



# Animal Grazing and Forage Effect on CO<sub>2</sub> Fluxes in a Semiarid Pastureland in Northern Nevada

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## BACKGROUND

Agricultural practices like animal grazing and forage management can influence soil greenhouse gas fluxes in semi-arid pastureland. Cattle grazing and forage treatments impact soil respiration and carbon dioxide (CO<sub>2</sub>) emission. Gas samples were collected in a rotational grazing pasture at the University of Nevada, Reno Main Experiment Station in Reno Nevada. The objective of this study was to evaluate animal grazing and forage management impact on soil CO<sub>2</sub> emission in a semi-arid ecosystem. Soil gas samples were collected before and during cattle grazing to determine grazing and forage effect on soil CO<sub>2</sub> fluxes. Soil temperature and moisture were measured during each sampling period. Six forage systems (treatments) were used in this study (i) Alfalfa Mix [contained: alfalfa (40%), tall fescue (30%), and smooth bromegrass (30%)], (ii) White clover Mix [contained: white clover (40%), tall fescue (30%), and smooth bromegrass (30%)], and four spatially separated (SS) adjacent monocultures of grass and legume (50:50 ratio) within the same paddock (iii) Tall fescue-alfalfa, (iv) Smooth bromegrass-alfalfa, (v) Tall fescue-white clover, and (vi) Smooth bromegrass-white clover. Soil gas samples were collected from each paddock about 60m distance from the water source. Gas was sampled bi-weekly in each paddock and analyzed for CO<sub>2</sub> emission. There was pasture and period effect in the emission of CO<sub>2</sub> between October and November respectively (P = 0.0244). CO<sub>2</sub> emission differs significantly among the various pasture treatments. The mixed pasture with white clover and smooth bromegrass are the only forage component significantly different in the October and November period (P=0.0164 and 0.0564). The soil CO<sub>2</sub> fluxes per day were positively correlated to soil temperature (0.0183) but showed a negative correlation with soil moisture (0.2165). Results from this study are preliminary as the study is still in its infancy stage and on-going..

## OBJECTIVES

To evaluate the effects of animal grazing and forage management on Soil CO<sub>2</sub> fluxes in a semi-arid ecosystem.

## HYPOTHESIS

1. Animal grazing would increase the emission of CO<sub>2</sub> during grazing season.
2. Grazed forage legumes like alfalfa and white clover would cause CO<sub>2</sub> efflux.

## MATERIAL AND METHODS

### Research Site

University of Nevada, Reno Main Experiment Station in Reno Nevada.

### Bi-weekly Data Collected

- ✓ **Soil CO<sub>2</sub>**: Soil CO<sub>2</sub> was collected from a static chamber in the field and analyzed using Licor instrument.
- ✓ **Soil Temperature**: This was measured using a soil thermometer probe.
- ✓ **Soil Moisture**: This was using a soil thermometer probe.

### Treatments

- Six treatments were used across 20 plots. The treatments includes;
- i. Alfalfa mixed with Tall fescue and smooth bromegrass (MPA)
  - ii. White clover mix with tall fescue and smooth bromegrass (MPW)
  - iii. Tall fescue (TF)
  - iv. Alfalfa (Alf)
  - v. Smooth bromegrass (SBG)
  - vi. White clover (WC)

## RESULTS AND DISCUSSION



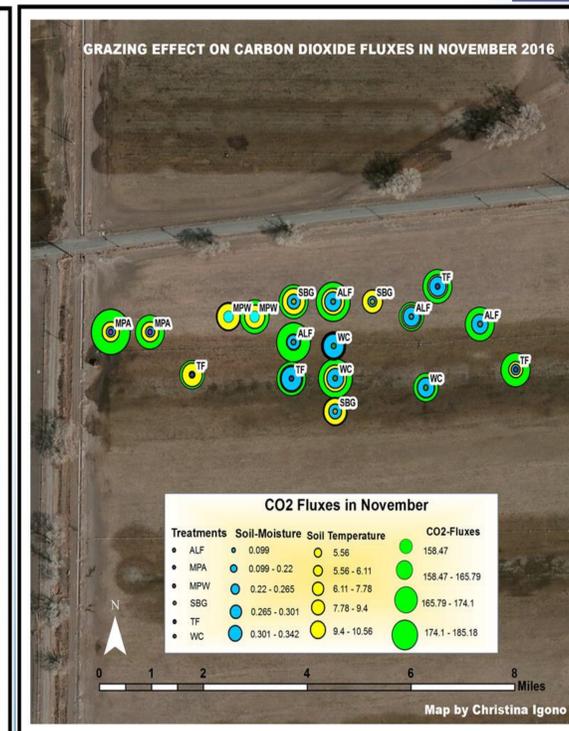
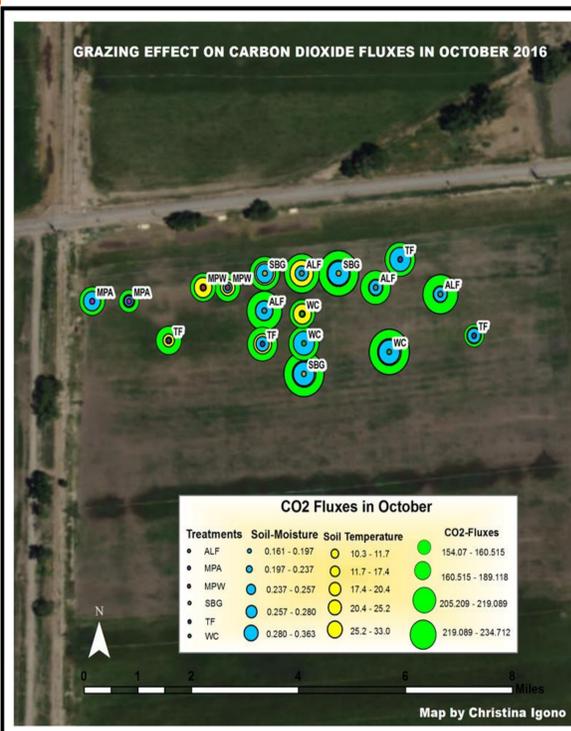
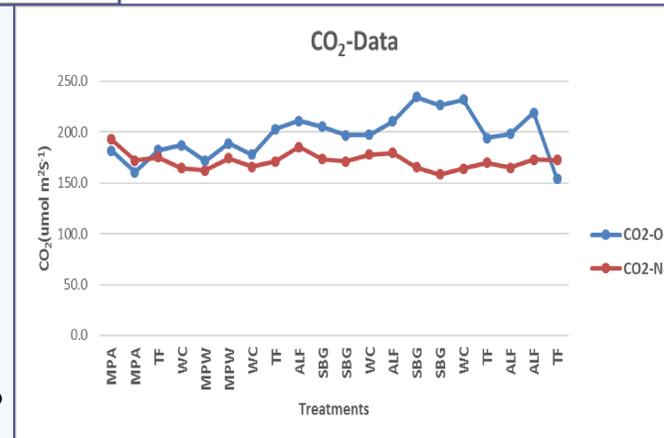
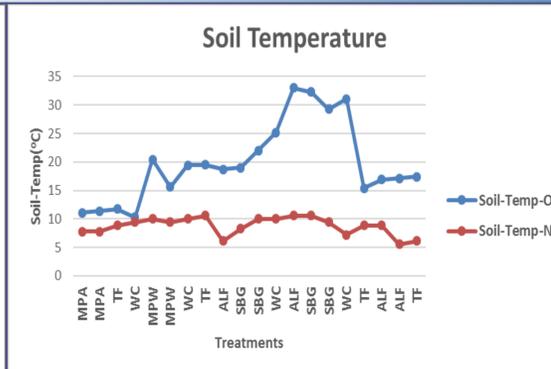
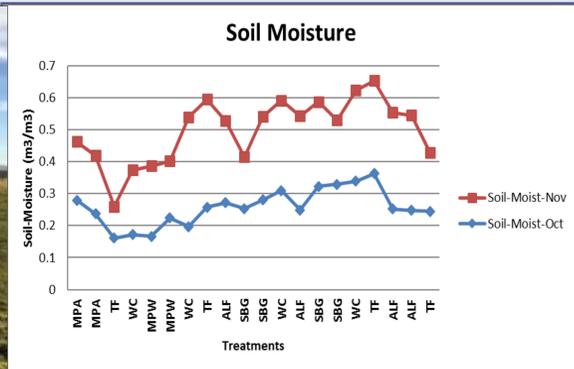
### Results on Treatments

#### October CO<sub>2</sub> fluxes

- In grass forages; there was increase in CO<sub>2</sub> emission in the smooth bromegrass compared to tall fescue.
- In legume forages; there was increase in CO<sub>2</sub> emission in white clover compared to alfalfa.

#### November CO<sub>2</sub> fluxes

- In legume forages; increase in CO<sub>2</sub> emission in the Alfalfa mixed(MPA) compared to the White clover mixed(MPW).
  - Alfalfa have higher CO<sub>2</sub> emissions than the white clover.
- In grass forages; increase in CO<sub>2</sub> emission in the tall fescue compared to smooth bromegrass.



## CONCLUSION

In general, there was more CO<sub>2</sub> emission in October than in November. This results could be due to change in soil temperature and moisture content.

Changes in emission of legume and grass forages could also be attributed to the change in climate condition between October and November.

Decomposition rate of legumes compared to grasses is another factor to consider

This is an on-going research, therefore, there is no concrete conclusion to determine if the different forages and animal grazing have a significant effect on CO<sub>2</sub> emission.

## REFERENCES

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