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Beyond tree planting: Species differences and drivers of tree survival rate in smallholder systems in eastern Rwanda

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Abstract

Tree planting interventions are useful if trees survive and remain on the landscape. High mortality rates of transplanted seedlings undermine the benefits of such interventions and have significant financial costs. They can also negatively affect public perception of tree planting programs. Field tree survival depends on various factors including seedling quality, growing practices and environmental conditions. This study was conducted in Eastern Rwanda, where on-farm planting of three indigenous and two exotic tree species was promoted to control soil erosion and enhance land restoration action. Seedlings were propagated in local project-supported farmer cooperative nurseries and planted just at the beginning of the rain seasons in March/April and October/November. We evaluate field performance of the five species and assess the impact of pests and pest management, tree management practices and local biophysical conditions on tree survival rates. We use data from 229 randomly selected farmers who planted tree seedlings in October/November 2023. Data was collected about six months and one year following planting work. Tree survival rate was calculated as a fraction of the number of trees observed growing to the number of trees initially planted. Field assessments revealed that the number of trees observed growing in different niches was much lower than the seedlings received. Although farmers planted all the trees they received, 62 % survived after six months and 34 % after one year. Survival rate varied by tree species and was strongly influenced by pests and the size of land, where higher survival rates were observed among farmers with larger plots of land. The average survival rates per species after six months were: *G. sepium* – 74 %, *M. indica* – 44 %, M. lutea – 63 %, M. eminii – 56 % and P. mildbraedii – 45 %. After one year, the rates dropped to 43 %, 32 %, 35 %, 20 % and 17 % for the species listed, respectively. Results show that survival rates diminished with time, and that pests and diseases, if overlooked may also affect the survival of trees. Recommendations on tree planting require more consideration of species choice for the target growing site in order to minimise or better plan for survival losses.

Keywords: Eastern Province of Rwanda, farmer characteristics, tree inventory survey, tree planting, tree survival rate

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