Soil Carbon Needs Limit Biomass Ethanol Feedstock Supply **O**NRCS Background Corn stover will be a major feedstock for biofuel production Estimates of available feedstock are needed for industry development 15 Maintenance of the soil resources must be addressed in feedstock availability Soil organic carbon calculations 12.50 Water erosion · Current estimates of feedstock supply computed by subtracting stover ha⁻ 10 Wind erosion needed for erosion control from total production (based on harvest index) Figure 1. Sites and soils used to compare stover needed to /er to retain (Mg 7.90 · Stover needed to replenish soil organic carbon (SOC) not considered control erosion and Johnson et al. (2006) estimates of source carbon needed to maintain SOC replenish soil organic carbon. Objective Compare amount of stover needed to control erosion and maintain SOC under 0.96 selected conditions No or No or Moldboard Moldboard conserv. tillage conserv. tillage plow plow Method Stover needed to control erosion Continuous corn Corn-soybean Water erosion-RUSLE2 (USDA-ARS, 2003a) State Soil Slope T-value County Figure 2. Stover needed to control erosion and replenish soil organic carbon Wind erosion-WEPS (USDA-ARS, 2003b) (%) Mg ha⁻¹) under selected production practices and locations Stover needed to replenish SOC Illinois DeKalb Fox SL 2-4 9.0 Johnson et al. (2006) Story Kossuth SCL 0-2 11.2 owa Sites and soils—ten important corn production counties in nine top corn 20 C-C. No or conserv. tillage ndiana Morley-Glywood 1-4 9.0 Koscinsko producing states (Fig. 1) C-C, Moldboard plow Complex L ha⁻¹) Conditions 15 C-S, No or conserv. tillage Michigan St Joseph Kalamazoo L 0-6 9.0 · Corn-corn vs. Corn-soybean C-S. Moldboard plow arvestable stover (Mg Minnesota Port Bryon SL 2-6 11.2 Dakota · Moldboard plow vs. conservation tillage 10 11.2 Harvestable stover • Erodibility (k) = 0.32 for all soils investigated Minnesota Freeborn Havden L 2-6 differs with yield and Nebraska Buffalo Holdrege SL 3-5 11.2 production practices Mermill L 0-2 9.0 Ohio Results Seneca Stover needed to replenish SOC exceeds that needed to control erosion for all 11.2 South Minnehaha Moody-Nora 2-6 Dakota SCL conditions evaluated (Fig. 2; Wilhelm et al., 2007) Minimum yield to produce Wisconsin Rock Dresden SL 2-6 9.0 Management practices greatly impact stover required to control erosion and sufficient stover to maintain SO

maintain soil quality (Fig. 2) Recent estimates of sustainably available biomass feedstock are likely overstated

(Fig. 3) Great urgency exists to gather reliable data to confirm these calculations and to

expand the computations to more cropping systems and agricultural regions

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Figure 3. Sustainably harvestable stover based on carbon input needed to

replenish soil organic carbon under selected production practices.

Grain vield (Mg ha-1)

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