Greenhouse gas mitigation strategies for the US sheep industry - Summary

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Improve ewe flock productivity, >60% of GHG is enteric CH_4 emissions from the ewe flock, representing a large overhead

Increase the number of lambs weaned per ewe exposed

- Approximately half of the variation in emissions is related to the number of weaned lambs/ewe/year
- **Increasing from 1 to 1.5 weaned lamb/ewe/year may reduce total GHG by 15-30%**
- Improve prebreeding nutrition (flushing) and breeding management (ram fertility and appropriate ram coverage)
- Adopt strategic nutritional inputs during late pregnancy and lactation

Breed ewe lambs when feasible: greater time to breeding = greater emissions

- **Reducing age at first lambing from 24 to 12 months may lower total GHG by 2-4%**

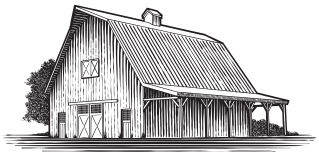
Improve animal health

Lower lamb mortality = more product per ewe

- Improve management of birth climate
- Improve bonding management
- Improve ewe nutrition for greater colostrum and milk production
- Reduce disease incidence: pneumonia, mastitis, clostridial diseases

Improve ewe flock health - Reducing ewe replacement rate from 25 to 20% may lower total GHG by 2-4%

- Eradicate or control chronic disease (i.e., ovine progressive pneumonia, contagious lymphadenitis, foot rot).
- Improved parasite management - integration of methods (genetics/selection, proper drug use, improved grazing management) for sustainable control



Increase lamb growth rate and harvest at efficient endpoints

- Fast and efficient gain = less emissions (use of terminal sires and/or improved diets)
- Overly mature lambs (>70% of mature size) are less efficient
- Highly immature lambs are an opportunity loss (< 60% of mature size)

Optimize forage management

- Match animal needs with pasture/forage quality
- Incorporate legumes and tannin-containing forages into pastures
- **Strategic use of annual forages, brassica grazing emits ~25% less GHG**

Supplement or balance diets to recommended protein levels

- Oversupplying protein results in N losses and subsequent N_2O emissions

Minimize fertilizer use

- Test soils frequently and apply only recommended level
- Apply manure and fertilizer during optimal conditions

Utilize cropping practices that promote soil health and carbon sequestration (maintenance of living roots, coverage, minimal disturbance, greater plant diversity in/of soil).

- Grow and graze cover crops on your farm or neighbors

Seek managed grazing opportunities (vegetation management of solar arrays, vineyards, watersheds, crop residues, fire breaks, etc.)

Improve manure management

- Avoid wet and/or warm storage conditions to limit fermentation (CH_4 formation)
- Minimize animal camping under trees and near water sources to lower N_2O emissions
- Utilize proper composting practices to avoid anaerobic conditions

Consult with local conservation experts to identify practices that improve wildlife habitat, increase biodiversity and enhance carbon sequestration

- Incorporate trees/shrubs, maintain/establish pollinator and bird habitats into appropriate areas
- Identify farm areas that can be maintained/reserved for wildlife habitat that is compatible with sheep production

Gases that trap heat in the atmosphere are called greenhouse gases (GHG). The main greenhouse gases in agriculture are:

Carbon dioxide (CO_2) is emitted from burning fossil fuels and organic material (vegetation, trees, etc.) and stays in the atmosphere for hundreds of years

Nitrous oxide (N_2O) is emitted from fertilizers and manure; it is 265 times more potent than CO_2 in terms of warming potential and stays in the atmosphere for over one hundred years.

Methane (CH_4) is mainly emitted from the microbial activity in the rumen, which is called enteric fermentation, but also from manure fermentation; it is 27 times more potent than CO_2 averaged over 100 years but is only in the atmosphere for about 12 years.