

Q2-10. According to the IPCC Guidelines CO₂ Emissions from the combustion of biomass are reported as zero in the Energy sector. Do the IPCC Guidelines consider biomass used for energy to be carbon neutral?

A: The IPCC Guidelines do not automatically consider biomass used for energy as "carbon neutral," even if the biomass is thought to be produced sustainably, because:

- 1) in any time period there may be CO₂ emissions and removals due to the harvesting and regrowth of bioenergy crops;
- 2) land use changes caused by biomass production can also result in significant GHG fluxes; and
- 3) there may also be significant additional emissions which are estimated and reported in the sectors where they occur e.g.:
 - a. from the processing and transportation etc. of the biomass;
 - b. direct methane and nitrous oxide emissions from the biomass combustion;
 - c. from the production and use of fertilisers and liming if either is used in cultivation of the biomass.

For example, direct methane and nitrous oxide emissions from biomass combustion for energy use are reported in the energy sector.

Although direct CO₂ emissions from biomass combustion used for energy are recorded as a memo item in the Energy sector these emissions are not included in the Energy sector total. This is to avoid double counting, because under IPCC guidelines carbon dioxide emissions and removals from the use of biomass for energy are included in the Agriculture, Forestry and Other Land-Use (AFOLU) sector (previously the LULUCF sector) as one of the factors that influence the losses (due to harvest) and any regrowth. Emission and removals in the AFOLU sector include:

- CO₂ emissions or removals due to changes in soil carbon and dead organic matter and
- for perennial crops, CO₂ emissions or removals resulting from changes in biomass stocks due to harvest and regrowth.

For annual crops, the IPCC Guidelines assume that biomass carbon stock lost through harvest and mortality equal biomass carbon stock gained through regrowth in that same year and so there are no net CO₂ emissions or removals from biomass carbon stock changes.

Growing crops for bioenergy can result in land-use changes, both directly through the conversion of land to bioenergy production, and indirectly by driving land use changes elsewhere. GHG emissions and removals due to all the land-use changes in a country are reported in the AFOLU sector and can occur for many years after the land-use change. These will include emissions from indirect land use change within a country, although it is difficult to separate out only those fluxes due to indirect land use change driven by bioenergy production. Indirect changes in terrestrial carbon stocks have considerable uncertainties, are not directly observable, are complex to model and are difficult to attribute to a single cause, in this case, bioenergy production.

Where biomass is transported across national borders, or land use changes occur across borders, CO₂ emissions and removals due to production of biomass for energy use will be reported in the AFOLU sector of the inventory of the country where the biomass is produced. Consequently, provided all countries follow the IPCC guidelines and report to the UNFCCC, all emissions from the use of biomass for energy will be estimated and reported.

The overall IPCC approach to bioenergy greenhouse gas emissions at the national level requires complete coverage of all IPCC sectors, including AFOLU. While individual methodologies and emission factors provided in the IPCC Guidelines may be relevant for estimating CO₂ emissions from the use of bioenergy at an individual facility or industry, the IPCC approach of not including these emissions in the Energy Sector total should not be interpreted as a conclusion about the sustainability or carbon neutrality of bioenergy. Applying the IPCC Guidelines to estimate carbon dioxide emissions from bioenergy at sub-national levels, including from individual industries or facilities, may require additional data to ensure that relevant emissions and removals due to harvesting and regrowth of perennial bioenergy crops, land use changes, fertilisation and liming, processing and transportation are considered at the appropriate level.