**Influence of conservation tillage on Greenhouse gas fluxes and crop productivity in spring-wheat agroecosystems on the Loess Plateau of China**

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**EQUATIONS**

$$F=\frac{dC}{dt}∙\frac{M}{V\_{0}}∙\frac{P}{P\_{0}}∙\frac{T\_{0}}{T}∙H (1)$$

where dC/dt is the rate of change of gas concentration; M is the molar mass of Carbon or Nitrogen (12 for CO2 and CH4 and 28 for N2O); Vo is standard molar volume of air (22.41 mol-1), P is the air pressure of the sampling site; Po is the standard air pressure, T is the air temperature in the chamber at the sampling time, To is the standard air temperature; and H is the chamber height.

Cumulative Flux was estimated using the formula below.

$Cumulative Flux=\sum\_{i=1}^{n}\left(\frac{F\_{i}+F\_{i+1}}{2}\right)×24×\left(D\_{i+1}-D\_{i}\right)x 10^{-2} ………………………………($2)

Fi and Fi+1 denote ecosystem respiration, N2O and CH4 fluxes for previous and current day (in mg m-2 h-1) respectively; Di and Di+1 are previous and current sampling days, respectively.

**Calculation of Carbon flux components**

Net primary productivity (NPP) was estimated as described in equation 3-7 by Bolinder et al (2007), while Gross primary production (GPP) was estimated from NPP using a factor of 0.54 as the ratio of NPP:GPP in cultivated and managed lands (Zhang et al. 2009). Grain yield and harvest index (HI) were used for calculation of NPP and GPP. It is worth noting that the CO2 measured by the opaque chamber is ecosystem respiration since plant community was not exposed to light and also undisturbed. From this, net CO2-C flux was calculated by equation 8.

$NPP=C\_{P}+C\_{S}+C\_{R}+C\_{E}$……………………………………………………………………...(3)

$C\_{P}= Y\_{P} × 0.45$………………………………………………………………………………..(4)

$C\_{s}=\frac{Y\_{P} (1-HI)}{HI} ×0.45$…………………………………………………………………………...(5)

$C\_{R}=\frac{Y\_{P}}{S:R×HI}×0.45$………………………………………………………………………………(6)

$C\_{E}=C\_{R} ×0.65$…………………………………………………………………………………(7)

Where

$C\_{P} $is the carbon in the harvested product (grain)

$C\_{s}$ is the carbon in straw

$C\_{R}$ is the carbon in root tissues

$C\_{E}$ is the carbon in extra root materials such as root exudate

$$Y\_{P} is the grain yield, S:R is the shoot-root ratio $$

As indicated by Bolinder et al. (2007), we assumed carbon concentration in all plant parts of 0.45 kgkg-1 while using actual harvest indexes in our study to calculate allocations in straw and root. S:R of 9 for spring wheat was used in this study following Huang et al. (2007).

$Net CO\_{2} flux=-GPP+R\_{eco}+C\_{harvested crop}$………………………………………………...(8)

GPP- gross primary production, Reco- cumulative ecosystem respiration, C harvested crop- Carbon contents in harvested crops (straw and grain).

**Note: The sign convention adopted is positive (+) means emission whilst negative (-) means absorption.**

**Calculation of Global warming potential (GWP) and Greenhouse Gas Intensity (GHGI)**

Net Global warming potential (GWP) in t CO2 eq ha-1 was determined using equation 9 and Greenhouse gas intensity (GHGI) was determined following equation 10. The IPCC (2013) emission factors of 1, 34 and 298 for CO2, CH4 and N2O respectively were used to convert all gases to CO2 equivalents (CO2eq).

$Net GWP= CH\_{4}flux ×34 +N\_{2}O flux×298+Net CO\_{2} flux…………………………..$(9)

$GHGI=\frac{GWP }{Grain yield}…………………………………………………………………………………$(10)

The sign convention adopted is positive (+) means emission whilst negative (-) means absorption.

**Statistical equations**

$R=α ×e^{βT}$…………………………………………………………………………………...(11)

$R=α ×W^{β}$…………………………………………………………………………………...(12)