S11.03a -6

ROLE OF CROP RESIDUE MULCHES AND THEIR DECOMPOSITION ON SOIL FUNCTIONS IN CONSERVATION AGRICULTURE

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Core principle of Conservation Agriculture is to maintain soil cover by crop residue mulching or cover crops. Mulching practice affects many agroecosystem services, through water dynamics and C and N transformations (Coppens et al., 2007) and their impact on climate change, water and nutrient cycling and soil biological activity. The objectives of this work were (i) to quantify the effects of biotic (diversity of mulches and soil types) and abiotic (climatic conditions) factors on soil functions such as C stabilization, C and N mineralization and transport, GHG emission, microbial dynamics and diversity; (ii) to assess by modeling how these factors affect agroecosystem services in a range of agricultural conditions met in conservation agriculture of France, Brazil and Madagascar. An experiment was performed in controlled conditions with soil columns. The treatments varied either by the type of residue mulch (Zea mais + Doliquos lablab or Triticum aestivum + Medicago sativa), or by the type of soil (sandy or loamy soil) and by the water regime (manipulated through the intensity and frequency of rain applied to the soil columns). The Pastis_Mulch model (Findeling et al., 2007) tested on the measured data, was then used to simulate different scenarii, particularly different crop rotations and associations representative of the CA agrosystems (amount and quality of crop mulches), amount and distribution of rainfall (dry and wet years) and types of soil. The results allowed to rank the factors according to their positive and negative effects on the different ecosystem services involved.