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## Effects of Gypsum on Degraded Alkaline Soils and Plant Growth in Urban Agriculture of Ouagadougou, Burkina Faso

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### Abstract

To meet the fresh food requirements of the rapidly increasing population of cities in the semi-arid tropics, farmers often employ low quality irrigation water. In an urban gardening area of Ouagadougou, Burkina Faso, farmers use alkaline industrial waste water since 2006 to irrigate the intensively managed fields leading to widespread salinisation. Hence, an on-farm experiment was conducted with two irrigation water qualities (clean water and wastewater) to (i) assess the effects of sodium (Na) and bicarbonate (HCO<sub>3</sub><sup>-</sup>) loaded industrial waste water on soil properties and plant development and (ii) improve the affected soil and growing conditions for plants by a gypsum (CaSO<sub>4</sub>) application as a soil amendment. To reach a target soil pH of 8 and an exchangeable sodium percentage (ESP) of 15 %, 6.8 and 10 t ha<sup>-1</sup> of finely powdered gypsum were incorporated into the topsoil (0–20 cm). Afterwards, rainfed maize (*Zea mays* L.) and irrigated spinach (*Spinacia oleracea* L.) were cultivated on the amended soils. Chemical and physical soil parameters, as well as plant growth, yield and nutrient contents were determined. In highly salinized field areas, gypsum application decreased soil pH on average from 8.5 to 7.2 and reduced ESP by 5.2 %. Therefore Na content in plant tissues was significantly diminished for maize (from 5.2 to 3.2 mg g<sup>-1</sup>) and for spinach (from 79.6 to 24.3 mg g<sup>-1</sup>). A decline in the soil sodium absorption rate during maize cultivation led to an increase in maize root length density in highly salinized areas by 82 %. Higher soil Ca following gypsum application also led to an increased Ca:Mg ratio from 3.5 to 7.8.

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