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Cornhusker Economics

Climate Smart Agriculture

What is climate-smart agriculture? This question has frustrated me from the first time I encountered it. A lot of the Biden administration's agricultural policy initiatives are "climate-smart," so it is worthwhile to explore what might be meant by this phrase, and how it might pertain to some related concepts, such as "carbon intensity," "regenerative agriculture" and "precision agriculture." As we will see, there is no precise "climate-smart" definition, but I think of "climate-smart" agriculture as basically being "climate-friendly" agriculture. More precisely, I think climate-smart means agricultural production with a lower carbon intensity, i.e. production with lower net greenhouse gas (GHG) emissions. This newsletter also briefly explores what "climate-smart commodities" are, and how Nebraska will encourage producers to use regenerative ag and precision ag practices to reduce climate-warming emissions through state and EPA cost-sharing programs. As long as we are dealing with the harmful effects of climate change (and I expect that will be the case indefinitely), the long-term effort will be to make agriculture less GHG intensive. The current "climate-smart" programs are the first attempt to do so, and the carbon intensity score will be a useful tool in tracking progress.

Background. Agriculture accounts for 10% of US greenhouse gas (GHG) emissions, those emissions that contribute to global warming. Agriculture's share of global GHG emissions is 22%. President Biden has established a goal to reduce US GHG emissions by 50-52% by 2030, in line with the UN Paris climate agreement. Accomplishing this will require significant GHG emission reductions throughout the entire US economy, including in agriculture.

Currently, the US has not taken a direct regulatory approach to GHG emission reduction (although pending EPA regulations would reduce GHG emissions in oil, gas, and electricity production). Instead, the Biden administration has provided financial incentives to businesses to voluntarily reduce their emissions. In agriculture, this financial assistance has taken the form of the USDA "climate-smart agriculture" programs.

Carbon intensity. Reducing GHG emissions associated with a particular activity – whether electricity generation, oil and gas production, or crop and livestock production – is sometimes referred to as reducing the activity's carbon intensity. Carbon dioxide is the largest GHG emitted in the US at 80%, followed by methane 11% and nitrous oxides 6%. So, activities that reduce emissions of any GHG are said to be reducing the carbon intensity of electricity, oil and gas, or crop and livestock production because carbon dioxide is 80% of US GHG emissions.

The label "carbon intensity" can be slightly misleading because it usually refers to reducing any GHG emissions, not just carbon dioxide emissions. So, what are the main sources of these GHG emissions? The main US sources of carbon dioxide emissions are transportation (35%), electricity generation from fossil fuel combustion (30%), and industry (16%). The main US sources of methane emissions are oil and gas operations (28%), enteric fermentation (cattle

digestive burps – 25%), landfills (16%), and manure management (9%). Methane is 28 times as potent a GHG as carbon dioxide. The main source of nitrous oxide emissions is agricultural soil management (fertilizer management–75%) with manure management another source at 4%. Nitrous oxide is 265 times as potent a GHG as carbon dioxide. So, activities that reduce methane or nitrous oxide emissions may also be referred to as reducing carbon intensity, even though it would be more accurate to say they are reducing GHG intensity. Carbon intensity is an important concept to understand because virtually everything else discussed in this newsletter involves reducing the carbon intensity (or GHG intensity) of agricultural activities.

What is climate-smart agriculture? Basically, it means a set of agricultural practices that reduce net GHG emissions in two broad ways:

1. practices that help store carbon in agricultural and forest soils, or
2. practices that reduce GHG emissions from agricultural operations.

In contrast to organic farming, climate-smart agriculture does not include a list of prohibited practices. Instead, there is a growing list of "climate-smart" practices. Practices storing carbon in agricultural and forest soils include

1. planting cover crops,
2. reduced tillage,
3. no-till production,
4. crop rotation incorporating legumes; and
5. improved grazing management, among others.

Practices reducing GHG emissions in farm and livestock operations include

1. reduced tillage including no-till,
2. reduced commercial fertilizer application,
3. other improved fertilizer management practices,
4. methane capture in livestock production, and
5. reduced methane emissions from cattle burps through feed additives.

Both groups of practices reduce the carbon intensity of agricultural production, and implementing any of these practices may be termed climate-smart agriculture. Some of these climate-smart practices may be eligible for NRCS cost-sharing (check with your local NRCS office).

What are climate-smart commodities? These are commodities produced using one or more climate-smart practices. USDA has provided funding to produce climate-smart commodity chains through the Partnership for Climate-Smart Commodities project per the USDA website. The eventual goal is to develop marketing channels for climate-smart commodities. Approval of a commodity as a climate-smart commodity would need to be approved by the USDA Food Safety and Inspection Service. As of this writing, there are no specific criteria established for commodities to be considered climate-smart commodities, but the more climate-smart production practices employed, and the more carbon intensity is reduced, the more likely a commodity is to be considered climate-smart, in my opinion. Expect to see climate-smart commodities appearing in a grocery store near you in the coming years. :-)

What is a carbon intensity score (CI score)? Again, carbon dioxide is the largest GHG being emitted in the US and globally. The terms "GHG emissions" and "carbon emissions" are often used interchangeably even though GHGs include more than carbon dioxide. A carbon intensity score is one emerging measure of how carbon-intensive (or GHG-intensive) an activity is, expressed in a number.

The model for carbon intensity scoring of transportation fuels – where CI was first developed – is the Greenhouse Gases, Regulated Emissions & Energy Use in Technologies or GREET model developed by the US Department of Energy's Argonne National Laboratory. The model is a full life-cycle model, evaluating energy and emission impacts of new transportation fuels. The GREET model was developed in part for use in California's Low Carbon Fuel Standard, to determine under what circumstances ethanol could be classified as a low-carbon fuel in California. The GREET model analyzes ethanol production (including the feedstock corn production) and generates a carbon intensity score for that ethanol. Corn producers with lower carbon intensity scores (CI scores) may earn a premium from the ethanol processor. The use of CI scores for corn and soybean production may become more widespread in Nebraska under the Nebraska Priority Climate Action Plan program, discussed below.

What are regenerative agriculture and precision agriculture? These are old and new agricultural practices and technology that can overlap with climate-smart agriculture practices and programs. They will be eligible for cost-sharing under the Nebraska Priority Climate Action Plan program, discussed below.

Regenerative agriculture seems to me to be a lot like organic agriculture, where agrichemical application may be prohibited. Regenerative ag is not organic ag but is very similar to it. Regenerative ag has a strong soil health element, as many of the practices are designed to regenerate soil health. Regenerative ag practices include

1. composting
2. using manure instead of commercial fertilizer
3. conservation buffers and riparian buffers
4. contour cropping
5. cover cropping
6. crop rotation
7. intensive rotational grazing
8. no-till production
9. prairie strips, and
10. reduced agrichemical use.

Not being an agronomist, it seems that some of these practices (composting? crop rotation?) might be challenging for some large commercial operators to implement. However, some other practices (contour cropping, conservation buffers, and riparian buffers) seem to fall within or be extensions of more traditional farm soil and water conservation practices. Cover cropping and no-till are on most lists of how to reduce agricultural CI and may become more widely adopted by farmers seeking to reduce their CI score.

Precision agriculture. Precision agriculture uses soil sampling, yield and soil maps, satellite imagery, and real-time field sensors to track growing conditions and provide crop inputs at variable rates to meet plant growth stage and site-specific crop needs. Precision ag practices include

1. GPS guidance systems, yield monitors, and soil mapping
2. variable rate input applications, and
3. drones for field scouting and livestock monitoring.

Precision ag practices can reduce the use of many crop inputs, which can reduce a producer's CI score.

Nebraska Priority Climate Action Plan (Nebraska Climate Action Plan). On March 1, 2024, the Nebraska Department of Environment & Energy (NDEE) submitted the Nebraska Priority Climate Action Plan to the US Environmental Protection Agency (EPA). EPA is administering a $5 billion program to support state programs to reduce GHG emissions within the state. Nebraska's plan proposed to reduce Nebraska ag GHG emissions through cost-sharing programs in precision ag, regenerative ag, and by establishing a voluntary CI score registry for corn and soybean producers.

In July 2024 EPA announced awards of $4.3 billion to projects in 30 states to reduce climate pollution. Nebraska received a $307 million grant and is currently negotiating with EPA regarding how the grant will be implemented. As 86% of the projected GHG emission reductions in Nebraska's proposal would come from agriculture, it seems likely that the agricultural portions of Nebraska's climate action plan will receive significant funding. But we may not learn more of this until 2025. It is likely that Nebraska's agricultural programs developed under the Nebraska Climate Action Plan will be models for other states, including the Nebraska CI scoring model.

Agricultural biologicals. On April 16, 2024, Governor Pillen signed LB1368, the Nitrogen Reduction Incentive Act. LB1368 will provide a $10/acre minimum payment to producers who reduce their nitrogen fertilizer applications by the smaller of 15% or 40 pounds per acre by use of a "qualifying product." The bill's general intent is to provide cost-share funding to encourage farmers to use biological nitrogen products to reduce their commercial fertilizer applications. If successful, this could reduce fertilizer runoff into streams or leaching into groundwater, as well as saving the producer on their fertilizer bill and reducing a producer's CI score. The program is initially funded at $1 million, although additional funding could be provided through the Nebraska Climate Action Plan. The program will be administered by the Nebraska Department of Natural Resources in cooperation with local Natural Resources Districts. The program may be operational by the time farmers are making their fertilizer purchases for the 2025 crop year.

Conclusion. There are several programs encouraging producers to reduce their carbon intensity, including USDA climate-smart agriculture programs, the 2024 Nebraska Climate Action Plan, and the 2024 Nitrogen Reduction Incentive Act. The hope is that producers with lower CI scores will receive a premium for their products.

Producers would be well advised to learn more about these programs, as reducing carbon intensity in agriculture seems to be an emerging agricultural policy trend that will be with us for some time to come.

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