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Designing viable cropping options for salt-affected lands

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Salinity cost agricultural sector over $27Bln pa in lost opportunities and is an issue that crosses all spatial and temporal scales – from individual fields, farms, catchments, landscapes to national and global levels. Salinity manifests itself in many forms and often leads to further soil degradation such as erosion, nutrient and soil organic matter depletion, and a loss of (soil) biodiversity. Salinity may also cause major disturbance to ecosystems due to its impact on resources (e.g. pollution of aquifers). In extreme cases it can turn previously highly productive areas into wastelands. An increasing global population and unprecedented urban sprawls are now putting additional pressures on our soil and water resources, particularly in regions where urbanisation directly competes with agriculture for access to land and water. And although everyone agrees that avoiding soil salinity in the first instance would be the most effective way of combating it, reality is that the amount of saline land and water resources is rapidly increasing, and will continue to increase, especially in developing countries. Purposefully designing our cropping systems that can cope with various levels of salinity could be one answer to this increasing problem.

In this work we review some of the key cropping options that can be deployed to either avoid, reduce or remediate salt-affected lands. We argue that for these measures to be most effective an ongoing science – policy - society dialogue is required to ensure that policy frameworks that govern land and water management are conducive to reducing salinity or even assist in restoring affected areas. We first consider several case studies highlighting the extent of the problem using ongoing salinity hotspots around the globe. We then look at halophytes as a possible biological tools to remediate already saline sols, and discuss prospects of mixed (halophytes and glycophytes) cropping solutions for various agricultural systems at different scales and geographic distribution. We then consider different scenarios of land use and link these with international, national and local policy frameworks that govern land and water management. Finally, we discuss the importance of developing modelling approaches that facilitate informed debates about alternative management options and so engender dialogs between scientists, policy makers, communities and end users.