MEASUREMENT OF SOIL CO_2 EMISSIONS IN CROATIA

Darija Bilandžija, Željka Zgorelec, Milan Mesić, Ivica Kisić
Sveučilište u Zagrebu, Agronomski fakultet
Svetošimunska cesta 25, 10 000 Zagreb

INTRODUCTION

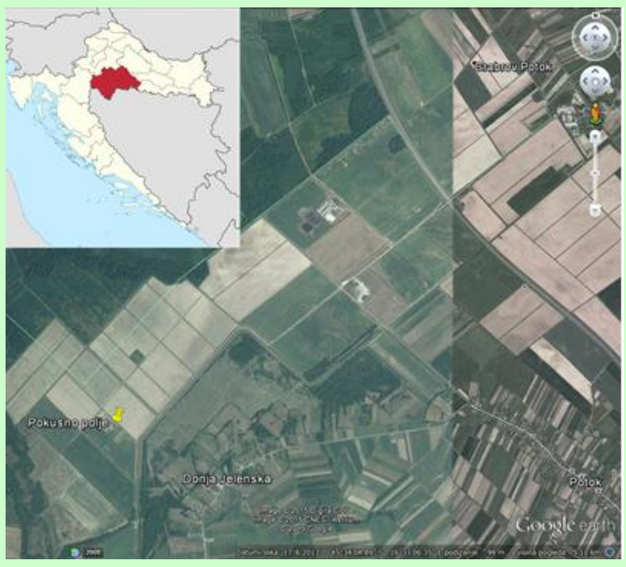
The agricultural sector is a source of greenhouse gas emissions that directly affect the global problem of climate change. Soil-plant-atmosphere interactions i.e. the boundary between the pedosphere and atmosphere is site of carbon exchanges. The studies have shown that factors such as agrotechnical measures, agroclimatic factors, vegetation, soil properties and many others, have influence on soil CO_2 emissions. Irregular and irresponsible agricultural practices, such as excessive tillage and improper fertilization often leads to soil carbon loss and increased CO_2 emissions to the atmosphere. The reduction of CO_2 emissions by soil carbon sequestration is of primary importance as agricultural and forestry practices can remove atmospheric carbon by sequestration and thus mitigate the climate change by maintaining and/or increasing the amount of carbon stored in the soil and plant material. Due to the lack of research and national data related to the soil respiration, a 3-year research, with the aim to determine the C-CO_2 emissions (fluxes) in natural agro-climatic conditions, was conducted under the project " *Influence of Different Land Management on Climate Change* " (leader: Željka Zgorelec, Ph.D.).

MATHERIALS AND METHODS

To determine the C-CO_2 emissions at two experimental fields in Blagorodovac and Potok which differs according to applied tillage methods (6 variants) and feritilization doses (10 variants) respectively, in different seasons of the year (seasonal variations), with different crop types (winter wheat, corn, triticale, double crop: soybean-barley) and agroclimatical conditions (temperature, moisture), the soil CO_2 concentrations were measured by *in situ* static chamber method.

Experimental fields

Blagorodovac (Daruvar)



Potok (Sisak)

Measurement of agroclimatical factors

Air: pressure
relative humidity
temperature

Soil: temperature
moisture,
electrical conductivity

Testo 511 and Testo 610 (2011)

IMKO HD2 (2011)

Measurement of soil CO_2 concentration

GasAlerMicro5 IR (2011)

Inserted chambers, initial concentration measurement, chambers closure, measurement of acumulated CO_2

RESULTS

Average annual C-CO_2 fluxes (kg ha^{-1} day^{-1}) in Blagorodovac regarding tillage and crop type

	n	Crop type	C-CO_2 flux
2011/2012	13	Corn	7,6 – 23,1
2012/2013	13	winter wheat	12,0 – 34,8
2013/2014	13	double crop	6,6 – 33,8

Average annual C-CO_2 fluxes (kg ha^{-1} day^{-1}) in Potok regarding fertilization and crop type

	n	Crop type	C-CO_2 flux
2011/2012	10	winter wheat	9,8 – 31,4
2012/2013	11	corn	8,6 – 15,9
2013/2014	7	triticale	10,4– 26,1

Of all measured agroecological factors, C-CO_2 flux showed the highest positive linear correlation with soil moisture content during entire studied period and in both agroecosystems, although in some research periods (the calendar and/or vegetation year; periods with or without crop presence) domination of other agroecological factors such as soil and/or air temperatures, was observed. Statistically significant differences in C-CO_2 emissions, measured at treatments with different tillage/nitrogen fertilization, were determined regarding tillage/nitrogen fertilization, time of measurement and vegetation.

CONCLUSIONS

Soil is reservoir, sink and emitter of carbon and it is very important to maintain the stable carbon balance in agroecosystem. Implementing good agricultural practices, based on scientific principles and principles of sustainable agriculture, it is possible to minimize total soil organic matter loss and slow the excessive, no natural soil mineralization and to increase terrestrial carbon sequestration and soil fertility.

GEWEX workshop on the climate system of the Pannonian basin
9 - 11 November 2015
University of Osijek Faculty of Agriculture, Osijek, Croatia