DRAWDOWN GA

FOOD & AGRICULTURE

COMPOSTING

CONSERVATION AGRICULTURE

PLANT-RICH DIET

REDUCED FOOD WASTE

COMPOSTING

OVERVIEW OF A HIGH-IMPACT DRAWDOWN SOLUTION

When organic matter decomposes in landfills, it releases methane, a potent GHG. Composting allows for organic matter to be broken down by microbes. The process sequesters carbon and produces fertilizer.

TECHNOLOGY AND MARKET READINESS

The technology is currently practiced and readily available in many counties in Georgia.

LOCAL EXPERIENCE AND DATA AVAILABILITY

Data is available in major cities and metro areas.

TECHNICALLY ACHIEVABLE CO2 POTENTIAL

Composting could reduce a number of landfills in Georgia and would potentially reduce methane emissions. According to the 2005 study by the Georgia Department of Community Affairs, about 3 million tons/y of organic fractions of municipal solid waste is available for composting. The organic fractions do not include food waste, but include mainly green wastes such as papers, wood and yard trimmings. Although some counties in Georgia operate composting facilities (e.g. Clarke county), a majority of green wastes are landfilled, which may be diverted to composting facilities. It was estimated by the EPA that about 0.16 t CO2-e is reduced for every short ton of mixed organic waste (EPA, 1998). If 50% of organic waste generated in Georgia is composted every year, composting could reduce about 2.4 Mt CO2-e by 2030.

COST COMPETITIVENESS

Usually economical. Operating expenses are often high.

BEYOND CARBON ATTRIBUTES

This solution can enrich soil health, reduce methane emissions and reduce the need for chemical fertilizers [4]. Microbial activity degrades raw food wastes resulting in end-products rich in microbial populations, creating extremely fertile soils (EPA, 1998). In addition, landfills will have reduced waste and land use demands will correspondingly decrease. Approximately 27 million tons of municipal solid waste was recovered in 2017 through composting, allowing for that waste to be diverted from landfills [6]. Composting can also provide increased food security and is affordable if composting at home [5]. If compost is used to return nutrients back into exhausted soils on farmlands, the food waste loop can narrow aiding in food security [7].

Negative beyond carbon impacts could result if operating costs for composting services become higher than those associated with landfills. An example from Colorado found backlash to mandatory composting when it added $4.45 to household's monthly expenses [8]. Additionally, there are costs associated with interventions and education required for households and businesses to change disposal practices.

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4. https://www.epa.gov/recycle/composting-home
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6. https://www.epa.gov/sustainable-management-food/reducing-impact-wasted-food-feeding-soil-and-composting
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CONSERVATION AGRICULTURE

OVERVIEW OF A HIGH-IMPACT DRAWDOWN SOLUTION

Conservation agriculture refers to a set of agricultural practices that supports biosequestration via crop rotation, managing soil organic matter, and reduced tillage.

TECHNOLOGY AND MARKET READINESS

Cover crops and reduced tillage practices are already widely used in the United States and Georgia. Natural Resources Conservation Services (NRCS) cost-share programs already established to incentivize their adoption.

LOCAL EXPERIENCE AND DATA AVAILABILITY

There is widespread adoption of reduced tillage and cover crops. Many empirical studies have been conducted analyzing the costs of these practices and the yield effects for a variety of crops.

TECHNICALLY ACHIEVABLE CO2 POTENTIAL

There is an issue of additivity here – namely, many farmers already use reduced tillage practices and cover crops. While many farmers use reduced tillage practices, they often alternate them with conventional tillage. According to Project Drawdown®, conservation agriculture practices increase the carbon sequestration rate at an average of 0.2 tons of C/ac/y. Georgia has about 3.8 million acre of croplands about 47% of the croplands are under conservation tillage practices. If another 40% of the land would be converted into conservation tillage, the CO2 sequestration potential could be about 1.1 Mt CO2-e per year.

COST COMPETITIVENESS

Cost depends on the types of crops and yield potentials. In the literature, there were limited data related to conservation tillage practices for specific crop types. The farm specific practiced conservation measures and the associated costs can be estimated by the procedures from Gordon (2013). In general, conservation agriculture practices save cost to farmers.

BEYOND CARBON ATTRIBUTES

This solution improves water quality and quantity, while also lowering soil erosion and improving soil health. Excess water runoff is minimized from better soil protection, reducing water use and the carrying of fertilizer contaminating water (Derpsh et al., 2010). Soil quality is improved though reducing the loss of organic material and improving/maintaining the original soil porosity, resulting in higher resistance to drought (Derpsh et al., 2010). Farmers may experience increases in crop/agricultural yield and thus increases in income and wages (Knowler & Bradshaw, 2007; Pretty et al, 2006). When plants have a better opportunity to healthily grow from the extension of water and plant nutrients, yields have been reported to increase anywhere between 20%-120% with lower energy and production costs (Derpsh et al., 2010). Water quality improvements can increase public health and raise the quality of life for farmers/rural communities, and upfront costs for farmers would be low if agricultural systems are already in place (Lal, 2015).

A negative impact of this solution is the difficulty in changing farmers' perceptions that conservation agriculture lowers yield and income. Interventions such as subsidies and interest groups continue to discourage farmers from adopting no-tillage practices, stagnating the preference for conservation agriculture (Derpsh et al., 2010).

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4. https://gaswcc.georgia.gov/agricultural-conservation-programs
5. https://www.drawdown.org/solutions/food/conservation-agriculture

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PLANT-RICH DIET

OVERVIEW OF A HIGH-IMPACT DRAWDOWN SOLUTION

A plant-rich diet, such as a vegetarian or vegan diet, would reduce emissions associated with meat production. This solution assumes people 1) maintain a 2,500 calorie per day nutritional regime; 2) meet daily protein requirements; and 3) purchase locally produced food when available.

TECHNOLOGY AND MARKET READINESS

Meat-rich diets are one of the major sources of GHG emissions in the United States. An alternative to meat, plant-rich diets have significant potential to reduce GHG emissions. The technology is becoming mature by brands such as “Beyond Meat” and “Impossible Foods”, but the market readiness depends on the shift of consumer choices and affordability. The National Academies of Sciences, Engineering and Medicine (2019) convened a workshop in 2019 to review and discuss the Sustainable Diets, Food and Nutrition for Americans.

LOCAL EXPERIENCE AND DATA AVAILABILITY

A good number of companies in the United States are promoting plant-rich diets and grass-fed meats that produce less CO2 emissions. There is a wide range of environmental impacts data for the production of animal-based proteins, which widely vary based on the production practices.

TECHNICALLY ACHIEVABLE CO2 REDUCTION POTENTIAL

The solution has significant potential to reduce CO2 emissions by displacing meat with plant-based diet or low-carbon meats. According to the USDA-ERS, the per capita disappearance of meat was about 100 kg of red meat and poultry in 2018. Based on the Life Cycle Analysis (LCA) data from Heller et al., (2013), the average GHG emissions rate is 12.05 kg of CO2 per kg of meat. If 10% of the Georgia population shifts to plant-based diet, the shift would reduce about 1.4 Mt CO2-e per year.

COST COMPETITIVENESS

It depends on the consumer choices, accessibility, availability and preferences.

BEYOND CARBON ATTRIBUTES

This solution results in improved water quality and less extensive farming practices. The farming efficiency of plant-based foods increases with the concentration of higher proteins, while higher animal protein foods decreases the efficiency of energy inputs (Sabaté & Soret, 2014). It promotes an increased quality of life due to the health benefits associated with a plant-rich diet, and it encourages a reduction in obesity.2 There is statistically significant protection from cancer associated with switching to a non-animal-based diet and a reduced risk of developing diabetes (Tonstad et al., 2013;Tantamango-Bartley et al., 2013). Plant-rich diets are less expensive, especially in healthcare costs from lowering chronic diseases (Tilman & Clark, 2014). An example from New Zealand found healthcare savings to be from $14-$20 billion over the lifetime of their population (Drew et al., 2020).

A negative impact can result from the possibility of increased water usage for plant-based crops, which could amount to 16% increase in freshwater usage (Springmann, et al., 2018). There could also be adverse monetary effects for producers of meat-based products and loss of money on livestock. A major difficulty for this solution will be overcoming opposition in specific regions to a non-meat diet, although smaller steps towards the new diet will be more effective in achieving success.

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REDUCED FOOD-WASTE

OVERVIEW OF A HIGH-IMPACT DRAWDOWN SOLUTION

Food waste refers to food that is produced but not eaten. This can occur for a variety reasons such as people purchasing more food than they need or customers rejecting bruised or mis-shaped produce. Food waste also can occur when food rots on farms or in the distribution process. Food waste generates GHGs in every step of the food production and distribution process. Organic matter also produces methane, a potent GHG, when it decomposes in landfills.

TECHNOLOGY AND MARKET READINESS

Multiple interventions are required both at the consumer and retail levels to reduce food waste. Major interventions have already been identified – Prevention; Recovery & Recycling (ReFED, 2016). Recent case studies by restaurants and hotels indicated that simple interventions would not only reduce food wastes, but also cut costs. A coordinated effort along the supply chain and policy changes are required to mitigate food wastes.

LOCAL EXPERIENCE AND DATA AVAILABILITY

According to USDA-ERS, about 67-63 million tons of food is wasted annually in the United States. Although no state-specific food loss data is available, several estimates are available at the national and global levels and also in specific sectors. USDA-ERS has national-level data on food wastes and the state-specific data can be obtained. However, the potential food waste from the State of Georgia can be estimated from the population data.

TECHNICALLY ACHIEVABLE CO2 REDUCTION POTENTIAL

For the state of Georgia with a total population of 10.52 million (2018), the estimated food waste is about 2.03 million tons. We assumed that for every ton of food waste diverted, about 1.35 tons of CO2 could be reduced depending on the interventions based on the study by ReFED (2016). If Georgia could reduce 50% of the food waste by 2030, it could reduce about 1.38 Mt CO2-e each year.

COST COMPETITIVENESS

According to ReFED organization, about $18 billion investment is required to reduce 13 million tons of food waste that would yield $100 billion net economic value (ReFED, 2016). However, costs depend on the potential food waste reduction solutions – Prevention, Recovery and Recycling.

BEYOND CARBON ATTRIBUTES

By reducing food waste, land use and landfill use decreases, aiding in environmental health. Around 56.7 million tonnes of food is wasted from farms to consumers in the United States, which entails using 16 million hectares of land, 3.9 million tonnes of fertilizers, and 17 billion cubic meters of irrigation (CAST, 2018). Water quality and air quality can be improved from less pesticide use (Tilman & Clark, 2014). Public health is improved from increased food security and safety, especially through donating food that would otherwise be wasted to those in need (Snyder et al., 2018).

Some potentially adverse effects include lower profits for farmers, since they may be encouraged to produce and sell smaller quantities of food. Overall, education needs to be spread to encourage changes in consumer and producer habits to lower food waste across all sectors (FAO, 2011).

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