Certified sustainable forest and life cycle management to support the implementation of an ecosystem service-based crediting mechanism

Research context

- International certification schemes already exist to ensure that sustainable practices are implemented in forest restoration and conservation interventions
- Most popular examples of those schemes are the Programme for Endorsement of Forest Certification (PEFC) and the Forest Stewardship Council (FSC)
- Both PEFC and FSC allow the quantification and monitoring of Ecosystem Services (ES), but with different perspectives, creating market uncertainty and biases
- Environmental crediting based on ES is a promising solution to ensure a compromise between the need to protect and conserve natural capital, and the market demand to make business and earning out of (forest) ecosystems
- We illustrate and test here the implementation of a new crediting system to support the recovery and sustainable management of thousands of hectares in Italy owned by Catholic Church; developed credits are called "Laudato Si'" (CLSi')

CLSi' calculation framework: parameters and rationale

1. Forest property under active management (*a*), in ha
2. Non-owned but actively managed forest (*b*), in ha
3. Income associated with the sale of timber extracted through improvement operations (*P*), in €
4. Costs for certification of ecosystem services (*C5*), in €
5. Costs for implementing the farm forestry plan and its management (*C5*), in €
6. Costs of forestry companies for interventions deducting the value of timber (*C5*), in €
7. Costs for administration and taxes (*C5*), in €
8. Costs for producing the paper and digital certificate (*C5*), in €
9. % increase in earnings to be sent to the Central Institute S.C. (*Δ%*), cross-ref. to n.15
10. Total duration of the active management and time span of intervention (T_n), in years (*n* = 5)
11. Annual maintenance cost of new trails and other generated infrastructure (*A1*), in €
12. Annual cost of auditing for certification (*A2*), in €
13. Annual cost of administrative and technical management, marketing and communication (assumed = 2% of implementation costs) (*A3*), in €
14. Rental or other management cost per *b* (*B*), in €
15. Profit to be sent to the Central Institute S.C. for clergy sustenance, health insurance for priests and energy efficiency of I.D.S.C. properties (*U*), assumed to be = 10% of total costs, in €
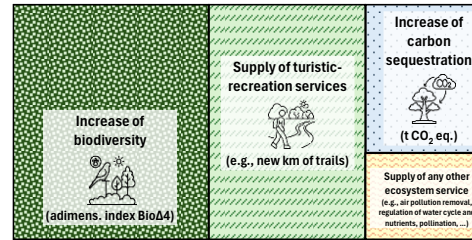
Components of the *Credit Laudato Si'*

Case study results and interpretation

- CLSi' are quantified for three pilot areas of the Institute for the Support of the Clergy (I.D.S.C.) of Asti, in the Region of Piedmont, Italy
- The environmental cost-benefit balance in Box 1 represents the credits calculation model, based on combination between life cycle benefits and costs of forest interventions and future management
- Possible model improvements concern the biophysical assessment of the ES as a basis for a more representative and non-market influenced valuation model
- The I.D.S.C. is currently investigating strategies to sell credits according to principles of sustainable forest management and intervention (focus on biodiversity and recreational/social services, rather than 'just' carbon uptake)

Intervention areas and location		ES* of priority for interventions according to a PEFC-based forest management plan	Average C uptake, from on-site surveys (t CO₂/yr)	*Una Tantum* earnings (*P*)	Sub-total *Una Tantum* costs (= Σ *C5ᵢ*)	Sub-totale annual costs, from 2nd year (= *A1+A2+A3*)	Total income for forest owners, excluding earnings (= *U*)	N_{CLSi} over project duration (T_n = 5 yrs)	N_{CLSi} over project duration, per hectare (T_n = 5 yrs)	Average value of the CLSi' per ha
AREA 1 (4.46 ha)	Municipality of Albugnano (AT), next to "Abbazia di Vezzolano"	· PRES: n/a · MRES: enhancement of biodiversity · CUES: recreational and educational services	0.00	7,848 €	78,780 €	86,628 €	9,376 €	2063	463	23,125 €
AREA 2 (1.12 ha)	Municipality of Albugnano (AT), next to "Monastero del Ruf"	· PRES: n/a · MRES: enhancement of biodiversity; increase of carbon stock · CUES: n/a	21.80	1,082 €	23,103 €	24,207 €	2,502 €	550	491	24,575 €
AREA 3 (4.48 ha)	Municipality of Silvano d'Orba (AL), next to "Santuario di San Pancrazio"	· PRES: n/a · MRES: enhancement of biodiversity · CUES: n/a	14.30	5,225 €	24,235 €	29,474 €	3,101 €	682	152	7,614 €
Aggregated indicators (for 10.06 ha = *a*)			**36.10**	**14,155 €**	**126,118 €**	**140,309 €**	**14,979 €**	**3295**	**328**	**16,379 €**

* Ecosystem Services (ES) from CICES taxonomy: PRES (Provisioning services); MRES (Regulation & Maintenance services); CUES (Cultural services)

Further info: https://oxygenmap.green/

Box 1

Total project implementation costs   Profits for the I.D.S.C. (variable parameter, 10% of the costs)

$$Y = \Sigma\ C5_i + \left[(A1 + A2 + A3 + B) \times T_n\right] \qquad\qquad U = Y \times \Delta\%$$

Number of generated credits per unit of area $N_{CLSi'} = (Y + U - P) / 50$, where 50 (euro) is assumed as hypothetic environmental credit cost parameter set by the I.D.S.C. on the basis of a market price analysis of carbon credits.

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