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Economic valuation of ecosystem services in multifunctional agroforestry: implications of diversified systems for productive and resilient farming

Authors

Albert Miquel Colom Bauza^{1*}, Vaibhav Pradip Chaudhary¹, Willem Van Colen², Paweł Radzikowski^{3, 4}, Tom Staton⁵, Rosy E. Scholes⁵, Julia Cooper⁶, Will Simonson⁶, Colin R Tosh⁶, Bhim Bahadur Ghaley¹

¹Department of Plant and Environmental Sciences, University of Copenhagen, Højbakkegård Alle 30, 2630 Taastrup, Denmark

²Inagro vzw, Ieperseweg 87, 8800 Rumbeke-Beitem, Belgium

³Department of Agroecology and Economics, Institute of Soil Science and Plant Cultivation - State Research Institute (IUNG-PIB), Puławy, Poland

⁴Polish Agroforestry Association (OSA), Puławy, Poland

⁵School of Agriculture, Policy and Development, Earley Gate, University of Reading, Reading, RG6 6EU, UK

⁶Organic Research Centre, RSK ADAS Ltd, Spring Lodge, 172 Chester Road, Helsby, Cheshire, WA6 0AR, UK

*Corresponding author, amcb@plen.ku.dk

Table 1. Ecosystem services (ES) valuation methods and prices used in the study.

Ecosystem service category	Biophysical indicator	Unit ES*	Valuation method	Price (€/unit)	Reference
Provisioning ES					
Food and fodder	Grain yield	Kg	Market price: grain for human consumption. Prices adjusted to organic management	Malting barley, inorganic: 0.24 Organic premium: +58% (breadmaking common wheat) Malting barley, organic: 0.38	Eurostat: https://ec.europa.eu/eurostat/databrowser/view/apri_ap_crpouta_custom_18694651/default/table Organic premium: https://agridata.ec.europa.eu/extensions/DashboardPrice/OrganicPricesTrends.html AHDB: https://ahdb.org.uk/cereals-oilseeds/ex-farm-prices-summary
	Grass yield	Kg	Market price: hay grass for fodder. Prices adjusted to organic management	Average meadow hay: 0.13 Organic premium: +27% (feed rye) Organic meadow hay: 0.16	AHDB: https://ahdb.org.uk/dairy/hay-and-straw-prices Eurostat: https://ec.europa.eu/eurostat/databrowser/view/apri_ap_ina_custom_18678981/default/table?lang=en Organic premium: https://agridata.ec.europa.eu/extensions/DashboardPrice/OrganicPricesTrends.html
	Fruit/Nut yield	Kg	Market price: fruits/nuts	Average: 2.04	https://ec.europa.eu/eurostat/databrowser/view/apri_ap_crpouta_custom_18694651/default/table

				*1.485 (peaches and others average) Average organic: 3.04	Organic premium: https://agridata.ec.europa.eu/extensions/DashboardPrice/OrganicPricesTrends.html
Wood biomass	Wood yield	Kg	Market price: woodchips	9.25 €/MJ Calorific value: 12.5 MJ/kg = 0.12	https://www.google.com/url?sa=i&source=web&rct=j&url=https://www.argusmedia.com/-/media/project/argusmedia/mainsite/english/documents-and-files/sample-reports/argus-biomass-markets-report-sample.pdf&ved=2ahUKEwix04CT-smQAxWRGRAIHZA0PCYQ1fkOegQIBhAC&opi=89978449&cd&psig=AOvVaw3Jp3gt_lUu7UfL3ITlAxiw&ust=1761846054324000 Calorific value: https://www.forestresearch.gov.uk/tools-and-resources/fthr/biomass-energy-resources/reference-biomass/facts-figures/typical-calorific-values-of-fuels/#:~:text=Table_title:%20Typical%20calorific%20values%20of%20fuels%20Table_content:,%7C%20Energy%20density%20by%20volume:%203%2C100%20%7C
Regulating ES					
Soil erosion	Soil loss by water	tonnes	Replacement cost: agricultural topsoil	56.8 (average)	https://doi.org/10.1002/gch2.202400336

Water holding capacity	Effective precipitation	m3	Avoided cost: water for irrigation	0.6 (median)	https://watereurope.eu/wp-content/uploads/2024/10/Water-Europe_Final-Report_15102024-1.pdf
Nutrient mineralisation	Potentially mineralizable nitrogen	kg N	Avoided cost: mean N levels in typical inorganic fertilisers	1.05	AHDB: AN – UK produced (34.5% N), AN – imported (34.5% N), Granular Urea - standard specification (46% N), UAN (30% N w/w kg per 100kg), Nitrate Sulphur (27N + 30-37SO3) https://ahdb.org.uk/GB-fertiliser-prices Eurostat: Sulphate of ammonia, Ammonium nitrate (26% N) (in sacks), Ammonium nitrate (26% N) (in bulk), Ammonium nitrate (33% N) (in sacks), Urea https://ec.europa.eu/eurostat/databrowser/view/apri_ap_ina_custom_18678981/default/table?lang=en
Soil formation	Net earthworm cast production	tonnes	Avoided cost: compost	10.1	https://www.compostnetwork.info/wordpress/wp-content/uploads/ECN-rapport-2022.pdf
Carbon sequestration	Carbon in SOM stocks,	tonnes	Market price: voluntary carbon credits	53.19	Mean of values https://files.unsdsn.org/SDSN%20SWG%20Report%202023_Final_upd10_2023.pdf
	Carbon in above- and belowground tree biomass	tonnes	Market price: voluntary carbon credits		