Population survey of *Milicia excelsa, Pouteria adolfi-fridercii, Antiaris toxicaria* and *Prunus africana* in south and south-western Ethiopia: implications for domesticating and establishing Seed Production Areas

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Introduction

Natural forests in western and south-western Ethiopia are the potential sources of economically important timber species such as *Milicia excelsa, Antiaris toxicaria, Pouteria adolfi-fridercii* and *Prunus africana*. However, in recent years, conversion of forest ecosystems into agriculture lands (coffee and tea plantations) is becoming increasing. As the result, species such as *Milicia excelsa, Antiaris toxicaria, Pouteria adolfi-fridercii* and *Prunus africana* are under high pressure due to random cuttings and deforestation (Zelalem Amdie, 2007; Teshome Besufekad, 2012).

The objectives of this study were (1) to conduct a population survey on *Milicia excelsa, Pouteria adolfi-fridercii, Antiaris toxicaria* and *Prunus africana* in selected forest ecosystems in south and south-western Ethiopia, and (2) to measure the stem height and diameter at breast height (dbh) of the populations thereby determining the best population and establishing Seed Production Area (SPA) for the target species *in-situ* and *ex-situ*.

Methodology

Systematic random sampling; transect and quadrat methods. A total of **10** systematic random transect lines (**30** quadrats) were set out across 13 forest ecosystems (Fig. 1). Each quadrat was set to have 20m by 20m size (400m²) across the transect line (modified from Cropper, 1993; Tiwari *et al.*, 2010). Accordingly, the population density (abundance), tree height and dbh were measured to identify potential populations viable for establishing the SPA *in-situ* and on-station.
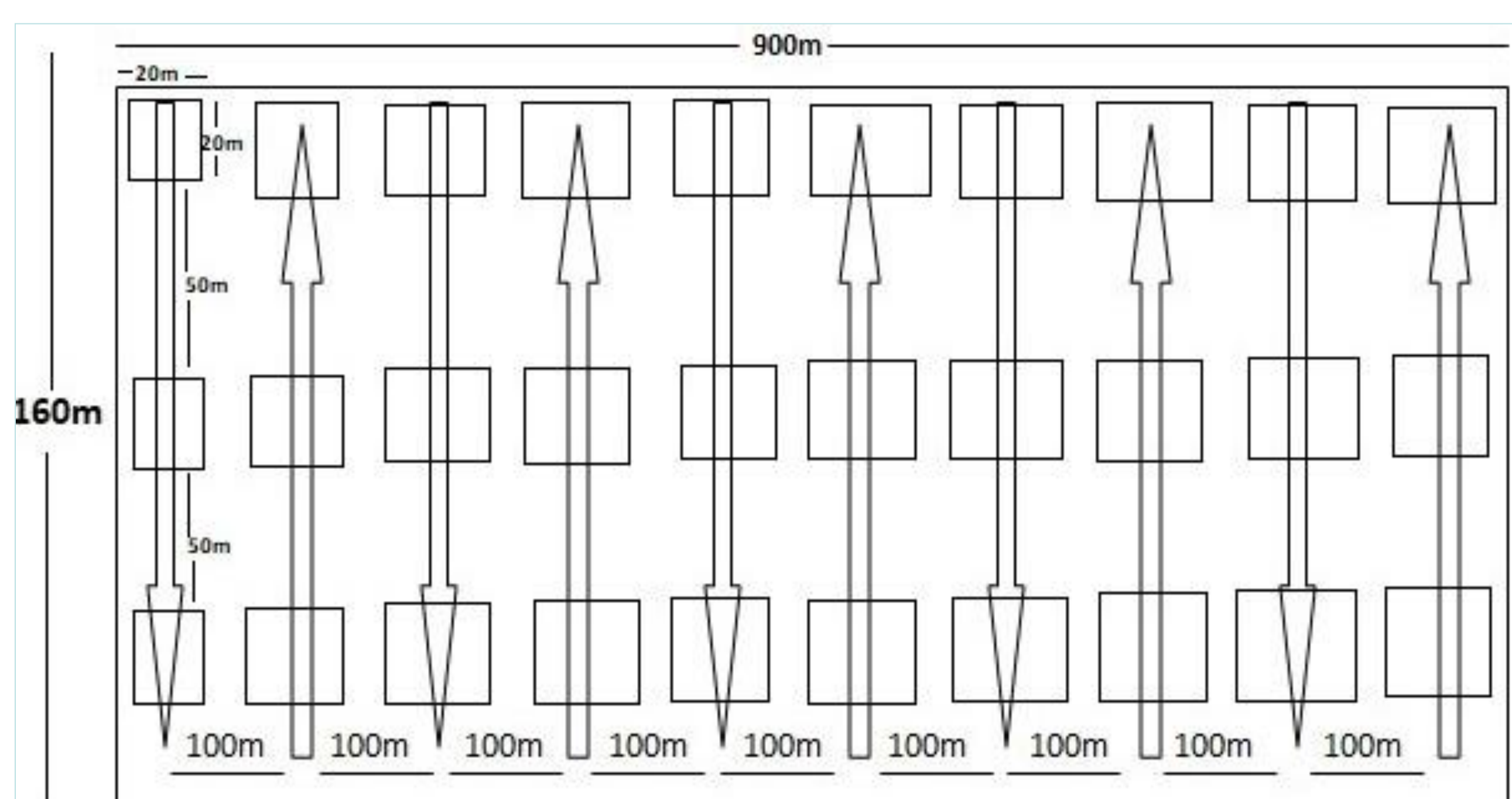

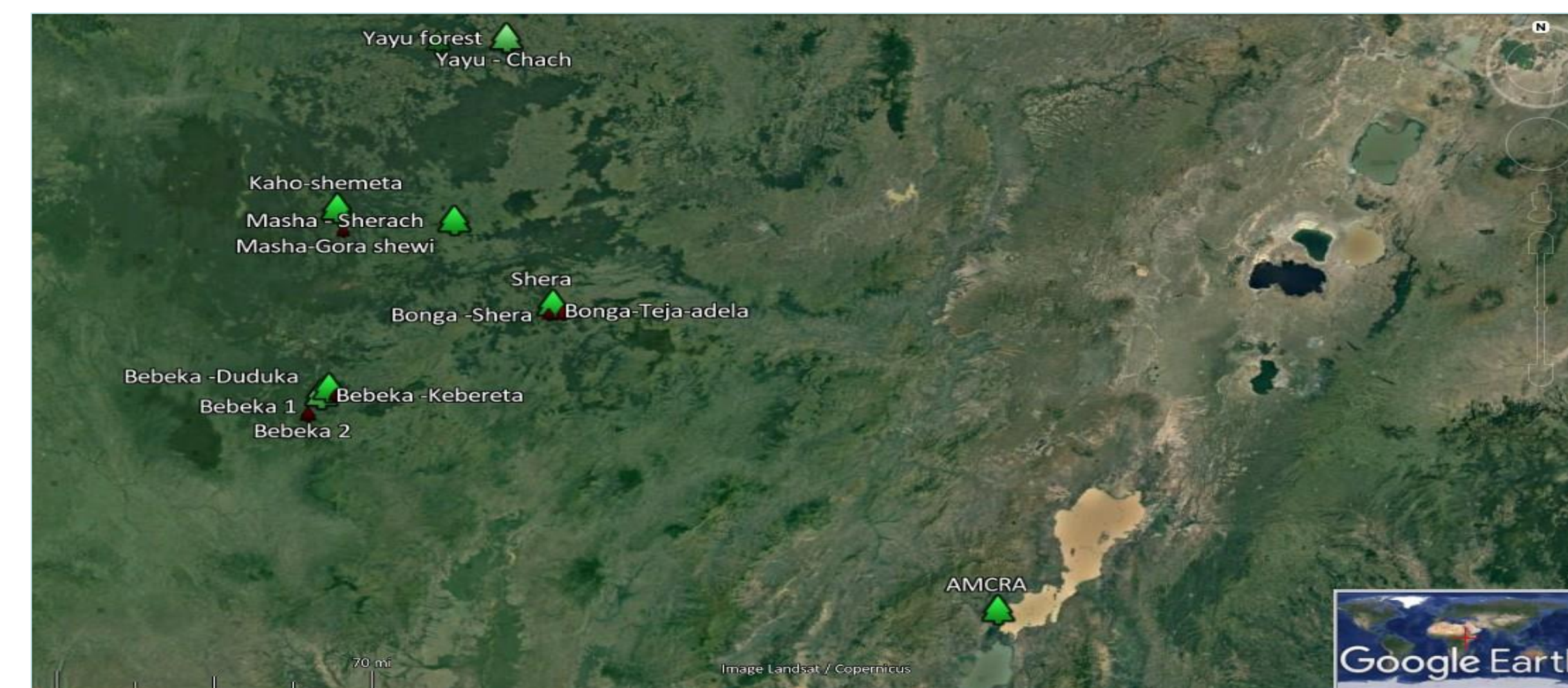**Figure 1.** Layout of the sampling design and sample plots (transects and quadrats)

Figure 2. Map of the study area and sample pilot forest sites

Results

- **Milicia excelsa** (Rock-elm, Iroko) assessed in four forest ecosystems; Bebeka -Duduka natural forest (45 tree stem ha-1) and Yayu coffee mixed forest (40 stem ha-1) appeared to have relatively denser population. According to Agroforestry Database, *M. excelsa* is a deciduous tree having 30-50 meter stem height (Orwa *et al.*, 2009).
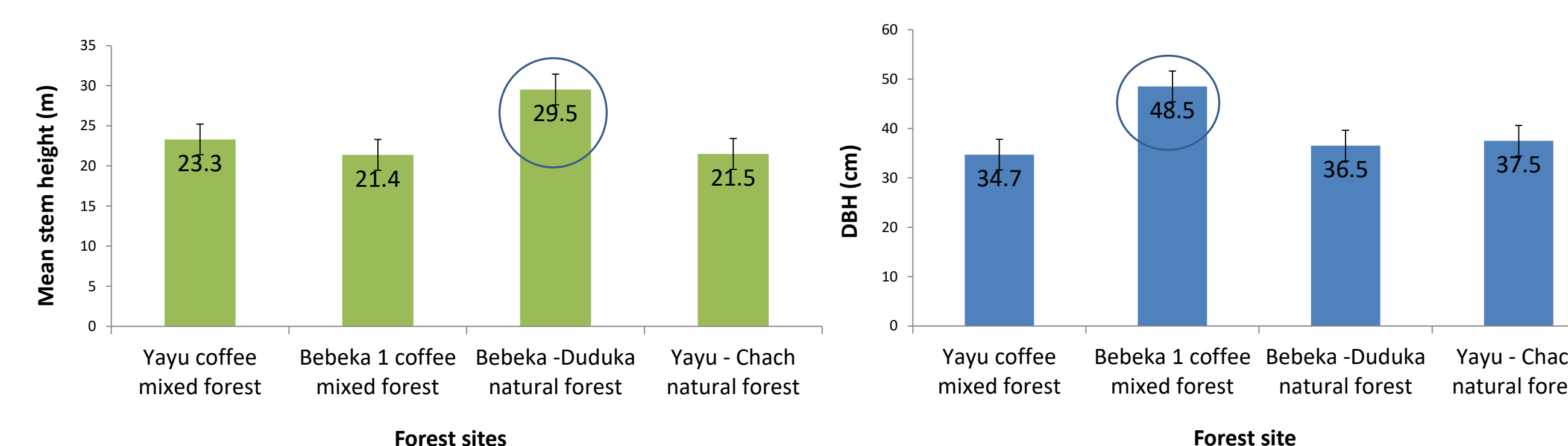

Figure 3. Comparison of mean ($\overline{x}$) and standard error (*SE*) for measurements of stem heights (Left) and DBH (Right) of *M. excelsa* population

- **Pouteria adolfi-fridercii** (Aningeria, Muna) assessed in eight forest ecosystems; Masha-Gora shewi forest appeared to have denser population of *P. adolfi-fridercii* (150 stem ha-1) followed by Bebeka-Kebereta (80 stem ha-1). According to Agroforestry Database, *Pouteria adolfi-fridercii* is reported to have *up* to 50 meter stem height (Orwa *et al.*, 2009).
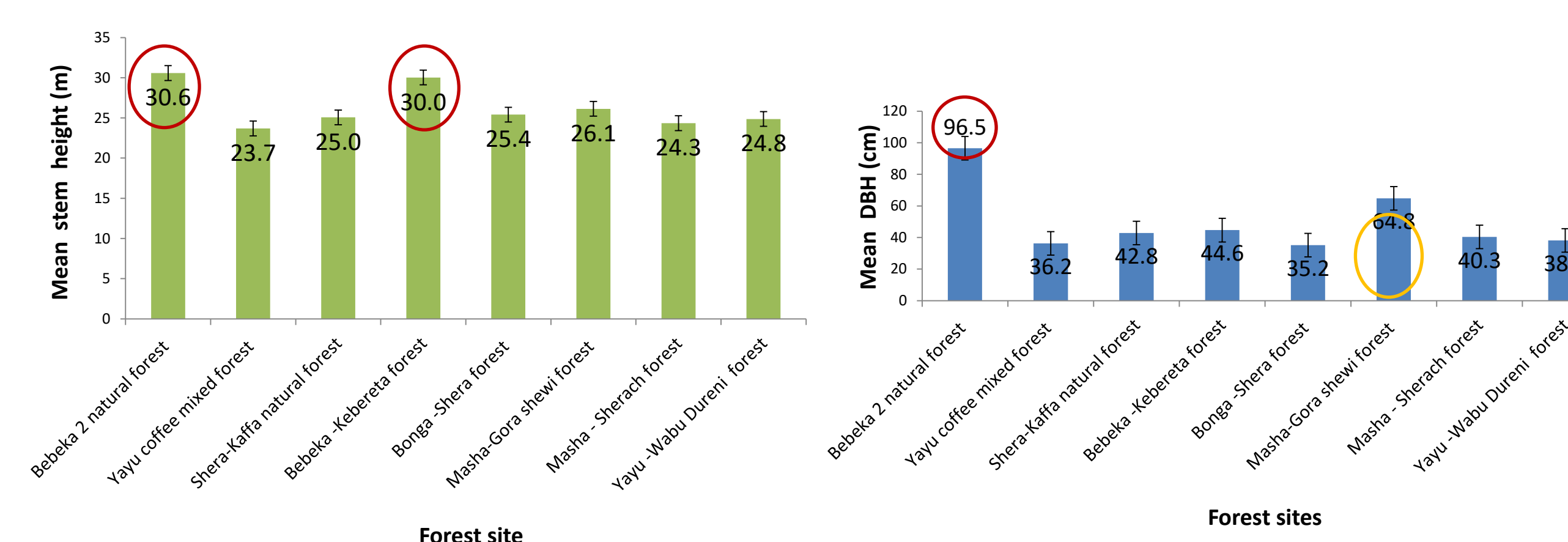

Figure 4. Comparison of mean ($\overline{x}$) and standard error (*SE*) for measurements of stem heights (Left) and DBH (Right) of *Pouteria adolfi-fridercii* population

- **Antiaris toxicaria** (False Iroko) assessed in two forest ecosystems; both forest habitats appeared to have the same density (12.5 stem ha-1). According to Agroforestry Database, *A. toxicaria* is reported to have 20-40 m stem height (Orwa *et al.*, 2009).
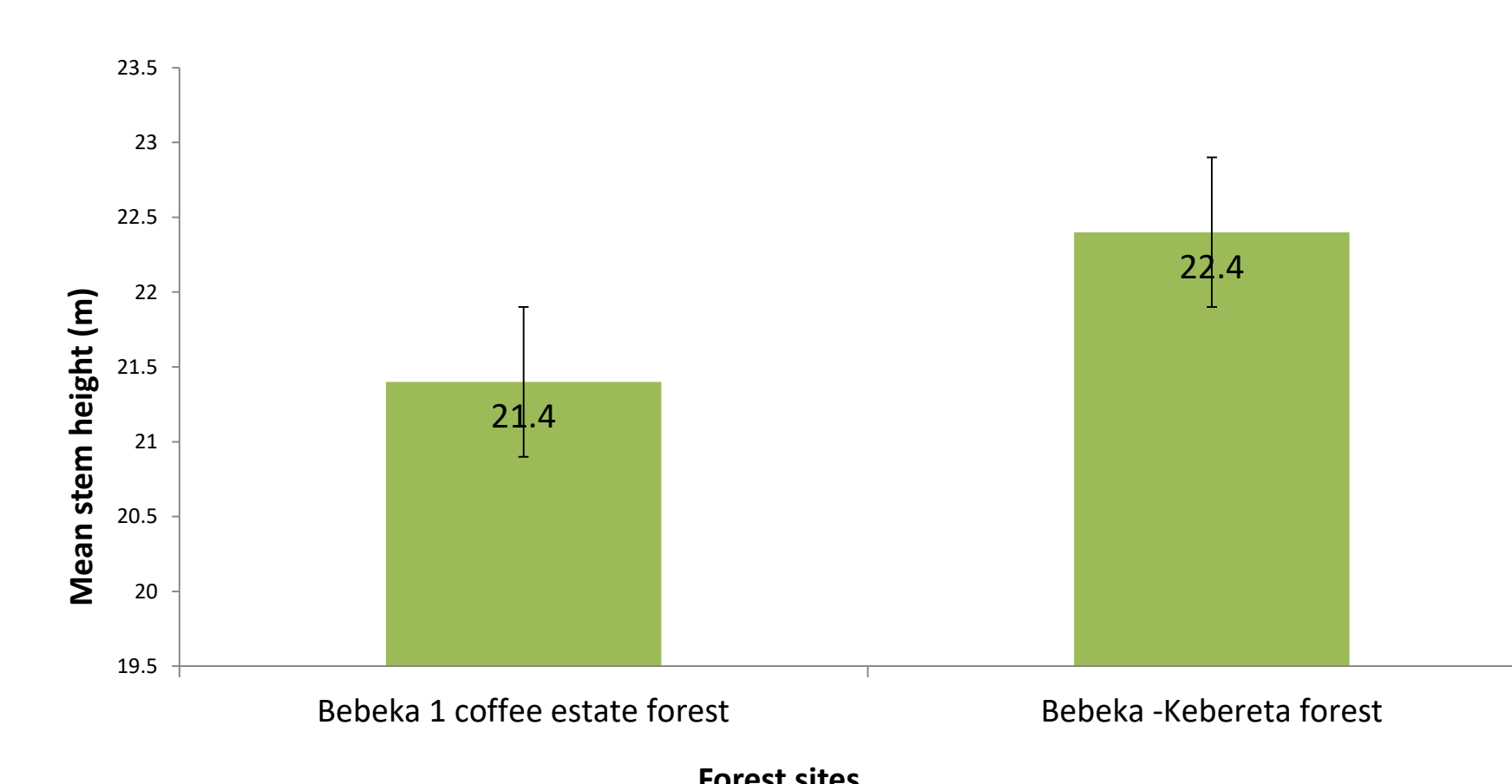

Figure 5. Comparison of mean ($\overline{x}$) and standard error (*SE*) for measurements of stem heights of *Antiaris toxicaria* population

- **Prunus africana** (Iron wood) assessed in five forest ecosystems; Masha-Gora shewi forest appeared to have denser population of *Prunus africana* (150 stem ha-1) followed by Kaho-shemeta forest (130 stem ha-1). According to Agroforestry Database, *Prunus africana* is reported to have 10-24 (36 max.) meters stem height (Orwa *et al.*, 2009).
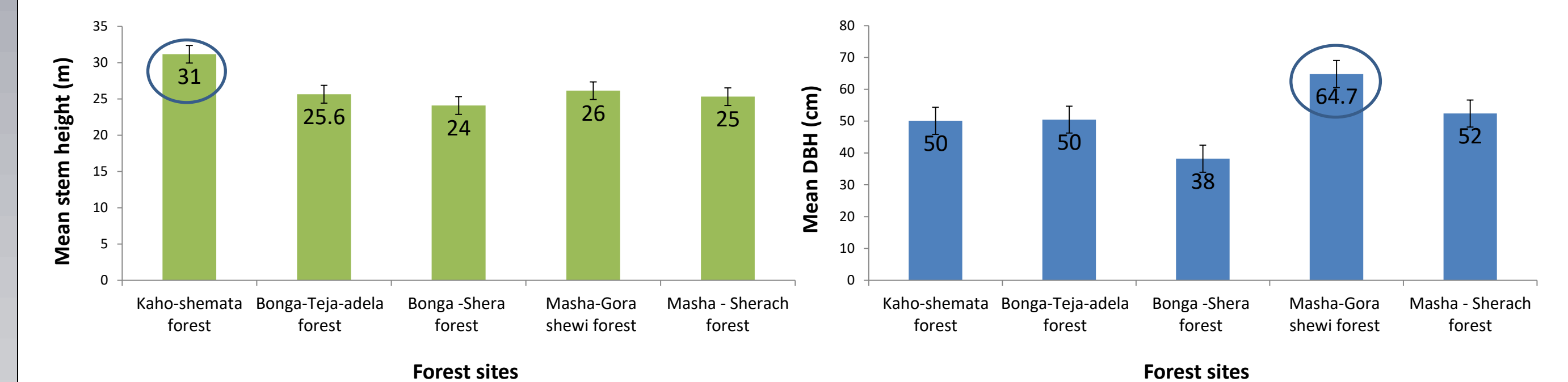

Figure 6. Comparison of mean ($\overline{x}$) and standard error (*SE*) for measurements of stem heights (Left) and DBH (Right) of *Prunus africana* population

Conclusions

Generally*,* Bebeka area forest complex is identified as potential *in-situ* site for domestication and SPA establishment project of *Milicia excelsa, Pouteria adolfi-fridercii* and *Antiaris toxicaria*. On the other hand, Kaho-shemeta natural forest and Bonga-Teja-adela forest are identified as potential *in-situ* site for domestication and SPA establishment project of *Prunus africana*. Therefore, biodiversity conservation institutes, forest and environmental institutes, forest and seed enterprise may refer and use this baseline information for related projects in the study area.

Acknowledgement

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