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Improved carbonization techniques for rural production of Eucalyptus charcoal in Madagascar: the Arina project approach

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In Madagascar, most people living in towns used charcoal for cooking. The 2 million inhabitants of Antananarivo consume annually 240,000 tons of charcoal, coming mainly from 150,000 ha of old *Eucalyptus robusta* coppices. However, there is a risk of rapid charcoal shortage due to continual decrease in eucalypt stand production, in parallel of the + 4.5% annual population growth rate and the increase in charcoal consumption (+ 210 % between 1993 and 2017). One major concern is the low gravimetric yield ($\approx 12\%$) got with the traditional technique as well as poor charcoal quality. One specific objective of the project ARINA "Integrated Forest Management and Reforestation of Anjozorobe District", part of the EU FED-Program "Agro-Sylviculture autour d'Antananarivo" (ASA, 2015-2019) was then to increase the quantity and quality of charcoal produced in the Analamanga region. The Improved Carbonization Technique (ICT) inherited from 20 year-experience in local development projects, aims at smoothly changing the local practices to enhance ITC acceptance and diffusion by charcoal producers (CP). No additional equipment or investment (e.g. metallic chimney, red bricks) is needed to practice ICT. Harvested stems dry during 3 weeks before being charged in the kiln that is oriented up-wind. These practices as well as *ad hoc* wood stacking, aeration holes or firing point positioning allow to increasing gravitational yield to 20%, with negligible percentage of un-carbonized wood. Moreover, charcoal produced by ICT is denser and much less friable than traditional one. In a first step, CPs recognized by the local communities for their competences are trained to ICT. Thereafter, they train in turn other CPs (> 1500 in total). CPs who master and actually practice ICT receive a specific certificate, as demanded by forestry administration in the next future to produce charcoal. ARINA supports formation of cooperatives of certified CPs that facilitate their members to buy eucalypt standing coppices for their own account, and to look for ITC charcoal buyers in Antananarivo. CPs can therefore generate higher profit (higher quantity of

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charcoal of better quality) than when they apply traditional carbonization techniques and work on behalf of charcoal wholesalers.

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