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Measuring extent of restoration using coffee (*Coffea arabica* L.) as a bioassay plant species

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This study was undertaken as part of the ongoing biological restoration efforts at the center for indigenous trees propagation and biodiversity development in Ethiopia (50-55 Km west of Addis Ababa, 09°01'188" N; 038°21'566" E). The main objective of the study was to measure extent of restoration over a degraded landscape using *Coffea arabica* L. as a bioassay plant. In order to measure this, the phrase restoration bioassay was coined for coffee plants which were established beneath *Acacia abyssinica*, *Croton macrostachyus* and *Euclea divinorum*. The trees were regenerated after 5-6 years` of intensive restoration activities. All the vegetative and reproductive responses were quantified on randomly selected 3 to 5 year old coffee plants. The results showed that mean number of lateral stem branch, leaves, leaf area and internodal lengths were significantly ($P < 0.05$) greater for those established beneath the shades of *E. divinorum* for 3-4 years, compared to those beneath the *C. macrostachyus* and *A. abyssinica* shades. Further, key biological indices such as mean number of fruiting nodes, berries per node, mature red berries harvested per plant, fresh weight of berries, size and weight of beans, bean to berry weight ratio, weight per 1000 beans and coffee bean yield (g/tree) were all significantly ($P < 0.05$) higher for coffee plants established under the shade of *A. abyssinica* than those established under the shades of *C. macrostachyus* and *E. divinorum* and on less restored area. Significant ($P < 0.001$) differences in the numbers of flower buds and flower numbers were observed between the control and the treatment groups where, GA3 levels of 100, 250 and 350 mg l⁻¹ were sprayed. This study showed that restoring native trees, shrubs, herbs and grasses over a degraded landscape restores key stone natural resources with far reaching positive consequences on economic growth, food security, biodiversity and livelihood restoration. We therefore, recommend that landscape restoration using native trees and shrubs must be scaled up using mechanisms detailed in this thesis. Further, Ethiopia`s nature and natural resources have been dilapidated for generations, since the nation`s poverty has been the direct consequences of these actions and biological restoration must be considered as Ethiopia`s prior agenda both by lawmakers and the government that enforces the laws.

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