# MEASUREMENT BY STATIC CHAMBER OF $N_2O$ EMISSION FROM AGRICULTURAL SOILS

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*The aim of this work is to estimate of nitrous oxide ($N_2O$) emission losses from agricultural soils. The emission of nitrous oxide was evaluated on a period of 10 months at the International Centre for Research in Organic Food Systems, ICROFS, Denmark. In order to evaluate $N_2O$ gas flux, the static chamber measuring technique is used. The samples collected are then analysed using a Gas Chromatograph (GC) with electron capture detector for $N_2O$.*

*The results indicate a difference, in nitrous oxide emission, between the cold and the hot season. The values from the ecological plot during the cold season were located between 0.04 and 2.83 g $N_2O$ -N /(ha*day), and during the hot season, the values were higher, located between 8.81 – 18.05 g $N_2O$ -N /(ha*day).*

***Key words**: Static Chamber” techniques, greenhuose gasses, nitrous oxide, agricultural soils, gas chromatograph (GC)*

Climate change is one of our greatest environmental, social and economic threats. The Intergovernmental Panel on Climate Change, (IPCC) said that the climate system is unequivocal. It is very likely that most of the warming can be attributed to the emissions of greenhouse gases by human activities [2].

The concentrations of the greenhouse gases CH4 and N2O, which are highly linked to agricultural production, have increased by 150% and 16%, respectively. The soil acts as both source and an absorber of N2O [3]. Globally dominates the absorption of N2O emissions, emissions from various industrial and agricultural sources.

Emissions from waste agricultural fields are important sources of C and N for nitrification and denitrification. In addition, the action of incorporation may also stimulate mineralization of soil organic matter. After some studies noted a higher denitrification and N2O flows higher, after having been detained residue on earth compared to removing them. Incorporation of residues may also accelerate the emissions of N2O [9].

Effects of the tillage on the mineralization of organic matter are well established. The tillage can influence the emission of N2O and NO from soils. Some studies have resulted in greater elimination of N2O systems where land was not worked compared to conventional practices of land [10].

Production and consumption of N2O in soil processes involving both biotic and abiotic. N2O formation is achieved by two microbial processes: nitrification and denitrification [7].

There are different methods of measuring gas N2O from agricultural soils. In this paper we presented "Chamber Method" that was experienced at the Institute International Center for Research in Organic Food Systems ", ICROFS, Denmark. Samples collected using this method, were subjected to gas chromatographic analysis [5].

## MATERIAL AND METHOD

**Materials used**: tubes, syringes for gas sampling, have been used closed rooms to collect gas, purity analytical reagents.

**The method**

To capture the gas we used the static chamber technique and to analyze the composition of gas mixture collected from the chambers was used gas chromatography. We used „PerkinElmer Clarus 500" Gas Cromatogrph which has:

- Oven, that provide a range of temperature from 10 degrees to 450 degrees and a speed temp increase from 0.1 to 45 degrees per minit;
- Elecron capture detector;
- Porapak QS stationary phase is used for separation. This permit measureament of nitrous oxide separated from the principal air constuets.

## RESULTS AND DISCUSSIONS

In this paper we assess the dynamics of emission of nitrous oxide from a conventional and organic vegetation covered field.

**Collection of gas from the chambers**

There were 4 rooms located on 4 lots conventional and organic. Half of the half hour was taken with a syringe, the mixture of gases which then was transferred to vials.

**Gas Chromatographic Analysis**

There were collected 3 g of gas for the chromatographic analysis. As a result of the analysis was a graph, where individual sample is shown as an area that is proportional to the concentration of individual sample. Analyzing the sample of 1.06 ppm, the linear regression was used to find a value measured in parts per million for samples collected.

The results were compared with a calibration curve *(fig. 1)* whose equation is $y = 0{,}0584x - 0{,}0236$ with the correlation coefficient $R^2 = 0.9995$.

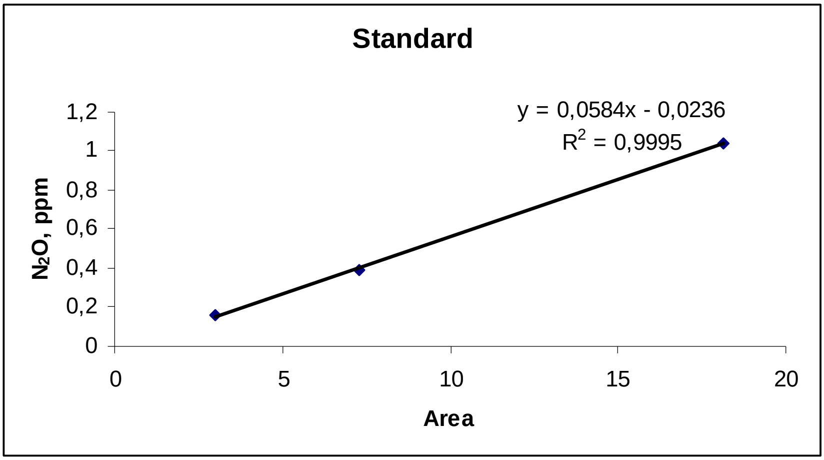


Figure 1 **Calibration curve**

Table 1

**The amount of nitrous oxide (ppm), collected from the 4 chambers, located on conventional plot within one hour**

| | Time | | | | | |
|---|---|---|---|---|---|---|
| | min | s | h | elapsed time, s | $N_2O$ ppm | The line expressed in ppm/h |
| Chamber 1 | 0 | 0 | 0.000 | 0.000 | 0.281 | y = -0.0247x + 0.3013 |
| | 30 | 4.00 | 0.501 | 0.501 | 0.329 | |
| | 59 | 58 | 0.999 | 0.999 | 0.257 | |
| Chamber 2 | 2 | 0 | 0.033 | 0.000 | 0.322 | y = -0.0373x + 0.3224 |
| | 32 | 4 | 0.534 | 0.501 | 0.304 | |
| | 62 | 7 | 1.035 | 1.002 | 0.285 | |
| Chamber 3 | 6 | 17 | 0.105 | 0.000 | 0.280 | y = 0.0028x + 0.285 |
| | 36 | 22 | 0.606 | 0.501 | 0.297 | |
| | 66 | 25 | 1.107 | 1.002 | 0.282 | |
| Chamber 4 | 7 | 48 | 0.130 | 0.000 | 0.355 | y = -0.0538x + 0.3341 |
| | 38 | 1 | 0.634 | 0.504 | 0.265 | |
| | 68 | 20 | 1.139 | 1.009 | 0.301 | |

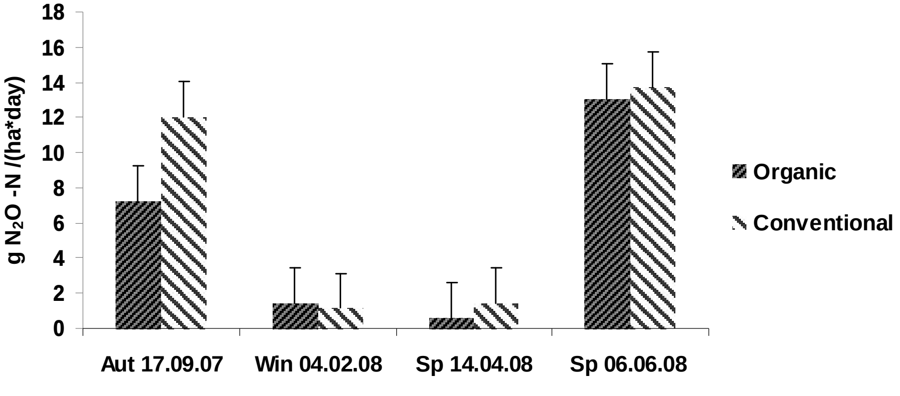


Figure 2 **The variation of $N_2O$ in the four seasons**

In the equation above is calculated quantity of nitrous oxide emitted every half hour, expressed in ppm.

*Table 1* contains an example of results obtained for the 4 chambers located on the ground conventionally.

In the same manner were determined values for emissions of protoxid from the organic plot.

By analysis of gas chromatography with external standard known were the results obtained from table 1.

Dynamics protoxid emissions was achieved in all 4 seasons, from the date 17.09.07 and ending on 06.06.08. In this period samples have been taken to observe the changes of emissions of nitrous oxide on experimental plots. Values of nitrous oxide emissions in cold seson from the organic plot is located betwen 0.04 and 2.83 g $N_2O$ -N /(ha*day). In the warm season nitrous oxide values are higher, located betwen 8.81 - 18.05 g $N_2O$ -N /(ha*day). In the cold season the conventional plot has values between 0.09 - 2.04 g and higher values in the range 12.5 - 15.18 g $N_2O$ -N /(ha*day) in the warm season, *(fig. 2)*. The results are in accordance with the literature [8].

## CONCLUSIONS

At the practical experiment made at the International Centre for Research in Organic Food Systems, ICROFS, Danemarca, tests indicate a difference in the emission of $N_2O$ from the cold to the hot season which is also found in literature [4].

The difference is given by the seasons, ranging $N_2O$ emission from winter to the hot issue and confirmed in literature [6].

It was found that the emission of $N_2O$ during 10 months on an organic plot is approximately equal to the emission of $N_2O$ from agricultural land cultivated conventionally [5].

It is estimated that from 10% to 12% of total emissions of greenhouse gases are generated from agriculture (mainly $N_2O$ from fertilized soils and $CH_4$ derived from animals). The contribution of agriculture as the global source of $N_2O$ is about 35% higher net industrial processes [1].

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