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# *Paulownia* Tree Planting in Sardinia (Italy) and Its Evaluation for Agroforestry Systems and Sustainable Land Use

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**Abstract:** The work reports about the establishment and the development after two years of a *Paulownia* tree plantation in a large and homogeneous agricultural area, representative as a test site for climate, soil and land use characters of the countryside of Oristano, central Sardinia, Italy. The first results showed that the role assigned to *Paulownia* trees can be a beneficial system leading to a low carbon and high biomass productive agriculture in short time.

**Key words:** Agroforestry, biomass, *Paulownia tomentosa*, Sardinia.

## 1. Introduction

The agroforestry is the integration of trees, crops and livestock on the same area of land and can be applied to all agricultural systems by planting trees on agricultural land or introducing agriculture in existing woodland [1, 2]. Sardinia (Italy) has a traditional heritage of agroforestry systems and a high potential value for innovative modern agroforestry systems that include on environmental strategies and sustainable land use, too [3]. For example, planting *Paulownia* trees could be a beneficial system leading to a low carbon and high biomass productive agriculture in short time, with other specific ecosystems services which include flood mitigation, reduction of diffuse pollution and soil erosion, protection of crops and livestock against climatic hazards due to climate change, integrated habitat network and landscape amenities [4-7]. For these main objectives, it appears an essential prerequisite to identify good practices operating in different situations from specific cases [8]. So this work reports about the establishment and the development after two years of a *Paulownia* trees plantation in a large and homogeneous agricultural area, representative as a test site for climate, soil and land use characters, of the countryside of Oristano, central Sardinia, Italy (Fig. 1).

## 2. Materials and Methods

The case study concerns plantation of *Paulownia tomentosa* (Thunb.) Steud. established during the autumn of 2009 on agricultural lands, partially covered by mediterranean vegetation dominated by *Cistus* spp.. After the harvesting of vegetation and an intensive cultivation of soil with Mediterranean crops, the plants (1 year bare rooted seedlings) were placed with spacing 3 m × 2.5 m (between and within rows respectively) with density of 1,333 p·ha$^{-1}$. The observations on the survival and some phenotypic traits of trees after two growing season (Figs. 2 and 3) were collected on four random plots regarding as total more than 1 hectare.

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The data have been interpreted by statistic analysis (analysis of variance) and were compared with as much as reported in Refs. [4-12].

## 3. Results

The results regarding the survival and some phenotypic traits of trees after two growing season in all the plots are reported in Figs. 4-6 and in Table 1. The survival rate was 78%, the average value of basal diameter was 4.4 cm, the average height was 2.1 m and the basal area ($G \cdot ha^{-1}$) was 3.04 $m^2$. Plots do not reflect significant differences regarding to each parameters.

**Fig. 1 *Paulownia* tree plantation location.**

**Fig. 2 *Paulownia* trees on the second summer after plantation.**

**Fig. 3 Surveys at the end of the second growing season.**

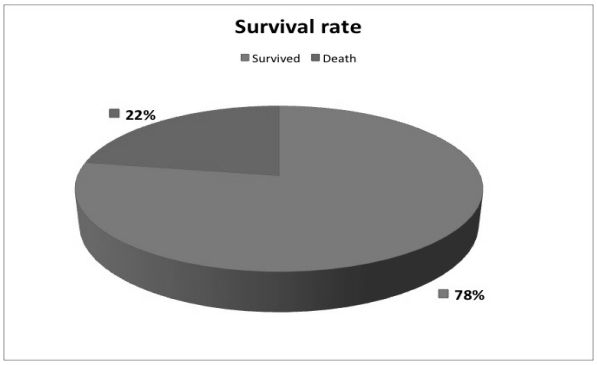


**Fig. 4 Survival rate in all the plots.**

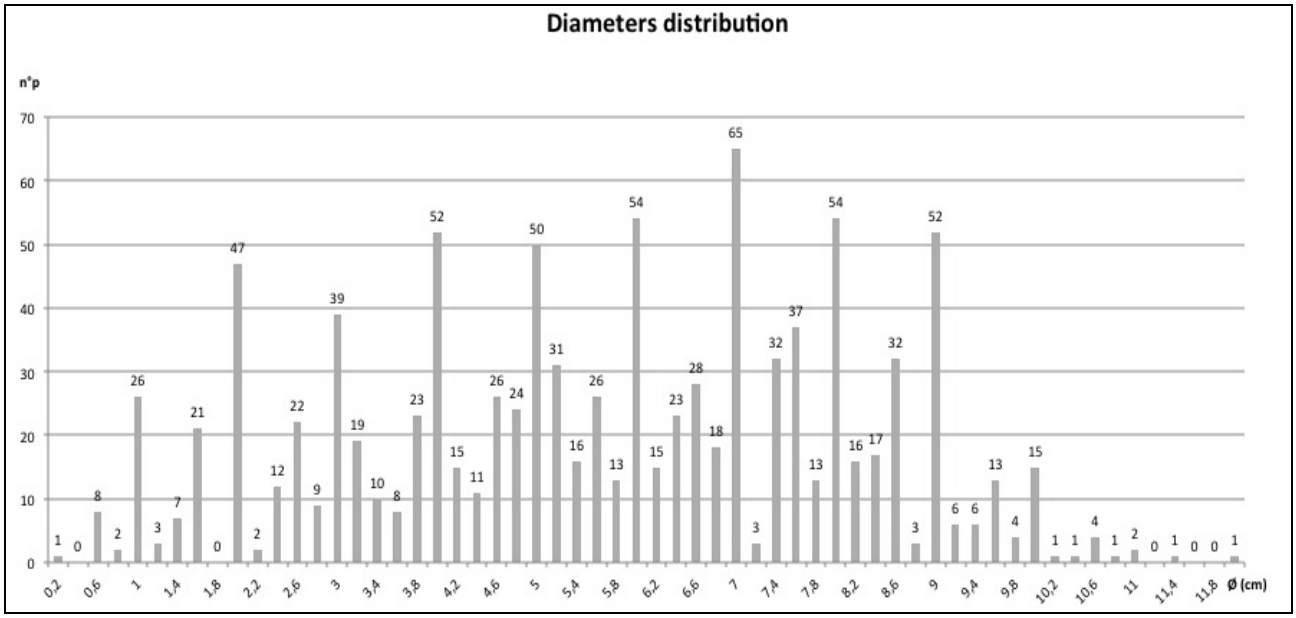


**Fig. 5 Diameters distribution in all the plots.**

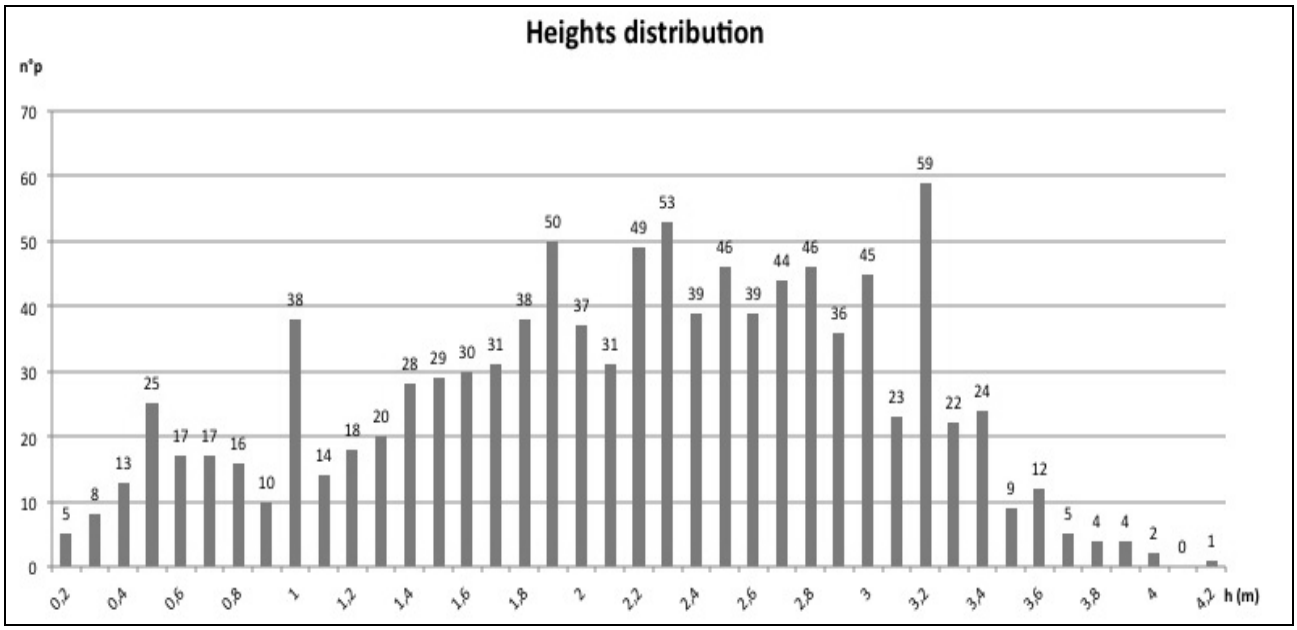


**Fig. 6 Heights distribution in all the plots.**

**Table 1 Average values of surveyed parameters.**

| Density (p·ha$^{-1}$) | Basal diameter (cm) | Height (m) | Basal area (G·ha$^{-1}$ ) |
|---|---|---|---|
| 1,040 | 4.4 | 2.1 | 3.04 |

## 4. Discussion and Conclusions

The establishment and the development of a agroforestry system as a *Paulownia* tree planting in a large and homogeneous agricultural area, representative as a test site for climate, soil and land use characters, in the central Sardinia (Italy), would have favor by the operating practices adopted as in the case study.

The first results show that the role assigned to *Paulownia* tree planting can be a beneficial system leading to a low carbon and high biomass productive agriculture in short time. At the same time, it appears to have high potentiality for other specific ecosystems services which include flood mitigation, reduction of diffuse pollution and soil erosion, protection of crops and livestock against climatic hazards due to climate change, integrated habitat network and landscape amenities that is imperative to evaluate as main objectives, too [4-12].

Data collection of recurrent monitoring will be basic to confirm this role also in the future.

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