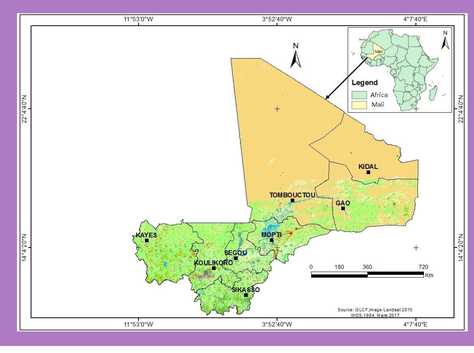
Planting Pit Size and Farmer's Management Practices Explained Survival and Growth of Planted Seedlings in Contrasting Land-Use Systems



Patrice Savadogo, Ky-Dembele Catherine, Jules Bayala

World Agroforestry Centre (ICRAF), Sahel Node BP E5118, Bamako, Mali

Introduction

- Successful establishment and growth of trees in degraded landscape is an important factor in efforts to land restoration in dryland.
- In Mali as in most the Sahelian countries, large tree plantations have started after the severe drought of the 70s.
- The high cost of plantation associated with low survival and slow growth has been the main impediment to large success.
- Planted trees performance in rural settings are affected not only by seedling related traits and environmental conditions, but also by the management practices of farmers who plant, own, maintain, and expect benefit from these trees (Figure 1).

Research question: What factors of the rural social–ecological land use system predict survival and growth of trees?

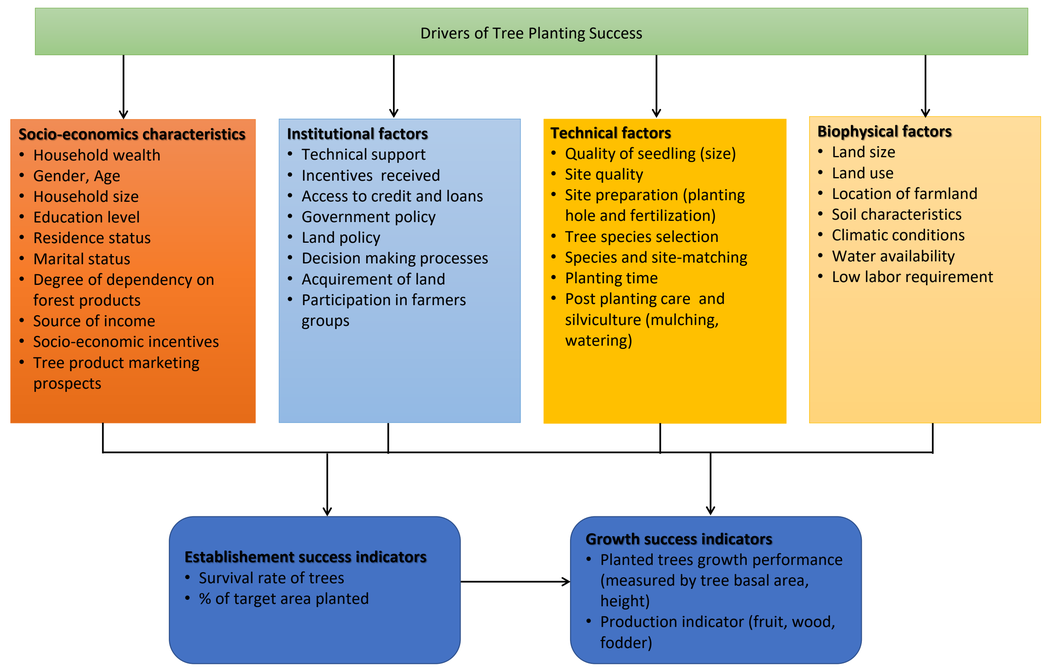
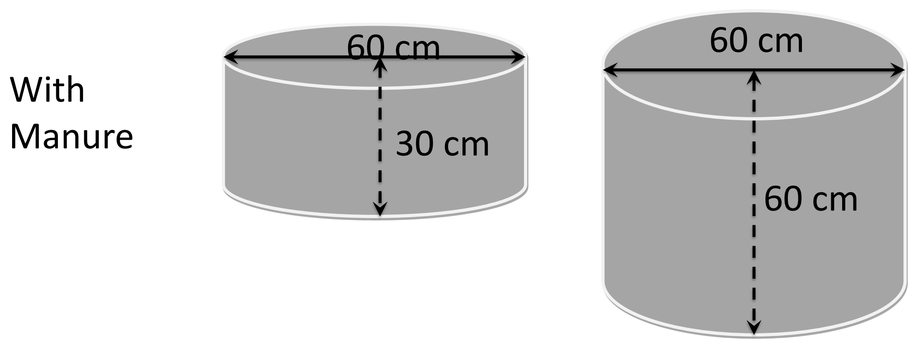
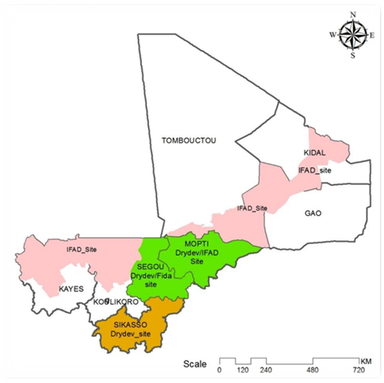


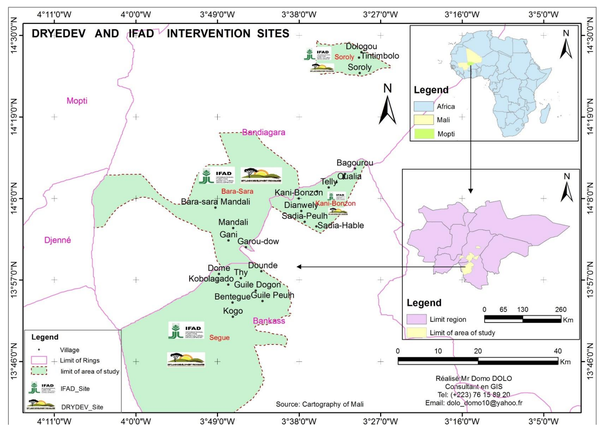
Figure 1: Conceptual Framework of Potential Drivers of Tree Planting Success

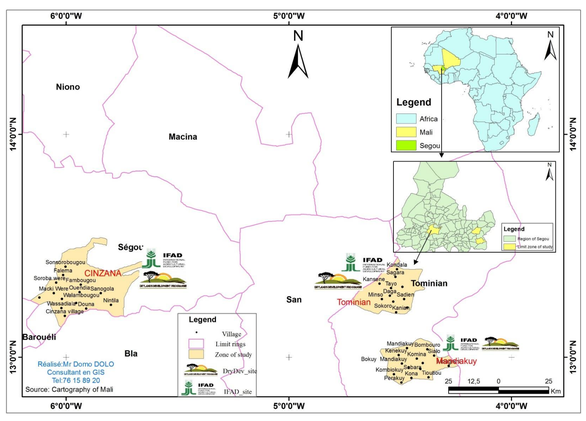
Material & Methods

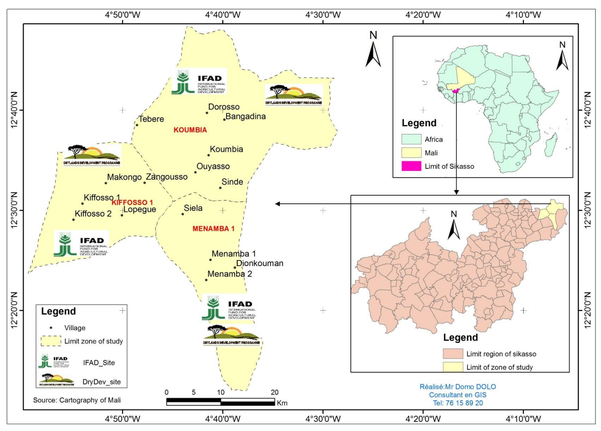
To examine tree planting success in the rural growing environment, this study uses data collected from a multi-environment trials of two planting pit sizes (small size planting hole [30×30 cm] vs. big size planting hole [60×60 cm]) by 1600 volunteer farmers from three contrasting regions Mopti, Sikasso and Ségou in Mali to create statistical models of grafted *Ziziphus mauritiana* survival and growth. Each farmer planted 10 seedlings in his/her own context.











Results & Discussion

Our results suggest that biophysical and socio-economic factors are all important in explaining the success (survival and growth) of young planted trees. The following variables are positively related to tree success (survival and/or growth): planting pit depth, median household income, planting location, farmers' motivations and tree planting experience, mulching, and a watering in the dry season.

Conclusion

The results from this study though limited in time, highlight the fact that more comprehensive evaluation that combined biophysical environment and social factors related to the farmers are needed to explain success in plantation.

Table 1. Categories of variables used in survival and growth model and their influence (positive or negative)

Independent variables		Dependent variables	
Categories	**Variables**	**Survival**	**Growth rate**
Technical factors	• Seedling size (collar diameter at planting)	sign (+)	sign (+)
	• Planting pit size	sign (+)	sign (+)
	• Fertilization	non sign	sign (+)
	• Tree species selection (*Ziziphus* Umran or *Ziziphus* Gola)	non sign	non sign
	• Post-planting care and silviculture (watering, mulching)	sign (+)	sign (+)
Institutional factors	• Technical support	sign (+)	non sign
	• Incentives received (project support)	non sign	non sign
	• Farmer ownership of land	sign (+)	non sign
	• Participation in farmers groups	sign (+)	sign (+)
Socio-economics characteristics	• Gender	non sign	non sign
	• Age	non sign	non sign
	• Household size	non sign	non sign
	• Household wealth	non sign	non sign
	• Education level for the responsible farmer	non sign	non sign
	• Residence status	sign (-)	sign (+)
	• Marital status	sign (+)	sign (+)
	• Source of income (dependency on forest products)	sign (+)	sign (+)
Biophysical factors	• Farmer description of soil quality (low, medium)	sign (+)	sign (+)
	• Climatic conditions (region of the planting)	sign (-)	sign (-)
	• Planting location (homestead or farm)	non sign	sign (+)
	• Water availability (closeness of water source)	non sign	non sign

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