3.2.1.4 GRAZING MANAGEMENT

Technology Description

Most grazing land soils can sequester carbon with alternative management technologies and practices. These practices increase the amount of carbon in the soil by increasing biomass production and reducing the amount of carbon lost to erosion. The production of methane by domestic ruminants also can be reduced. Methane production depends on the quality of forage ingested and the efficiency of the digestive process – and can be reduced with improved diet and the use of supplements. These practices increase production efficiency while reducing methane emissions. Environmental and production benefits are high in all cases.

System Concepts

- Increasing carbon storage on grazing lands depends on implementing management technologies (e.g. fire, grazing, seeding) to achieve an appropriate mix of plants that optimize the use of available sunlight, water, and nutrients in biomass production.
- Pasturelands use more fertilizer and water than rangelands, and mesic rangelands have a relatively high sequestration potential.
- Nitrous oxide emissions from fertilizer application on pastures can be dramatically reduced by split applications or applications when plants are actively growing.
- Reduction of methane production by ruminant animals has been demonstrated in grazing systems where improved diet quality and herd management practices have been implemented. In addition, organisms in grassland soils decompose methane into the less-potent greenhouse gas CO_2 and water.

Representative Technologies

- Alternative grazing practice.
- Livestock herd management.
- Vegetation management.
- Water management.
- Erosion control.

Technology Status/Applications

- Each of these technologies has been researched and implemented for purposes other than carbon sequestration, primarily conservation.
- These technologies have generally been demonstrated to be economically feasible.
- Some soil carbon data has been gathered while these practices were investigated for their conservation and yield benefits.

Current Research, Development, and Demonstration

RD&D Goals

- Construct quantitative models that describe site-specific interactions among grazing systems, vegetation, soil and climate, and the effects on greenhouse gas dynamics.
- Develop and optimize the combination of practices that maximize carbon sequestration for various grazing systems and geographical areas.
- Develop decision support tools for ranchers, technical assistance providers, and policy makers to inform the relative costs and benefits of different grassland management scenarios for carbon sequestration and other conservation benefits.
- Demonstrate and refine decision-support tools through pilot projects.

RD&D Challenges

- Develop and implement measurement and monitoring technologies and protocols with sufficient site specificity and acceptable cost-benefit ratios.
- Determine the effectiveness of practices and systems in sequestering carbon.
- Quantify the effects of land and livestock management on carbon sequestration and CO_2, methane, and nitrous oxide emissions across a variety of climates, soils, and production systems.
- Address difficulties in quantifying and verifying additional GHG reductions from grazing-land systems for use in accounting regimes.

Recent Progress
• Estimates of the potential for range and pastureland soils to sequester soil carbon have been published and provide a baseline for future activities. • Development of the Pasture Land Management System (PLMS) decision-support tool, a joint project of EPA, National Resources Conservation Service, and Virginia Tech. • Research programs already have been established in the USDA Agricultural Research Service, Natural Resources Conservation Service, Land Grant Universities, DOE Office of Science, and U.S. Geological Survey to study soil carbon sequestration. • New technologies for the measurement of greenhouse gas fluxes have been developed.
Commercialization and Deployment Activities
• USDA has provided technical assistance to landowners for implementing these technologies. • Commercial application of grazing land restoration has been successful but is limited in extent. **Market Context** • Virtually 100% of rangeland and grazing lands could increase carbon storage.