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## Book of Abstracts



## Effect of coppice management of shrubs associated with cereals on their root dynamics features in dry Western Africa

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To cope with nutrient depletion in poor soils, agronomic strategies have been set up in West Africa by combining traditional annual crops with local shrubs, such as *Guiera senegalensis* or *Piliostigma reticulatum*, which contribute significantly to improve soil fertility. These shrubs are traditionally cut to provide fodder to livestock and let the aerial parts of associated crops, such as millet or sorghum, growing freely. The objective of this study was to evaluate the effect of the management mode of *Guiera* and *Piliostigma* in association with millet and sorghum, respectively, on the dynamics and phenology of shrub roots and the agronomic performances of cereals. An experiment was conducted under natural conditions in Senegal where 6 shrubs of *Guiera*, already well established for several decades, were chosen. Nine young *Guiera* plants were transplanted to characterize juvenile stage. A millet crop has been established per pouch in and near each shrubbery. A similar experiment was installed in Burkina Faso at the same time where 12 shrubs of *Piliostigma*, 6 aged of several decades and 6 transplanted juveniles, were associated or not with sorghum. In both situations, half of the shrubs were coppiced, the other left intact as a control object. Rhizotrons of 1x1m were placed 20cm from each shrub in a vertical position, allowing observation of the roots of the shrubs and cereals between 0 and 1m deep.

The results showed the positive impacts of the shrubs on the aerial phenology of millet and sorghum (earlier heading, flowering and maturation), their growth (millet four times larger, 1.5 times more leaves, 1.8 times more tillers) and their yield (3.8 times more spikes, 3 times more spike biomass and straw). The root dynamics of shrubs are stalled over the rainy season with a very pronounced seasonal variation in all root categories: higher elongation rates in the wet season compared to the dry one. This seasonal variation was observed in both young 1 to 3 year-old plants (0.62 cm/day in the rainy season and 0.36 cm/d in the dry season) and old (0.15 cm/d and 0.13 cm/d respectively the same year). On the other hand, shrub coppicing did not show any significant depressive effect on the average rate of elongation of their roots. However, a 1-month root-growth stop was observed for *Guiera* 1.5 months after cutting, a condition that did not exist in uncut shrubs. In addition, these growth stops correspond exactly to the peak of cereal root growth, a phenomenon observed for the 3 consecutive years.

The coppice management of the shrubs has a positive influence on the phenology, the agro-morphological parameters and yield of millet and sorghum through a better conservation of the physicochemical and biological properties of the soil as well as a good complementarity of root growth providing benefits and sustainability to cereal shrub intercropping in the context of climate change with strong drought constraints.

**Keywords:** *Guiera senegalensis*, *Piliostigma reticulatum*, *Pennisetum glaucum*, *Sorghum bicolor*.