

# Utilization of Tannin-Containing Forages For Sustainable Beef Production in the Intermountain West

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## Introduction

Ruminants and pastures contribute significant amounts of nitrous oxide (N<sub>2</sub>O), and carbon dioxide (CO<sub>2</sub>) to the atmosphere and nitrogen (N) to waterways. Tannins and saponins are secondary plant compounds which have been shown to reduce N cycling in forest systems by binding proteins and alkaloids (Waghorn et al. 2008). We hypothesize that finishing beef cattle on tannin-containing legumes such as birdsfoot trefoil (*Lotus corniculatus*) and sainfoin (*Onobrychis viciifolia*) or saponin-containing legumes such as alfalfa (*Medicago sativa*) may reduce soil N mineralization, increasing overall N retention in pastures.

## Methods

Purified tannins from birdsfoot trefoil (BFT) and sainfoin (SFN) and saponins from alfalfa (SAP) were added to a uniform pasture soil and incubated for 84 days. Saponins were added at a low dose (3 mg/g soil) and tannins were added at low (3 mg/g soil) and high (15 mg/g soil) doses. Nitrate (NO<sub>3</sub><sup>-</sup>) and ammonium (NH<sub>4</sub><sup>+</sup>) concentrations and N<sub>2</sub>O and CO<sub>2</sub> production rates were measured throughout the study.

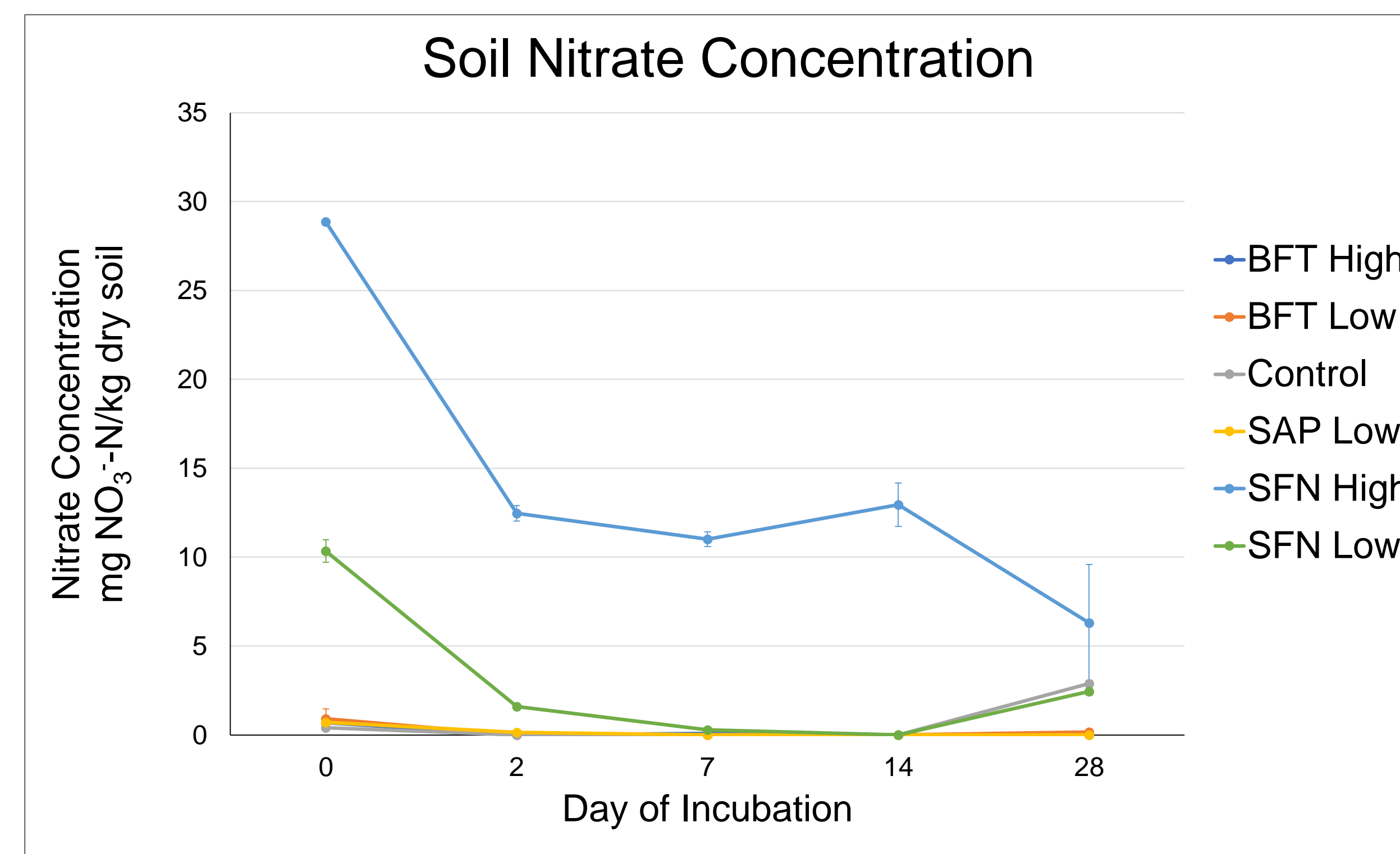
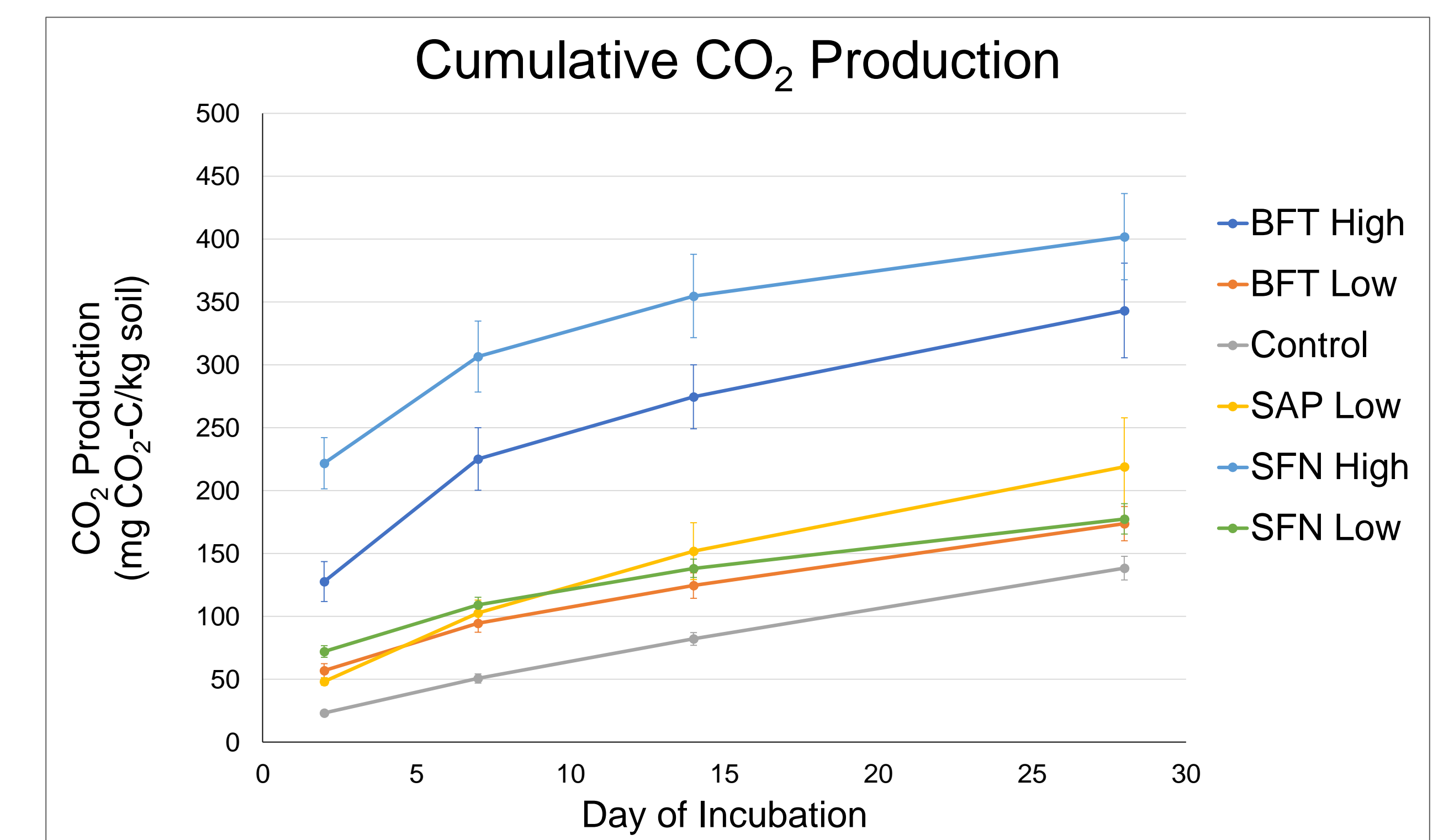
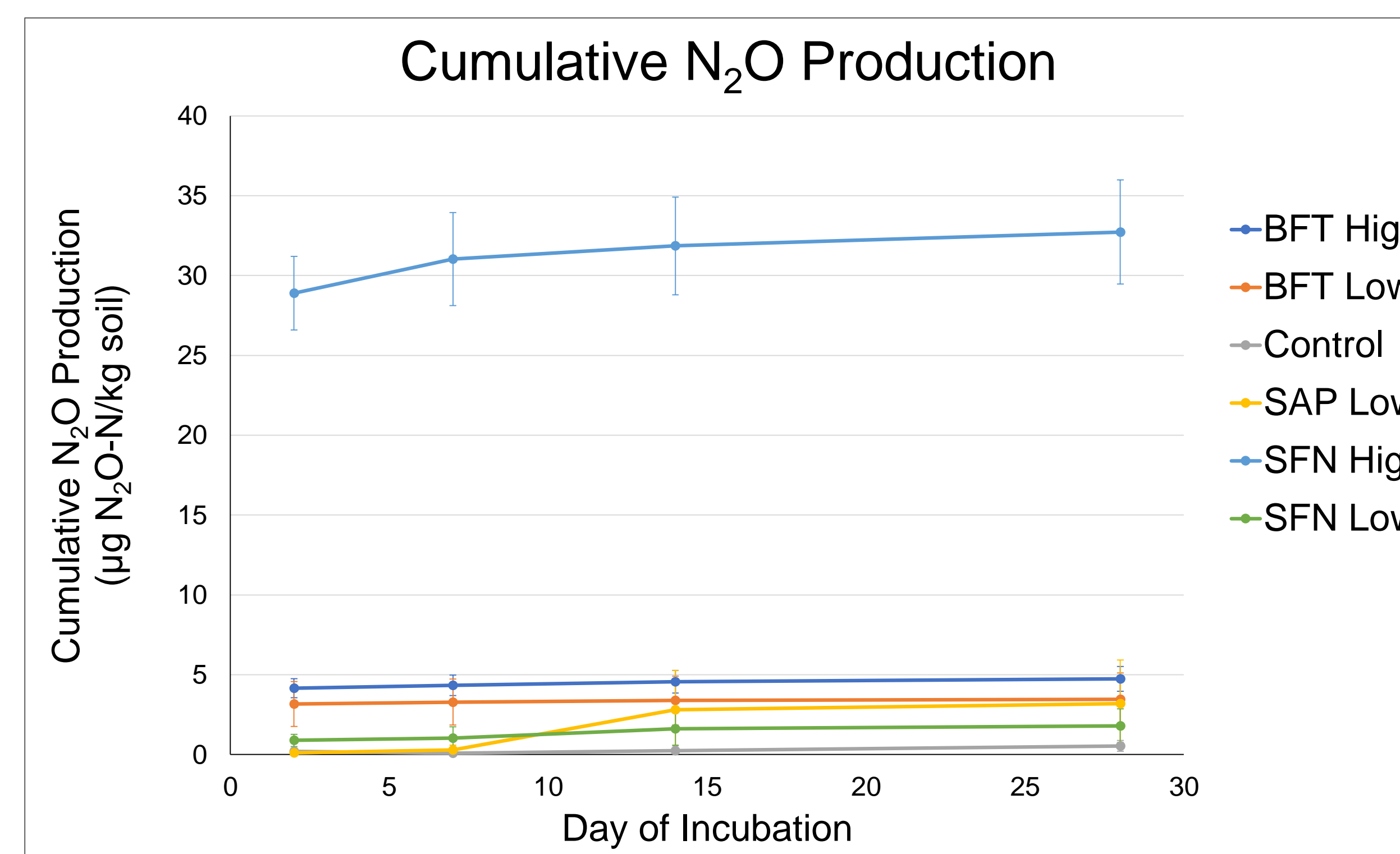
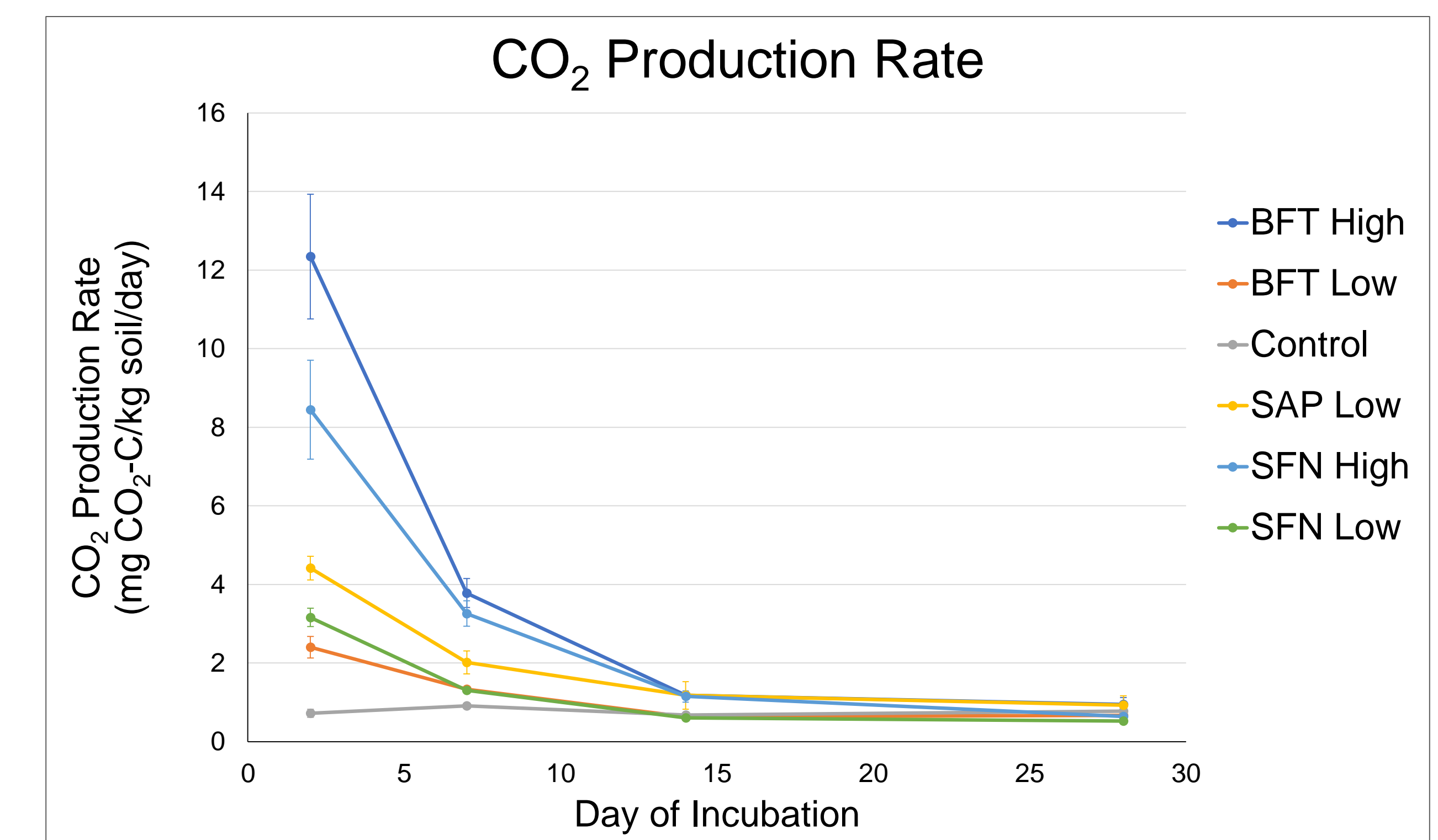
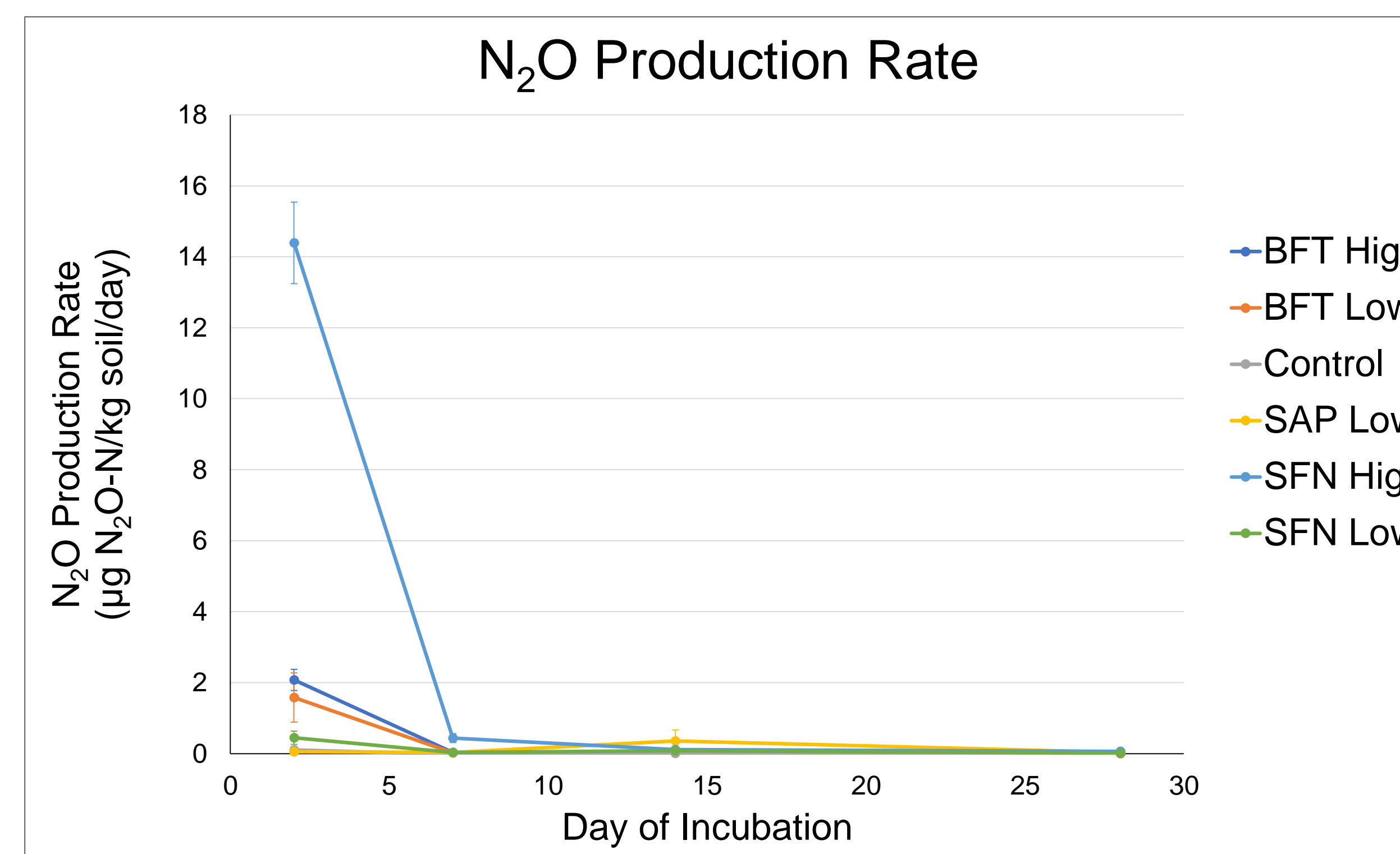


Fig. 1

ammonium (NH<sub>4</sub><sup>+</sup>) concentrations and N<sub>2</sub>O and CO<sub>2</sub> production rates were measured throughout the study.

Figure 1: Preparing soil samples for incubation

## Preliminary Results



## Conclusions

High doses of sainfoin tannins produced significantly higher N<sub>2</sub>O emission rates and cumulative production, which may be related to soil nitrate concentration. All treatments significantly increased rates of CO<sub>2</sub> production as compared to the control. However, cumulative CO<sub>2</sub> production for low doses of tannins and saponins did not differ significantly from the control by day 28. Low doses of secondary plant compounds may inhibit N mineralization in pastures without significantly increasing greenhouse gas emissions.

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## References

Waghorn, Garry et al. "Beneficial and Detrimental Effects of Dietary Condensed Tannins for Sustainable Sheep and Goat production—Progress and Challenges." *Animal Feed Science and Technology* Waghorn / *Animal Feed Science and Technology* 147.147 (2008): 116–139. Web. 25 July 2017.