August 3, 2020

Ms. Maggie Stehn
Office of Associate, Chief Counsel
Department of the Treasury
Internal Revenue Service (IRS)
CC:PA:
LPD:PR (REG-112339-19), Room 5205,
P.O. Box 7604, Ben Franklin Station,
Washington, DC 20044

Re.: Credit for Carbon Oxide Sequestration; REG-112339-19; RIN1545-BP42

Dear Ms. Stehn:

The Alternative Fuels & Chemicals Coalition (AFCC) is pleased to provide comments to the Department of the Treasury, Internal Revenue Service (IRS), proposed rule on the Credit for Carbon Oxide Sequestration, Federal Register, Vol. 85, No. 126, published on Tuesday, June 30, 2020.

AFCC is a collaborative government affairs effort organized by the Kilpatrick Townsend & Stockton law firm and American Diversified Energy. AFCC was created to address policy and advocacy gaps at the federal and state levels in renewable chemicals, bioplastics/biomaterials, cell-cultured food ingredients, single cell protein for food and feed, enzymes, alternative fuels, biobased products and sustainable aviation fuels (SAF) sectors. AFCC member companies work on feedstocks, renewable chemicals, food, feed, fiber, bioplastics and biomaterials, and biofuels impacting the biobased economy.

Introduction

The risk of global warming caused by carbon dioxide (CO_2) has triggered various efforts to reduce CO_2 concentrations in the atmosphere. A viable option is to utilize photosynthesis and innovative livestock production processes to draw incremental CO2 out of the atmosphere and store some of the recovered carbon (C) in solid (organic or mineral) form in US soils. Grossly missing in section 45Q tax incentive proposed regulations is recognition of "regenerative" food and fiber production processes as qualified carbon capture or that C storage in soils and root systems can be as verifiable and permanent as storage in deep saline formations.

By adopting regenerative food and fiber production processes, US crop and livestock producers have the potential to capture and store 0.5 to 1.5 billion TCO2/year (Chambers, Paustian, Lal, https://www.jswconline.org/content/71/3/68A), for at least 50 years, while

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coincidentally building US soil organic carbon stocks back to where they were 300 years ago, before the introduction of net C and nutrient extractive production methods.

Table 1

Potential of US soils to sequester carbon (C) and mitigate climate change.

Ecosystem	Land area* (Mha^{-1})	Rate ($Mg\ C\ ha^{-1}\ y^{-1}$)	Total potential ($Tg\ C\ y^{-1}$)	Reference
Cropland	156.9	0.3 to 0.5	45 to 98	Lal et al. (1998c)
Grazing land	336.0	0.04 to 0.21	13 to 70	Follett et al. (2001)
Forest land	236.1	0.11 to 0.43	25 to 102	Kimble et al. (2002)
Land conversion	16.8	0.125 to 0.46	21 to 77	Lal et al. (2003)
Soil restoration	498.4	0.05 to 0.12	25 to 60	Lal et al. (2003)
Other land use	166.0	0.09 to 0.15	15 to 25	Lal et al. (2003)
Total			144 to 432 (288)	Lal et al. (2003)

*Land area under different uses cannot be added because of the overlap with total area where "soil restoration" practices could be implemented.

Note: To convert teragrams (Tg) into million tonnes in TCO2-equivalents, multiply the teragrams by 3.6667. So 144 to 432 Tg of C stored, each year, in US soils equates to removing an incremental 528 to 1,584 million TTCO2-e from the atmosphere each year.

The many co-benefits of regenerative soil management and cropping practices include healthier soils that are more resilient and productive in the event of global warming. There is no other investment that delivers to US taxpayers comparable societal value in both climate change risk mitigation and adaptation terms.

Notwithstanding the lower relative cost and high economic and social return potential for carbon capture through the adoption of regenerative photosynthetic processes, success relies on the capacity of US land managers to bear the significant up-front cost of equipment to implement the carbon capture process, and continuing costs of data collection, monitoring and reporting cost. The continuous data collection, monitoring and reporting informs land managers' cropping and livestock management decision-making processes, as well as ensures that their carbon capture and storage claims can be verified. Access to the capital required to deliver this significant ecosystem service to society is very limited for US food and fiber producers. Hence the need to qualify projects that meet specific existing and proposed C storage quantification, verification and retention standards as 45Q compliant.

In fact, in all of the examples cited in the regulatory guidance, there appears to be emphasis on neglecting photosynthetic processes as a qualified carbon capture facility or process. Photosynthesis is currently deemed qualified C "utilization" in the regulation, as proposed, but not a qualified C capture process. This makes little sense. In its current form, the regulation says, effectively, that if an entity builds a direct air capture (DAC) facility to draw CO2 out of the atmosphere, and the CO2 is pumped into a commercial greenhouse to enhance in-door tomato and cucumber production rates, then the project potentially qualifies for the 45Q tax credit. But if another entity invests in the new equipment and data management systems required to regeneratively produce cucumbers and tomatoes on the land, and this entity can prove that in addition to storing some of the recovered C in the food products, they are also building up permanent organic C in the soil, this entity does not qualify for the 45Q tax credit.

Note that at least 90% of any C that is stored in the tomatoes and cucumbers is released to the atmosphere shortly after the products are consumed by humans. So the project that qualifies for 45Q, in this example, is valuable in that it recycles some of the C that is recovered from the atmosphere. But DAC, CO2 compression and compressed CO2 transport to the greenhouse are also energy-intensive processes, and at least some of the net benefit of the C capture and recycling will be offset by emission released in the energy production process.
But when a US farmer invests in equipment and the data management capacity they need to regeneratively produce tomatoes and cucumbers (or livestock) they will typically reduce on-farm fossil fuel use per unit of nutrient output. Their demand for trained labor does tend to go up. Some of the recovered atmospheric C is released when the tomatoes and cucumbers are consumed, but a portion of the recovered C can almost always be permanently stored in the soils. There are no additional CO2 compression or transport costs associated with the regenerative ag project. So the project that does not qualify for 45Q, will almost always permanently store more recovered C, with no incremental fossil-based energy demand and--more often than not--associated GHG emission reduction co-benefits that are not typically associated with the project that does currently qualify for 45Q.

Industrial Biotechnology Processes: Photosynthesis in Carbon Capture & Utilization

AFCC and its member companies applaud the inclusion of regulatory guidance for section 45Q to qualify carbon oxide for capture, storage and utilization. However, the limitations section 45Q imposes on industrial biotechnology processes by not qualifying photosynthesis as a capture methodology is undermining *Subtitle D-Sustainable Chemistry Research and Development* as proposed in the bipartisan FY2021 *National Defense Authorization Act*[1], and limiting the growth of the national biobased economy. AFCC and its member companies urge the Department of Treasury and the IRS in its proposed regulations regarding the tax credit for carbon oxide sequestration under section 45Q of the Internal Revenue Code to find photosynthesis to be *both* a qualified CO2 capture process and a qualified C utilization under section 45Q. Further, we urge the Department of Energy and the IRS to recognize carbon that is verifiably retained in solid (organic or mineral) form in the top 48 inches of the soil layer as “disposed”.

While some of the C recovered from the atmosphere is embedded in food and fiber products that will eventually be consumed, at least a portion of the recovered C will be fixed in the top 48 inches of the soil layer when the land manager invests in the equipment and data management tools they need to implement and build on regenerative practices. Fixation of qualified CO_2 through photosynthesis and chemosynthesis are viable economic and environmental methodologies and practiced in industrial biotechnology processes. Microbes aid plants in converting atmospheric carbon into soil carbon, they fix stored soil carbon, and thereby, fix CO_2 through photosynthesis utilizing crops.

"Carbon Neutral" versus "Carbon Negative"

At this time, 45Q phase in two separate CO2 carbon capture and storage incentives, a lower tax credit, scheduled to grow to $35/TCO2e, is being offered to capture processes when the recovered C is recycled into biofuels or compressed, transported and injected, typically in gaseous form, into flood units to enhance oil and gas recovery rates at semi-depleted reserves. (The latter process is called Enhanced Oil Recovery" or "EOR"). For purposes of this submission, we are referring to captured CO2 capture and utilization processes which result in the return of the captured C to the atmosphere as "Carbon Neutral".

When the recovered C is processed into biofuel and then consumed, it is directly returned to the atmosphere, but deemed to be displacing demand for virgin fossil fuels. So the process of capturing captured CO2 and converting some of the recovered C into biofuels can reasonably be described as "carbon neutral", as long as the GHGs discharged in the CO2 capture and conversion-to-biofuel processes do not exceed the GHGs that would be discharged if the biofuel was derived from biomass sources.

Similarly, when captured CO2 is utilized in EOR, and it can be verified that a portion of the injected captured CO2 remain below-ground, as long as the "enhanced" oil supply is displacing demand for fossils fuels in which there is no net C sequestration, this C utilization strategy might also reasonably be deemed either "Carbon Neutral", depending on the applicable baseline scenario. In the fossil fuel-based energy product lifecycle, the GHGs discharged to the atmosphere at the point of product end-use are typically 7 to 9 times (depending on the fossil fuel) total GHGs discharged over the extraction through finished product refining process. CO2 permanently stored underground through EOR can partially offset some oil and natural gas extraction GHGs, but is rarely of sufficient volume to offset any of the fossil-based secondary project end-use GHGs. This form of CO2 utilization is only "Carbon Neutral", to the extent that it is reasonable to assume that in the absence of the EOR project, virgin fossil fuels would be extracted from other flood units where no CO2 is being injected or sequestered.

When the recovered C injected in a deep saline reservoir and deemed permanently stored, the proposed regulation proposes a tax incentive that is scheduled to grow to $50/TCO2e. This disposition of CO2 is often referred to as "Carbon Negative". The CO2 is typically compressed and injected into an anaerobic environment (deep saline reservoir), where the C typically splits from the O2, forming pockets of methane (CH4) or other compounds that are presumed to transform into minerals when they come into contact with the walls and floors of the deep saline reservoirs. The mineralization process can actually take 100s of years, but the CO_2 is deemed to be permanently stored once it is injected, on the expectation that the recovered C will ultimately be mineralized.

At a Minimum, Regenerative Agriculture CO_2 Capture and Utilization Processes Meet the Existing 45Q Standard for "Carbon Neutrality"

When land owners invest in the equipment and data management capacity they need to transition from extractive to regenerative food, fiber and livestock production processes, the products they produce can be Carbon Neutral. In many cases, over time, they are Carbon Negative.

Drawing incremental CO_2 out of the atmosphere through photosynthesis using soil management and cropping practices that, at a minimum, reduce demand for fossil-based artificial fertilizers and soil nutrients, is, at a minimum, equivalent to utilizing recovered C to produce biofuels. Whether the recovered C is utilized to displace fossil fuel demand for energy or food, livestock or fiber production purposes, this is clearly analogous to utilizing recovered C to produce biofuels.

When investments in equipment and new data management capacity results in incremental C storage in the form of soil organic or mineral carbon, we argue that this carbon capture and disposition process is analogous to C sequestration in deep saline reservoirs, except that C stored in soils and root systems is immediately converted into a solid (organic) form, while C stored in deep saline reservoirs might take 100s of years to convert into a solid (mineral) form.

Costs of Different CO_2 Capture, Disposition and Utilization Options

In 2017, Nori LLC commissioned an independent academic economist to review the existing body for peer-reviewed science on the potential for the adoption of regenerative food and fiber production methods to draw down and store incremental C in US soils. The literature review found that at CO_2 values--combining prices the market is willing to pay with taxpayer-funded tax incentives--in the US$16 to $35/TCO2e range (2018 US$s), US crop and livestock producers have the capacity to draw down and store between 200 and 400 million TCO2e/year, for at least 30 and perhaps as much as 50 years. At CO_2 values ranging between US$35 and $50/TCO2e, US crop and livestock producers could draw down between 400 million and 1.5 billion TCO2e/year.

By comparison, a recent study by the Rhodium Group (Larson, J. et al, 2020, https://rhg.com/wp-content/uploads/2020/06/Capturing-New-Business-Market-Opportunities-from-DAC-Scale-Up.pdf) found that to be viable Direct Air Capture (DAC) technology requires a market price-plus-tax incentive in the order of US$242/TCO2e drawn down and disposed of or utilized. The Rhodium study finds that for DAC to be viable over the short to medium term, the combination of market payments and taxpayer-funded subsidies for CO_2 need to be in the US$125-$303 range (median $242/TCO2e),with the expectation that as investment in DAC scales over time, the marginal cost of DAC could from to US$40 to $60 (in 2018 US$s).

It is irrational for 45Q to disqualify photosynthesis as a carbon capture mechanism, in this context. US soils to have a maximum incremental C storage capacity, which is generally thought to be between 25,000 and 30,000 billion TCO2, at a maximum annual incremental C storage rate of 539 million to 1.5 billion TCO2/year (median 1.01 billion TCO2/year) (as illustrated in Table 1, above). A rational US climate change mitigation plan would mobilize private and taxpayer-funded investments in both photosynthesis and DAC carbon capture processes, with the goal that the cost of DAC will start falling as the US potential to capture and store C in croplands and grazing lands approaches saturation.

Small Businesses and Farmers

To transition from extractive to regenerative food and fiber production processes, farmers typically must invest, heavily, in new equipment and labor. Most of the time, there is an immediate reduction in their fossil fuel (particularly diesel) use, so a net GHG reduction often coincides with carbon capture and disposition. But, in the earliest stages of the transition process, new labor costs typically outweigh the fuel cost savings. If the food and fiber producers do everything right (a rare experience but everyone's goal, 5 to 10 years into the 12+/- year transition, cash crop yields tend to grow, delivering) a return on the up-front investment in equipment and the continuing increase in farm labor costs.

But relatively few US food and fiber producers have the financial strength to wait for a 7 to 15 year payback on the up-front and following investments required to complete the full transition to regenerative ag and to build their soil carbon stocks up to saturation. Qualifying photosynthesis that builds soil organic carbon stocks up, relative to regional norm baselines, as a qualified carbon capture process under 45Q would enable US food and fiber producers to exploit their significant CO2 capture, disposition and utilization potential. Integrating natural solutions and DAC as qualified CO2 capture processes is key to maximizing US job growth, and protecting US capital stock values at least cost the US taxpayer, over the 2020 to 2050 timeframe,

Investments in the equipment and technologies that are key to the widespread adoption of regenerative ag in the US would inject strong and purposeful flows of capital and introduce new, high skill jobs into rural America. These are the primary benefits of affording small businesses (landowners and farmers) the opportunity to engage in conservation and land use actions that would qualify for the tax credit.

One third of cumulative global carbon dioxide emissions since 1750 has resulted from land-use change. We now have, at our disposal, the equipment and data management capacity we need to recover most (or perhaps even more), that the C stocks we have lost, while we increase soil health and productivity. Investments of this nature both mitigate climate change risk, while building more resilient soils that are more likely to remain productive in the event of global warming. There is no other potential investment with comparable climate change risk mitigation and adaptation potential, at such low relative cost. But in the absence of an incentive like 45Q, most US farmers will not have the capacity to access the funds they need to initiate and maintain their transition from extractive to regenerative food and fiber production, notwithstanding the potential 7 to 12 year payback. Additionally, for rural counties that are struggling with unfunded mandates, new sources of capital income tied to property can help with these growing needs at the local level.

Carbon Sequestration by Photosynthesis: Expanding 45Q Tax Mechanism for Small Businesses and Farmers

The farmer uses approved regenerative practices[2], and additional complementary technologies that build up soil organic carbon. The farmer adopts a shift or "switch" change to one or more of the approved regenerative practices within the past five or more years to satisfy the concept of additionality. The tax payer can hold a lien on the land for the years the land owner claims the 45Q credit, and unless/until independent 3rd party verifiers provide assurance that the soil organic carbon stocks have been built up and are sustainable. The regulation can stipulate that if/when a landowner that claimed the tax credit chooses to let their soil carbon stocks deplete, the landowner would have to repay all tax credit value they had previously claimed. The 45Q tax credit should be transferrable, through a mechanism that could be similar to how company K-1s are constructed, where profits and losses can be passed through to the stakeholders. The tax credit is in the form of a deduction or credit, which payment can be vested over a period that is double the number of years of verified storage the IRS wants to see. The purpose of vesting the credit payment over a term that is double the permanence standard set by the IRS, is to provide insurance against negative practice changes or loss of control of land. For example, if the permanence requirement is 10 years, then use 20 as the denominator which is the value of the amount of carbon sequestered. The tax payer can file for a deduction or credit for claiming 1/20th the value of the amount of carbon sequestered for each of the next 10 years.

Proof of continuation or improvement to practice changes that originated the original claim to get the tax credit is through submission of records appropriate to the practice. For practices where third-party records might be difficult to obtain, vouching from credible third-parties would be acceptable. Third-party certification of practice change is needed to claim credit or deduction for the first year, and after every three years.

Proof of carbon sequestration amount is through what is generated by the USDA-backed COMET-FARM tool for every specific farm address, practices where there was a positive change within the past years. Proof of carbon sequestration amount can also be provided through direct third-party soil sampling measurements. The soil sampling measurements should be according to any of the approved soil sampling methodologies as defined by the USDA, Verra, Climate Action Reserve (CAR) or American Carbon Registry (ACR).

Agricultural Greenhouse Gas Emissions Reduction for Nitrous Oxide in Soil: Expanding 45Q

Nitrous oxide (N_2O) levels are now higher today than at any other time during the last 800,000 years. Nitrous oxide molecules stay in the atmosphere for an average of 114 years before being removed by a sink or destroyed through chemical reactions. The impact of 1 pound of N_2O on warming the atmosphere is almost 300 times that of 1 pound of carbon dioxide. Nitrous oxide accounted for about 6.5 percent of all U.S. greenhouse gas emissions from human activities, such as agriculture, fuel combustion, wastewater management, and industrial processes are the principal causes of human-generated N_2O emissions.[3] Synthetic and organic nitrogen-based fertilizer in agriculture is the principal contributor of these nitrous oxide emissions (77%). Emissions can be reduced by reducing nitrogen-based fertilizer applications and applying these fertilizers more efficiently, as well as modifying a farm's manure management practices. Tax credits can therefore be issued on a percentage savings basis for the following practices: Reducing the amount of nitrogen input evaluated through a percent reduction in nitrogen-based fertilizer spent compared to: a) Average of previous five years' spent, if in a monoculture scenario, b) Average of previous three instances' spent for the same crop under a crop rotation scenario. Tax payers would provide proof of reduction, which would entail minimum 10% reduction to claim credit. Percentage and quantity reduction in fertilizer use to be converted to CO_2 equivalents savings using the GREET model developed by the USDA Argonne Laboratory. Reducing soil nitrous oxide emissions using non-synthetic chemistry based methods. Reductions to be verified either through credible third-party testing or Argonne-labs approved models. Percentage reduction in N_2O flux to be converted to CO_2 equivalents savings using the GREET model developed by the USDA Argonne Laboratory.

Conclusion

AFCC and its member companies recommend the Treasury Department and the IRS expand section 45Q to provide the investment certainty and business model flexibility intended by Congress by being inclusive towards sustainable technologies such as microbial conversion technologies which uses photosynthesis for the capture of CO_2 in soil and awarding tax credits, and not only credits for photosynthesis technologies for use of CO_2. Expanding and building upon section 45Q in financing newer technologies mitigating other greenhouse gas emissions such as nitrous oxide and methane; and expanding the manufacturing source to agricultural process of CO_2, N_2O, CH_4 emissions and not just limiting the tax credits to enhanced oil recovery benefiting the fossil fuel industry.

AFCC asks that the Treasury Department and the IRS to work with our member companies to make our recommended changes. The result will bolster agriculture and rural communities, provide farmers spur the development of new investment, innovation, and job growth; and to promote the production of biobased products, build the nations biobased economy, and enhance energy and national security.

We look forward to working with you toward these goals. Thank you for considering these comments.

Sincerely,

Rina Singh, PhD.
Executive Vice President, Policy
Alternative Fuels & Chemicals Coalition

1. Sustainable Chemistry Research and Development; *William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021, H.R.6395; National Defense Authorization Act for Fiscal Year 2021, S.4049.*

2. http://www.regenerativeagriculturedefinition.com/

3. https://www.epa.gov/ghgemissions/overview-greenhouse-gases#nitrous-oxide