

contributing directly to volume index followed by collar diameter (0.206) and number of branches (0.110). Diversity analysis using Mahalanobis-D2 resulted in seven clusters. Genotypes in cluster 2,3,4,5, and 6 have a combination of desirable traits and can be directly selected for further improvement.

**Multipurpose trees as tools for ecosystem services deployment: a case study in Uruguay.** Bennadji, Z. (*Instituto Nacional de Investigaciones Agrícolas (INIA), Uruguay; zbennadji@tb.inia.org.uy*).

This work aims to present the main results of two projects on multipurpose trees as tools for ecosystem services deployment in Uruguay. The projects were executed from 2007 to 2013. The first project included an Internet survey and two national workshops, allowing the identification of a nucleus of forest owners and producers interested in the identification and priority setting of multipurpose trees. The participatory involvement of this target nucleus allowed the identification and priority setting of a native multipurpose tree (*Prosopis affinis* Spreng) and an exotic one (*Carya illinoensis* (Wangenh.) K. Koch). The second project was oriented to the evaluation of the potential of these two species for traditional wood uses: (i) timber, energy, nonwood forest products, and (ii) the exploration of ecosystem services. The main ecosystem services identified were soil restoration and use and conservation of forest genetic resources. A collect of germplasm from all over the country was realized for the establishment of a network of 10 provenances and progenies trials in five national forestry zones. Adaptation and productivity results data at 3 years of age show preliminary trends on seed sourcing and transfer for the two species. Effects on soil properties are under study.

**Sex ratio and status number in progenies test of dioecious tree species.** Cambuim, J. (*São Paulo State University (UNESP), Brazil; josecambuim@yahoo.com.br*), Aguiar, A. (*EMBRAPA, Brazil; ananda.aguiar@embrapa.br*), Zaruma, D., Moraes, M. (*São Paulo State University (UNESP), Brazil; darlin@fca.unesp.br*); *ma\_apmoraes@yahoo.com.br*), Freitas, M. (*Forestry Institute of São Paulo, Brazil; miguellmfreitas@yahoo.com.br*), Moraes, M., Sebbenn, A.

The dioecious trees *Astronium fraxinifolium* and *Myracrodruon urundeuva* occur naturally in some forest fragments of savannahs in Brazil, but are threatened due to agricultural development in the region. To conserve and maintain genetic diversity of the remaining populations of these species, we need information about genetic parameters, mating system, reproductive phenology, and sex ratio. Maintaining a sex ratio of 1:1 can maximize the effective population size. Progeny of two species (*M. urundeuva* and *A. fraxinifolium*) were evaluated for the sex ratio and estimates of the status number [ $N_s = 4 \cdot N_m \cdot N_f / (N_m + N_f)$ ] in Selvíria, Brazil. The design was a randomized complete block with 28 progenies, 4 repeats, and 10 trees per plot in a 1.5 m × 3.0 m spacing. At 19 years of age, male and female trees were evaluated. The sex ratio of the two species was 4:1 (81.3% males and 18.7% females) which deviated from the expected 1:1 ratio. *M. urundeuva* presented 158 females and 685 males and *A. fraxinifolium* presented 158 females and 685 males. The estimated status numbers were 514 and 481 for *M. urundeuva* and *A. fraxinifolium*, respectively. This value is approximately 60% of the census size of each species. Comparing the results from these studies suggests that the progeny test of these species exhibits sufficient genetic variability for long term *ex situ* conservation strategies.

**Effect of silvicultural intensity and spacing on crown architecture of four loblolly pine clones.** Carbaugh, E., Fox, T., Yanez, M. (*Virginia Tech, USA; ecarbaug@vt.edu; trfox@vt.edu; myanez@vt.edu*).

Four loblolly pine clonal genotypes have been established in three contrasting study sites in order to determine whether they retain consistent crown architecture with their respective counterparts at each study site, as well as to assess the effect of silvicultural intensity and spacing deployment on growth and crown architecture. Two of the study sites were established in the United States, one at the Reynolds' Homestead Research Center, VA, the second at Bladen Lakes State Forest, NC, and the third in Parana, Brazil. The study consisted of a split-split-plot design with two silvicultural treatments, four clones, and three spacing deployments. Three trees from each clonal plot were selected in the intermediate spacing of 1 235 trees/ha. On each selected tree, every branch was measured and evaluated for branch height above ground, length, basal diameter, and position relative to stem. The crown architecture for each clone was quantified. Results indicate that crown architecture of individual clones remained consistent among study sites and silvicultural intensity.

**Effect on chlorophyll fluorescence in seedlings of four families of *Pinus leiophylla* under drought and recovery.** Castelán Muñoz, N., Campos García, H., Jiménez Casas, M., Vargas Hernández, J. (*Agricultural Sciences Graduate College, Montecillo, Mexico; nayaritzin@yahoo.com.mx; hcamposg@colpos.mx; marcosjc@colpos.mx; vargashj@colpos.mx*), López Delgado, H. (*National Institute for Agriculture, Forestry and Livestock Research, Mexico; lopez.humberto@inifap.gob.mx*).

The evaluation of the relationship between moisture regimes and plant physiology in phenological stages of development is essential for the proposal of successful reforestation alternatives in regions that suffer from water shortage or where water shortage may increase due to climate change. The variation between seedlings of four families of *Pinus leiophylla* of the seed orchard at the Postgraduate College of Montecillo, Mexico, was determined. These seedlings were submitted to a cycle of drought and subsequent irrigation for recovery. The fluorescence was evaluated four times by JIP analysis parameters using PEA, and the hydric potential ( $\Psi_w$ ) was determined with a Scholander chamber. The test seedlings maintained  $\Psi_w$  close to -0.4 Mpa, while the average  $\Psi_w$  of the seedlings exposed to drought amounted to -2.34 MPa and -3.38 MPa on days 17 and 26 of the cycle and -0.61 MPa on day 17 after recovery. Seedling of the mother from Tlalmananco, Edo Méx., showed a higher abatement of photochemical activity and very little recovery. The seedlings from the family stemming from Santa María Atepetzingo, Puebla, showed early susceptibility to the stress but a better recovery capacity. Seedlings from San Juan Tetla, Puebla, were the least affected, and those from San Rafael, Edo. Méx., had an intermediate response.

**Selection of poplar clones to combat desertification in Inner Mongolia, China.** Cho, W., Kang, H. (*Dongguk University, Republic of Korea; valkyre@naver.com; hdk0225@dongguk.edu*).

The objective of this study was to select poplar clones with enhanced survival rate and potential for advanced growth for combating desertification in Inner Mongolia autonomous region. After establishment of research sites in Inner Mongolia, China,