The conditions for RAS (Rubber Agroforestry Systems) to emerge? Income diversification and positive environmental externalities for a better farm resilience.

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Background Some countries have historically developed rubber agroforestry practices: Indonesia, Thailand, Malaysia (as jungle rubber, or later in Sri Lanka, China and India,. Other countries rely entirely on monoculture (Cambodia, Vietnam, Ivory Coast.....). Historically, jungle rubber was the first rubber cropping system very adapted to local conditions in Southeast Asia but with a low productivity (500 kg/ha/year). Since the 1980's Rubber Agroforestry Systems (RAS) are clone based RAS with a high rubber productivity (1300-1800 kg/ha/year) that replace gradually jungle rubber in Indonesia or are being developed beside monocultures. Objective The objective is to understand why some farmers have adopted agroforestry practices and identify what are the cultural, socio-economic, technical and political conditions necessary for such development. Methods We explored the existing bibliography in the top ten rubber producing countries and try to find genericity of RAS development. Results From 1910 to the 1970's, jungle rubber was widely adopted by poor farmers (no improved planting material nor inputs) in Southeast Asia. The implementation of rubber development projects brought in clonal planting material. Low productivity triggered the end of jungle rubber and boosted RAS development with clonal rubber associated with fruits, timber trees, vegetable, spices, Tea or resins such as Gaharu. Although rubber monoculture became the main rubber cropping system in many countries, some farmers reintroduced agroforestry practices in their rubber plots. Social role of agroforestry products, income diversification and positive externalities on soil, water and biodiversity were the main reasons for RAS adoption thanks to markets access (fruits in Thailand) and the great facility of rubber to be associated with other trees. In countries with no RAS history and where the development of the rubber smallholder sector was strongly linked to the agro-industrial plantations (Cambodia, Ivory Coast), monoculture remains the main cropping pattern preferred by extension, research and privates estates. However most farmers with cocoa plot do know about agroforestry practices. Most farmers therefore have no incentives, needs nor previous knowledge on rubber agroforestry systems and they go on with rubber monoculture. Discussion The main question is how can we boost RAS development knowing that specific socio-economic and political conditions are required. Conclusion Knowledge about local contexts and historical conditions of emergence are key elements to boost and promote RAS further development. New tools need to be developed and used to encourage the adoption of RAS.