Soil regeneration for coffee agroforestry

Alana Lea (iGiveTrees) | Paula Ponteli Costa & Valter Ziantoni (PRETATERRA)

Climate change and desertification challenges to coffee production

The Mantiqueira region, in southern Brazil, is suffering the effects of droughts and soil degradation, the state of Minas Gerais is considered to be under desertification process accelerated by climate change. New regenerative production models, which consider soil micro-life restoration, nutrient cycle reestablishment and moisture conservation are needed so that coffee production can thrive under these harsh conditions while eliminating chemical fertilizers and agregating value.

The project implemented

A regenerative and elastic agroforestry system was designed, considering conservative soil management techniques, aiming to maximizing biological nutrient cycling and water retention, improving coffee resilience on drought slope zones in Monte Sião, MG, Brazil. Final model with explained arrangements and units is shown in illustration 1.

The ancestral method

For soil life regeneration, and water and nutrients retention, an ancestral method based on Anthropogenic Dark Earth formation was employed, mainly based on charcoal and sawdust deposition. High nitrogen fixer species were selected for alley green manure. Selection and arrangement of species considered succession, stratification, shade tolerance, treetop architecture, permeability, lifecycle, root depth, nutrition and water need. Agricultural and forestry crops are *Macadamia ternifolia*, *Coffea arabica* - Catucaí 2SL (perennial crops) and *Toona ciliata* (timber), *Musa paradisiaca* (short-cycle crop), and *Inga vera* (nitrogen-fixing, biomass-producing service species). A seed-mixture for alley biomass enrichment was composed using *Urochloa brizantha*, *Cajanus cajan*, *Helianthus annus*, *Pennisetum glaucum* and *Crotalaria spectabilis*. Soil management and mulching method was established using a regenerative mix for nutrional ferlilizing purposes, charcoal residues and ashes for raising soil CEC, coffee rusks + poultry manure (12% N) and eucalyptus sawdust for soil covering. All attributes of the design were systematized (quantitative and qualitative variables).

Illustration 2. No-tillage conservative soil management during plantation, only subsoiling along planting lines.

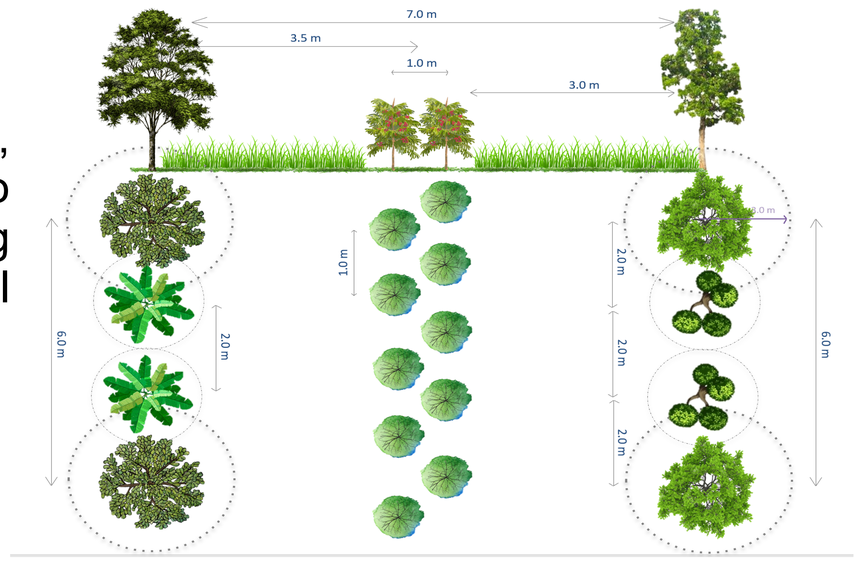
PRETATERRA © 2019

Illustration 3. Lime, ashes and charcoal added along subsoiled planting lines.

PRETATERRA © 2019

Illustration 4. Coffee Agroforestry implemented after 10 months.

PRETATERRA © 2019



Main System	
Species	Plant / ha
Coffea arabica (Catucaí 2SL)	2857
Toona ciliata	119
Macadamia integrifolia	119
Musa sp.	238
Inga vera	238

Green manure	
Species (seeds)	kg/ha
Cajanus cajan	30
Helianthus annus	20
Pennisetum glaucum	10
Crotalária spectabilis	10
Urochloa brizantha	30

Fertilizer	
Product	Kg/ha
Agricultural lime	893
Agricultural Gypsum	400
superphosphate simple	893
Fertilizer 10:10:10	179

Soil cover	
Element	Ton/ha
Charcoal / Ashes	3
Poultry Manure + coffee husk compost	30
Eucalyptus sawdust	12

Illustration 1. Agroforestry design, and general quantitatives os the system. PRETATERRA © 2019

Results & Conclusions

With a cost of USD 6,316 / ha, the first 1 hectare was implemented in November, 2018 in the Farm "Café dos Contos" as a demonstrative model for local farmers, and entrepreneurs. Design, planning and economic analysis of agroforestry systems are fundamental for investment acceptance while integrated systems diversify revenues and maximize cash flow. Designing an elastic and highly acceptable agroforestry model for Mantiqueira coffee-based agriculture, will drastically improve soil conservation and crop resilience, while building a new sustainable productive paradigm.

Contact

iGiveTrees - USA
www.igivetrees.org

PRETATERRA - Brazil
apretaterra@gmail.com