Aggregate stability, carbon and nitrogen storage in soils after eight years of swine effluent application and crop rotation

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## SUMMARY

In a long term (9 years) trial under center pivot irrigation in Oklahma's Panhandle, forms of organic and inorganic N input, crop rotation, and tillage systems were evaluated. After a 9 yr period, aggregate stability, total C and total N were determined in the following treatments: 1) NT/0 (C/W) – No tillage, no N input under corn/wheat rotation; 2) NT/75/S (C/W) – No tillage, 75 kg N $ha^{-1}$ from swine effluent under corn/wheat rotation; 3) NT/150/S (C/W) – No tillage, 150 kg N $ha^{-1}$ from swine effluent under corn/wheat rotation; 4) NT/300/S (C/W) – No tillage, 300 kg N $ha^{-1}$ from swine effluent under corn/wheat rotation; 5) NT/150/AA (C/W) – No tillage, 150 kg N $ha^{-1}$ from Anhydrous Ammonia under corn/wheat rotation; 6) CT/0 (C/W) – Conventional tillage, no N input under corn/wheat rotation; 7) NT/0 (S/W) – No tillage, no N input under sorghum/wheat rotation; 8) NT/75/S (S/W) – No tillage, 75 kg N $ha^{-1}$ from swine effluent under sorghum/wheat rotation; 9) NT/150/S (S/W) – No tillage, 150 kg N $ha^{-1}$ from swine effluent under sorghum/wheat rotation; 10) NT/300/S (S/W) – No tillage, 300 kg N $ha^{-1}$ from swine effluent under sorghum/wheat rotation; 11) NT/150/AA (S/W) - No tillage, 150 kg N $ha^{-1}$ from Anhydrous Ammonia under sorghum/wheat rotation; 12) CT/0 (S/W) – Conventional tillage, no N input under sorghum/wheat rotation. Samples were collected from 0 – 10 cm, air dried and sieved to pass a 2mm sieve for total C and N analysis, while water aggregate stability samples were sieved to pass a 8mm sieve and air dried. Initial and air dried moisture content were determined (data not shown). Total N and C was determined using a Carlo Erba Analyzer and water aggregate stability was determined with a mechanical shaker at 30 rotations per minute using 5 sieves set (4, 2, 1, 0.5, and 0.25 mm mesh).

The use of manure did not necessarily result in an increase of total C and N in the surface 10 cm of soil . The treatment that showed the greatestamount of Total C received anhydrous ammonia as the N source and had a corn/wheat rotation. When crop rotations where compared, sorghum/wheat rotation generally had greater amounts of total C and N when compared to the corn/wheat rotation. Even the treatment that did not receive N input and was conventionally tilled, but was under sorghum/wheat rotation had significant increase in total C and N. The corn/wheat rotation increased total C and N when going from 75 to 150 kg N $ha^{-1}$ using swine effluent , but increasing from 150 to 300 kg N $ha^{-1}$ did not result in a response in total C and N. The corn/wheat rotation responded to N application from both sources, but did not increased soil total C and N without N fertilization, while the sorghum/wheat rotation did not necessarily had to have N input to increase its total C and N levels. Total N showed positive correlation with total C, since total N level stayed around 10% of the total C level. Aggregate stability did not have positive correlation with swine effluent input. However it did respond to crop

rotation. The use of corn/wheat rotation resulted in higher aggregate stability (GMD and sum of 3 classes) then sorghum/wheat rotation.

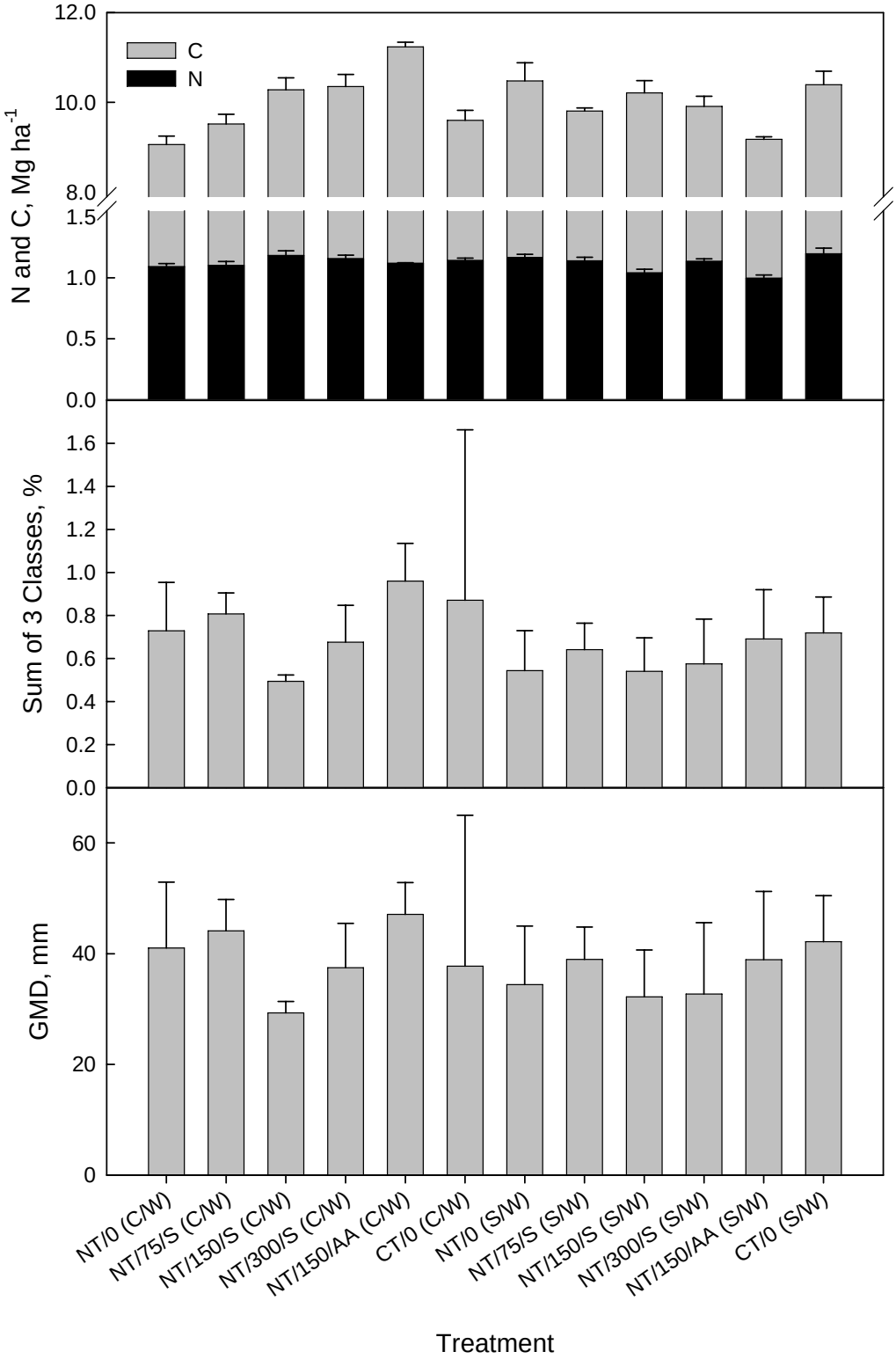

Figure 1. Total N and C, Aggregate stability (Sum of 3 classes and GMD – geometric mean diameter) of soil under different N source, crop rotation and tillage practices in Oklahoma's panhandle.