

The following information is a thought experiment, not an actual program proposal endorsed or supported by VAAFM

Draft Approach 3: Soil Carbon Modeling via Process Based Model

All cropland and pasture fields managed by a farmer are modeled for annual soil carbon sequestration based on annual cropland and pasture management choices. Cyclical, annual program of crop-year planning, implementation, verification, and payment. Program may additionally pay for performance thresholds or existing soil carbon stocks, but these considerations are not included in this program draft.

Pros:

- Annual feedback, planning, and payment process lowers risk to the farmer and provides understanding of how to improve management/maximize payment
- Directly supports improvements (additionality) and pays for a quantifiable benefit to society.
- 30-year weather data smooths inter-annual variability and provides representative feedback on long-term impacts of farm management (e.g. avoids all farms not getting paid on a “bad year” or all farms getting paid a really high amount on a “good year”, considers the long-term effect of management)
- Lower need for measurement/verification = lower admin costs in long term
- Possibility to leverage VPPF data, admin & application process

Cons:

- High data need
- Requires local calibration and validation of the model- would take time
 - Would need discussion/decision on balance between accuracy & simplicity. For example: corn, soy, grass hay, legume hay, and generic “pasture” and “vegetables” can be modelled. Pasture of various livestock types, various vegetable crops, different berries, orchards, etc could potentially be added. However, as you get more specific (accurate) you need more data/more admin time.
- Scales with size – likely easier for larger-scale farms to achieve and document larger-scale improvements.

Possible Program Details/Considerations:

Ecosystem Service Valued: Soil Health – Soil Carbon Accumulation

Output: Performance – modeled Soil Carbon Accumulation as direct proxy for sequestration of CO₂

Quantification: Modeling calibrated and validated to local conditions using local and regional measured data.

1. Agricultural Policy/Environmental eXtender Model (APEX)
 - a. Ability to model individual farm management

‘Whole Farm’ Consideration:

- a. A farmer would be required to submit all fields under management – and those field’s management – for evaluation in the program.
- b. Unanswered considerations:
 1. *Land use limitations for enrollment?*
 2. *Land tenure requirements (rented vs. owned) – all rented/managed fields would be proposed to be included*

Modeling costs:

- a. Vermont specific calibration of APEX for carbon would require updates to the tool.
 - ii. *\$137K required for this work – work would be completed with funds outside of PES Working Group*

Who Pays?

- a. PES Program Pays for:

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- iii. Farmer time for entering data in APEX
 - 1. Costs are already borne in VFPF
- iv. Tons of carbon sequestered for each evaluated crop year on a net-basis across the 'whole farm'.

Who Verifies?

- a. TA Provider required to validate crop rotation / crop implementation.
- v. Unanswered considerations:
 - 1. QA/QC
 - 2. Verification
 - 3. California model of farmers sending in geotagged photos

How often Evaluate?

- a. APEX and sequestration able to be modeled and paid on an annual basis.

Payment

- a. Will be based on Social Cost of Carbon at time of program grant execution
 - a. USEPA calculates \$51. Higher SCC in Vermont.
- b. Payment per ton of carbon stored in soil
- c. Payment rate flat rate at time of grant execution
- d. Net farm field sequestration rate submitted for sampling and payment
- e. Payment in Year 1 for data entry (if not already covered); payment in year 1 for net positive sequestration
- f. Payment will be direct financial remuneration
- g. Funding source: \$1,000,000 PES GF appropriation

Baseline

- a. No baseline – is a performance program proposal.
- b. Eligible for payment each year there is a net sequestration

Threshold

- a. Threshold will be an improvement in soil carbon levels on an annual net-farm basis.

Farm Eligibility

- a. Major commodity crop types & pasture would be eligible at this time.
- b. All RAP farm sizes
- c. Farm must be in good standing with VAAFM

Farm Ranking

- a. First come first served based on application deadlines set by program

Pilot Specifics

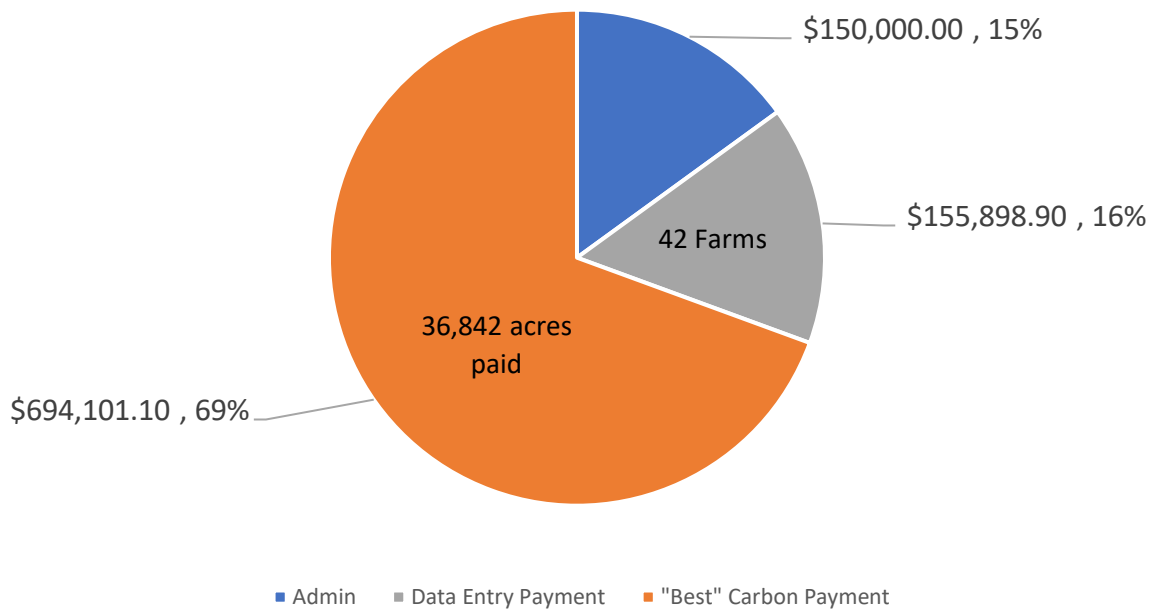
- a. 1 Year:
 - a. Planning Winter 2023
 - b. Implementation Spring 2023
 - c. Verification Fall 2023
 - d. Payment early winter 2023
- b. Tool requires calibration (This winter?)

Payment Scenarios:

Two payment scenarios are considered for this pilot thought experiment. These payment rates are based from data reported in the PES WG Task 5: Valuation of Ecosystem Services report. A fixed cost of 15% is considered for administration costs between program payment rates– this will need to be revisited as complexity is introduced into a

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APEX Modeling Soil Carbon Storage "Best" Payment Scenario: \$18.84/ac



APEX Modeling Soil Carbon Storage "Good" Payment Scenario: \$9.42 / ac.

