

The waterlogged volcanic ash soils of southern Chile. A review of the ?Ñadi? soils

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The Ñadi soils (ÑS) is a local name for soils occurring at southern Chile (38° to 43° S) covering around 4250 km² hectares. Derived from volcanic materials, have discontinuous iron-cemented layers (the placic horizon) which favour waterlogging during the winter. The studies of iron-cemented layers are predominant in USA and Taiwan, but we provide an overview of ÑS research to position them within the group of soils with iron-cemented layers, and to highlight the distribution, formation, processes, and the relevance of placic horizons in land use and ecosystem services that ÑS provide. We surveyed the worldwide literature of iron-cemented layers to put the Chilean soils with placic horizons. A fraction analysis was conducted in a longitudinal transect of five ÑS to evaluate the Si, Al, Fe and Mn reactive pools in the soil. A principal component analysis (PCA) was performed to separate the soil Series. Finally, a comparison between chemical properties of placic horizons and bog iron in Chile with other soils in the world was realised. Further south, the Chilean ÑS have more SOC in surface horizons thus enabling more intensive iron translocation with the reactive soils pools decreasing with the latitude. The iron-cemented layers probably consist of

goethite, ferrihydrite and gibbsite. A 51.8% of bog iron are compound of Fe while only 36.2% in the placic horizon, which also have 12.1% of Al₂O₃ in the molecular structure. Land uses in ÑS vary, from forestry to archaeology coexisting in these soils. In agricultural terms, we suggest a soil depth of 50 cm as the limit to drainage, shallower depth is at risk of severe soil degradation. Finally, several research questions are posed which may help to define the use and importance of the Ñadi ecosystem to the people who use the soils currently and to future generations within the context of climate change scenario.