Institute *for* Policy Integrity
NEW YORK UNIVERSITY SCHOOL OF LAW

December 21, 2022

To: Natural Resources Conservation Service, U.S. Department of Agriculture

Subject: Request for Public Input About Implementation of the Inflation Reduction Act Funding, 87 Fed. Reg. 70,770 (Nov. 21, 2022) (NRCS-2022-0015)

The Institute for Policy Integrity at New York University School of Law[1] (Policy Integrity) respectfully submits these comments to the Natural Resources Conservation Service (NRCS) in response to its Request for Information (RFI) about implementing its share of the Inflation Reduction Act funding.[2] Policy Integrity is a nonpartisan think tank dedicated to improving the quality of government decisionmaking through advocacy and scholarship in the fields of administrative law, economics, and public policy.

The Inflation Reduction Act[3] (IRA) appropriates over $19 billion to several of NRCS's core conservation programs for the purpose of reducing and sequestering greenhouse gas emissions.[4] This RFI seeks input regarding how NRCS can maximize the climate impact of this funding, improve program delivery, and expand access to underserved farmers.[5] To ensure that this funding is put to its most effective use, NRCS should:

- Maximize net social benefits when selecting which projects to fund;
- Prioritize conservation projects that will efficiently reduce greenhouse gas emissions, while also providing indirect benefits like ecosystem services, knowledge production, and desirable distributional effects; and
- Publish a more detailed explanation of how its project-ranking tool functions and publicly report on how the agency distributes IRA funding.

We expand on these suggestions below and demonstrate how NRCS can put them into practice, using the examples of perennial agriculture and concentrated animal feeding operations to illustrate the types of benefits and costs the agency should account for in its analysis.

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[1] These comments do not reflect the views of NYU School of Law, if any.
[2] Request for Public Input About Implementation of the Inflation Reduction Act Funding, 87 Fed. Reg. 70,770 (Nov. 21, 2022) [hereinafter RFI].
[3] Pub. L. No. 117-169, 136 Stat. 1818 (2022).
[4] RFI, 87 Fed. Reg. at 70,771.
[5] *Id.*

I. NRCS should aim to maximize net social benefits when determining which conservation projects to fund, while prioritizing program transparency.

A. Maximizing net social benefits

The IRA's conservation funding represents an exciting opportunity to support a transition to climate-friendly agriculture. Currently, the agricultural industry serves as a major source of greenhouse gas emissions, accounting for around 11% of the U.S. total.[6] NRCS administers several conservation programs that could help producers improve environmental outcomes, but these programs are heavily oversubscribed; between 2010 and 2020, only 31% of farmers who applied to the Environmental Quality Incentives Program (EQIP)—NRCS's "flagship" conservation program[7]—and 42% of farmers who applied to the Conservation Stewardship Program (CSP) were awarded contracts.[8]

Moreover, research reveals that NRCS awards only a small percentage of conservation money to support the most environmentally effective practices. One study found that between 2009 and 2018, NRCS allocated between just 2–27% of EQIP funding toward practices with the greatest conservation benefits.[9] This suboptimal outcome occurred despite the fact that NRCS must evaluate EQIP applications "based on their overall level of cost-effectiveness to ensure that the conservation practices and approaches proposed are the most efficient means of achieving the anticipated conservation benefits of the project."[10] Since 2018, NRCS has released the Conservation Assessment and Ranking Tool (discussed below), a project-ranking tool designed to enhance program effectiveness, but public information on the tool and its effectiveness is limited.

NRCS can make better use of its limited money by applying principles of social benefit maximization to guide its decisionmaking. Ideally, NRCS should rank all conservation program applications it receives in order of their anticipated net social return on spending. To do so, NRCS should quantify each proposed project's expected net social benefits and divide it by the project's corresponding cost to the agency (i.e., the amount of funding to be distributed); the resulting benefit-cost ratio would demonstrate how net-beneficial each application is expected to be per dollar of agency spending. By doing so, NRCS could maximize overall social benefits[11] while not disadvantaging smaller agricultural operations.

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[6] *Sources of Greenhouse Gas Emissions*, ENV'T PROT. AGENCY (Aug. 5, 2022), https://perma.cc/SRU6-9FZR. Around 40% of these emissions come from livestock and 54% from crop cultivation. *Greenhouse Gas Inventory Data Explorer*, ENV'T PROT. AGENCY, https://perma.cc/3426-W8SX.

[7] *Environmental Quality Incentives Program*, NAT. RES. CONSERVATION SERV., https://perma.cc/EZK9-G3TV.

[8] MICHAEL HAPP, INST. FOR AGRIC. & TRADE POL'Y, CLOSED OUT: HOW U.S. FARMERS ARE DENIED ACCESS TO CONSERVATION PROGRAMS 3 (2021), https://perma.cc/3BCW-ZTJE.

[9] Andrea Basche et al., *Evaluating the Untapped Potential of U.S. Conservation Investments to Improve Soil and Environmental Health*, 4 FRONTIERS SUSTAINABLE FOOD SYS. 1, 1 (2020).

[10] 16 U.S.C. § 3839aa-3(b)(1).

[11] *See, e.g.*, Bruce A. Babcock et al., *Targeting Tools for the Purchase of Environmental Amenities*, 73 LAND ECON. 325, 325 (1997) ("[M]aximization of environmental benefits obtained from a fixed budget is accomplished by purchasing those goods that offer the highest benefit to cost ratio until the budget limit is reached."); B. GUY PETERS, AMERICAN PUBLIC POLICY 306–07 (2d ed. 1986) (When funding is limited, "we should rank [] projects according to the ratio of net benefits to initial costs . . . and then we should begin with the best projects, in terms of

In conducting this analysis, NRCS should account for a proposal's anticipated greenhouse gas emissions reductions, as greenhouse gas reduction is the primary purpose of this IRA funding.[12] To monetize the climate benefits resulting from a particular conservation measure, NRCS should use the social cost of greenhouse gases, which estimates the monetary cost to society from the emission of one ton of greenhouse gases.[13] NRCS should also consider a project's indirect benefits and costs and additionality—the likelihood that the conservation project would take place only with the support of NRCS funding. Conservation funding should then be distributed in order of each application's net social return on spending (as defined above, i.e., net social benefits divided by funding amount).

NRCS may currently lack the capacity and data necessary to conduct an analysis geared at calculating the net social benefits of a proposed project. Still, NRCS can enhance the success of its conservation programs in the meantime by employing an index or rubric to evaluate each conservation proposal's costs and benefits, such as its recently developed Conservation Assessment and Ranking Tool (CART). Doing so would help standardize how NRCS evaluates project applications so that it can select the most beneficial candidates. An extensive literature exists regarding how to rank agricultural conservation mechanisms and maximize the benefits of limited conservation money;[14] NRCS should review this literature and use it to inform its ranking process.

As it designs a project evaluation rubric, NRCS should include a uniform set of core benefits and costs and quantify those benefits and costs to the extent practicable.[15] In any rubric, the value of a proposal's anticipated greenhouse gas reductions should receive substantial weight, along with the other factors discussed in this comment. To make this process easier, NRCS could first calculate each proposal's anticipated greenhouse gas reduction, divide that value by the proposal's anticipated costs to the agency, and then conduct further analysis of costs and benefits only on proposals that appear to most efficiently reduce greenhouse gas emissions.

B. Program design and transparency

NRCS should publish any rubric or other criteria that it uses to select conservation projects so that applicants know which projects the agency is most likely to fund. The tool that NRCS currently uses to rank conservation program applications, CART, lacks transparency.[16]

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the ratio of benefits to initial costs, until the budget is exhausted. In this way, we will get the greatest benefit for the expenditure of our limited funds.").

[12] *See infra* text accompanying notes 22–23.

[13] Other agencies apply the social cost of greenhouse gases in distributing grant funding. *See, e.g.*, DEP'T OF TRANSP., BENEFIT-COST ANALYSIS GUIDANCE FOR DISCRETIONARY GRANT PROGRAMS 38 tbl.A-6 (2022), https://perma.cc/S2G9-P7Y3.

[14] *See, e.g.*, K.A. Lewis et al., *Scoring and Ranking Farmland Conservation Activities to Evaluate Environmental Performance and Encourage Sustainable Farming*, 5 SUSTAINABLE DEV. 71 (1998); E.A. Machado, *Prioritizing Farmland Preservation Cost-Effectively for Multiple Objectives*, 61 J. SOIL & WATER CONSERVATION 250 (2006); Stefan Hajkowicz, Kerry Collins & Andrea Cattaneo, *Review of Agri-Environment Indexes and Stewardship Payments*, 43 ENV'T MGMT. 221 (2009); KENT D. MESSER & WILLIAM L. ALLEN III, THE SCIENCE OF STRATEGIC CONSERVATION (2018).

[15] *See* Inst. for Pol'y Integrity, Comment Letter on Building the Future Through Electric Regional Transmission Planning and Cost Allocation and Generator Interconnection 27 (Aug. 17, 2022), https://perma.cc/Q9CS-VWZS.

[16] *See* NAT'L SUSTAINABLE AGRIC. COAL., 2023 FARM BILL PLATFORM 24–25 (2022), https://perma.cc/24T9-268P.

While it is unclear whether NRCS plans to use CART to evaluate applications for the IRA conservation funding, it appears from the limited publicly available information that CART may not be suited for this task in its current design. First, CART pools project applications by type and then ranks applications within those pools.[17] While pooling may have some benefit, it should play little role in decisions about IRA funding, which possesses fewer restrictions than the standard conservation funding.[18] Second, CART places substantial weight on state priority resource areas when ranking applications.[19] Because these priorities may not include reducing greenhouse gas emissions or incorporate other principles of net social benefit maximization, they should receive limited independent weight in application ranking. NRCS should consider whether CART is well-suited to evaluate IRA conservation funding in light of these limitations, and if it does use CART, should consider modifying it to address these concerns.

Because NRCS has not made CART publicly available or published detailed information about how CART ranks applications, the public's ability to offer targeted suggestions for improving the tool are currently limited. Regardless of how NRCS proceeds, the agency should publish detailed information about the mechanics of project ranking. NRCS should also tell unsuccessful applicants why their projects were not selected so that these applicants can learn for the future.

Finally, NRCS should publicly report how it ultimately distributes its IRA money. While NRCS provides some statistics about its conservation programs, this data is incomplete and reported in formats that can be difficult to evaluate. For example, NRCS reports most CSP payments by land use, not by practice, making payments difficult to track.[20] And in the past, stakeholders have needed to resort to Freedom of Information Act requests to obtain what limited information does exist.[21] Going forward, NRCS should publish more comprehensive, granular data on how funds are distributed so that interested constituencies can better evaluate how effectively NRCS distributes its limited resources.

II. NRCS should award funds to conservation projects that are anticipated to provide the most social benefit.

As described above, NRCS should evaluate conservation program applications so as to maximize net social benefits. NRCS should consider including the following non-exhaustive list of benefits and costs in its analysis, only some of which CART appears to account for:

A. Greenhouse gas emissions reductions

The IRA specifies that the money it allocates to NRCS conservation programs must be used to fund conservation practices that have climate benefits. The law directs NRCS to use EQIP, CSP, and Regional Conservation Partnership Program money to fund practices that "directly improve

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[17] *See, e.g.*, NAT. RES. CONSERVATION SERV., RANKING CRITERIA FOR NRCS PROGRAMS — FISCAL YEAR 2022, at 2, https://perma.cc/T7SS-LKCU.
[18] *See infra* text at note 35.
[19] NAT. RES. CONSERVATION SERV., *supra* note 17, at 2–3.
[20] Anne Schechinger, *New EWG Analysis: Of $7.4B Spent on Two of USDA's Biggest Conservation Programs in Recent Years, Very Little Went to 'Climate-Smart' Agriculture*, ENV'T WORKING GRP. (Sept. 28, 2022), https://perma.cc/3NS3-GADU.
[21] *Id.*

soil carbon, reduce nitrogen losses, or reduce, capture, avoid, or sequester carbon dioxide, methane, or nitrous oxide emissions, associated with agricultural production."[22] The law places similar requirements on the funding for the Agricultural Conservation Easement Program.[23] As such, NRCS should select conservation projects based primarily on their proven potential to reduce greenhouse gas emissions.

In evaluating a project's potential to reduce greenhouse gas emissions, NRCS should reward reductions that are likely to be permanent. Currently, about 40% of the EQIP money that NRCS allocates to "climate-smart" practices supports the implementation of cover crops.[24] While cover cropping can increase carbon sequestration in soil, this climate benefit disappears if the soil is later plowed.[25] NRCS should consider this issue when assessing a project's ability to reduce greenhouse gas emissions.

Perennial agriculture serves as a good example of a conservation practice with extensive climate benefits. Perennial agriculture refers to the growth of crops that stay in the ground and produce food across years.[26] Agroforestry refers to the use of woody perennials and agricultural crops or animals on the same piece of land.[27] Perennials store more carbon in the soil than annual crops; land planted with perennial crops generally serves as a carbon sink, whereas land planted with annual crops generally adds greenhouse gases to the atmosphere.[28] Perennial crops more effectively store carbon than annual crops because, unlike annual crops, perennial crops stay in the ground year-to-year and are able to grow deep roots.[29] According to one study, implementing agroforestry in the U.S. alone has the potential to sequester 530 million metric tons of carbon per year.[30] Another study finds that agroforestry can sequester two to five times more carbon per acre than the most promising climate-friendly practices for annual crops.[31]

Conversely, conservation practices that bolster the livestock industry may actually *increase* greenhouse gas emissions. The livestock industry emits a large amount of methane, a greenhouse gas 28–34 times more potent than carbon. Enteric fermentation, the process by which cattle

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[22] Inflation Reduction Act § 21001(a)(1)(B)(iii), (a)(2)(B), (1)(4)(B)(ii), 136 Stat. at 2016–17.
[23] *Id.* § 21001(a)(3), 136 Stat. at 2016 (NRCS must use the money for "easements or interests in land that will most reduce, capture, avoid, or sequester carbon dioxide, methane, or nitrous oxide emissions.").
[24] Schechinger, *supra* note 20.
[25] Noah Wicks, *Saving the Planet by Saving the Soil: Can Cover Crops Fulfill Their Promise?*, AGRIPULSE (Nov. 29, 2021, 1:00 PM), https://perma.cc/4LP6-J2V7.
[26] FARM BILL L. ENTER., CLIMATE & CONSERVATION 4–5 (2022), https://perma.cc/KE2N-P4C9. Varieties of perennial crops include all trees and perennial varieties of grains, legumes, and oilseeds. *Perennial Grain Crops: New Hardware for Agriculture*, LAND INST., https://perma.cc/G4XR-R8TM.
[27] Peter H. Lehner & Nathan A. Rosenberg, *Agriculture*, *in* LEGAL PATHWAYS TO DEEP DECARBONIZATION IN THE UNITED STATES 772, 783 (Michael B. Gerrard & John C. Dernbach eds., 2019).
[28] G. Philip Robertson, Eldor A. Paul & Richard R. Harwood, *Greenhouse Gases in Intensive Agriculture: Contribution of Individual Gases to the Radiative Forcing of the Atmosphere*, 289 SCIENCE 1922, 1923–24 (2000); *see also* Ranjith P. Udawatta & Shibu Jose, *Agroforestry Strategies to Sequester Carbon in Temperate North America*, 86 AGROFORESTRY SYS. 225, 226 (2012).
[29] Peter Lehner & Nathan A. Rosenberg, *Legal Pathways to Carbon-Neutral Agriculture*, 47 ENV'T L. REP. 10,845, 10,852 (2017).
[30] Udawatta & Jose, *supra* note 28, at 238.
[31] Lingxi Chenyang et al., *Farming with Trees: Reforming U.S. Farm Policy to Expand Agroforestry and Mitigate Climate Change*, 48 ECOLOGY L.Q. 1, 4 (2021) (citing *COMET-Planner*, U.S. DEP'T OF AGRIC., https://perma.cc/KQE9-JLZB).

digest food, is responsible for 25% of all U.S. methane emissions.[32] Methane and nitrous oxide (265–298 times more potent than carbon) also result from manure management on cattle and pig farms. A large percentage of these greenhouse gas emissions come from concentrated animal feeding operations (CAFOs),[33] an industry that already receives significant financial support from NRCS. Per statutory requirement, NRCS must award at least half of all (non-IRA) EQIP funding to practices relating to livestock production.[34] But the EQIP money appropriated through the IRA lacks this 50% requirement.[35] NRCS could take this opportunity to evaluate whether livestock operations, and CAFOs in particular, merit the same degree of funding they usually receive through its programs.

B. Additionality

Additionality, a key concept in greenhouse gas reduction efforts, is the reduction in greenhouse gas emissions for a given project that is "above and beyond what would have occurred in the absence of a targeted effort addressing climate change."[36] In other words, the money that the IRA allocated to NRCS will only accomplish its purpose of reducing greenhouse gas emissions if NRCS distributes it to support conservation practices that farms would not undertake but for this money. It does not appear as if CART currently takes this issue into account in its ranking methodology.[37]

It can be difficult to determine a particular conservation practice's additionality. But, as USDA's existing research shows,[38] NRCS could consider a few relevant factors. A practice is less likely to be additional if its anticipated on-farm benefits exceed the costs to the farm.[39] Some practices appear more or less likely to be additional based on past analysis; USDA has previously studied additionality within conservation programs and found that some conservation practices are more likely to be adopted without conservation funding than others.[40] Data like this can be helpful, although NRCS should account for the variation of a practice's likely additionality by location.[41]

C. Distributional effects

NRCS should also distribute IRA funding with an eye towards the distributional impacts of its actions. It is well documented that USDA has historically discriminated against farmers of color in its loan and conservation payment programs.[42] The effects of this discrimination persist to this

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32 Lehner & Rosenberg, *supra* note 29, at 10,847.
33 *Id.*
34 16 U.S.C. § 3839aa-2(f)(1).
35 Inflation Reduction Act § 21001(a)(1)(B)(i), 136 Stat. 1818, 2015.
36 Nora Greenglass, Note, *The Quest for Climate Additionality: Searching for Emission Reductions Under the UNFCCC's Clean Development Mechanism*, 39 VT. L. REV. 489, 489–90 (2014).
37 *See* NAT. RES. CONSERVATION SERV., *supra* note 17, at 2–3.
38 *See* ROGER CLAASSEN ET AL., ECON. RSCH. SERV., U.S DEP'T OF AGRIC., ADDITIONALITY IN U.S. AGRICULTURAL CONSERVATION AND REGULATORY OFFSET PROGRAMS (2014), https://perma.cc/7R2Y-FPGE.
39 *Id.* at 2–3.
40 *See generally id.*
41 *Id.* at 14.
42 Jared Hayes, *Timeline: Black Farmers and the USDA, 1920 to Present*, ENV'T WORKING GRP. (Feb. 1, 2021), https://perma.cc/P7WS-VJSD.

day; in 2017, Black farmers operated only 1.7% of U.S. farms and 0.5% of farm acres.[43] And while USDA possesses a unique history of discrimination toward Black farmers, disparities exist across race, ethnicity, and gender.[44] Disparities also exist among farmworkers, and regarding which communities experience agriculture's negative and positive externalities. For example, pesticide use impacts Latinx communities more acutely than others because 83% of U.S. farmworkers identify as Latinx or Hispanic.[45] Research also demonstrates that CAFO exposure disproportionately affects disadvantaged groups; [46] these large facilities release unpleasant—and sometimes unhealthy—ammonia and hydrogen sulfide emissions into surrounding communities, many of which are low-income and have large nonwhite populations.[47]

Despite these existing disparities, CART does not seem to account for an application's projected distributional impacts.[48] While it can be difficult to quantify distributional impacts, NRCS can still consider a conservation project's distributional effects in a systematic way by considering distributional impacts as an unquantified benefit.[49] NRCS could, for example, use the Council on Environmental Quality's new Climate and Economic Justice Screening Tool[50] to determine which communities are already overburdened by pollution and prioritize practices that would abate local pollution in those areas. Similarly, NRCS could consider the distributional impacts of projects submitted by farmers that have previously faced discrimination at the hands of USDA or that have not previously received conservation funding. In doing so, NRCS should consult with the USDA staff that are currently designing a process to distribute IRA funding directed specifically toward producers and landowners who have experienced discrimination. [51]

D. Indirect environmental benefits and costs

While NRCS's IRA funding is primarily intended to support greenhouse gas reduction, many greenhouse gas-reducing conservation measures also impact other natural resources, such as soil and water. When evaluating conservation program applicantions, NRCS should consider what

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[43] NAT'L AGRIC. STAT. SERV., 2017 CENSUS OF AGRICULTURE: RACE/ETHNICITY/GENDER PROFILE 5 (2017), https://perma.cc/U3MW-V2MV.
[44] *See id.*
[45] Nathan Donley et al., *Pesticides and Environmental Injustice in the USA: Root Causes, Current Regulatory Reinforcement and a Path Forward*, 22 BMC PUB. HEALTH 1, 2, 5 (2022).
[46] Ji-Young Son et al., *Distribution of Environmental Justice Metrics for Exposure to CAFOs in North Carolina, USA*, 195 ENV'T RSCH., art. 110,862, at 6 (2021).
[47] DOUG GURIAN-SHERMAN, UNION OF CONCERNED SCIENTISTS, CAFOS UNCOVERED: THE UNTOLD COSTS OF CONFINED ANIMAL FEEDING OPERATIONS 14 (2008), https://perma.cc/V3PL-DDLD; Wendee Nicole, *CAFOs and Environmental Justice Communities: The Case of North Carolina*, 121 ENV'T HEALTH PERSPS. A182, A183 (2013).
[48] *See* NAT. RES. CONSERVATION SERV., *supra* note 17, at 2–3.
[49] *See* JACK LIENKE ET AL., INST. FOR POL'Y INTEGRITY, MAKING REGULATIONS FAIR: HOW COST-BENEFIT ANALYSIS CAN PROMOTE EQUITY AND ADVANCE ENVIRONMENTAL JUSTICE (2021), https://perma.cc/Z2BW-X46A.
[50] *Climate and Economic Justice Screening Tool*, COUNCIL ON ENV'T QUALITY, https://perma.cc/HY6W-X9TV.
[51] *See* Inflation Reduction Act § 22007, 136 Stat. at 2022–23 (enacting a program "to provide financial assistance, including the cost of any financial assistance, to farmers, ranchers, or forest landowners determined to have experienced discrimination . . . in Department of Agriculture farm lending programs"); Note of Request for Public Comment on Providing Financial Assistance for Producers and Landowners Determined to Have Experienced Discrimination, 87 Fed. Reg. 62,359 (Oct. 14, 2022) (requesting information on implementing that statutory provision).

other indirect environmental benefits and costs the proposed practices are likely to provide.[52] Indirect benefits and costs are widely accepted components of sound regulatory analysis and are relevant information in determining a conservation practice's total social benefits.[53]

NRCS should consider a particular conservation practice's impact on soil health, water quality, land erosion, and air pollution, in addition to the practice's impact on biodiversity and the availability of green space. Consider, again, perennial agriculture. Perennial crops are better at maintaining topsoil than annual crops[54]—50 times better, per one estimate[55]—and they can be planted on marginal land that may be inappropriate for annual crops.[56] Furthermore, perennial crops are more efficient processors of fertilizer and water than annual crops.[57] For this reason, nitrogen loss from perennial crops may be 30 to 50 times lower than that from annual crops,[58] an important benefit considering the havoc that excess nitrogen wreaks on aquatic ecosystems.[59] Perennial crops are associated with biodiversity,[60] and they may even be less sensitive than annual crops to increases in temperature caused by climate change.[61]

On the other hand, CAFOs generate several types of indirect environmental costs. Most notably, animal waste from CAFOs cause a large amount of water pollution, leading to the accumulation of nutrients, pathogens, hormones, heavy metals, and antibiotics in sources of water.[62] This negatively impacts not only human health, but also surrounding ecosystems.[63]

E. Knowledge production

In recent years, public spending on agricultural research has decreased by around one-third.[64] Of the research spending that does occur, less than 2% goes toward research on diversified systems,

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[52] *See* INST. FOR POL'Y INTEGRITY, THE IMPORTANCE OF EVALUATING REGULATORY "CO-BENEFITS" (2017), https://perma.cc/3QMK-2JQZ.
[53] *Id.* at 1.
[54] Thomas S. Cox et al., *Prospects for Developing Perennial Grain Crops*, 56 BIOSCIENCE 649, 649 (2006).
[55] C.J. Gantzer et al., *Estimating Soil Erosion After 100 Years of Cropping on Sanborn Field*, 45 J. SOIL & WATER CONSERVATION 641, 644 (1990).
[56] Jerry D. Glover & John P. Reganold, *Perennial Grains: Food Security for the Future*, ISSUES SCI. & TECH., Winter 2010, at 41, 43.
[57] Cox et al., *supra* note 54, at 649; Timothy E. Crews, Wim Carton & Lennart Olsson, *Is the Future of Agriculture Perennial? Imperatives and Opportunities to Reinvent Agriculture by Shifting from Annual Monocultures to Perennial Polycultures*, 1 GLOB. SUSTAINABILITY 1, 5 (2018).
[58] Gyles W. Randall & David J. Mulla, *Nitrate Nitrogen in Surface Waters as Influenced by Climatic Conditions and Agricultural Practices*, 30 J. ENV'T QUALITY 337, 342 (2001).
[59] *See* Fred Pearce, *Can the World Find Solutions to the Nitrogen Pollution Crisis?*, YALE ENV'T 360 (Feb. 6, 2018), https://perma.cc/T5FD-4YR8 (describing how synthetic nitrogen, a common compound in fertilizer, is the largest cause of global nitrogen pollution, a phenomenon that has led to over 400 dead zones in the world' oceans).
[60] Crews, Carton & Olsson, *supra* note 57, at 6–7.
[61] Cox et al., *supra* note 54, at 650; MARIA K. JANOWIAK ET AL., U.S. DEP'T OF AGRIC., ADAPTATION RESOURCES FOR AGRICULTURE: RESPONDING TO CLIMATE VARIABILITY AND CHANGE IN THE MIDWEST AND NORTHEAST 29 (2016), https://perma.cc/K3NJ-F5PK (recommending perennial forage as an option for adapting to climate change).
[62] JoAnn Burkholder et al., *Impacts of Waste from Concentrated Animal Feeding Operations on Water Quality*, 115 ENV'T HEALTH PERSPS. 308, 308 (2007).
[63] *Id.* at 309–10.
[64] Peter H. Lehner & Nathan Rosenberg, *A Farm Bill to Help Farmers Weather Climate Change*, 14 J. FOOD L. & POL'Y 39, 44 (2018).

which provide the most climate and environmental benefits,[65] and in 2014, less than 0.1% went toward agroforestry research.[66] To combat this lack of knowledge, NRCS should consider an application's potential to increase knowledge about an under-studied, under-implemented conservation practice; various methods exist to quantify the value of this information,[67] but CART does not appear to take information production potential into account in its ranking methodology.[68]

NRCS has previously used its conservation programs to generate knowledge; for example, its encouragement of no-till agriculture has increased this practice's adoption.[69] Supporting perennial conservation practices could also foster knowledge production. Most of the food we eat comes from annual crops, such as corn, wheat, and soy,[70] likely in part because USDA invests significantly more money in annual crop research and adoption than it does in perennial crops.[71] This reliance on annual crops for food could change. Efforts are underway to develop high-yield perennial versions of the staple crops we rely on,[72] and we could source more of our food from existing perennial crops, like fruit and nut trees. On-farm trials that incorporate lesser-known and under-researched perennial practices would create knowledge that would then inform future efforts, leading to additional benefits.

Sincerely,

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Peter Howard, Economics Director

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65 *Id.*
66 Marcia S. Delonge, Albie Miles & Liz Carlisle, *Investing in the Transition to Sustainable Agriculture*, 55 ENV'T SCI. & POL'Y 266, 266 (2016).
67 *See, e.g.*, Friederike C. Bolam et al., *Using the Value of Information to Improve Conservation Decision Making*, 94 BIOLOGICAL REVS. 629 (2019); D.W. Stephens, *Variance and the Value of Information*, 134 AM. NATURALIST 128 (1989).
68 *See* NAT. RES. CONSERVATION SERV., *supra* note 17, at 2–3.
69 Lehner &Rosenberg, *supra* note 29, at 10,861.
70 Colin McCrate, *The Perennial Question: What if We Could Produce Without the Ecological Issues of Annual Crops?*, SEATTLE TIMES (Apr. 20, 2019, 7:00 AM), https://perma.cc/A3A7-S2UQ.
71 *See* Delonge, Miles & Carlisle, *supra* note 66, at 269 (finding that in 2014, only 1% of U.S. public funding for agricultural research was spent on perennial crops).
72 *See, e.g.*, *Kernza® Grain*, LAND INST., https://perma.cc/43KM-PMUC; Elizabeth A. Chapman et al., *Perennials as Future Grain Crops: Opportunities and Challenges*, 13 FRONTIERS PLANT SCI., art. 898,769, at 9–10 (2022).