Service species biomass cost and quantification for self-sustainable syntropic agroforestry in Fazenda da Toca, Brazil

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Syntropic agroforestry seeks self-sufficiency and independence from external inputs, producing biomass within the system through service-plants. The study evaluated biomass quantity and cost-benefit in a citrus agroforestry. Management and ecological features were registered in Jan-Oct, 2017. Dry biomass was measured and extrapolated. Management practices were assessed using PDCA. Time-motion study and management costs were combined with biomass weight and translated into monetary costs of tons/ha. Calibration based on seasonality-productivity-intensity was used to calculate system average production along 20 years life-cycle. Components, densities, arrangements, costs and canopy covering are shown in figure 1. Annual dry-biomass weight and calibration are shown in figure 2. Results showed annual production of 25.78 ton/ha of dry biomass, twice superior to the natural deposition in semideciduous seasonal forests in Brazil. Banana was the most cost-effective, due to the easy management and decomposition of its biomass. Grass shows similar cost but occupies 2.5 times more area. Eucalyptus is the most expensive, due to time-consuming apical-pruning and expensive machinery. Qualitative features of biomass are object of ongoing studies. Understanding service-plants and their comparable productive indicators, will help regenerative agroforestry to prevail over monoculture-chemical based plantations, while giving necessary tools to spread large-scale agroforestry models worldwide.

Species	Main Service	Unit / ha	Arrangement	Cycle (years)	Canopy area (m^2)	Covered area / ha	Ton / ha (per year)	Cost / Ton (USD)
(service species used in the citrus agroforestry)	(number of trees per hectare)		in the line x between lines (m)		(total area covered by the summed canopy individual areas)		(calibrated yearly avarage for the system life-cycle)	Management cost of the production of 1 Ton of dry biomass in USD (Sep, 2018)
Brachiaria brizantha	Biomass	100	-	20	-	0.84	15.91	$ 17.50
Musa paradisiaca	Biomass	476	3.5 x 6.0	18	7.07	0.34	5.55	$ 12.50
Eucalyptus urograndis	Biomass	139	12.0 x 6.0	19	12.57	0.17	4.32	$ 57.50

Figure 1. Overall data of biomass production average in the agroforestry citrus system (20 years).

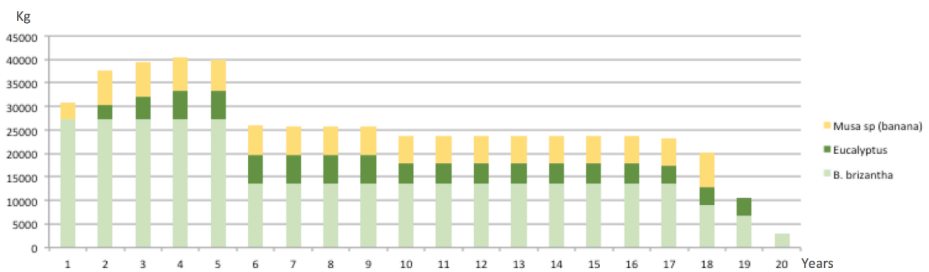

Figure 2. Production per year (in kilograms) of dry-biomass of *Musa paradisiaca*, *Eucalyptus urograndis* and *Brachiaria brizantha during the life-cycle of the system.*

Characterisation and description of the system and general information about biomass production per specie and costs related

Keywords: large-scale agroforestry, regenerative-agroforestry, service-species, syntropic-agroforestry, biomass.

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