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Economic Assessment for Ecosystem Service Market Credits from Agricultural Working Lands

Prepared for

Ecosystem Services Market Consortium (ESMC) LLC

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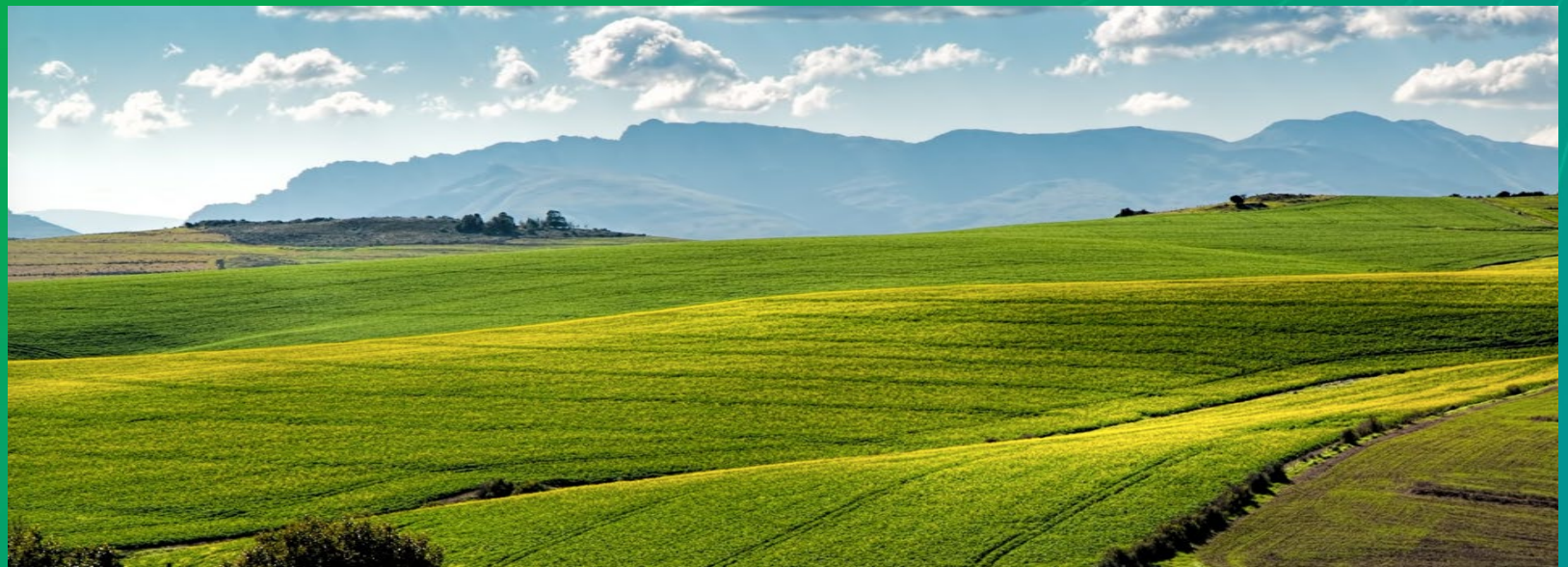
ESMC Mission: To advance ecosystem service markets that incentivize farmers and ranchers to improve soil health systems that benefit society.

- Intent is to enable and encourage farmers and ranchers to adopt and sustain conservation management practices to reduce GHG emissions and improve water quality and reduce water use.
- Healthy soils improve crop yield and resilience while decreasing farmers' and ranchers' "need for agricultural inputs."



ESMC High Level Timeline

2017
Multi-stakeholder convenings to assess market-based ecosystem service opportunities for agriculture

2018
ESM strategic & infrastructure development for national ESM program
Ex., protocol, economic assessment

2019
ESM Consortium formed to build ESM market in time for 2022 national market launch
Ex., pilot test, refine

ECOSYSTEM SERVICES MARKET CONSORTIUM

Economic Assessment for Ecosystem Service Market Credits from Agricultural Working Lands

Potential value of ecosystem services for national/regional supply/demand.

- Supply side – monetize soil health to reward farmers and ranchers actively adopting and improving management practices that protect the environment.
  - > GHG mitigation potential is associated with changes in farm management practices for field crops, specialty crops and pasture/rangeland.
  - > Water quality improvement is based on reducing agricultural nutrient runoff focusing on nitrogen and phosphorous.
- Demand side - potential buyers of ecosystem credits such as corporations, industrial operations or municipal operations.
  - > Interest in meeting publicly stated environmental goals;
  - > Shareholder or stakeholder environmental expectations; or
  - > Regulatory compliance obligations.

Potential Demand for Environmental Credits

Credit Type	Demand	
	Volume	Value ($bil)
Carbon (vol in MMt Co2e)	189.7	5.2
Water Quality (vol in bil pounds)		
Nitrogen	1.58	4.8
Phosphorous	0.8	3.9
Total		**13.9**

- Combined demand of carbon and water quality credits estimated at $13.9 billion.
  - > Carbon credits demand estimated at $5.2 billion.
    - – Carbon prices range from $3 to $150 per tonne depending on region and voluntary or compliance market.
    - – Internal carbon pricing - mechanism to help companies manage risk and capitalize on emerging opportunities in transition to a low carbon economy.
  - > Carbon impact equivalent to 40.7 million passenger vehicles off the road for one year.
  - > Water quality credits valued at $8.7 billion.

Carbon Credit Supply Potential by Land Use/Region

In 1,000 Tonnes CO2e

Region	Field Crops	Fruit, Vegetable & Tree Nuts	Pasture	Rangeland	Total
Northeast	5,581	1,204	1,743	0	8,528
Lake States	25,374	1,495	2,652	0	29,520
Corn Belt	56,446	344	5,799	13	62,602
Northern Plains	46,730	174	2,151	16,414	65,469
Appalachia	9,977	427	4,671	0	15,075
Southeast	5,501	2,050	2,809	686	11,046
Delta	10,561	129	2,852	60	13,603
Southern Plains	18,475	497	6,660	24,551	50,183
Mountain	11,798	754	1,982	35,474	50,008
Pacific	5,488	6,180	1,018	7,279	19,965
United States	**195,931**	**13,255**	**32,337**	**84,477**	**326,000**

- Field crops account for 60% of the potential carbon credit supply.
  - > Corn Belt, Northern Plains and Lake States account for two-thirds of this potential.
- Rangeland and pasture account for 35% of the potential supply.
  - > Mountain States, Southern Plains and Northern Plains account for 75% of this potential.
- Specialty crops account for 5% of the potential supply because of relatively smaller land area.

Carbon Credit Demand Potential

Sector	Company Potential	
	Offsetting	Insetting
Agriculture, Food & Beverage	18.7	89.9
Energy	6.8	
Industrial	42.0	0.1
Chemical, Fertilizer & Other Materials	1.9	
Information & Telecommunications	3.9	
Utilities	23.0	
Financial	1.0	
Consumer Discretionary	2.5	
Total Potential	**99.7**	**90.0**

- Evaluated potential demand for over 100 companies across several sectors including: food and beverage; energy; industrial; chemical; fertilizer; utilities; financial; etc.
- Food and beverage sector estimated to account for 57 percent of total potential demand for carbon credits.
- Many food and beverage companies are already committed to working with their suppliers, NGOs and their communities to reduce their carbon footprints.

Water Quality Credit Supply and Demand Potential

- Total potential supply of water quality credits for nitrogen exceeds demand in all waterways.
- Total potential supply of water quality credits for phosphorous is the opposite with demand exceeding supply.
- Matching supply with demand for all waterways indicates that 1.58 billion pounds of nitrogen and about 800 million pounds of phosphorous could be credits bought through an ecosystems market.

Nitrogen Runoff Credit Supply
Demand in All Waterways
In Million Pounds

Region	Supply	Demand
Appalachia	384.2	155.1
Corn Belt	1,303.9	421.6
Delta	214.4	166.0
Lake States	409.8	146.0
Mountain	263.5	87.9
Northeast	129.7	558.5
Northern Plains	514.8	56.8
Pacific	100.7	210.4
Southeast	267.5	149.1
Southern Plains	168.9	208.8
Total	**3,757.5**	**2,160.2**

Phosphorus Runoff Credit Supply
Demand in All Waterways
In Million Pounds

Region	Supply	Demand
Appalachia	62.7	23.5
Corn Belt	565.6	1,999.6
Delta	125.0	38.7
Lake States	157.0	6.8
Mountain	24.7	883.9
Northeast	36.9	79.9
Northern Plains	288.5	46.8
Pacific	4.2	22.0
Southeast	33.5	26.6
Southern Plains	30.9	24.2
Total	**1,329.1**	**3,152.0**

Water Quality Credits

- Based on interviews and requirements for compliance markets the supply of water quality credits will need to be in the same waterways as demand for credits.
- Greatest potential for an ESM is in impaired waterways. But waterways not currently considered impaired could be impaired in the future and should also be considered.
- A summary of the estimated discharges by facilities show that publicly owned treatment plants (POTWs) are the main sources of nutrient discharges into waterways accounting for approximately 63% of nitrogen discharges and 94% of phosphorous discharges.
- It is difficult to come up with an average price for water quality credits based on nutrient runoff.
  - > Availability of water quality credits is limited because trading has yet to take off on a widespread scale and information on prices market participants are willing to pay can vary widely by region.

Protocols for GHG Emission Reductions and Water Quality Trading

- Protocols are being developed to accurately measure reductions in GHG emissions and improvements in water quality from agriculture production.
  - > Priority interest of potential ecosystem credit buyers is whether protocols are accurate.
  - > Changes in outcomes are measured or modeled on an annual basis.
  - > Protocols vary by crop, field, region, management practice, soil type etc.
  - > Producers provide historical information to create a baseline. They will need to provide records collected throughout the growing season to quantify improvements in water quality and reduction in GHG emissions.
  - > Track farmer field management practices.

Ecosystem Market Consortium

- Ecosystem Services Market program started by NRI in 2017 became the Ecosystem Market Consortium (ESMC) LLC in May of this year.
- The ESMC will continue to invest resources, test and refine protocols through pilots, and bring technical and scientific developments to bear to establish a successful ecosystem services market by 2022.
- This report shows there is a market and demand for ecosystem services from agriculture, and that demand is only likely to grow in time as demand on natural resources intensifies.
- ESMC intends for this report release to be the beginning of a dialogue with its members and stakeholders on how to better valuate ecosystem services from agriculture.

Thank You

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