



UNITED NATIONS
UNIVERSITY

UNU-LRT

UNU Land Restoration Training Programme
Árleynir 22, 112 Reykjavík, Iceland

Final project 2015

ESTIMATION OF RECLAMATION TREATMENTS ON SOILS IN SOUTH ICELAND

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ABSTRACT

Land degradation is one of the biggest issues we face and leads to expanses of desertification around the world. This process negatively affects the agricultural sectors, especially herders' and farmers' activities and, furthermore, their livelihoods. In the last few decades, humans have realized that we do not have infinite natural resources. Therefore in some places budget plans for land reclamation and laws and regulations were passed to prevent further destruction of land and protect the parent material which life depends on: the soil.

This study was conducted to estimate the efficacy of different restoration treatments in a degraded area in South Iceland. The study area had been degraded by a combination of climatic factors together with anthropogenic activities. The study area included four treatments: 1) pristine land that had not been degraded during the disturbance; 2) reclaimed land using the legume *Lupinus nootkatensis* in 1991; 3) reclaimed land using the grass *Festuca richardsonii* with fertilizer in 1962-1975; and 4) degraded land. The goal was to estimate the effect of the reclamation treatments on soil physical properties such as texture, structure, bulk density, and water retention, and chemical properties such as soil pH and carbon and nitrogen content.

The A soil horizon for each treatment occurred at depths that varied from 0 – 17 cm in pristine land, 0 – 6 cm in reclaimed land with legumes, 0 – 10 cm in reclaimed land with grasses, and 0 – 4 cm in degraded land. Moreover, the structure was granular in all treatments and the texture was well-formed loam in pristine land and sandy loam in the other treatments. The bulk density was between 0.55 – 0.89 g/cm³, water content was 26.51 – 46.47% at 1/3 bar, 18.9 – 29.7% at 1 bar, and 7.7 – 15.9% at 15 bar at a depth of 0 – 10 cm.

Carbon sequestration in the treatments was between 0.04 – 0.18 t/ha. Accumulation of carbon and nitrogen were significantly higher in pristine land with 20.4 t/ha C and 1.36 t/ha N compared with the other treatments. The amount of carbon was 8.73 t/ha in reclaimed land with legumes, 6.44 t/ha in reclaimed land with grasses, and 4.2 t/ha in degraded land. The amount of nitrogen was 1.36 t/ha in reclaimed land with legumes, 0.6 t/ha in reclaimed land with grasses and 0.34 t/ha in degraded land. The soil pH range in the treatments was between 6.43 – 6.92, with the degraded land showing the highest pH value of 6.92. The reclaimed land with legumes was more effective for the reclamation of degraded land since accumulated carbon and nitrogen were higher than in the reclaimed land with grasses in a short period.

Key words: South Iceland, reclamation, *Lupinus* sp., *Festuca* sp., carbon, water retention.