91. Introducing a legume cover crop in rubber plantations is not necessarily an option for their sustainability in dry areas

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Rubber plantations (Hevea brasiliensis) are expanding in areas with low soil fertility, long dry seasons, and high risks of soil erosion in rainy seasons. The introduction of a N_2 fixing legume cover crop in the interrows of the tree plantation might reduce runoff, soil erosion and increase the availability of nutrients and the growth of young trees. This study aimed at quantifying over a four year period (2007-2010), the impacts of a legume cover crop (Pueraria phaseoloides) to N nutrition, water status, and growth of young rubber trees planted along a toposequence with contrasted soil depths in north-east of Thailand.
The biomass production and N released by the legume reached 8 $Mg.ha^{-1}y^{-1}$ and 240 kg N. $ha^{-1}y^{-1}$ respectively. The N_2 fixation rates of the legume averaged 81% and N transfer from the legume to the rubber tree was also high; an average of 58% of tree leaf N was derived from atmosphere. Both variables were not significantly different along the toposequence. At the bottom of the toposequence, the combined improvement of nitrogen and water status of the trees in the rubber tree/cover crop system resulted in doubling the tree girth at seven-year age. At that position, the root profiles and soil water dynamic suggested that the cover crop allowed the rubber tree roots to tap water from deep soil layers during severe drought periods. Conversely, at the top of the toposequence where water was not available at depth, the legume had negative impacts on tree ability to survive intense drought.
It is concluded that improving N nutrition of young rubber trees in marginal area could affect their resilience to drought. In a context of climate change, the questions of where and how the best trade-off between N and water nutrition of crops could be achieved would concern more and more areas.