Regula Christon (2015). Vegetation, interrill erosion and aggregate stability on grazed alpine meadows. Masterarbeit. Geographisches Institut, Universität Zürich und WSL Institut für Schnee- und Lawinenforschung SLF. Betreuer: Dr. Christian Rixen. Fakultätsvertretung: Prof. Dr. M. W. I. Schmidt.

Abstract

Alpine meadows are prone to serious soil erosion due to terrain steepness but also due to ongoing climate change. Widespread and intensive grazing activities lead additionally to the reduction of the protective vegetation cover. For a better understanding of the functions of the protective vegetation cover, 111 rainfall simulation experiments were conducted on cattle grazed Suisse alpine meadows differing in the degree of vegetation cover, but not in slope inclination (20°). Micro plots (25 cm * 25 cm) were irrigated for approximately five minutes with a simulated rainfall intensity of 48 to 60 mm h^{-1} which corresponds to a heavy and rare rainfall event in Switzerland. The influence of a decreasing vegetation cover was investigated on interrill erosion but also on various soil parameters.

Results showed that a reduction of vegetation cover led to an exponential increase in soil particle yield (Figure 1). Negligible soil particle yields were measured when micro plots were covered with more than 50% of living or dead plant material. Furthermore, a decrease in vegetation cover led to an increase in runoff but to no significant changes in infiltration. Concerning soil properties, a decrease in vegetation cover was related to a decrease in soil organic matter and root density. It was hypothesized that these changes in soil lead to a lower aggregate stability which in turn is responsible for variations in interrill erosion parameters. Results showed that aggregate stability was significantly influenced by the decrease in root density but had no significant impact on interrill erosion parameters. Variations in soil particle yield could be best predicted with the variables total cover and runoff. It was finally concluded that interception, instead of aggregate stability, was most likely responsible for the increases in soil particle yield and runoff with decreasing vegetation cover. The non-significant changes in infiltration might have been due to aggregate stability which showed high values nearly independent of vegetation cover.

This study indicates that vegetation cover protects soil from interrill erosion by its significant influence on various soil parameters. Therefore the maintenance of an intact vegetation cover with little open ground is essential for the protection of grazed alpine meadows.

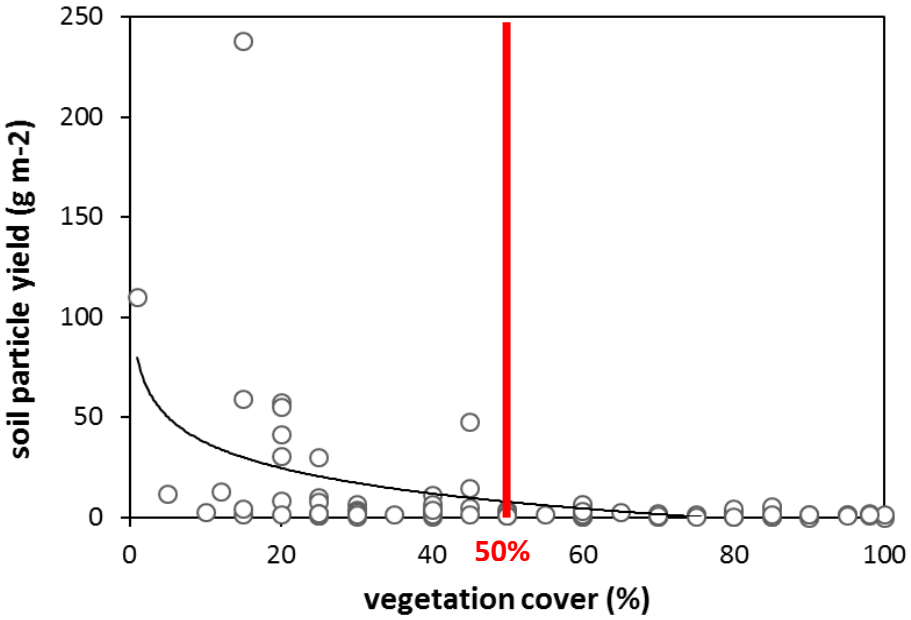

Figure 1: Relationship between vegetation cover and soil particle yield.