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Clay mineralogy and related properties of irrigated soils in middle valley river of Senegal

Constituants minéraux et propriétés des sols irrigués en moyenne vallée du Fleuve Sénégal

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Alluvial soils in the Senegal river valley are increasingly cultivated under irrigation and it is suspected that land degradation by alkalisation is occurring. Clay minerals can influence this process significantly. Some reference sites were monitored for salt and water balance and their clay components were studied using elemental analysis, X-ray diffraction and gravimetric analysis.

Mineralogical studies showed the presence of three major categories of clay minerals, i.e. kaolinite, illite and smectite. The two first categories come mainly from deposits and might have been brought by the river. For smectite, X-ray diffraction showed very small particles poorly crystallised. Analysis indicates that this smectite is an alumino-magnesium smectite, which is in agreement with ponding water composition. We conclude that current soil conditions induce smectite genesis, which reflects the soil water geochemistry.

Thermoponderal gravimetric analyses were performed using oxidising and non-oxidising atmospheres. Results indicated an increase of clay mass in the oxidising atmosphere at high temperatures. We think that it is due to ferrous ions in the 2:1 clays structure (illite and smectite). We conclude that the water regime of the soil favours the presence of ferrous ions in the clay structure. Several hypotheses were made regarding the variations of clay properties: exchange capacity, water retention, and ion selectivity.

Using the results of *in situ* soil water chemistry, we discuss the past and current evolution of the soils.

Key words: irrigation, mineralogy, clay fractions, pedogenesis

Mots clés : argile, irrigation, beidellite, réduction du fer, capacité d'échange