LIFE14 CCM/IT/000905
"Recovery of degraded coniferous
Forests for environmental sustainability
Restoration and climate change Mitigation"

Deliverable - Action D2

Detailed protocol of GHG fluxes measurement and quantification

Deadline: 31/01/2016

CHAMBER CONSTRUCTION

Chamber collar

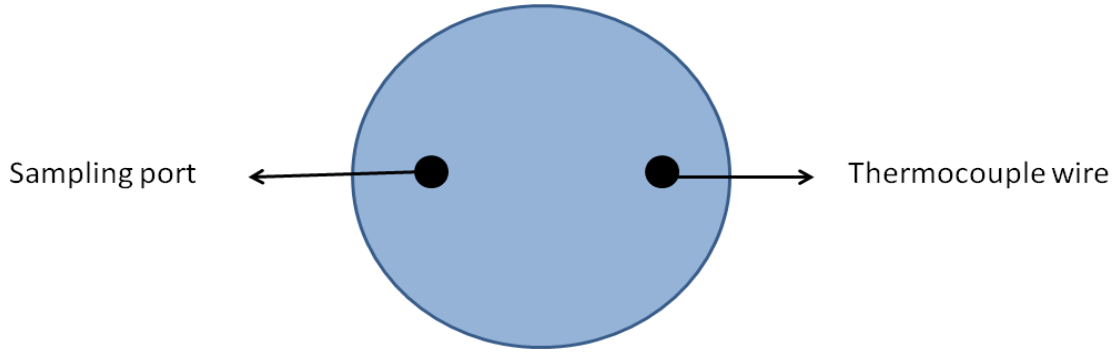
Cut a 20 cm length of PVC pipe. Using a router with a 45 degree bevel chamfer bit, make a reasonably sharp edge on the anchor PVC ring. This will make it easier to insert into the soil.

Chamber lid

i. Cement (PVC heavy duty cement) PVC sheets (33 x 33 cm) to end of 8 cm PVC pipe and then use a router to remove square edges.

ii. Apply a layer of silicone to the inside joint of PVC pipe and sheet after PVC cement has dried to ensure airtight seal.

iii. Drill two holes using bit size #18 onto PVC sheet which will serve as sampling port and hole for thermocouple wires.

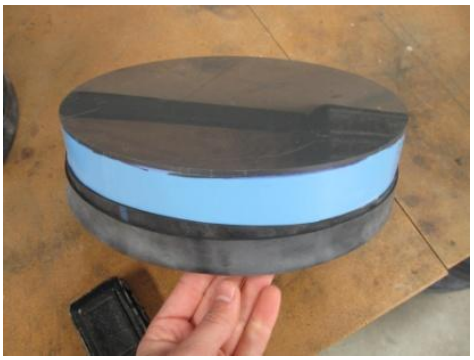


iv. Screw the brass fitting (#10-32 to 1/8” ID Hose Barb with Captivated O-Rings) onto the hole that will serve as sampling port.

v. Place the silicon port on to brass fittings for sampling port. Silicon port is prepared by cutting a 1 cm of 1/8” ID, 1/4" OD and 1/16” wall thickness silicon tubing with one end filled with silicon sealant halfway.

vi. Cut thermocouple wires into 16 in. length , solder two wires at one end of the wire and insert this end about halfway into the hole of thermocouple wire port. Apply silicon on the hole for thermocouple wire for airtight seal.

vii. Cut inner rubber tube into approximately 3 in. straps and stretch the strap around PVC lid. Secure the rubber strap with super glue to ensure airtight seal. This rubber strap will be used to close the chamber during headspace gas sampling.



viii. Insulate the top and side of chamber lid with Reflectix bubble foil to prevent heat build-up during gas sampling.

GHG EMISSIONS – GAS SAMPLING

During each gas sampling event, chambers will be closed for 30 min with three gas sampling (at 0, 15, and 30 min).

The gas is collected with pre-evacuated glass vials (Glass vial – Exetainers 12ml Soda Glass Vials - Flat Bottomed, Labco limited) with a Septa (spare Septa for Labco Exetainer® 16.5mm Screw Caps, Labco limited). Apply a primer (Dow Corning Primer PR-1200 309g Clear)on surface of septa to enhance contact of silicon sealant on rubber surface. Apply silicon on surface of septa leaving no gap between the plastic cap and septa of glass vial. Note: The silicon sealant should level the surface of plastic cap of glass vial otherwise it will cause jamming of autosampler and bending of injector needle. Dry the silicon for 2 d or more.

Collect gas samples according to the following steps:

a. Place all chamber lids near collars to be sampled.

b. Randomize the sequence of gas sampling in all flux chambers on each sampling date to avoid bias due to rising air temperature in the field.

c. Plan a sequential gas sampling to maximize the sampling time in the field. On each chamber, gas mixing, sampling and air temperature measurement take 2 min.

d. On the first flux chamber for sequential sampling, set the start time for gas sampling. Record air temperature above 1 m from the soil surface using the thermocouple wire before the start of gas sampling.

e. Take 30 mL ambient gas sample from 1 m above the soil using a 35 mL plastic syringe with a 22 G 0.7 x 25.4 mm hypothermic needle. Push 5 mL of gas out of syringe before transferring 25 mL to a 12-mL glass vial with a Si sealed septa and labeled “Ambient”. Note: It is best to take ambient gas from behind than in front to avoid breath contamination.

f. Before placing chamber lid onto collar, plug in the end of thermocouple wire to thermocouple meter terminal port (Type K HH603A series, Omega Engineering, CT) and switch on the meter for air temperature reading.

Note: Make sure that the thermocouple wire inside the chamber lid is positioned at the middle and 5 cm away from the backside of lid.

g. Carefully place the chamber lid with thermocouple meter on top of the chamber collar and unfold the inner rubber tube strap onto the side of collar to make an airtight seal (Fig. 3). Note: Minimize movement on top of flux chamber to prevent artificial gas diffusion from soil surface.

Immediately insert a 22 G 0.7 x 25.4 mm hypothermic needle with a 35 mL plastic syringe into the silicon sampling port (Fig. 4), take 30 mL gas from the and record air temperature during this time. Push 5 mL out of syringe before transferring 25 mL to 12 mL glass exetainer® vial (Labco Limited, England) with a Si sealed septa and labeled T0. Note: It is best to place the glass vial upside down in the tray to indicate filled glass vial. Cover the glass vials with aluminum sheet to prevent heat build-up during high solar radiation.

h. Move to the next chamber and repeat Steps f to h. Flush the plastic syringe with ambient air 3x before drawing headspace gas from chamber to clean plastic syringe with any contamination from the previous flux chamber.

i. After gas samples are taken from all flux chambers at time zero (T0), wait until the first chamber in the sequential sampling is ready for gas sampling at time 15 min chamber closure (Fig. 5).

j. Once the first flux chamber is ready for sampling, repeat Steps f to I for time 15 and 30 min, make sure that headspace gas sample is transferred to glass vial with correct label i.e. T15 and T30.

k. Transfer all glass vials in a plastic bag, label with date and site of sampling and store in ambient laboratory temperature prior to shipping for gas chromatography analysis.