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Analysis of the propensity of Italian and German forest owners towards forest certification for ecosystem services

*Emanuela Lombardo**

Department of Agricultural, Food and Forest Sciences, University of Palermo, Palermo, Italy

**Corresponding author: emanuela.lombardo@unipa.it*

Electronic Supplementary Material (ESM)

The authors are fully responsible for both the content and the formal aspects of the electronic supplementary material. No editorial adjustments were made.

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Table S1. General characteristics of the company/entity and respondents

Country	Distribution of entities	Percentage
Germany	Baden-Wuerttemberg	24.3
	Bavaria	15.7
	Rhineland-Palatinate	14.3
	North Rhine-Westphalia	11.4
	Hessen	8.6
	Saxony-Anhalt	5.7
	Lower Saxony	5.7
	Brandenburg	4.3
	Thuringia	4.3
	Saxony	2.9
	Mecklenburg-Vorpommern	1.0
	Saarland	1.0
	total	100.0
Italy	Friuli-Venezia Giulia	34.0
	Veneto	28.0
	Trentino-Alto Adige	11.0
	Lombardy	10.0
	Tuscany	6.0
	Emilia-Romagna	2.0
	Piedmont	2.0
	Sardinia	2.0
	Calabria	1.0
	Lazio	1.0
	Liguria	1.0
	Umbria	1.0
	total	100.0
Country	Forest types	Percentage
Germany	mixed deciduous and coniferous forest	47.8
	coniferous forest	17.0
	broadleaf forest	24.0
	n/a	11.2
	total	100.0
Italy	mixed deciduous and coniferous forest	36.0
	coniferous forest	21.0
	broadleaf forest	43.0
	total	100.0
Country	Legal form	Percentage
Germany	individual enterprise	21.1
	another form	78.9
	total	100.0

Table S1 to be continued

Country	Legal form	Percentage
Italy	individual enterprise	26.5
	another form	73.5
	Total	100.0
Country	Type of forest ownership	Percentage
Germany	private	28.2
	public	71.8
	total	100.0
Italy	private	59.0
	public	41.0
	total	100.0
Country	Total forest area (ha)	Percentage
Germany	up to 100	11.3
	from 101 to 300	8.5
	from 301 to 1 000	28.2
	over 1 000	52.1
	total	100.0
Italy	up to 100	32.5
	from 101 to 300	12.0
	from 301 to 1 000	20.5
	over 1 000	34.9
	total	100.0
Country	Main distribution channels	Percentage
Germany	direct sale	28.2
	processing industries	56.3
	other	15.5
	total	100.0
Italy	direct sale	61.4
	processing industries	18.1
	other	20.5
	total	100.0
Country	Adopted certifications	Percentage
Germany	FSC	5.6
	FSC, PEFC	28.2
	PEFC	66.2
	total	100.0
Italy	FSC	16.9
	FSC, PEFC	24.1
	PEFC	59.0
	total	100.0
Country	Main production types	Percentage
Germany	timber for industry	74.7
	other functions	12.7
	wood for energy	9.8
	n/a	2.8
	total	100.0

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Table S1 to be continued

Country	Main production types	Percentage
Italy	timber for industry	53.0
	other functions	15.6
	wood for energy	3.6
	n/a	27.7
	total	100.0
Country	Number of employees in the business	Percentage
Germany	< 50	88.7
	between 50 and 250	4.2
	more than 250	7.05
	total	100.0
Italy	< 50	95.2
	between 50 and 250	4.8
	more than 250	0
	total	100.0
Country	Main destination markets	Percentage
Germany	domestic market	95.8
	foreign market	4.2
	total	100.0
Italy	domestic market	86.7
	foreign market	13.3
	total	100.0
Country	Average company turnover	Percentage
Germany	≤ 2 million EUR	76.1
	between 2.1 and 10 million EUR	12.7
	between 10.1 and 50 million EUR	11.2
	n/a	–
	total	100.0
Italy	≤ 2 million EUR	79.5
	between 2.1 and 10 million EUR	4.8
	between 10.1 and 50 million EUR	–
	n/a	15.7
	total	100.0
Country	Years of experience in the forestry	Percentage
Germany	from 1 to 15 years	19.7
	from 16 to 30 years	18.3
	over 30 years	31.0
	n/a	31.0
	total	100.0
Italy	between 1 to 15 years	23.0
	from 16 to 30 years	27.7
	over 30 years	14.4
	n/a	34.9
	total	100.0

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Table S2. Perceptions of certification as a tool to support ecosystem services

Items		Italy		Germany	
		mean*	st. dev.	mean*	st. dev.
Provisioning and availability	the availability of woody biomass	3.37	1.13	2.76	1.15
	the availability of water resources	3.04	1.23	2.87	1.12
	the availability of non-timber forest products	3.20	1.27	2.68	1.05
Regulation and maintenance	erosion regulation and control	3.36	1.26	3.25	1.24
	maintaining the condition of the soil and its natural composition	3.67	1.20	3.66	1.15
	biodiversity conservation	3.96	1.07	3.86	1.21
	maintaining the hydrogeological cycle	3.59	1.20	3.37	1.14
	maintaining air quality	3.72	1.19	3.38	1.26
	maintaining water quality	3.61	1.21	3.51	1.23
	maintaining the health of ecosystems	3.90	1.13	3.77	1.17
	the regulation of climatic conditions through the reduction of greenhouse gas concentrations and through carbon storage	3.95	1.11	3.32	1.24
	the regulation of the microclimate	3.77	1.07	3.37	1.15
Cultural	the maintenance and improvement of cultural, tourist and recreational services	3.58	1.14	3.01	1.21
	maintaining aesthetic values	3.59	1.13	3.23	1.17

* With 5-point Likert scale (1= completely disagree; 5= completely agree); st. dev. – standard deviation

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Table S3. Means and standard deviations of the items considered

Name		Item	Mean*	Standard deviation
Intentions	int1	I plan to certify (or have already certified) the impact of my management on ecosystem services and facilities	3.14	1.34
	int2	I plan to follow all necessary steps to certify carbon sequestration and storage and biodiversity conservation. soil conservation. water regulation services and recreational services in my forest area and/or the forest area I manage	3.44	1.26
	int3	I intend to adopt the certification of ecosystem services in order to make my company and/or organisation even more sustainable	3.36	1.33
	int4	I am interested in evaluating the various opportunities that may arise from the certification of ecosystem services	3.71	1.25
Subjective norms	ns1	I think that most forest owners/managers like me will certify the impacts of their practices on ecosystem services in the coming years	3.18	1.14
	ns2	Most of the people important to me think I should implement certification of ecosystem services.	3.18	1.17
	ns3	Most people who are important to me (family and friends) think that engaging in programmes to protect ecosystems is desirable	3.74	1.10
Attitudes	att1	I think that adopting the certification of ecosystem services is a good practice for my company/entity	3.59	1.30
	att2	I think that certification of ecosystem services ensures the protection of services provided by the environment and increases the value of my forest area	3.58	1.27
	att3	I think that certification of ecosystem services improves relations with stakeholders and the community at large. enhancing the 'green' image of the company/entity	3.73	1.23
	att4	I think the adoption of certification of ecosystem services is absolutely necessary	3.38	1.32
Perceived control	pc1	For me. certification procedures for ecosystem services are simple to implement	2.96	1.14
	pc2	The resources (human and material) available to my company/entity are sufficient to adopt certification for ecosystem services	3.13	1.24
	pc3	My knowledge of environmental management systems is sufficient for effective implementation of certification of ecosystem services	3.28	1.17
	pc4	Whether or not to adopt the certification of ecosystem services depends solely on me and not on other factors that might favour its implementation	2.51	1.17
Reasons for (financial)	RPfin1	Adoption of certification for ecosystem services enables market demand to be met	3.26	1.15
	RPfin2	Adoption of certification for ecosystem services can generate a premium price	3.10	1.28
	RPfin3	Adopting certification for ecosystem services increases brand value	3.21	1.21
	RPfin4	Adopting certification for ecosystem services provides other market benefits than Sustainable Forest Management certification	3.23	1.19

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Table S3 to be continued

Name		Item	Mean*	Standard deviation
Reasons for (environmental)	RPenv5	The adoption of ecosystem services certification ensures the conservation of forest biodiversity	3.55	1.19
	RPenv6	Adoption of ecosystem services certification reduces risks associated with air pollution and climate change through carbon sequestration and storage	3.34	1.30
	RPenv7	Adopting certification for ecosystem services reduces the risks associated with water pollution by facilitating water purification and flow regulation	3.23	1.27
Reasons against (barrier & cost)	RCbc1	I am afraid that there is little or no market demand for the certification of ecosystem services	2.39	1.16
	RCbc2	I think the initial compliance costs for adopting ecosystem services certification are too high	2.85	1.27
	RCbc3	I think the costs of managing certification for ecosystem services are too high for my company/body	2.67	1.26
	RCbc4	I think that adopting certification for ecosystem services entails some additional work for my company/body to do	3.14	1.37
Reasons against (incompatibility)	RCinc5	I fear that with certification for ecosystem services there may be a reduction in forest areas to be harvested	2.10	1.25
	RCinc6	I think that at present the characteristics of my forest area are not suitable for the certification of ecosystem services	1.79	0.98
	RCinc7	My company/entity can adopt the certification of ecosystem services provided certain changes are made	2.31	1.15

* With 5-point Likert scale (1= completely disagree; 5= completely agree)

Table S4. Pearson correlations between latent variables

	Int	Rcbc	Rcinc	Att	Pc	Ns	Rpfin	Rpenv
Int	1	–0.266**	–0.179*	0.811**	0.466**	0.639**	0.630**	0.653**
Rcbc	–0.266**	1	0.525**	–0.254**	–0.205*	–0.233**	–0.238**	–0.301**
Rcinc	–0.179*	0.525**	1	–0.155	–0.142	–0.092	–0.136	–0.194*
Att	0.811**	–0.254**	–0.155	1	0.465**	0.762**	0.665**	0.715**
Pc	0.466**	–0.205*	–0.142	0.465**	1	0.527**	0.401**	0.397**
Ns	0.639**	–0.233**	–0.092	0.762**	0.527**	1	0.570**	0.574**
Rpfin	0.630**	–0.238**	–0.136	0.665**	0.401**	0.570**	1	0.659**
Rpenv	0.653**	–0.301**	–0.194*	0.715**	0.397**	0.574**	0.659**	1

* correlation is significant at the 0.05 level (two-tailed); ** correlation is significant at the 0.01 level (two-tailed); Int – intentions; Rcbc – reasons against (barrier and control); Rcinc – reasons against (incompatibility); Att – attitudes; Pc – perceived control; Ns – subjective norms; Rpfin – reasons for (financial); Rpenv – reasons for (environmental)

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Table S5. Values of the *KMO*. explained variance and coefficient alpha for the items analysed

Factors	*N°* item	*KMO*	Bartlett *P*-value	Explained variance	Alpha
Int	4	0.835	<0.001	75.695	0.908
Ns	3	0.678		65.430	0.767
Att	4	0.830		79.805	0.919
Pc	4	0.748		59.671	0.769
Rpfin, Rpenv	7	0.854		75.146	0.918
Rcbc, Rcinc	7	0.708		52.214	0.827

KMO – Kaiser-Meyer-Olkin test values; Int – intentions; Rcbc – reasons against (barrier and control); Rcinc – reasons against (incompatibility); Att – attitudes; Pc – perceived control; Ns – subjective norms; Rpfin – reasons for (financial); Rpenv – reasons for (environmental)