Geophysical Research Abstracts
Vol. 20, EGU2018-13129, 2018
EGU General Assembly 2018

Reclamation of soil salinity of saline Vertisols by Echinochloa stagnina

Nassirou ADO Maman (1,2), Christian Walter (1), Didier Michot (1), and Yadji Guero (2)

(1) Agrocampus Ouest - INRA, INRA, SAS, Rennes, France (christian.walter@agrocampus-ouest.fr), (2) Faculté d'Agronomie, Université Abdou Moumouni de Niamey, Niger

Irrigated crop areas provide about 35% of world agricultural production while they represent only 18% of cultivated lands. However, irrigation may lead to soil salinization particularly in arid and semi-arid zones, thus limiting the productivity of irrigated lands. Irrigated vertic soils are particularly exposed to soil salinization because of their low saturated hydraulic conductivity inhibiting salt leaching. In Niger, irrigated rice production accelerates soil salinization in the Niger River valley, which causes agricultural land to be abandoned.
Different engineering-based remediation techniques have been developed to decrease soil salinity, including physical remediation, chemical remediation and phytoremediation. Phytodesalinization is a biological approach using salt-tolerant plants or halophytes to decrease soil salinity and improve crop production. This approach is increasingly investigated since conventional approaches are difficult to apply in water-limited areas and are less effective in fine-textured soils. The objective of this study was to test the effect of this semi-aquatic grass Echinochloa stagnina, known to exhibit a strong rooting capacity and likely to grow on saline conditions, to decrease soil salinity of irrigated saline Vertisols of Niger River valley in comparison to ponded bare soil. The experimental study was conducted on soil columns, collected in saline Vertisols in irrigated paddy-crop and installed in laboratory conditions. We tested three treatments: i) ponded bare soil without crops (CT), ii) soil cultivated with E. stagnina (CEs) in two successive cropping seasons and (iii) soil permanently cultivated with E. stagnina (CEp) with a staggered harvest.
After 11 months for two growing seasons, the initial electrical conductivity (ECe) decreased from 84 to 88 % in the topsoil layer (0-8 cm) both in soil cultivated with E. stagnina and in ponded bare soil. In constraint, in deeply at 18-25 cm soil layer, decrease of initial ECe was greater in soil cultivated with E. stagnina (72-83%) than in ponded bare soil (32-58 %). Moreover, salt stock, which was initially similar in the columns, decreased by 65-87% in soil cultivated with E. stagnina and by 34-45% in ponded bare soil.
Phytodesalinisation based on E. stagnina crop appears finally as an efficient alternative technic to reclaim soil salinity of Vertisols.