Soil physicochemical property and arbuscular mycorrhizal fungi resilience to degradation and deforestation of a dry evergreen Afromontane forest in central Ethiopia

Fisseha Asmelash[1], Tamrat Bekele[2], Fassil Kebede[3], and Zerihun Belay[4]

[1]Ethiopian Biodiversity Institute
[2]Addis Ababa University Faculty of Science
[3]Ethiopian Environment and Forest Institute
[4]Adama Science and Technology University

October 28, 2020

Abstract

We investigated the soil physicochemical property and arbuscular mycorrhizal fungi (AMF) resilience to degradation and deforestation of the Chilimo dry evergreen Afromontane forest. Topsoil (1-10cm) physicochemical property was determined across four land uses, viz. natural forest (NF), shrubland (ShL), cropland (CrL), and grazing land (GrL). AMF spore abundance (SA) and AMF infectivity of these land uses were also determined. One-way ANOVA results indicated that most soil physicochemical variables were significantly affected by land-use change. According to the nonmetric multidiamentiaonal scaling ordination result, soil physicochemical property was found to be resilient to degradation (NF-ShL conversation) but not deforestation (NF-CrL or NF-GrL conversions) of Chilimo forest. Whereas SA was found to be resilient to both the degradation and deforestation, infectivity was resilient only to NF-CrL conversion. Although our results did not show a similar pattern in soil property, SA and AMF infectivity resilience due to Chilimo forest degradation and deforestation, both the soil physicochemical property and AMF infectivity were found to be not resilient to NF conversion to GrL. Hence, based on our results, it can be concluded that AMF inoculation could be more beneficial to NF restoration if the planting sites are in GrL. However, in the future, the AMF community composition of these four land uses should be determined morphologically and molecularly from field soil and trap culture so that AMF resilience to DAF deforestation and degradation is better understood.

Hosted file

`JDD_Body.pdf` available at https://authorea.com/users/370725/articles/489305-soil-physicochemical-property-and-arbuscular-mycorrhizal-fungi-resilience-to-degradation-and-deforestation-of-a-dry-evergreen-afromontane-forest-in-central-ethiopia

Hosted file

`Figure 1.pdf` available at https://authorea.com/users/370725/articles/489305-soil-physicochemical-property-and-arbuscular-mycorrhizal-fungi-resilience-to-degradation-and-deforestation-of-a-dry-evergreen-afromontane-forest-in-central-ethiopia

Hosted file

`Figure 2.pdf` available at https://authorea.com/users/370725/articles/489305-soil-physicochemical-property-and-arbuscular-mycorrhizal-fungi-resilience-to-degradation-and-deforestation-of-a-dry-evergreen-afromontane-forest-in-central-ethiopia

Hosted file

Figure 3.pdf available at https://authorea.com/users/370725/articles/489305-soil-physicochemical-property-and-arbuscular-mycorrhizal-fungi-resilience-to-degradation-and-deforestation-of-a-dry-evergreen-afromontane-forest-in-central-ethiopia

Hosted file

Figure 4.pdf available at https://authorea.com/users/370725/articles/489305-soil-physicochemical-property-and-arbuscular-mycorrhizal-fungi-resilience-to-degradation-and-deforestation-of-a-dry-evergreen-afromontane-forest-in-central-ethiopia

Hosted file

Figure 5.pdf available at https://authorea.com/users/370725/articles/489305-soil-physicochemical-property-and-arbuscular-mycorrhizal-fungi-resilience-to-degradation-and-deforestation-of-a-dry-evergreen-afromontane-forest-in-central-ethiopia