameworks and how might those limitations be overcome?
B. What specific approaches could be used to integrate cellulosic feedstock production into existing agricultural and forestry systems that maintain or enhance environmental sustainability and food/feed/fiber/fuel production? Examples might include planting bioenergy crops as riparian buffers to improve water quality, planting bioenergy crops to better utilize "marginal land," adding bioenergy crops to commodity cropping systems, and others. To what degree have these practices been validated and at what scale? What are the barriers to implementing these practices and how might those barriers be overcome?

CATEGORY 2: Experimental Methods for Assessing Environmental Sustainability Indicators

A. Relying on empirical data to evaluate the environmental sustainability of cellulosic feedstock production at the watershed or similar scale is costly and logistically challenging. Both direct and indirect field measurements, as well as modeling approaches, are needed to quantify a range of sustainability indicators (greenhouse gas emissions, water quality and

quantity, soil quality/soil carbon, productivity, air quality, and biodiversity), as is measuring or quantifying indicator values at larger spatial scales.

i. What are possible cost-effective sampling schemes for directly measuring sustainability indicators at a field or larger spatial scale?

ii. What are cost-effective experimental and/or modeling approaches for estimating and validating indicator values at a watershed or similar scale for which empirical data are not available? How can these approaches be validated in real world situations? Please explain the appropriate plot sizes and/or plot configurations that would be needed to adequately assess indicator values.

B. Do field trials and/or demonstration plots currently exist that could be employed to evaluate the environmental sustainability of cellulosic feedstock production systems at the watershed scale? How long have these trials been in place? Who is conducting these trials? What feedstocks are currently available for study in these trials? Were appropriate baseline measurements taken prior to crop establishment or residue harvesting, and are those data available for use?

CATEGORY 3: Data and Analysis Needs for Understanding Logistic Systems and Costs

A. What specific types of data need to be collected to assess logistics systems for dedicated energy crops, agricultural residues, or forestry residues for bioenergy when integrated into agricultural and forestry landscapes? Examples might include feedstock yield, moisture, density, quality, flowability, inorganic element content, or other characteristics affecting the transport and conversion of biomass material.

B. What minimum size for each field trial location is necessary to obtain accurate and reproducible data on feedstock logistics?

C. What specific analysis should be conducted to understand the costs of harvesting and transporting high quality cellulosic feedstocks from existing agricultural and forestry landscapes?

D. How can landscape design be used to increase feedstock availability and quality while reducing logistic costs when integrating bioenergy feedstock production into existing agricultural and forestry systems? How are logistic costs such as harvesting, preprocessing, and transport affected by the amount and distribution of biomass across the landscape? Are there ways to reduce these costs?

E. How can logistic systems be evaluated and better managed? Are there ways to consider the logistics to optimize the location and integration of biomass production systems into the agricultural and forestry landscapes? Are any models available to help with the design?

CATEGORY 4: Possible Projects for Testing Landscape Design Approaches for Bioenergy

A. What types of multi-disciplinary R&D projects would address current gaps in testing landscape design approaches for bioenergy and evaluating the feedstock logistics as a function of the landscape design (i.e., evaluating the feedstock harvesting, preprocessing, and transport of the introduced feedstocks to understand feedstock availability, quality, and costs)? Responses should describe possible initiatives that include field research as well as active landowner and local stakeholder participation.

B. What is a reasonable timeframe to design and execute such a project? How long would a trial need to be conducted to provide sufficient data to conclude that the practices/designs implemented are environmentally sustainable? What is a reasonable cost estimate for such a project? What is the basis for these cost estimates?
C. What types of organizations and expertise should be included in these partnerships to design and monitor the environmental sustainability of cellulosic feedstock production systems? Discuss the reasoning behind your recommendations.

REQUEST FOR INFORMATION RESPONSE GUIDELINES: Responses to this RFI must be submitted electronically to BETOLandscapeDesignRFI@ee.doe.gov no later than 5:00pm (EDT) on September 2, 2014. Responses must be provided as attachments to an email. It is recommended that attachments with file sizes exceeding 15MB be compressed (i.e., zipped) to ensure message delivery. Only electronic responses will be accepted.

Please identify the specific question(s) that your response(s) address (e.g., 1.B.). Respondents may answer as many or as few questions as they wish.

EERE will not respond to individual submissions or publish publicly a compendium of responses. A response to this RFI will not be viewed as a binding commitment to develop or pursue the project or ideas discussed.

Respondents are requested to provide the following information at the start of their response to this RFI:

- Company / institution name;
- Company / institution contact person;
- Contact's address, phone number, and e-mail address.