

Transmission of Conservation Agriculture information project

The Finnish Conservation Agriculture Association FiCA has completed the "Transmission of Conservation Agriculture information" project during 2019-2020. Main activities in this project were measuring carbon dioxide emissions and estimating of carbon sinks in different cultivation methods and different soil types. Measurements were done especially in organic and peatlands. Measurements were done from farmers fields, which have been in Conservation Agriculture compared to different tillage methods. Longest continuous CA was carried out over 20 years. Measurements are taken from Conservation Agriculture, minimal tilled soil and ploughed soil. Carbon dioxide measurement were done with handheld Vaisala CarboCab GM70 meter and with transparent and opaque chambers.



CA CO2 flux +0 - 100 ppm



Plough CO2 flux +1000 - 3000 ppm



Crop photosynthesis sink -0 - 200 ppm

Conservation Agriculture sequester and bind CO2 to soil

Measurements of the FiCA project show, that in the long-lasting Notill Conservation Agriculture, the carbon dioxide emissions out of soil are very much smaller than in plough based cultivation system. (stubble flux average only +30 ppm in organic soil and +100 in peatsoil). The traditional plowing method was a major source of CO2 emissions. After ploughing (flux +1000-3000 ppm), especially in peatlands (flux 3000-5000 ppm). Minimal tillage also increased CO2 emissions (flux+100-200 ppm), but at lesser amount compared to ploughing. Conservation Agriculture binds with crop vegetation more carbon dioxide (by photosynthesis) over the growing season than it releases by respiration from the soil. Conclusion is, when soil is not tilled, carbon increases and stays in the soil.

Soil is carbon store

Project has also measured the accumulation of organic carbon (SOC) in the soil by loss of ignition (LOI) measurements. Over 20 year Notill CA, the amount of organic matter in fields has increased by 1-1.5%. This proves that CA is significant carbon sink and store. The soil mulch content increases and soil growth condition improve. Plant cover and notilled soil also hold better moisture and nutrient in soil and also reduce nutrient emissions to water.

Conservation Agriculture decreases peat soil CO2 emissions

To reduce CO2 emissions in peatsoils, official research recommends restoration of peatlands by rewetting to natural swamp, raising groundwater levels, grass cultivation and afforestation. Theoretically this might decrease CO2 emissions, but simultaneously the risk of methane and even nitrite oxide increases. Grass cultivation in peatsoils decrease CO2 emission from soil. However, if grass is renewing by ploughing and new seedbed is prepared by harrowing, then the CO2 emissions strongly increase again. In other words, stored carbon sink is lost at great extent. Renewing grassland by non plough methods is very important way to preserve the carbon sink in grasslands. Notill techniques need to be taken into farmers toolbox to preserve the carbon especially in peatsoils. Conservation Agriculture so makes it possible to retain peatsoils and organic soils in agricultural use and keep the carbon in the soil in which case these above-mentioned actions and peatsoil restriction on use are not required.

FiCA farmer user interview

FiCA has also interviewed FiCA association farmers, how to succeed in Notill Conservation Agriculture. This interview shows, which management details have been most effective adapting to CA. Most important is, farmers good CA knowhow, field good drainage, field levelling, crop harvesting to long stubble, straw and shcaff spread evenly over the field, crop rotation and nutrient balance, sowing depth and soil moisture, Or focused to CA method weeds and their pesticides, sowing is done with a CA intended machine and its operating instructions and manuals are well studied. When these things are ok. Conservation Agriculture has saved cost, increase yields, carbon to soil and weather resilience

Keywords: Soil carbon sink and store, experience and information sharing and resilience