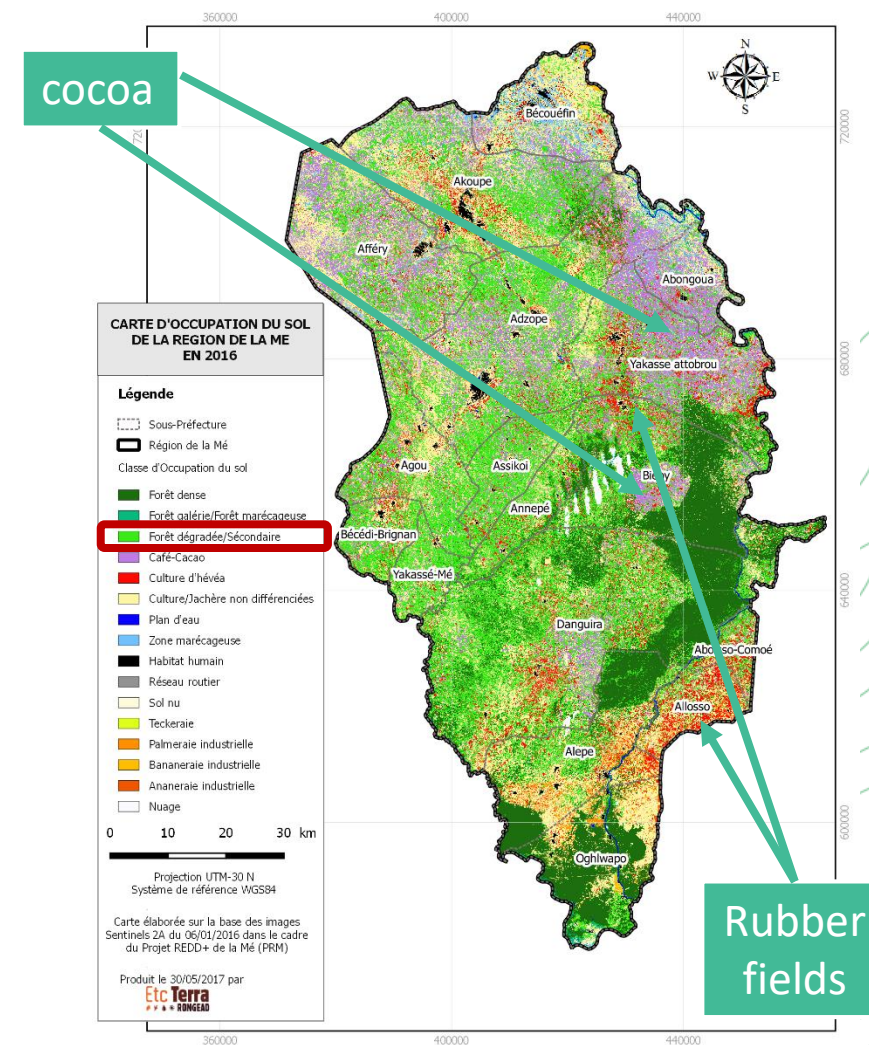


A new Payment for Ecosystem Services in organic cocoa agroforestry systems in Ivory Coast

VAUDRY R., ETTIEN R., RULLIER N., GARNIER B., NOURTIER M. & RABANY C.

Context – deforestation and cocoa in Ivory Coast

- Ivory Coast : 1st world producer of cocoa (*Theobroma cacao*)
- Cocoa, historically the main cause of deforestation (~150 000 ha/yr) in Ivory Coast¹
- Study area: Mé Region
 - Deforestation and forest degradation due to cocoa
 - Conversion of cocoa field to rubber ones
 - Mainly degraded forests (*light green – 31% of the region*)



Context – deforestation and cocoa in Ivory Coast

- Classic succession in the study area : from dense forests to rubber field through cocoa fields



Dense forest: 120 000 ha



Cocoa field (full sun):
100 000 ha



Old cocoa field/fallow/
degraded forest: 245 000 ha



Rubber field (*Hevea
brasiliensis*): 55 000 ha

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- Objectives: stop conversion from forest or agroforestry to monospecific fields + promote agroforestry (forest tree cover and diversity)

Objective and strategy of the PES

- Objectives: **stop conversion from forest or agroforestry to monospecific fields + promote agroforestry** (forest tree cover and diversity)

Agroforestry PES

for the **keeping of forest trees** in the old cocoa field

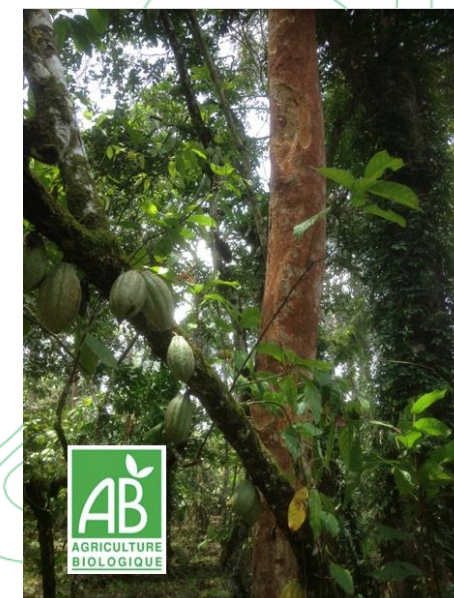
+

Organic PES

for organic cocoa cultivation
(usually no chemical treatment in old cocoa fields with low valorization)

- premium price from the purchaser
- give additional value to low productive cocoa fields (sometimes abandoned)

- Collaboration between private sector (purchaser) + NGO (technical support and identification of producers) + local farmers cooperative



Objective and strategy of the PES

- Objectives: **stop conversion from forest or agroforestry to monospecific fields + promote agroforestry** (forest tree cover and diversity)
 - **Agroforestry + organic PES**
 - Collaboration between private sector + NGO + local farmers cooperative
- PES should be effective
 - If spatial target is clear + conditionality for payment is well monitored + farmers are differentiated (Ezzine-De-Blas et al., 2016¹)
 - Premium price for organic production show its effectiveness worldwide
 - example of positive trade of between organic certification for cocoa and diversity of shade tree (Jacobi et al., 2014²)

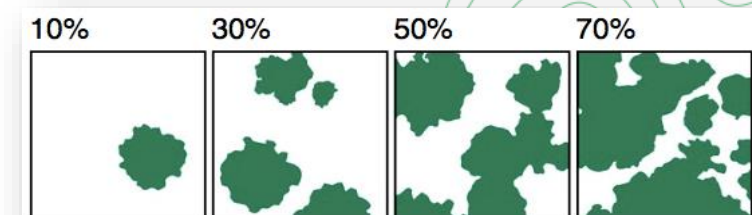


¹Ezzine-de-Blas D, Wunder S, Ruiz-Pérez M, Moreno-Sanchez RdP (2016) Global Patterns in the Implementation of Payments for Environmental Services. *PLoS ONE* 11(3)

²Jacobi et al., 2014. Carbon stocks, tree diversity, and the role of organic certification in different cocoa production systems in Alto Beni, Bolivia. *Agroforest System*, vol. 88.

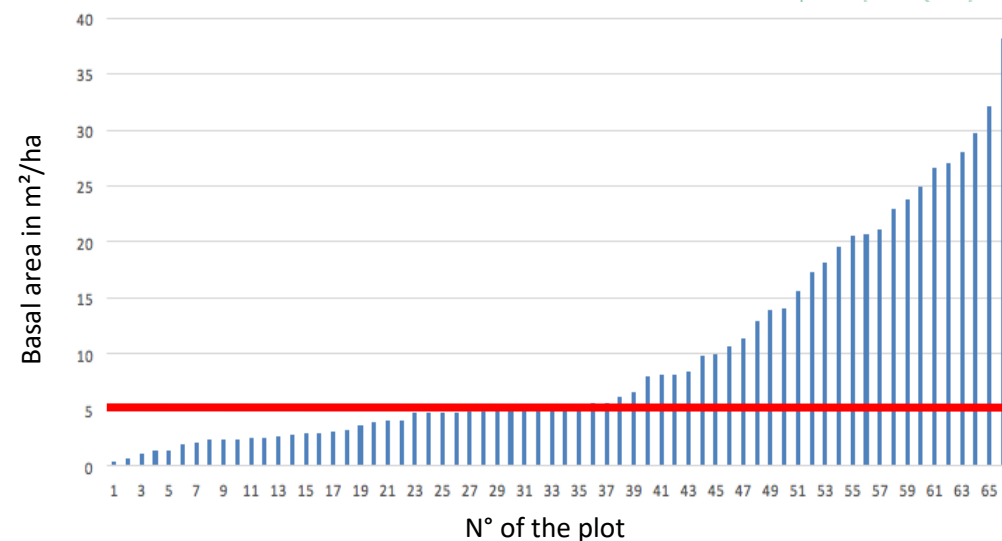
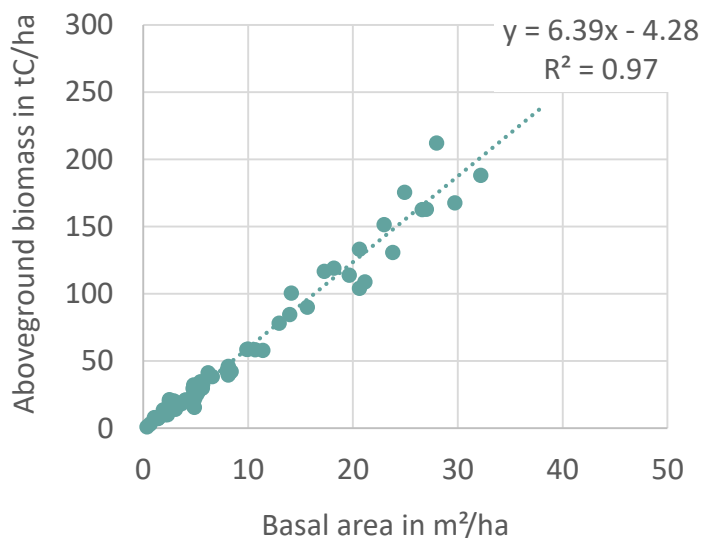
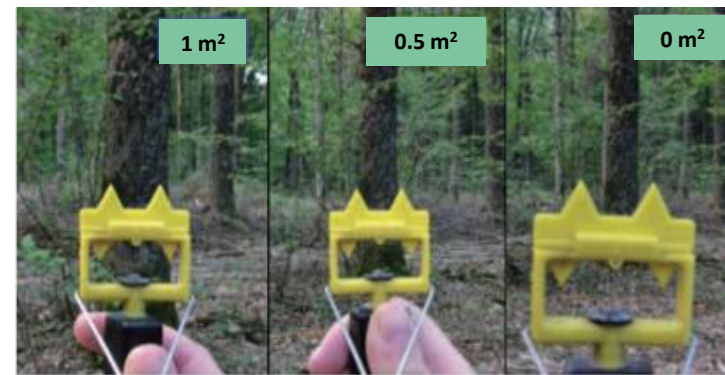
Implementation of the PES

- Organic cocoa :
 - Classic certification of organic production
 - Certification in response to the demand and engagement of a purchaser:
 - Purchase and price guaranteed before engaging the cost of certification → **no risk for the producer**
 - Technical support from the NGO (Nitidæ) to adapt crop management techniques in order to maximise yields and labor productivity in this context
- Agroforestry: what to measure to be simple and understandable for the producer & purchaser ?
 - Measurements have to remain simple to be repeated each year
 - Based on carbon stocks of forest stratum (easier to measure than tree cover)
 - Biodiversity index (Shanon) for the 1st year in the program for information
 - Measurements realised by the NGO as technical support



Implementation of the PES

- Agroforestry: measurements have to remain simple to be repeated each year
 - Based on carbon stocks of forest stratum
 - Basal area (quick measurement on the field) as a proxy of carbon stocks (estimated with Chave et al. (2014) allometric equation)
 - Definition of a minimum threshold for the payment



Results of the PES

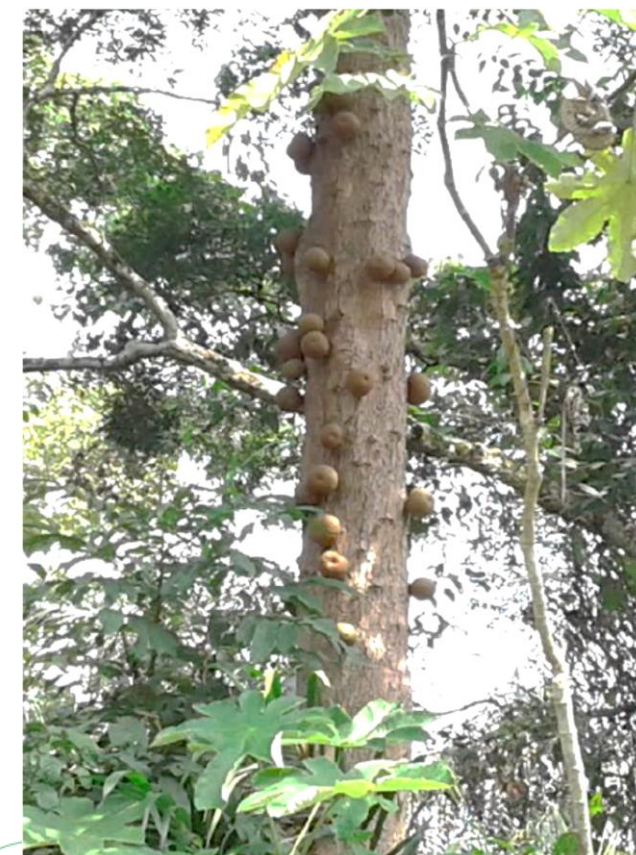
- Much lower yields but compensated by price compared to an average production in Ivory Coast
 - Evaluation of the labor productivity needed
 - Fair valorization of low productive cocoa fields

1250 FCFA for the producer + 150 FCFA for the cooperative

price in the project	FCFA/kg	€/kg
basic price for cocoa	750	1.14
agroforestry bonus	100	0.15
organic & fair trade bonus	400	0.61

	mean yield kg/ha/an	standard deviation kg/ha/an	price		potential value of cocoa production	
			FCFA/kg	€/kg	FCFA/ha	€/ha
standard cocoa production in Ivory Coast	500		750	1.14	375 000	572
good production full sun in Ivory Coast	800		750	1.14	600 000	915
agroforestry and organic fields in the project	275	133	1 250	1.91	344 288	525

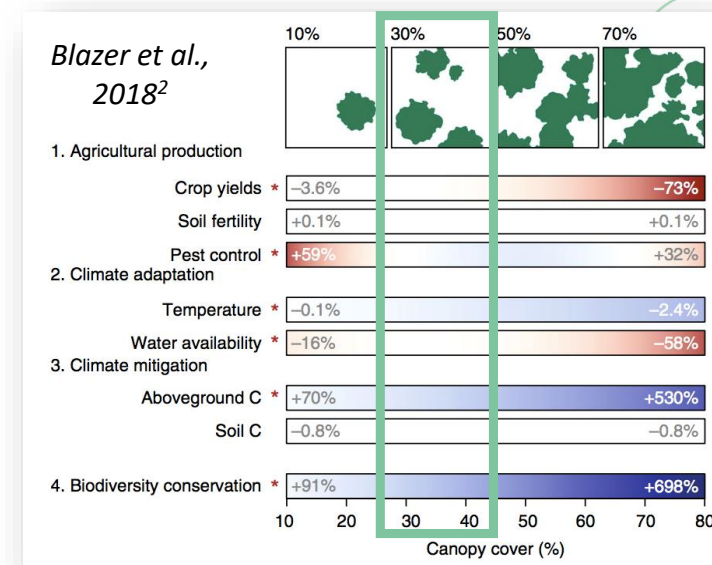
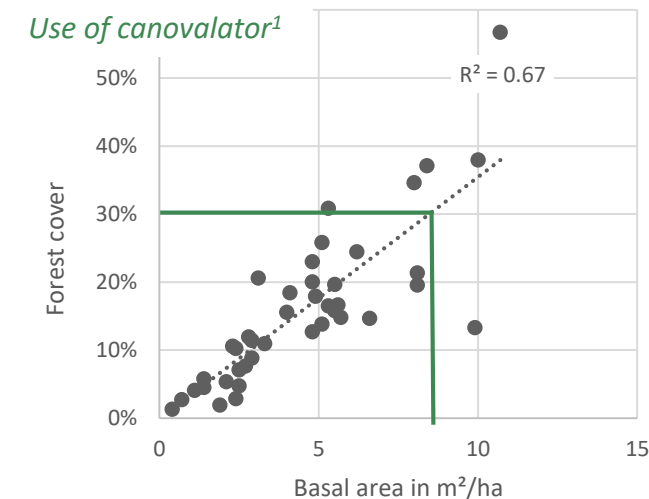
- Stocks C of the tree stratum (average):
 - **113 tC/ha** (AGB+BGB – Allometric equation: Chave et al., 2014¹)
- Biodiversity
 - **128 species** (21 on the IUCN red list)
 - **Shanon index: 2,44**



Discussion

- 1st year of implementation
 - **25% of households would have converted** old cocoa fields to rubber ones without the PES (survey done in 2018)
 - Better definition of the basal area threshold: **8 m²/ha to correspond to at least 30% of forest cover**
- Valorization of biodiversity in the plots
 - 98% of **tree species with local use**: timber, food, medicine or handicraft → support of the NGO for market structuration
 - New forest code: valorization of timber with land tenure certification ?
- Attention to the location of fields in order to not include those from recent deforestation

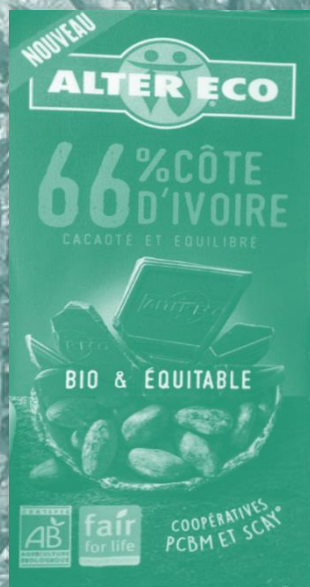
Incentives to increase forest cover



¹ <http://www.mightyearth.org/launch-of-agroforestry-app-canoalator/canoalator-french-canopy-cover-calculator-2/>

² Blazer et al., 2018. Climate-smart sustainable agriculture in low-to-intermediate shade agroforests. *Nature Sustainability*, vol. 1, pp 234–239

Thank you for your attention



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