Adaptation of indigenous economically important multipurpose trees in the dry lowlands of Abergele

Haile Adamu
Sekota Dryland Agricultural Research Center, P.O. Box 62, Sekota, Ethiopia.

Abstract

The study was carried out in 2006-2009 in Abergele, Wag-himra, to determine the adaptability of different indigenous multipurpose tree species. Five economically important multipurpose tree species namely: *Moringa stenopetala, Moringa oleifera, Tamarindus indica, Acacia senegal*, and *Casuarinas equistifolia* were evaluated for their adaptability using RCB design in three replication. Half moon structures were used as moisture conservation technique. Data on root collar diameter, height, and survival rate were collected at every 3 months for 36 months. Data analysis was done with Excel spreadsheet. The result revealed that *Moringa stenopetala* was the most adaptive species with 83.3% survival rate, 330.65 cm height, and 145.83 mm of root collar diameter. *Acacia senegal* was the second adaptive species with 52.08% survival rate, 209.07 cm height, and 43.67 mm root collar diameter. Therefore, scaling up and demonstration of *Moringa stenopetala* and *Acacia senegal* in Abergele and similar areas in Wag-himra is recommended. This study further recommended that planting of these species should be done using half moon structure as moisture conservation techniques.

Keywords: Abergele, adaptation, dryland, Moringa, root collar diameter, survival rate.

Introduction

The United Nations Environment Program (UNEP) has estimated that 35 million km^2 of the dryland regions of the world, an area approximately the size of both North and South America, are affected by desertification. Nearly 20 million km^2 of this area has been classified as being subjected to "high" and "very high" desertification risk. Equally important is the fact that 30,000 km^2 are reduced to a state of "uselessness" every year, a loss that is expected to continue into the future unless remedial actions are taken (FAO, 1989). Worldwide, one billion people in 110 nations earn their livelihoods directly in drylands. Nearly all of these people, and the drylands on which they depend, are at constant risk from land degradation/desertification, which can be the result of climate change or

natural phenomena but is more likely to arise from human activity (Laudazi and Lambrou, 2003). There are many factors that trigger desertification, including the effect of drought and climate change, fragile soils and geological erosion, livestock pressure, nutrient mining, growing populations, inadequate/ambiguous property and tenure rights, landlessness and an equitable distribution of assets, poor infrastructure and market access, neglect by policy makers and agricultural and environmental research systems, and the failure of markets to reward the supply of environmental services (Akimaliev, 2005).

Abergele is one of such dryland parts of Ethiopia located in the Northeastern part of the Amhara Regional State, Ethiopia. Like other dryland parts of the country, land degradation is rife in Abergele area because of over exploitation of the woodlands and farming of the fragile lands. Transgression of agriculture towards the natural woodland, burning and overgrazing resulted in the clearing of woodlands. This in turn accelerated soil erosion and destroyed the soil and floristic diversity of the area. To address these overriding problems of the area, some research activities like adaptability experiment of different important tree and shrub species is paramount. This is due to the fact that there are some promising species, both in and out of Ethiopia which could withstand the existing harsh climatic conditions. Such species are said to be the species that can survive and thrive in a changing climate, probably they will be the dominant species ones in the aftermath of environmental calamity. The objective of this research was, therefore, identify the most adaptive indigenous tree species which have multipurpose use and are economically important.

Materials and methods

Five economically important indigenous multipurpose tree species namely: *Moringa stenopetala*, *Moringa oleifera*, *Tamarindus indica*, *Acacia Senegal*, and *Casuarinas equistifolia* were evaluated in 2006-2009 for their adaptability using RCB design in three replication. Half moon structures were used as moisture conservation technique. Data on root collar diameter, height, and survival rate were recorded every 3 months for 36 consecutive months. The collected data were analyzed using Excel Spread Sheet.

Results and discussion

The results of survival rate data revealed that *Moringa stenopetala* was the most adaptive species with 83.3% survival rate followed by *Acacia Senegal* and *Moringa oleifera*. *Casuarinas equistifolia* was the least adaptive species which was not more reckoned as alive after nine month (Figure 1).

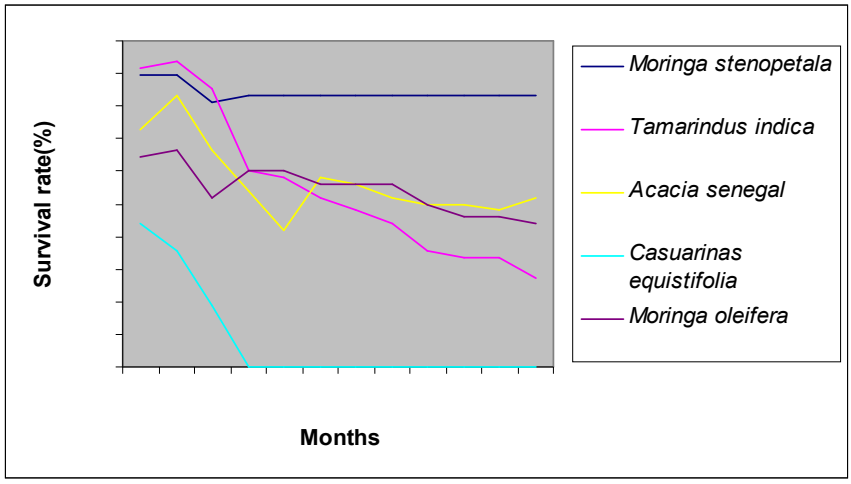

Figure 8. Survival rate of species across months at Abergele.

Plant height was highest for *Moringa oleifera* (342.5 cm) and *Moringa stenopetala* (330.65 cm) followed by *Acacia Senegal* (209.07 cm) and *Tamarindus indica* (54.33 cm) (Figure 2).

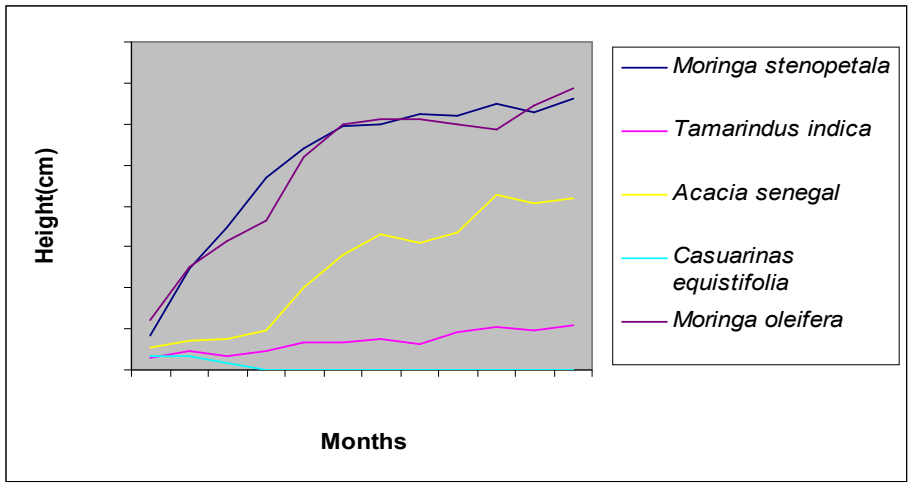

Figure 9. Plant height of the species across months at Abergele.

Root collar diameter was highest for *Moringa stenopetala* (145.83 mm) followed by *Moringa oleifera* (83.25 mm), *Acacia Senegal* (43.67 mm) and *Tamarindus indica* (13.25 mm) (Figure 3).

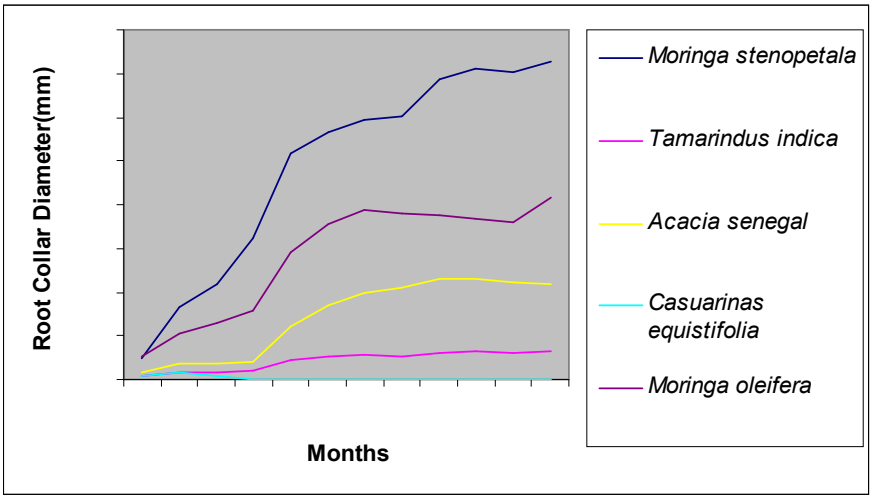

Figure 10. Root collar diameter of the species across months at Abergele.

Generally, from overall growth performance points of view, *Moringa stenopetala* and *Acacia senegal* (Figure 4) were the most adaptive species in the highly moisture stressed Abergele.

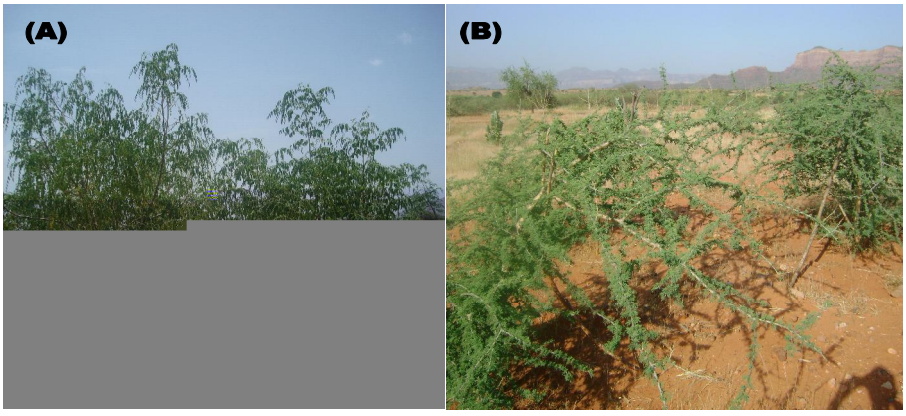

Plate 1. *Moringa stenopetala* (A) and *Acacia Senegal* (B)

Conclusion and Recommendations

Despite the fact that Abergele area is one of the most moisture stressed areas of Amhara region, which is the pivotal hindrance for growth and survival of trees and shrubs, this research finding came up with results that prove the previous prevailing wrong notions as wrong. Especially, the growth performance of *Moringa stenopetala* and *Acacia senegal* revealed that tree seedlings can grow well in such area as long as we could choose best species which can thrive well in harsh environments. Scaling up and demonstration of *Moringa stenopetala* and *Acacia Senegal* species in Abergele and similar areas in Wag-himra with a special focus on their utilization and silvicultural management is recommended. It is further recommended that planting of these species should be done using half moon structure as moisture conservation techniques.

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