

Grazing as reduced tillage, weed and nutrient management tool in western Canadian organic systems

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Organic farms in western Canada rely on green manures for fertility building, as well as, disease and weed control. Inclusion of green manures in rotation not only increases the reliance on tillage but also incurs cash crop opportunity loss. Grazing of green manures can be used to reduce tillage, control weeds, enhance nitrogen availability and generate income in the form of live weight gain.

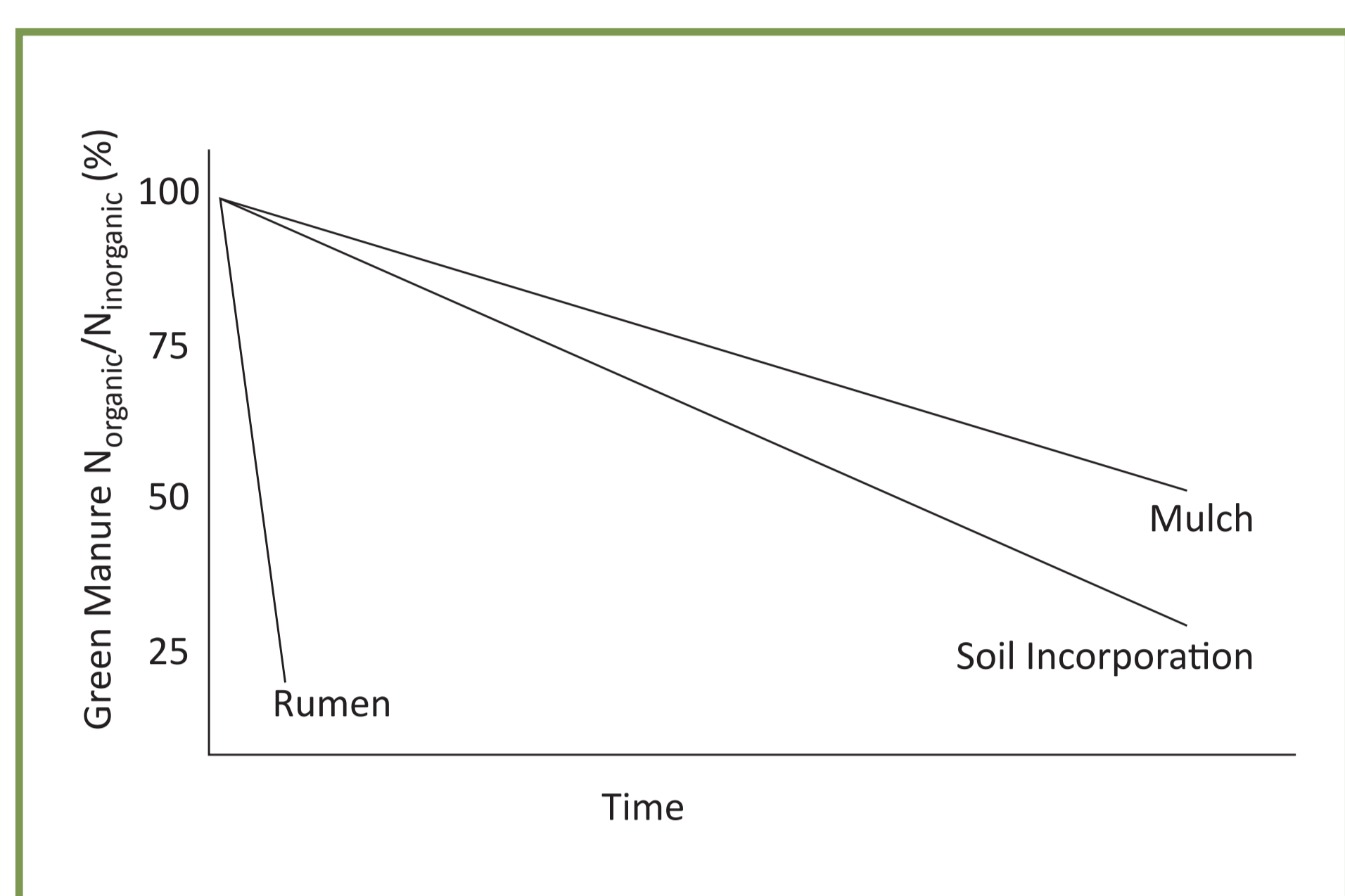


Figure 1. Conceptual model for green manure plant biomass decomposition in terms of N availability in the rumen, on soil (mulch) and incorporated into soil. Organic N to inorganic N ratio represents the transformation of biomass bound N (organic N) to plant available soluble N (inorganic N).



Figure 2: Sheep grazing pea/oat green manure.



Figure 3: Implements used for management of the green manure crops at Carman (L-R): disc, wide blade cultivator (Noble blade), blade roller.

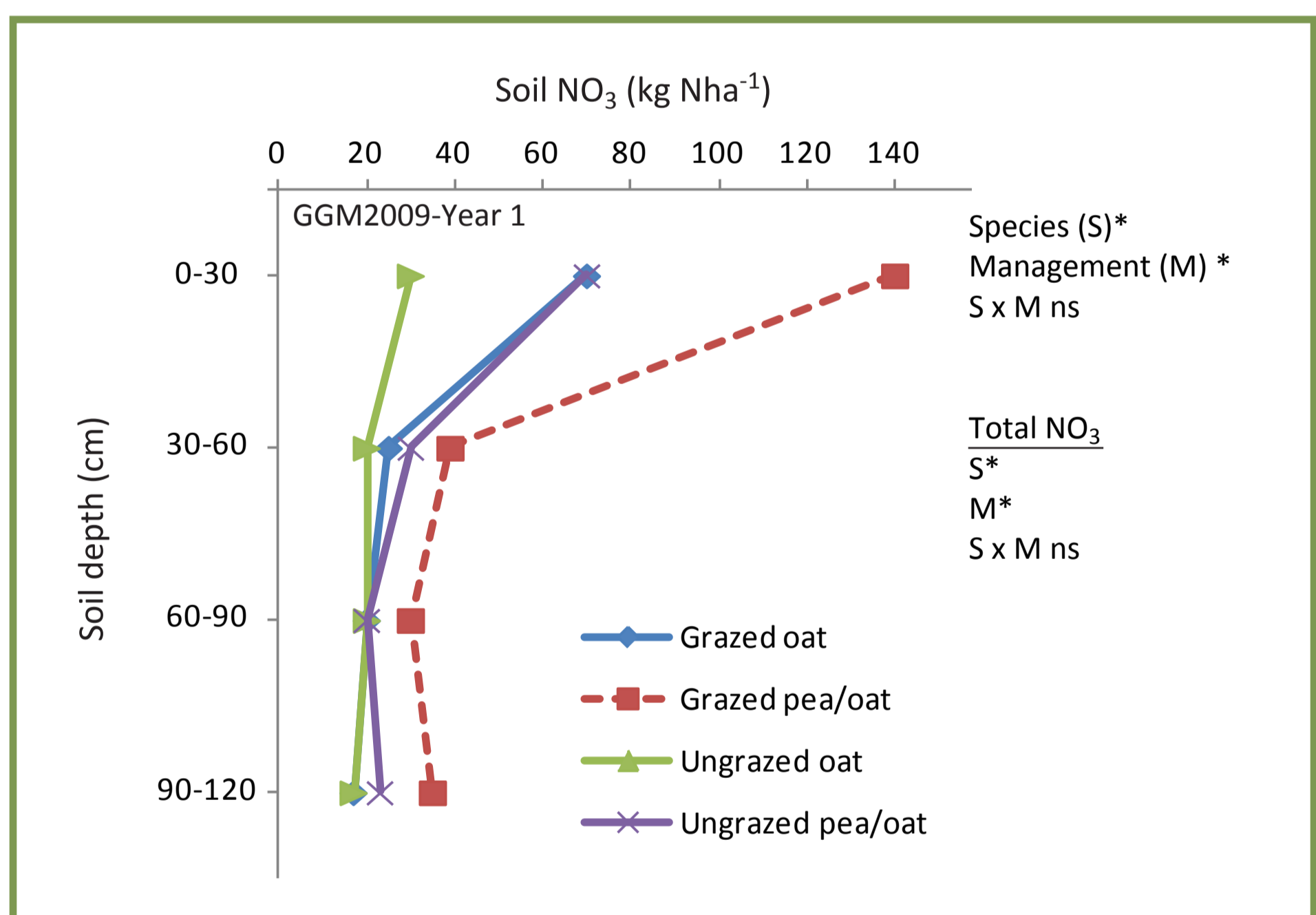


Figure 4. Soil NO₃-N as affected by green manure species ([S] pea/oat and oat) and green manure management ([M] grazing and incorporation) at depths of 0-30, 30-60, 60- 90 and 90-120 cm.

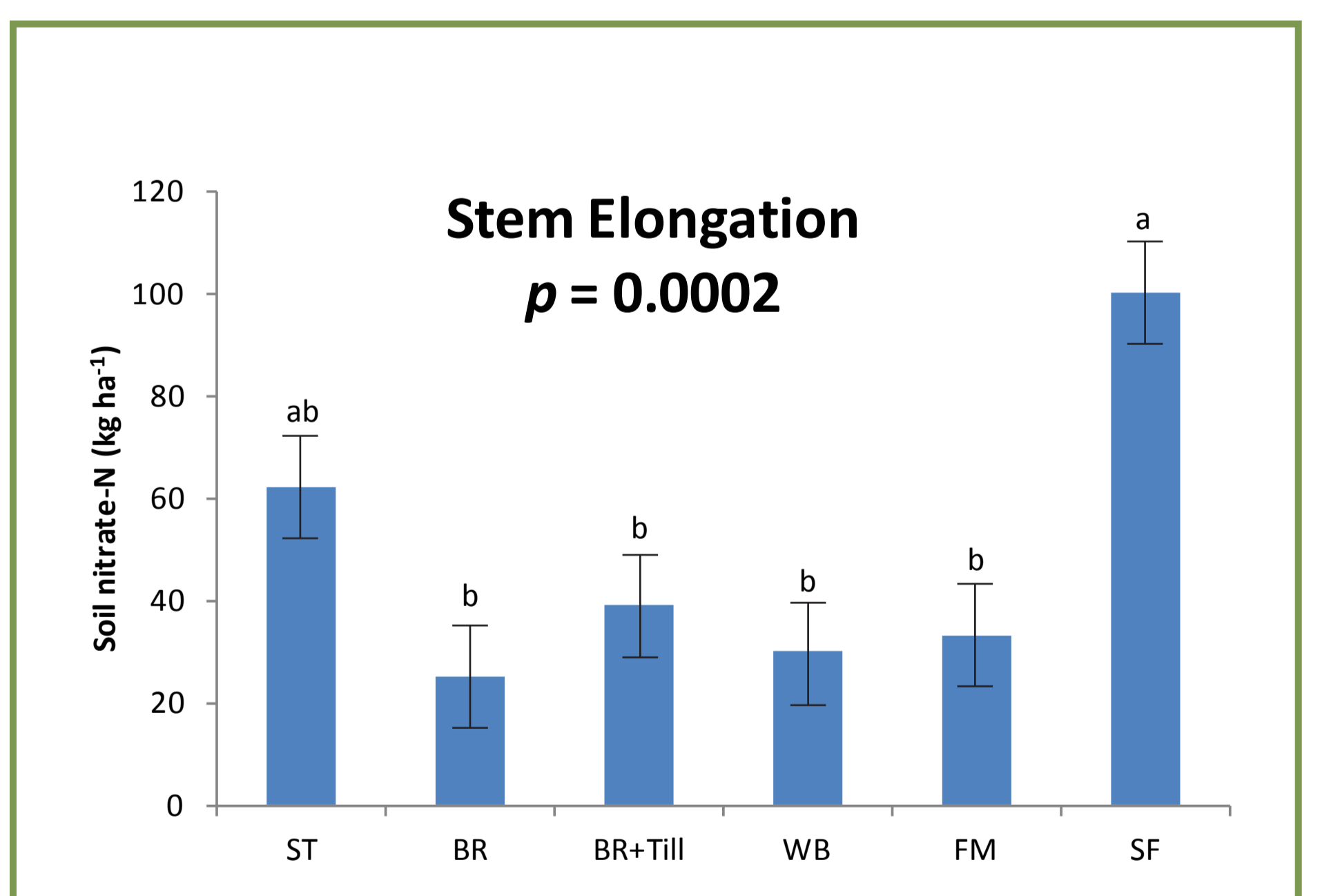


Figure 5: Effect of green manure termination method on soil nitrate-N from 0-30 cm during the wheat crop production year at Lethbridge (2011). Error bars indicate standard error of the mean. ST=standard tillage, BR=blade roll, BR+Till=blade roll plus tillage, WB=wide blade cultivation, FM=flail mow, SF=standard fallow.

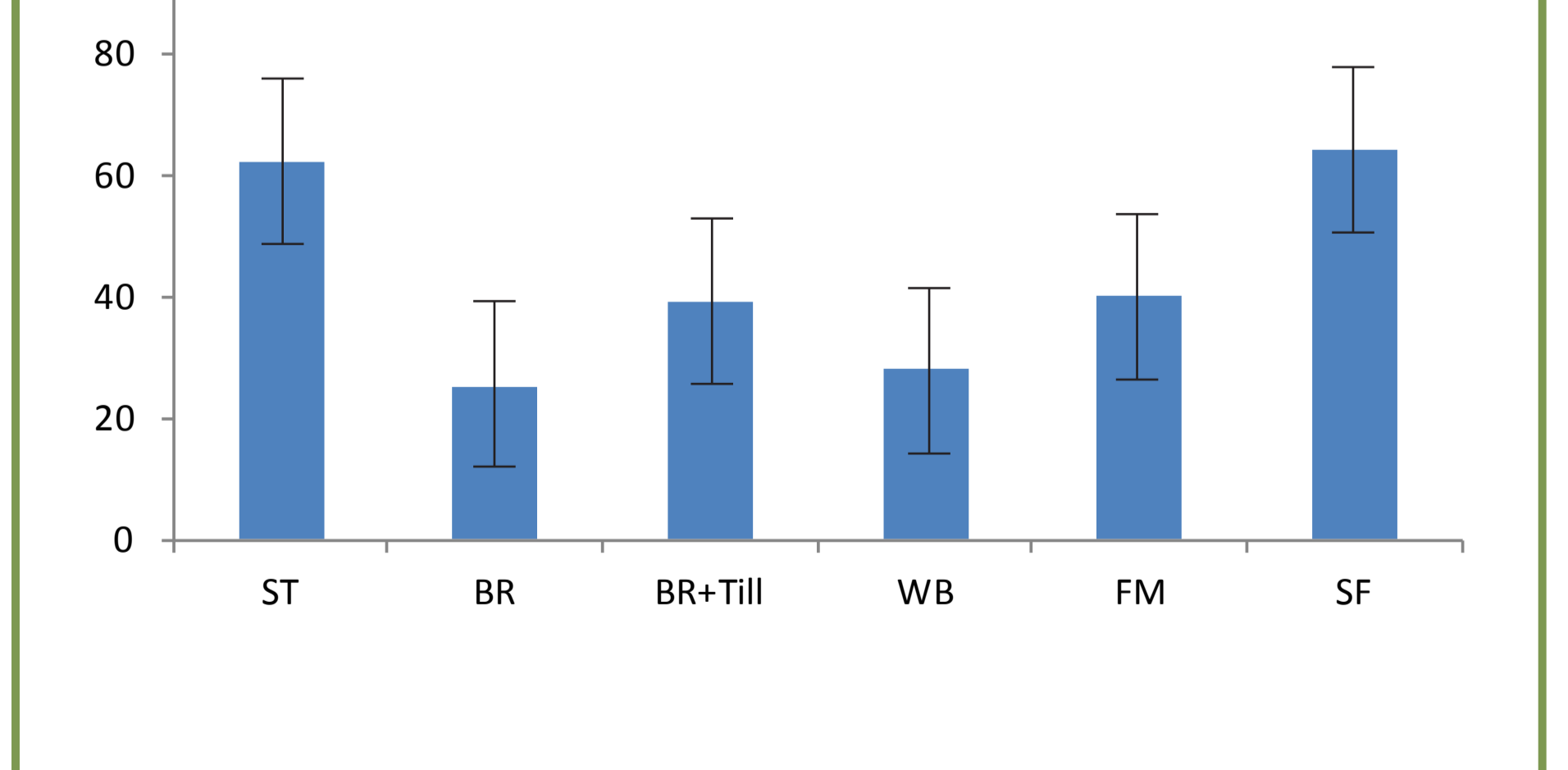
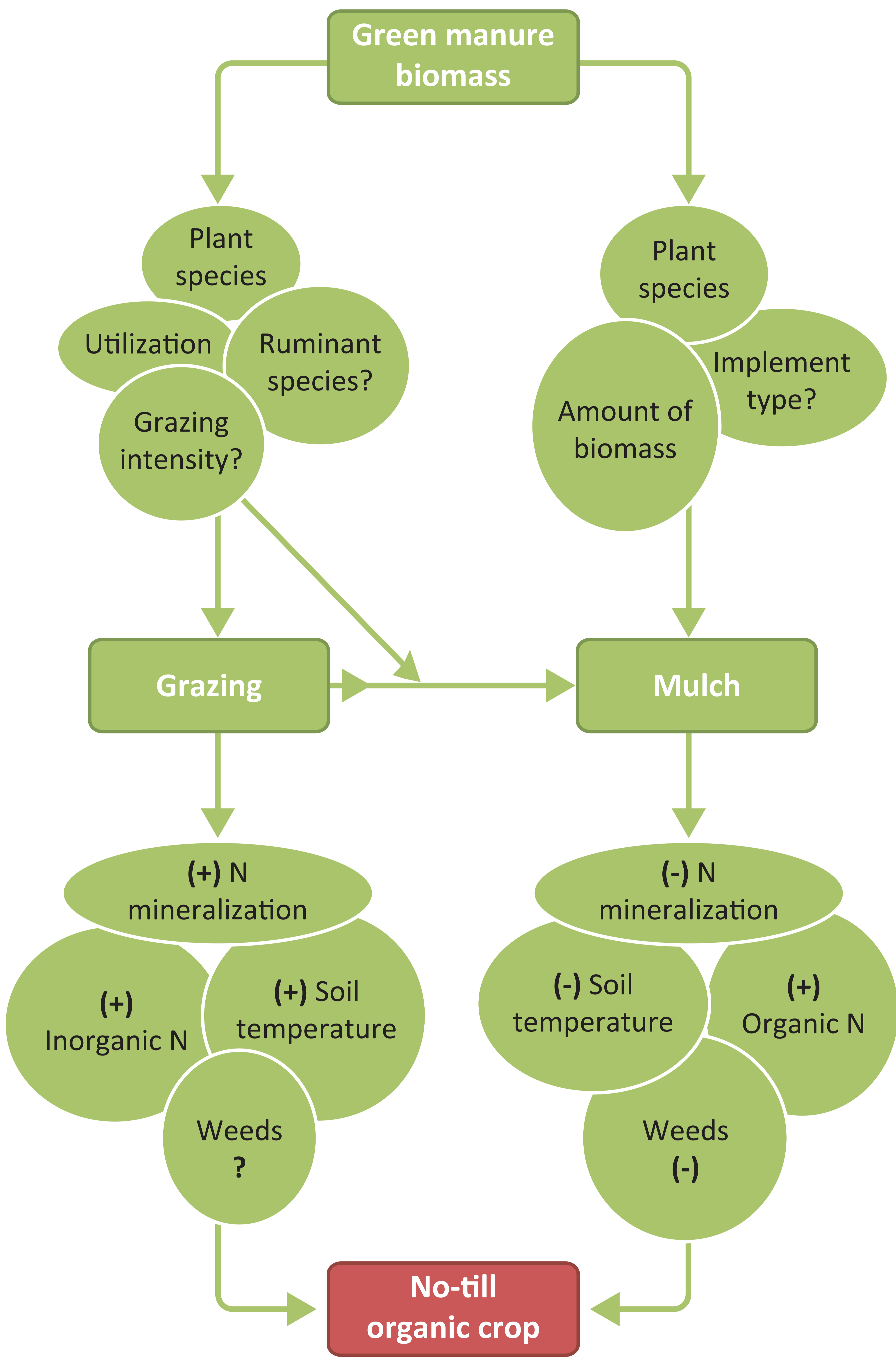


Figure 6: Soil nitrate in the first autumn after grazing in direct and conventionally seeded plots.



Figure 8: Oilseed radish and Barley crops no-till seeded into grazed green manure residue



	Efficacy/ Usability	Erosion protection	Weed control	Nitrogen availability	Main crop yield	Energy Savings	Score
Tillage	★★★★★	★	★★★★★	★★★★★	★★★★★	★	18
Blade roll + tillage	★★★★★	★★	★★★★★	★★★★	★★★★★	★★	18
Blade roll	★★★★	★★★★★	★★	★★	★★	★★★★★	17
Flail Mow	★★★	★★★★★	★★	★★	★★	★	12.5
Wide blade cultivation	★★	★★★★★	★★★★	★★★★	★★★★	★★	15.5
Grazing	★★	★★★★★	★★★★	★★★★★	★★★★★	★★★★★	20

Table: strength and weaknesses of each management system as deduced from results and experiences of the present study at Carman from 2010-2012.

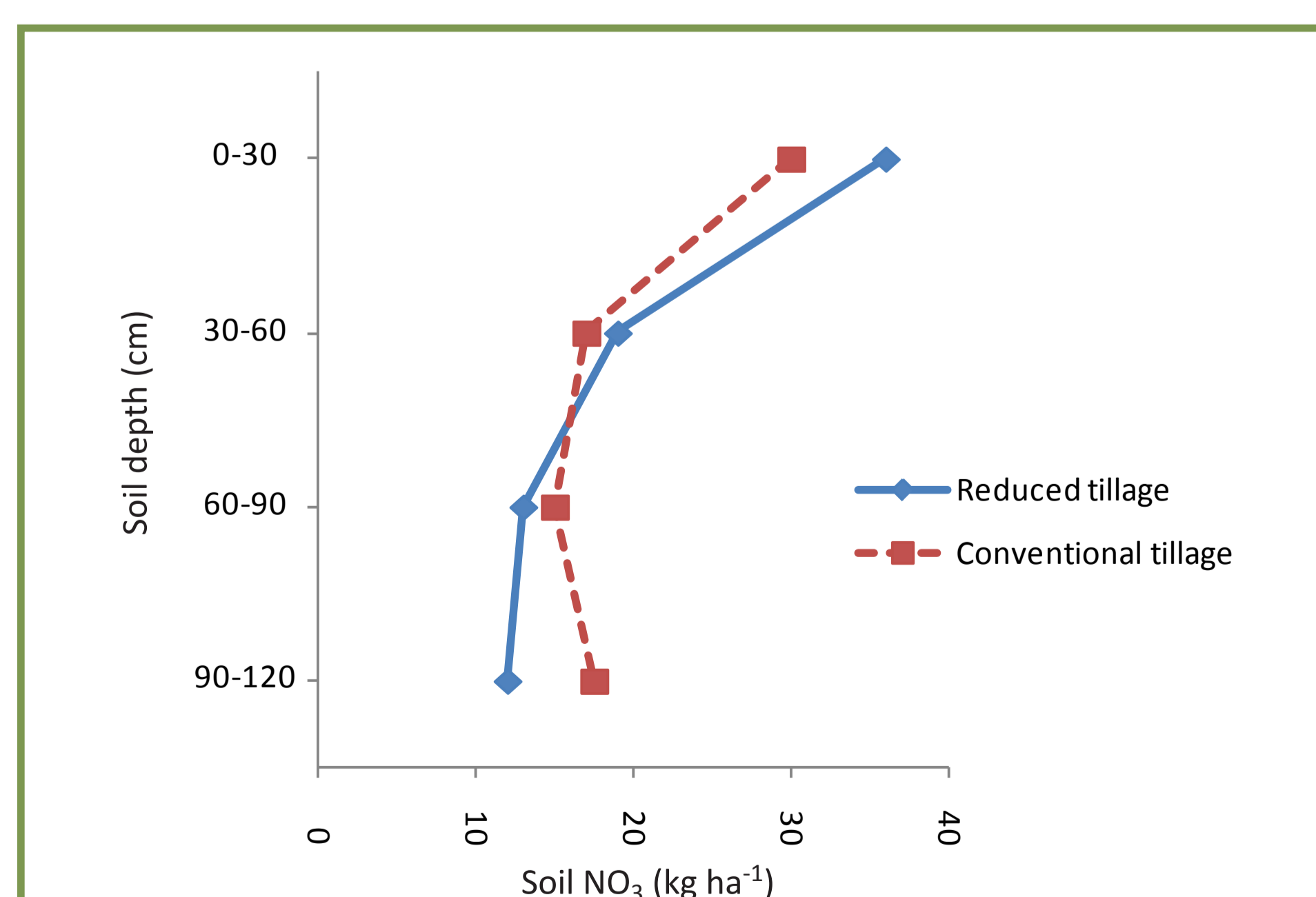


Figure 7: Weed biomass in various rolled/mulched green manure at three stages of a rotation.

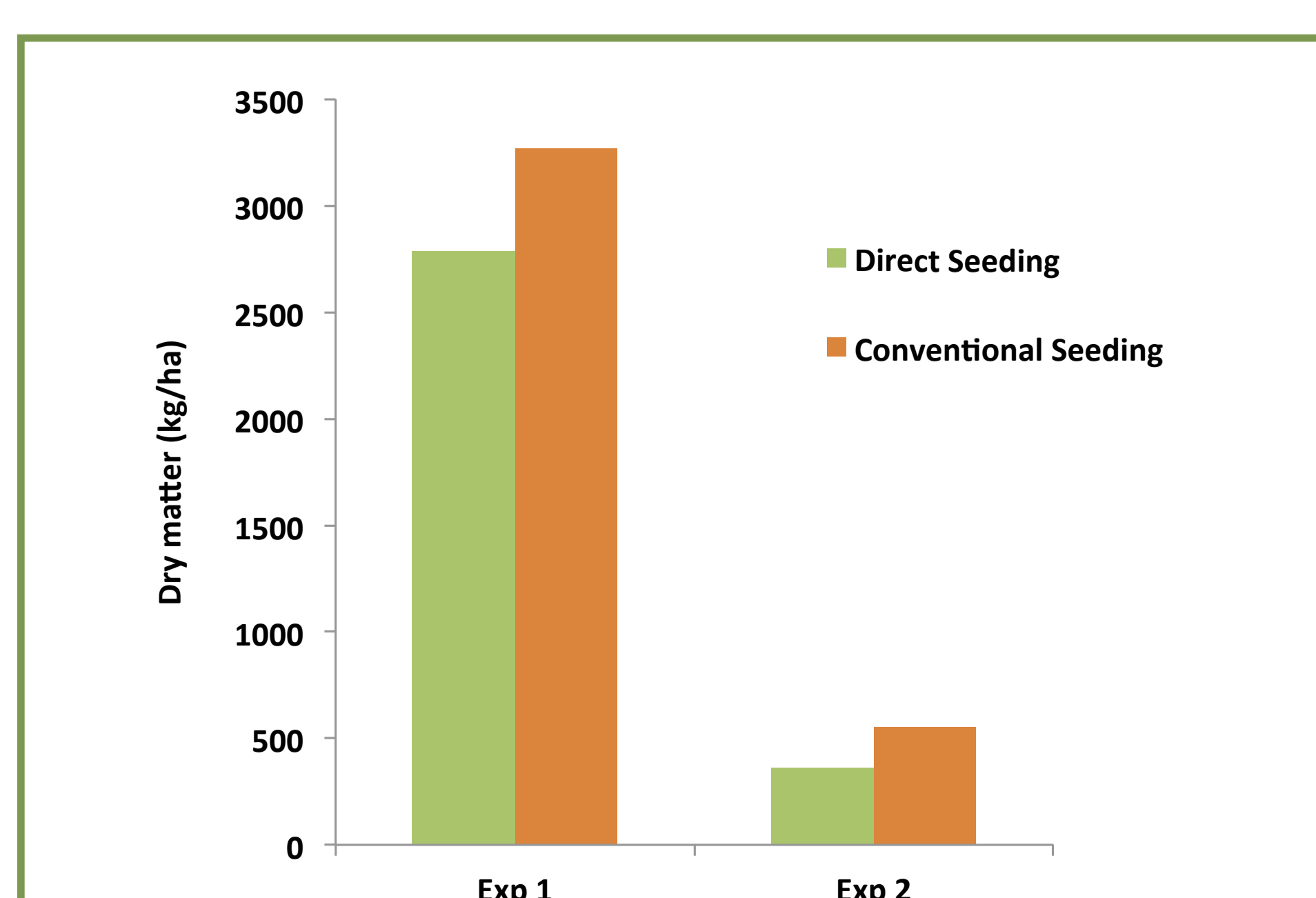


Figure 9: Dry matter of barley and oilseed Radish crops no-till seeded into grazed green manure residue



Figure 10: Barley crops no-till seeded into grazed green manure residue