

118TH CONGRESS
1ST SESSION

S. 2241

To require the Secretary of Agriculture to conduct research relating to measurement, monitoring, reporting, and verification of greenhouse gas emissions and carbon sequestration, and for other purposes.

IN THE SENATE OF THE UNITED STATES

JULY 11, 2023

Ms. SMITH (for herself and Mr. YOUNG) introduced the following bill; which was read twice and referred to the Committee on Agriculture, Nutrition, and Forestry

A BILL

To require the Secretary of Agriculture to conduct research relating to measurement, monitoring, reporting, and verification of greenhouse gas emissions and carbon sequestration, and for other purposes.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*

3 **SECTION 1. SHORT TITLE.**

4 This Act may be cited as the “Advancing Research
5 on Agricultural Climate Impacts Act of 2023”.

6 **SEC. 2. DEFINITION OF SECRETARY.**

7 In this Act, the term “Secretary” means the Sec-
8 retary of Agriculture.

1 **SEC. 3. STANDARD SOIL CARBON MEASUREMENT METHOD-**
2 **LOGY.**

3 (a) METHODOLOGY.—

4 (1) IN GENERAL.—Not later than 270 days
5 after the date of enactment of this Act, the Sec-
6 retary shall develop a standardized methodology to
7 directly measure soil carbon for research and con-
8 servation purposes.

9 (2) REVIEW.—In developing the methodology
10 under paragraph (1), the Secretary shall conduct a
11 review of widely used existing methodologies for di-
12 rect soil carbon measurement.

13 (3) CONSULTATION.—In developing the meth-
14 odology under paragraph (1) and conducting the re-
15 view under paragraph (2), the Secretary shall con-
16 sult with—

17 (A) agricultural producers, including so-
18 cially disadvantaged farmers and ranchers (as
19 defined in section 355(e) of the Consolidated
20 Farm and Rural Development Act (7 U.S.C.
21 2003(e)));

22 (B) soil carbon experts;

23 (C) nonprofit organizations;

24 (D) academic researchers; and

1 (E) other stakeholders who reflect the
 2 operational, geographic, and socioeconomic di-
 3 versity of United States agricultural operations.

4 (4) REQUIREMENTS.—The methodology devel-
 5 oped under paragraph (1) shall, to the maximum ex-
 6 tent practicable—

7 (A) be usable at any location at which soil
 8 carbon can be directly measured;

9 (B)(i) require measurement to a standard
 10 soil depth sufficient for measuring the core set
 11 of variables described in paragraph (5), deter-
 12 mined using the best available science; or

13 (ii) if measurement to the standard soil
 14 depth described in clause (i) is not practicable
 15 due to insufficient soil depth or other factors
 16 relating to the applicable sample site, require
 17 measurement in accordance with an alternate
 18 approach developed by the Secretary, using the
 19 best available science, that—

20 (I) requires measurement to the max-
 21 imum allowable depth of a sample site; and

22 (II) produces data that is interoper-
 23 able with data collected by measurement to
 24 the standard soil depth in accordance with
 25 clause (i);

1 (C) measure the core set of variables de-
 2 scribed in paragraph (5) to produce a standard
 3 set of reporting metrics;

4 (D) produce data that is interoperable with
 5 other data collected by the Department of Agri-
 6 culture;

7 (E) account for calibration differences in
 8 soil analysis between testing facilities;

9 (F) account for differences in uncertainty
 10 between different measurement tools; and

11 (G) be usable for voluntary reporting of
 12 soil carbon data under subsection (b).

13 (5) CORE VARIABLES.—The methodology devel-
 14 oped under paragraph (1) shall measure the fol-
 15 lowing core set of variables for each sample:

16 (A) Bulk density.

17 (B) Organic carbon concentration.

18 (C) Rock fraction volume and weight.

19 (D) Other variables, as determined by the
 20 Secretary.

21 (b) VOLUNTARY SOIL CARBON DATA REPORTING.—

22 (1) TECHNICAL ASSISTANCE.—

23 (A) IN GENERAL.—The Secretary, acting
 24 through the Chief of the Natural Resources
 25 Conservation Service, shall provide to producers

described in paragraph (2) technical assistance, including guidance, for voluntarily measuring, monitoring, and reporting to the Secretary soil carbon data using the methodology developed under subsection (a).

(B) GUIDANCE.—Guidance provided under subparagraph (A) shall be, at a minimum—

(i) available in multiple languages;

and

(ii) available to producers described in paragraph (2) in both digital and analog formats.

(2) APPLICABILITY.—The guidance developed under paragraph (1) shall be applicable to—

(A) producers that are recipients of grants under programs described in paragraph (3) to voluntarily measure, monitor, and report to the Secretary soil carbon outcomes under those programs; and

(B) any other producer that elects to voluntarily report to the Secretary direct measurements of soil carbon data.

(3) PROGRAMS DESCRIBED.—The programs referred to in paragraph (2)(A) include—

1 (A) conservation innovation grants under
 2 section 1240H of the Food Security Act of
 3 1985 (16 U.S.C. 3839aa–8);

4 (B) the sustainable agriculture research
 5 and education program under subtitle B of title
 6 XVI of the Food, Agriculture, Conservation,
 7 and Trade Act of 1990 (7 U.S.C. 5801 et seq.);

8 (C) the organic agriculture research and
 9 extension initiative established under section
 10 1672B of that Act (7 U.S.C. 5925b);

11 (D) grants under the Agriculture and Food
 12 Research Initiative under section 2(b) of the
 13 Competitive, Special, and Facilities Research
 14 Grant Act (7 U.S.C. 3157(b)); and

15 (E) such other programs as the Secretary
 16 determines to be appropriate.

17 (4) REQUIREMENT.—The Secretary shall seek
 18 to provide culturally appropriate technical assistance
 19 and guidance under paragraph (1) to socially dis-
 20 advantaged farmers and ranchers (as defined in sec-
 21 tion 355(e) of the Consolidated Farm and Rural De-
 22 velopment Act (7 U.S.C. 2003(e))).

23 (c) UPDATES.—

24 (1) IN GENERAL.—The Secretary shall update
 25 the methodology developed under subsection (a)(1)

1 and the guidance issued under subsection (b)(1)(B)
 2 as needed to reflect the best-available data science.

3 (2) INTEROPERABILITY.—In making any up-
 4 dates under paragraph (1), the Secretary shall en-
 5 sure that data collected with the updated method-
 6 ology remains interoperable with previously collected
 7 measurements.

8 (d) AUTHORIZATION OF APPROPRIATIONS.—There is
 9 authorized to be appropriated to carry out this section
 10 \$2,000,000 for each fiscal year.

11 **SEC. 4. DEVELOPMENT OF NEW MEASUREMENT TOOLS**
 12 **UNDER AFRI.**

13 Section 2(b)(2)(D) of the Competitive, Special, and
 14 Facilities Research Grant Act (7 U.S.C. 3157(b)(2)(D))
 15 is amended—

16 (1) in clause (vii), by striking “and” at the end;

17 (2) in clause (viii), by striking the period at the
 18 end and inserting “; and”; and

19 (3) by adding at the end the following:

20 “(ix) measuring, monitoring, report-
 21 ing, and verifying greenhouse gas emis-
 22 sions and carbon sequestration.”.

1 **SEC. 5. SOIL HEALTH AND CARBON DEMONSTRATION**
 2 **TRIALS.**

3 (a) ON-FARM CONSERVATION INNOVATION
 4 TRIALS.—Section 1240H(c) of the Food Security Act of
 5 1985 (16 U.S.C. 3839aa–8(c)) is amended—

6 (1) in paragraph (1)(B)(i), by striking sub-
 7 clause (III) and inserting the following:

8 “(III) soil health management
 9 systems, including—

10 “(aa) systems to maintain or
 11 increase soil carbon levels; and

12 “(bb) cost-effective tools to
 13 measure, monitor, report, and
 14 verify greenhouse gas emissions
 15 and carbon sequestration;”; and

16 (2) in paragraph (3)(D), by striking “3 years”
 17 each place it appears and inserting “5 years”.

18 (b) SUSTAINABLE AGRICULTURE RESEARCH AND
 19 EDUCATION PROGRAM.—Section 1621(e) of the Food, Ag-
 20 riculture, Conservation, and Trade Act of 1990 (7 U.S.C.
 21 5811(e)) is amended—

22 (1) by striking “The Secretary” and inserting
 23 the following:

24 “(1) IN GENERAL.—The Secretary”; and

25 (2) by adding at the end the following:

1 “(2) SOIL CARBON SEQUESTRATION DEM-
 2 ONSTRATION PROJECTS.—In carrying out this sec-
 3 tion, the Secretary shall conduct on-farm demonstra-
 4 tion projects for soil carbon sequestration.”.

5 **SEC. 6. SOIL CARBON INVENTORY AND ANALYSIS NET-**
 6 **WORK.**

7 Chapter 5 of subtitle D of title XII of the Food Secu-
 8 rity Act of 1985 is amended by inserting after section
 9 1240M (16 U.S.C. 3839bb) the following:

10 **“SEC. 1240N. SOIL CARBON INVENTORY AND ANALYSIS NET-**
 11 **WORK.**

12 “(a) DEFINITIONS.—In this section:

13 “(1) CONSERVATION ACTIVITIES.—The term
 14 ‘conservation activities’ has the meaning given the
 15 term in section 1240I.

16 “(2) ELIGIBLE LAND.—The term ‘eligible land’
 17 means public and private cropland, rangeland,
 18 pastureland, and wetlands in the United States.

19 “(3) PROGRAM.—The term ‘program’ means
 20 the program established under subsection (b)(1).

21 “(4) REGIONAL RESOURCE AREA.—The term
 22 ‘regional resource area’ means a contiguous area of
 23 eligible land that has similar resource characteris-
 24 tics.

1 “(5) RESOURCE CHARACTERISTICS.—The term
2 ‘resource characteristics’ means—

3 “(A) geographic, climate, natural resource,
4 and soil type characteristics; and

5 “(B) any other characteristics that the
6 Secretary determines to be appropriate for the
7 purpose of carrying out the program.

8 “(6) SECRETARY.—The term ‘Secretary’ means
9 the Secretary, acting jointly through the Chief of the
10 Natural Resources Conservation Service and the Ad-
11 ministrator of the Agricultural Research Service.

12 “(b) ESTABLISHMENT.—

13 “(1) IN GENERAL.—The Secretary shall estab-
14 lish a program to inventory, monitor, and analyze
15 soil carbon changes on eligible land in the United
16 States.

17 “(2) PURPOSES.—The purposes of the program
18 are—

19 “(A) to analyze soil properties, including
20 soil organic carbon, across space, time, and
21 depth;

22 “(B) to analyze the impacts of land man-
23 agement strategies, including conservation ac-
24 tivities, on soil carbon sequestration; and

1 “(C) to inform any tools of the Secretary
2 designed to predict the impacts of different land
3 management practices, including implementing
4 conservation activities, on greenhouse gas emis-
5 sions and soil carbon sequestration across the
6 United States.

7 “(3) CONSULTATION.—In carrying out the pro-
8 gram, the Secretary shall consult with the Director
9 of the National Institute of Food and Agriculture,
10 the Chief of the Forest Service, the Chief Data Offi-
11 cer, the Administrator of the Environmental Protec-
12 tion Agency, the Secretary of Energy, and the head
13 of any other department or agency that the Sec-
14 retary determines to be appropriate.

15 “(c) SAMPLING.—

16 “(1) SAMPLE SITES.—The Secretary shall select
17 sample sites under the program by taking into con-
18 sideration—

19 “(A) the accessibility of sites;

20 “(B) the ease of collecting repeated meas-
21 urements over time; and

22 “(C) such other factors as the Secretary
23 determines to be appropriate.

24 “(2) PREFERENCE.—In selecting sample sites
25 under paragraph (1), the Secretary shall give pref-

1 erence to sites that have been used for soil testing
2 previously.

3 “(3) NUMBER OF SAMPLE SITES.—The Sec-
4 retary shall select sufficient sample sites under para-
5 graph (1) to analyze changes in soil carbon across
6 regional resource areas, as determined by the Sec-
7 retary, over time, taking into account the geo-
8 graphical size and heterogeneity of each regional re-
9 source area.

10 “(d) INVENTORY.—

11 “(1) IN GENERAL.—Every 5 years, the Sec-
12 retary shall prepare an inventory of soil carbon
13 stocks on eligible land, under which the Secretary
14 shall collect measurements at each sample site se-
15 lected under subsection (c).

16 “(2) METHODOLOGY.—The Secretary shall en-
17 sure that the methodology developed under section
18 3(a) of the Advancing Research on Agricultural Cli-
19 mate Impacts Act of 2023 is used for purposes of
20 conducting measurements at each sample site under
21 the program.

22 “(3) MINIMUM NUMBER OF SAMPLES.—The
23 Secretary shall measure a sufficient number of sam-
24 ples to analyze changes in soil carbon at each sample

1 site selected under subsection (c) for each inventory
 2 under paragraph (1).

3 “(4) CHARACTERISTICS.—In preparing the in-
 4 ventory under paragraph (1), the Secretary shall
 5 document the following characteristics for each sam-
 6 ple site selected under subsection (c):

7 “(A) Soil type and texture.

8 “(B) Land use history, including conserva-
 9 tion activities.

10 “(C) Environmental characteristics, such
 11 as temperature and precipitation.

12 “(D) Other characteristics, as determined
 13 by the Secretary.

14 “(e) INDIVIDUAL PROTECTIONS.—

15 “(1) PROTECTION OF PRIVATE PROPERTY
 16 RIGHTS.—Before selecting a sample site under sub-
 17 section (c) or conducting any measurement under
 18 subsection (d)(1), the Secretary shall obtain author-
 19 ization from the owner of the eligible land.

20 “(2) VOLUNTARINESS REQUIREMENT.—The
 21 Secretary may not require authorization under para-
 22 graph (1) or any other participation in any activity
 23 under this section as a condition on receipt of any
 24 benefit under a program administered by the Sec-
 25 retary.

1 “(3) DATA PRIVACY PROTECTION.—In carrying
2 out the program, the Secretary shall ensure that
3 data is collected and analyzed while respecting rel-
4 evant privacy safeguards and does not include any
5 identifiable, proprietary, or personal information of
6 individual land owners or operators.

7 “(f) DATA CENTER.—

8 “(1) IN GENERAL.—Data collected under the
9 program shall be maintained in a data center oper-
10 ated by the Secretary.

11 “(2) PARTNERSHIPS.—The data center de-
12 scribed in paragraph (1) may be operated in part-
13 nership with 1 or more of the following entities, if
14 the entity complies with paragraph (4):

15 “(A) An 1862 Institution (as defined in
16 section 2 of the Agricultural Research, Exten-
17 sion, and Education Reform Act of 1998 (7
18 U.S.C. 7601)).

19 “(B) An 1890 Institution (as defined in
20 that section).

21 “(C) A 1994 Institution (as defined in sec-
22 tion 532 of the Equity in Educational Land-
23 Grant Status Act of 1994 (7 U.S.C. 301 note;
24 Public Law 103–382)).

1 “(D) Institutions of higher education with
2 expertise in predictive modeling, large-scale
3 data collection, soil carbon research, or agricul-
4 tural land management to mitigate climate
5 change.

6 “(E) Federal research centers.

7 “(3) APPLICATIONS.—An entity described in
8 any of subparagraphs (A) through (E) of paragraph
9 (2) seeking to enter into a partnership to manage
10 the data center described in paragraph (1) shall sub-
11 mit to the Secretary an application at such time, in
12 such manner, and containing such information as
13 the Secretary may require.

14 “(4) REQUIREMENTS.—The data center de-
15 scribed in paragraph (1) shall—

16 “(A) use the industry standard protocols
17 to protect identifiable, proprietary, or personal
18 information of individual land owners or opera-
19 tors;

20 “(B) ensure that individual producer data
21 is not sold through the center; and

22 “(C) comply with all applicable privacy re-
23 quirements, including—

24 “(i) section 1770 of the Food Security
25 Act of 1985 (7 U.S.C. 2276);

1 “(ii) section 1619 of the Food, Con-
2 servation, and Energy Act of 2008 (7
3 U.S.C. 8791);

4 “(iii) section 502(c) of the Federal
5 Crop Insurance Act (7 U.S.C. 1502(c));
6 and

7 “(iv) section 552 of title 5, United
8 States Code.

9 “(5) LIMITED RELEASE OF INFORMATION.—
10 The Secretary may release or disclose information
11 maintained in the data center described in para-
12 graph (1) pursuant to section 1619(b)(3)(A)(i) of
13 the Food, Conservation, and Energy Act of 2008 (7
14 U.S.C. 8791(b)(3)(A)(i)) to researchers for the pur-
15 poses of statistically analyzing the information.

16 “(g) PUBLIC AVAILABILITY.—On completion of each
17 inventory under subsection (d)(1), the Secretary shall
18 make publicly available—

19 “(1) the statistical or aggregated form of data
20 collected from measurements under that subsection;

21 “(2) information regarding the methodology
22 used to collect that data; and

23 “(3) any analysis made of the measurements
24 described in paragraph (1).

1 “(h) REPORTS.—On completion of each inventory
2 under subsection (d)(1), the Secretary shall prepare, pub-
3 lish, and make available to the public a report that—

4 “(1) contains a description of soil carbon
5 trends, including by incorporating measurements
6 conducted under subsection (d) during the 5 years
7 covered by the report;

8 “(2) contains an analysis of the impact of dif-
9 ferent land management practices, including imple-
10 menting 1 or more conservation activities, on soil
11 carbon levels;

12 “(3) contains an analysis of the effect of weath-
13 er and climate variability on the observed trends;

14 “(4) contains an analysis of how land manage-
15 ment practices, including conservation activities,
16 that influence soil carbon sequestration may affect
17 the rate of emissions of other greenhouse gases in
18 the agricultural sector, including methane and ni-
19 trous oxide; and

20 “(5) establishes a benchmark for the baseline
21 soil carbon absent additional conservation activities.

22 “(i) STRATEGIC PLAN.—Not later than 1 year after
23 the date of enactment of the Advancing Research on Agri-
24 cultural Climate Impacts Act of 2023, the Secretary shall
25 prepare and submit to Congress a strategic plan to imple-

1 ment and carry out this section, which shall describe in
2 detail—

3 “(1) the organization and procedures necessary
4 to implement and carry out this section;

5 “(2) the plan for measurements in each re-
6 gional resource area under subsection (d)(1) for the
7 first 5-year interval, including the schedule and the
8 number of samples collected from each sample site
9 selected under subsection (c).

10 “(j) AUTHORIZATION OF APPROPRIATIONS.—There
11 is authorized to be appropriated to carry out this section
12 \$17,500,000 for each fiscal year.”.

13 **SEC. 7. PREDICTIVE MODELS.**

14 (a) IN GENERAL.—The Secretary shall develop and
15 maintain a modeling tool (or combination of tools) that
16 shall predict the impacts of different land management
17 practices, including implementing conservation activities,
18 on greenhouse gas emissions and soil carbon sequestration
19 across the United States.

20 (b) CONSULTATION.—In developing the modeling tool
21 or tools under subsection (a), the Secretary shall consult
22 with—

23 (1) the Secretary of Energy;

24 (2) the Administrator of the Environmental
25 Protection Agency;

(3) agricultural producers, including socially disadvantaged farmers and ranchers (as defined in section 355(e) of the Consolidated Farm and Rural Development Act (7 U.S.C. 2003(e)));

(4) soil carbon experts;

(5) nonprofit organizations;

(6) academic researchers;

(7) private companies with expertise in soil carbon sequestration or greenhouse gas monitoring for agricultural operations; and

(8) other stakeholders, including the heads of other appropriate Federal agencies or non-Federal entities, who reflect the operational, geographic, and socioeconomic diversity of United States agricultural operations.

(c) REQUIREMENTS.—The modeling tool or tools described in subsection (a) shall—

(1) be anchored in direct measurements of land, including soil sampling, such as under the program established under section 1240N of the Food Security Act of 1985 and the programs described in section 3(b)(3);

(2) account for differences that could impact land management outcomes, including—

(A) soil type;

- 1 (B) type of land use;
- 2 (C) type of crop;
- 3 (D) geography and local climate;
- 4 (E) geographic size of the land-use oper-
- 5 ation;
- 6 (F) ongoing or existing conservation activi-
- 7 ties; and
- 8 (G) such other items as the Secretary de-
- 9 termines to be appropriate;
- 10 (3) allow a user of the tool to estimate the
- 11 changes in greenhouse gas emissions or soil carbon
- 12 sequestration, and the uncertainty of those esti-
- 13 mated changes, that occur as a result of imple-
- 14 menting 1 or more conservation activities; and
- 15 (4) be user friendly and accessible—
- 16 (A) to producers and researchers; and
- 17 (B) in multiple languages.

18 (d) REVIEWS AND UPDATES.—

19 (1) REVIEWS.—Not less frequently than annu-

20 ally, the modeling tool or tools described in sub-

21 section (a) shall be reviewed to determine if an up-

22 date is required to reflect the best available data and

23 science.

24 (2) UPDATES.—If it is determined that an up-

25 date is required under paragraph (1), the update

1 shall be made not later than 1 year after the date
2 of that determination.

3 (e) PARTNERS.—

4 (1) IN GENERAL.—In analyzing data, con-
5 ducting research, and developing and maintaining
6 the modeling tool or tools under subsection (a), the
7 Secretary may partner with—

8 (A) an Institution described in paragraph
9 (2);

10 (B) an institution of higher education with
11 expertise in predictive modeling, large-scale
12 data collection, soil carbon research, or agricul-
13 tural land management to mitigate climate
14 change; or

15 (C) a Federal research center.

16 (2) INSTITUTIONS DESCRIBED.—An Institution
17 referred to in paragraph (1)(A) is any of the fol-
18 lowing:

19 (A) An 1862 Institution (as defined in sec-
20 tion 2 of the Agricultural Research, Extension,
21 and Education Reform Act of 1998 (7 U.S.C.
22 7601)).

23 (B) An 1890 Institution (as defined in
24 that section).

1 (C) A 1994 Institution (as defined in sec-
2 tion 532 of the Equity in Educational Land-
3 Grant Status Act of 1994 (7 U.S.C. 301 note;
4 Public Law 103–382)).

5 (f) REPORTING.—Not later than 2 years after the
6 date of enactment of this Act, and annually thereafter,
7 the Secretary shall submit to Congress a report that—

8 (1) describes the progress of the Secretary in
9 developing the modeling tool or tools under sub-
10 section (a);

11 (2) contains an assessment of the accuracy with
12 which a user will be able to use the tool to determine
13 the permanence and additionality of greenhouse gas
14 emissions reduced or carbon sequestered;

15 (3) describes the models and data that the Sec-
16 retary has developed or collected, or intends to de-
17 velop or collect, as applicable, for purposes of devel-
18 oping or maintaining the tool;

19 (4) describes—

20 (A) whether it was determined that an up-
21 date was required under subsection (d)(1); and

22 (B) if an update was required, the specifics
23 of the update;

24 (5) includes any other information that, as de-
25 termined by the Secretary, is relevant to—

1 (A) the efficacy of the tool;

2 (B) the intended applications of the tool;

3 or

4 (C) the determination of—

5 (i) changes in greenhouse gas emis-
6 sions or soil carbon sequestration associ-
7 ated with producer land-use practices; or

8 (ii)(I) estimates of the impacts of land
9 use practices, including conservation activi-
10 ties, on greenhouse gas emissions and soil
11 carbon sequestration; and

12 (II) the measurement error of the
13 tool.

14 (g) AUTHORIZATION OF APPROPRIATIONS.—There is
15 authorized to be appropriated to carry out this section
16 \$500,000 for each fiscal year.

○