PROVIDE

PROVIding smart DElivery of public goods by EU agriculture and forestry

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[1] A.J. Villanueva and J.A. Gómez-Limón have written the main document, putting together the information reported by partners. M. Raggi, R. D'Alberto, and D. Viaggi carried out the analysis of CAP priorities (section 3.1). All the authors have reported the results of the valuation assessments carried out from each case study (see annexes) and reviewed the final version of the main document.

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List of abbreviations

AES: Agri-environmental schemes

AFS: Agricultural and forestry systems

AHP/ANP: Analytic Hierarchy Process / Analytic Network Process

BOCR: Benefits, Opportunities, Costs, and Risks (approach)

CAP: Common Agricultural Policy

CE: Choice experiment

CSR: Case Study Region

CV: Contingent valuation

DoA: Document of Agreement

DPSIR: Driving forces, Pressures, States, Impacts, and Responses (approach)

EU: European Union

FFH: Fauna, flora, habitat

GM: Governance mechanism

HS: Hotspot

LRVT: Landscape and Recreational Values Trading (Finnish scheme)

NGO: Non-governmental organisations

PES: Payments for ecosystem services

PG: Public good

PB: Public bad

PGBs: Public goods and bads

RDP: Rural Development Policy

STK: Stakeholder

TEV: Total economic value

UAA: Utilised Agricultural Area

VM: Valuation method

WFD: Water Framework Directive

WTP: Willingness to pay

1 Introduction

This document reports results of the valuation assessments made within **Work Package 4 WP4 "Improved valuation of public goods"** in the context of the European Union (EU) Horizon 2020 project PROVIDE (PROVIding smart DElivery of public goods by EU agriculture and forestry) focusing on determinants of value (**Task 4.4**) and value transferability (**Task 4.5**) of benefits (demand-side) and costs (supply-side) of the public goods and bads (PGBs) provided by agricultural and forestry systems (AFS). Thus, it provides subsequent analysis of heterogeneity of such benefits and costs, to some extent anticipated in the previous Deliverable D4.2 "Report on valuation results" (Villanueva *et al.*, 2017c), which included the first results of the valuation assessments carried out within WP4[2].

This document relates to other specific tasks of the PROVIDE Project, both previously addressed and forthcoming. With regards to the former, apart from the previous tasks addressed within **WP4**, it is also strongly connected to the previous tasks within **WP2** (namely Task 2.2, including stakeholders' workshops on the evaluation of WP4 results, among other results of the Project) and **WP3** (namely Task 3.3, which provides mapping of demand and supply of public services and related determinants at case-study region (CSR) level (see Marconi *et al.*, 2017)). With regards to the latter, it will very much feed the final **Task 4.6** within WP4, which summarises the main lessons obtained from addressing the previous tasks within this work package, and which will be embodied in the final WP4's deliverable (Deliverable D4.4), as well as it will provide valuable information for **WP5** tasks, especially Task 5.4 with respect to factors and barriers for uptake governance mechanisms (GMs) to improve PGBs provision by AFS and transferability of results. Eventually, the results shown in this document will also provide useful information to be disseminated within **WP6**.

It is worth reminding that within WP4 twofold assessments have been carried out: first, on the demand side, focused on the benefits for the whole society derived from an enhanced provision of PGBs by AFS; and second, on the supply side (valuing an improved provision of PGBs), centred on the GMs and their implementation costs. With regards to the former, two types of assessments were made, one related to a common exercise focusing PGBs as EU Common Agricultural Policy (CAP) priorities, and the other consisting of case-specific assessments at hotspot (HS) scale; while the latter, all the supply-side assessments are HS-specific. Thus, this report will focus the results from these three types of assessments and is organised as follows: in Section 2 the methodological approaches followed for valuation assessments of determinants of value and value transferability are

[2] For an overview of the valuation methods used to carry out the assessments in each case study, see Villanueva *et al.* (2017d).

explained, Section 3 shows the results with regards to the former, distinguishing among the three types of assessments performed, while Section 4 does so for the latter. Section 5 discusses the results obtained and Section 6 concludes. Additionally, three annexes are enclosed, the first two including partners' reports for demand-side and supply-side valuation assessments, while the third one includes a pending report that could not be included in deliverable D4.2[3].

[3] Due to causes beyond the analysts control, PL1's report for supply-side valuation assessment could not be included in Deliverable D4.2, so now it is included as a separate annex (Annex 3).

2 Methods

2.1 Determinants of preferences towards CAP priorities (demand-side common valuation assessment)

The method to analyse general determinants of benefits related to the provision of PGBs by the European AFS is based on the *PGBs-related common valuation assessment at EU-level* (see Villanueva *et al.*, 2017d). This common exercise is applied by framing the valuation questions attached to the EU CAP and its priorities with regards to the expenditure focused a list of the main PGBs provided by the European AFS. In particular, this common part of the questionnaires was structured upon three different questions. Firstly, respondents were asked about their priorities in terms of budget allocated for PGBs provision under the current scenario of CAP expenditure (each EU household is actually paying about 240 euro per year, and about one third of this payment is used to support farmers and foresters in the PGBs provision). Respondents were asked to state their priority in terms of a score in a scale ranging from 0 (no priority) up to 3 (high priority). Secondly, respondents were asked to state their opinions concerning the ongoing expenditure for PGBs provision, equal to 80 euro per year (if it is adequate/too low/too high). Finally, respondents were asked to state (if it is the case they answered it is too low/too high) what is the maximum amount they would be willing to pay for.

As shown in Table 1, this common part of the individual questionnaires produced a common survey structured upon 10 valuation assessment exercises, six related to the demand side and four to the supply side. A total number of 2,456 valid questionnaires were finally produced.

Table 1. PROVIDE partners contribution to the common valuation exercise.

Country	Demand-side	Supply-side	No. of valid answers
IT	X		490
DE		X	91
AT	X		204
ES	X		494
UK	X		313
FI		X	344
EE		X	67
RO	X		102
BG	X		87
PL		X	264
Total	**6**	**4**	**2,456**

Source: Own elaboration using the information provided by the partners.

The information collected for the valid questionnaires were merged into a database to carry out a pooled sample analysis of determinants of benefits. Using this database, a cluster analysis was used to look for homogeneous groups of respondents according to their preferences towards CAP priorities related to PGBs provided by AFS.

2.2 DETERMINANTS OF BENEFITS (DEMAND-SIDE HS-SPECIFIC VALUATION ASSESSMENTS)

As each of the partners used different valuation techniques to assess the benefits stemmed from the PGBs provided by AFS in their HSs, the method to analyse factors that significantly determine such benefits differ among case studies. Table 2 shows the method used in each case study. In this table it can be underlined that, although partners were given the option to carry out either quantitative analysis, qualitative analysis, or both, all of them opted for using quantitative analysis. For example, in most of the CSRs where choice experiments were used (i.e. AT1, UK1, and ES1), there were used mixed logit models where interactions between PGBs variables (i.e. preferences towards PGBs) and respondents' socio-economic variables were included to show how each of the latter influence the former. In addition, interactions between the alternative-specific constant (ASC) and socio-economic variables were included to analyse general determinants of benefits stemmed from the bundle of PGBs under analysis. The interested reader can find more information on the method used by each partner in Annex 1, which includes all the reports for the demand-side assessments. It is also worth noting that besides these assessments focusing on heterogeneity of benefits, valuable information from local stakeholders, especially on identifying determinants of value and/or interpreting results (i.e. determinants identified) from these assessments, was collected during the 3rd Local Stakeholder Workshops held around May 2017 in each of the CSR[4]. Therefore, all these assessments actively involved stakeholders' knowledge.

[4] An extensive description of these workshops and their results will be provided in the forthcoming deliverable D2.4 "Guidelines and report on workshops supporting WP4 and WP5" of the PROVIDE Project.

Table 2. Overview of methods used to analyse determinants of benefits derived from PGBs provided by AFS in each CSR/HS.

Hotspot	Quantitative analysis	Qualitative analysis	Involvement of stakeholders
AT1	Random Parameter Logit (RPL) models by including interaction terms of the three PGBs ground water quality, scenery and recreation (agricultural landscape), climate stability and the alternative-specific constant (ASC) for the status-quo option (i.e. bundle of PGBs).	---	Yes
UK1	Random Parameter Logit (RPL) models by including interaction terms of the PGBs water quality and biodiversity and the alternative-specific constant (ASC) for the status-quo option (i.e. bundle of PGBs).	---	Yes
ES1	Random Parameter Logit (RPL) models by including interaction terms of the three PGBs (biodiversity, soil functionality, and rural vitality) and the alternative-specific constant (ASC) for the status-quo option (i.e. bundle of PGBs).	---	Yes
FR1	Benefit transfer for two PGBs (recreation and flood prevention) and cost accounting for the remainder three (biodiversity, climate stability, water quality).	---	Yes
IT1	Binary Logistic Regression Model (BLRM) including intercept and interaction variables with both the three attributes (PGBs) and the cost.	---	Yes
CZ2	Literature review based on revealed preferences methods (travel costs and hedonic pricing models).	---	Yes
NL1	Linear regression per variable and the three attributes representing the willingness to pay for nature management and maintenance (willingness to pay (WTP) referring to entrance fees of cultural facilities, gastronomy products and accommodation), improving the supply of outdoor recreation.	---	Yes
BG1	X^2 test between PGBs and socio-economic variables.		Yes
RO1	Ordered Logit models including interactions between the three PGBs under study and socio-economics variables.	---	Yes
FI1	Ordinary least squares regression model with a dependent variable relating to respondent's assessment of the importance of improved landscape quality for the increase of tourism company's revenues or number of customers.	---	Yes

Source: Own elaboration from partners' demand-side reports (see Annex 1).

To facilitate comparison among results, a common set of variables were proposed to be used by each partner. Table 3 shows this common set of variables for the demand-side assessments, while Table 4 shows which of them were finally included in the assessments in each CSR.

Table 3. Common set of variables included in the analysis of determinants of benefits derived from the PGBs analysed the CSR/HS.

Variable code	Description of the variable	Units/Category
GENDER	Individual's gender	0 = Female 1 = Male
AGE	Individual's age	Years
EDUCLEV	Education level	1 = No formal education 2 = Primary 3 = Secondary 4 = University
INCOME	Household income	Euros/ha/year (in segments of income depending on the average income in the CSR)
CHILDREN	Number of children (i.e. <18 years old)	Number of children
RELATAGR	Any of the individual's relatives is farmer	0 = No 1 = Yes
PLACERES	Population of the town/city where the individual lives	1 = 0 – 5,000 inhab. 2 = 5,000 – 20,000 inhab. 3 = 20,000 – 100,000 inhab. 4 = More than 100,000
DISTANCE	Distance from the place of residence to the HS	Km
FREVISIT	Frequency of visits to the HS areas in the last year	1 = None 2 = 1 to 2 visits 3 = 3 to 5 visits 4 = 6 to 10 visits 5 = More than 10 visits
ENVIAWA	Individual's environmental awareness (self-assessment)	1 = Not aware of environmental issues 2 = Slightly aware of environmental issues 3 = Quite aware of environmental issues 4 = Very much aware of environmental issues 5 = Absolutely aware of environmental issues
POLSCA	Individual's policy preferences with regards to the scale of implementation of the policy aimed at improving the provision of PGBS	1 = I prefer that the policy will be implemented by local institutions 2 = I prefer that the policy will be implemented by regional institutions 3 = I prefer that the policy will be implemented by national institutions 4 = I prefer that the policy will be implemented by EU institutions
POLPUPR	Individual's policy preferences towards the type (public vs. private) of the implementing institutions	1 = I prefer that the policy will be implemented by private institutions (citizens' associations, trusts, etc.) 2 = I prefer that the policy will be implemented by public institutions
FARMER*	Whether the respondent is a farmer	0 = No 1 = Yes
FAAREA*	Indicates, whether the respondents feel as a local in the CSR	0 = No 1 = Yes
SCALE*	Scale considered during the survey	Local, Regional, National, International scale.
LINKAFS*	Individual's relationship with producers involved in the HS under assessment	Likert scale from 1-No relationship at all to 5-Very high relationship
OBLIGATION*	Individual's opinion about obliging farmers to provide PGBs at high levels	How do you think farmers should apply the improvements included in the scheme? 0 = Voluntary 1 = Compulsory
SUBSIDIES*	Individual's opinion on subsidising farmers for their provision of PGBs at high levels	Do you think that farmers enrolled in this scheme should be compensated for it? 0 = No 1 = Yes

* Not included at the beginning in the common set of variables but *a posteriori* in some of the assessments.

Source: Own elaboration.

Table 4. Detail of the variables analysed by each partner from the common set of variables included in the analysis of determinants of benefits derived from the PGBs analysed the CSR/HS.

Variable (code)	AT1	UK	ES1	FR1[1]	IT1	CZ2	NL1	BG1	RO1	FI1[1]	No. of HS
GENDER	X	X	X		X	X	X	X	X	X	**9**
AGE	X	X	X		X	X	X	X	X	X	**9**
EDUCLEV	X	X	X			X	X	X	X	X	**8**
INCOME	X	X	X		X	X	X	X	X		**8**
CHILDREN	X	X	X			X	X		X		**6**
RELATAGR	X	X	X		X		X		X		**6**
PLACERES		X	X		X	X	X				**5**
DISTANCE		X	X		X	X	X	X			**6**
FREVISIT		X	X		X	X	X	X	X		**7**
ENVIAWA	X	X	X			X	X	X	X		**7**
POLSCA			X				X		X		**3**
POLPUPR			X				X		X		**3**
FARMER	X	X							X		**3**
FAAREA	X	X									**2**
SCALE	X	X									**2**
LINKAFS			X				X				**2**
OBLIGATION			X				X		X		**3**
SUBSIDIES			X				X		X		**3**

[1]In FR1, although no variable was systematically controlled, its results also show factors related to determinants of value. With regards to FI1, its specificity (focusing on private benefits of tourist-based companies) makes it difficult to systematically control most of the variables of the common set.

Source: Own elaboration from partners' demand-side reports (see Annex 1).

2.3 DETERMINANTS OF COSTS (SUPPLY-SIDE HS-SPECIFIC VALUATION ASSESSMENTS)

As for demand-side assessments, partners used different valuation techniques to assess the costs of provision of PGBs provided by AFS in their HSs, thus the method to analyse factors that significantly determine such benefits differ among case studies as well. Table 5 shows the method used in each case study. As shown in this table, most of the partners used quantitative analysis. For example, ES1, PL1, and DE1 followed the same approach abovementioned for AT1, UK1, and ES1 for the demand-side assessments, that is, mixed logit models with interactions between PGBs variables and the ASC with producers' socio-economic variables. Other quantitative (such as cost accounting –e.g. CZ2 and EE1– and econometric models) and qualitative approaches (such as deliberative workshops –UK1– and expert-based –FR2) were also used. The interested reader can find more information on the method used by each partner in Annex 2, which includes all the reports for the supply-side assessments.

As for demand side, besides these assessments focusing heterogeneity of costs of provision of PGBs, valuable information from local stakeholders was gathered during the 3rd Local Stakeholder Workshops. Therefore, all these assessments actively involved stakeholders' knowledge as well.

Table 5. Overview of methods used to analyse determinants of costs of provision of PGBs by AFS for each CSR/HS.

Hotspot	Quantitative analysis	Qualitative analysis	Involvement of stakeholders
AT1	Monte Carlo simulation using two different models based on diverse assumptions.	---	Yes
DE1	Mixed Logit models including interaction terms with the three PGBs biodiversity, climate stability, and water quantity, and the alternative-specific constant (ASC) for the status-quo option (i.e. bundle of PGBs).	---	Yes
PL1	Mixed Logit models including interaction terms with the three PGBs biodiversity and scenery and recreation, and the alternative-specific constant (ASC) for the status-quo option (i.e. bundle of PGBs).	---	Yes
UK1	---	Deliberative workshop with farmers.	Yes
ES1	Mixed Logit models including interaction terms with the three PGBs biodiversity, soil functionality, and rural vitality, and the alternative-specific constant (ASC) for the status-quo option (i.e. bundle of PGBs).	---	Yes
FR1	Econometric analysis based on primary data informing on agricultural wetlands and data from the land parcel to explore determinants of land abandonment.	---	Yes
CZ2	Cost accounting focusing investments/maintenance costs of forest recreational infrastructure and income forgone.	Expert interviews.	Yes
NL1	Quantitative analysis using several sources of information.	---	Yes
BG1	---	Qualitative analysis using farmers' information.	Yes
CZ1	Analysis of variance between farmers' willingness to provide land or to invest in water retention measures and socio-economic variables.	---	Yes
FR2	---	Expert interviews.	Yes
RO1	Ordered Logit models including interactions between the three PGBs under study and socio-economics variables.	---	Yes
EE1	Cost calculation and Pearson correlations.	---	Yes
FI1	Heckman-type quantitative analysis based on sample selection model including two-steps estimation procedure as follows: Step 1 is a binomial probit model for forest owners' participation in LRVT and Step 2 a least squares regression model for compensation claimed for making an agreement for the protection and increasing the quality of forest landscape within LRVT.	---	Yes

Source: Own elaboration from partners' supply-side reports (see Annex 2).

To facilitate comparison among results, a common set of variables was proposed to be used by each partner. Table 6 shows this common set of variables for the supply-side assessments, while Table 7 shows which of them were finally included in the assessments in each CSR.

Table 6. Common set of variables included in the analysis of determinants of costs of provision of the PGBs by the HS under analysis*.

Type of variable	Variable (code)	Description of the variable	Units/Category
Farm characteristics	FSIZE	Farm size	Hectares
	FSPECI	Farm specialisation (main productive orientation of the farm)	Several ways (e.g. percentage of land devoted to a certain AFS, share of income from a AFS, etc.)
	PRODLAB	Producers' labour time used for farming	Percentage of producer's total labour time devoted to farming
	FAMLAB	Family labour	Percentage of family labour over total farm labour
Farm management	FINTLEV	Farm intensification level	Several ways (e.g. yields in relative terms to average yield)
	FEXPER	Previous experience on the GM under assessment	0 = No 1 = Yes
	FTECHN	Main production technique	0=Conventional 1=Non-conventional
Producer characteristics	GENDER	Producer's gender	0 = Female 1 = Male
	AGE	Producer's age	Years
	CHILDREN	Number of children (i.e. below 18 years old)	Number of children
	EDUCLEV	Education level	1 = No formal education 2 = Primary 3 = Secondary 4 = University
	TRAINING	Agricultural/forestry training level	0 = No formal training 1 = Have undergone formal training
	FINCOME	Importance of farm income on households	Percentage of farm income over total household income
Producer knowledge, attitudes, and opinions	PRODKNO	Producer's knowledge on CAP measures	Several ways (e.g. ask the producer for certain CAP requirements or measures)
	ENVIAWA	Producer's environmental awareness (self-assessment)	1 = Not aware of environmental issues 2 = Slightly aware of environmental issues 3 = Quite aware of environmental issues 4 = Very much aware of environmental issues 5 = Absolutely aware of environmental issues
	FUTURE	Producer's expectations regarding the maintenance of farming activity	Several ways (e.g. Likert scale for the question "do you think that your farm will keep on producing once you will be retired?")
Others	FREQADV	To what extent the producer asks for technical advice	1=Once a week 2=Once a month 3=Once every 3 months 4=Less than once every 3 months

* Different coding may have been used depending on the assessment. See Annex 2 for in-detailed description.

Source: Own elaboration.

Table 7. Detail of the variables analysed by each partner from the common set of variables included in the analysis of determinants of costs of provision of PGBs by the HS under analysis.

Type of variable	Variable (code)	AT1	DE1	PL1	UK1	ES1	FR1	CZ2	NL1[1]	BG1	CZ1	FR2[1]	RO1	EE1	FI1	No. of HS
Farm characteristics	FSIZE		X	X	X	X		X		X	X		X		X	**9**
	FSPECI	X	X	X	X	X	X	X		X	X					**9**
	PRODLAB			X	X	X				X	X		X			**6**
	FAMLAB			X	X	X				X						**4**
Farm management	FINTLEV	X	X	X	X	X	X			X						**7**
	FEXPER			X	X	X		X		X			X			**6**
	FTECHN		X	X	X	X				X						**5**
Producer characteristics	GENDER		X	X	X	X		X		X	X		X	X	X	**10**
	AGE		X	X	X	X		X		X	X		X	X		**9**
	CHILDREN		X	X	X	X				X	X		X			**7**
	EDUCLEV		X	X	X	X		X		X	X		X			**8**
	TRAINING		X	X	X	X				X			X			**6**
	FINCOME	X	X	X	X	X		X		X	X		X		X	**10**
Producer knowledge, attitudes, and opinions	PRODKNO		X		X	X				X						**4**
	ENVIAWA			X	X	X				X			x			**5**
	FUTURE			X	X	X				X			X			**5**
Others	FREQADV					X				X						**2**

[1]In NL1 and FR2, although no variable was systematically controlled, their results also show factors related to determinants of value. In-detailed information on these case studies is included in Annex 2.

Source: Own elaboration from partners' supply-side reports (see Annex 2).

2.4 VALUE TRANSFERABILITY

For the analysis of value transferability, for both demand-side and supply-side, a qualitative method was used, very much relying on stakeholders' knowledge. In particular, two main sources of information were used. First, stakeholders were asked in the 3rd Local Stakeholder Workshops about the value transferability of the results. The following two questions were included for both demand-side and supply-side:

- Relevance of the valuation assessments for other areas/PGBs: AFSs for which these results could be especially relevant
- Level of transferability (from 1-Very low transferability to 5-Very high transferability) of results to be agreed by the stakeholders.

Second, the project's analysts were asked about to what extent the results could be transferred to other regions and AFSs. The same question framing was used for both demand-side and supply-side, with the analysts answering to the following two questions for both:

- To what extent do you think your results from the valuation assessment can be transferred to other case studies (agricultural and forestry systems or regions)? Please, provide examples of case studies (agricultural and forestry systems or regions) for which value transferability could be used and comment on the main adjustments that should be made for each agricultural and forestry systems or region.
- What are the main issues (biases, strong assumptions, etc.) that you find concerning transferring your results to that other case studies (agricultural and forestry systems or regions)?

3 Results: Determinants of value

3.1 Determinants of preferences towards CAP priorities (demand-side common valuation assessment)

The results from the common exercise on CAP priorities show that there is a high heterogeneity of general preferences towards the main PGBs provided by European AFSs. Table 8 shows the five different clusters or groups of respondents identified, included the cluster centres for each PGB, while Table 9 shows their main characteristics with regards to their composition.

Table 8. Final cluster centres (average of priority score for each PGB in each cluster).

CAP priorities related to PGB provision	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
Rural landscape	1.95	1.38	2.16	2.66	0.55
Farmland biodiversity	2.08	1.43	2.00	2.72	0.43
Water availability and quality	2.92	2.41	2.19	2.97	0.91
Air quality	2.92	2.41	1.92	2.95	0.77
Soil functionality	2.34	1.79	1.94	2.77	0.55
Climate stability	2.38	1.79	1.65	2.79	0.36
Resilience to flooding, landslide and wildfire	2.53	1.79	2.03	2.83	0.60
Rural viability/vitality and cultural heritage	1.99	1.08	2.21	2.73	0.53
Food, energy and timber security and quality	2.45	1.70	2.17	2.89	0.34
Farm animal health/welfare	2.33	1.62	2.16	2.89	0.28
Share of respondents (in %)*	**34.5**	**9.3**	**16.7**	**37.4**	**2.1**

* There are 88 missing values, not grouped in any cluster.

Source: Own elaboration.

Table 9. Cluster composition.

Variable	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
Willingness to pay (WTP) (mean)	85.6	78.0	100.0	98.0	55.1
WTP (median)	80.0	80.0	80.0	80.0	30.0
Budget-Too high (%)*	19.7	29.9	24.7	15.6	45.7
Budget-Adequate (%)*	61.4	52.6	53.4	60.6	26.1
Budget-Too low (%)*	12.4	12.3	17.4	18.3	17.4
Budget-Don't know (%)*	6.5	5.2	4.5	5.5	10.9
Age (mean)	46.1	45.7	46.5	48.1	50.6
Female (%)	46.4	32.5	30.6	51.5	34.0
Demand side (%)	74.4	66.5	64.7	70.1	68.1
Supply side (%)	25.6	33.5	35.3	29.9	31.9
AT (%)	11.2	7.1	4.5	9.9	0.0
DE (%)	1.8	7.5	9.9	2.0	2.1
EE (%)	1.3	5.2	5.2	2.6	4.3
ES (%)	25.4	13.7	14.9	23.6	14.9
FI (%)	11.9	12.7	17.8	13.3	25.5
IT (%)	20.3	23.6	21.7	22.2	17.0
PL (%)	10.7	8.0	2.4	12.1	0.0
RO (%)	4.9	4.7	4.5	3.9	6.4
UK (%)	12.6	17.5	19.1	10.6	29.8

* Response to the question "Do you think that the current per household CAP expenditure of 80€/year devoted to promote the provision of PGBs by agriculture and forestry is…?"

Source: Own elaboration.

As shown in Table 8, **Cluster 1** groups 34.5% of the respondents, showing high priorities on *Water availability and quality* and *Air quality* (both scoring 2.92 −while the maximum scoring is 3-High priority) and, to a lesser extent, *Resilience to flooding, landslide and wildfire* (scoring of 2.53), medium on *Rural landscape* and *Rural vitality* (1.95 and 1.99, respectively), and medium-to-high for other PGBs (with scores ranging between 2.08 and 2.45). With regards to its composition (see Table 9), the majority of respondents (61%) think that the current CAP expenditure devoted to promote the provision of PGBs by EU AFS is adequate, showing a mean willingness to pay (WTP) of €85.6/household, slightly higher than the current expenditure (€80/household). On average they are 46 years old, almost half are female, three quarters belong to a demand-side assessment, and 46% are from ES and IT.

Cluster 2 represents 9.3% of respondents, showing a general low degree of priorities, with the highest degree of priority found for *Water availability and quality* and *Air quality* (both scoring 2.41), the lowest degree of priority for *Rural vitality*, *Rural landscape*, and *Farmland biodiversity* (1.08, 1.38 and 1.43, respectively), as well as overall low-to-medium priorities for the remainder PGBs (with scores of 1.62-1.79). Almost half of Cluster 2's respondents think that the current CAP expenditure devoted to promote the provision of PGBs by EU AFS is adequate, showing a mean WTP

slightly lower than the current expenditure. On average they are 46 years old, just 32% is female, two thirds belong to a demand-side assessment, and 41% are from IT and UK.

Cluster 3 (16.7% of respondents) shows mild levels of priority, with nine out of the ten PGBs ranging between 1.92 and 2.21 (i.e. all around medium degree of priority). The only PGB out of this interval is *Climate stability* with a scoring of 1.65, i.e. showing a low-to-medium level of priority. In this cluster, the highest level of priority is found for *Water availability and quality* and *Food, energy and timber security and quality*. Almost half of the respondents think that the current CAP expenditure devoted to promote the provision of PGBs by EU AFS is adequate, showing a mean WTP of €100.0/household, the highest among the five clusters. On average they are 46 years old, just a 31% is female, 65% belongs to a demand-side assessment, and 58% are from IT, UK, and FI.

Cluster 4 (37.4% of respondents) shows a general high degree of priority for all the PGBs, with all of them scoring over 2.66. The highest values are found for *Water availability and quality*, *Air quality*, *Food, energy and timber security and quality*, and *Farm animal health/welfare* (with scorings of 2.89-2.97), whereas the PGB with the lowest score is *Rural landscape*. A 61% of respondents think that the current CAP expenditure devoted to promote the provision of PGBs by EU AFS is adequate, showing a mean WTP of €98.0/household. On average they are 48 years old, with slightly more than half being female, 70% belongs to a demand-side assessment, and 46% are from ES and IT.

Cluster 5 (2.1% of respondents) groups a low share of respondents with nearly no interest in the provision of PGBs by AFS, as all the PGBs show degree of priority lower than 1 (i.e. all are below the level Low priority). Accordingly, just 26% of the respondents think that the current CAP expenditure devoted to promote the provision of PGBs by EU AFS is adequate, showing a mean WTP of €55.1/household, the lowest among the five clusters. On average they are 51 years old (the oldest), just a 34% is female, 68% belongs to a demand-side assessment, and 55% are from UK and FI.

3.2 DETERMINANTS OF BENEFITS (DEMAND-SIDE HS -SPECIFIC VALUATION ASSESSMENTS)

Table 10 summarises the determinants that significantly influence benefits stemmed from PGBs provided by AFS identified in the specific the demand-side valuation assessments, while Table 11 includes an example of identification of determinants using mixed logit models for the case of AT1.

By observing Table 10, the first outcome that clearly stands out is the high variety of determinants influencing such benefits. Actually, only 2 out of the 18 variables shown in the table have resulted to be insignificant in all the case studies. According to the results, the benefits

stemmed from PGBs are significantly determined by respondents' socioeconomic characteristics especially, as well as their lifestyle features and attitudes and opinions towards these goods and the related policies. However, as shown in this table, the impacts of these individuals' variables are often PGB- and HS-specific, observing that sometimes the same determinant can either positively or negatively affect the benefits stemmed from the PGBs provided by AFS depending on the PGB (or bundle of PGBs) and HS considered. This suggests that the way that determinants influence these benefits often rely on contextual aspects. Thus, we recommend the reader to consult the reports included in Annex 1[5] to see the broader picture behind the results shown in Table 10. Following, the main determinants of benefits stemmed from PGBs provided by AFS identified are commented.

With regards to respondents' **socioeconomic characteristics**, the greatest determinants of benefits are age (*AGE*), gender (*GENDER*), and education level (*EDUCLEV*), with some other variables like number of children (*CHILDREN*), to have a farmer as a relative (*RELATAGR*), distance to the place of provision of PGBs (*DISTANCE*), and frequency of visits to the countryside (*FREVISIT*) also remarkably influencing. All this has been evidenced by the specialised literature as factors impacting benefits stemmed from PGBs provided by AFS (Colombo *et al.*, 2009; Hanley *et al.*, 2007; Kallas *et al.*, 2008; Rodríguez-Entrena *et al.*, 2012; Rodríguez-Entrena *et al.*, 2017). Interestingly, if we observe the results obtained for the different HSs, we find that the effect of each determinant very much varies depending on the PGB (or bundle of PGBs) and HS. For example, respondents' age (*AGE*) is found to be significant in 7 out of the 9 HSs where this variable has been controlled. In 5 HSs (CZ2, UK1, IT1, ES1, and RO1) it has been found to be positively related to the benefits stemmed from the PGBs provided by AFS (i.e. the older, the higher the benefits), with three of them (IT1, ES1, and RO1) having identified it for the bundle of PGBs under study and two having done so for certain PGBs (rural landscape for CZ2, and biodiversity for UK1). In one HS (NL1), a negative relationship is found, while in the other two HSs (AT1 and BG1), the effect is positive or negative depending on the PGB (or bundle of PGBs) considered. Looking at these results, it is more probable to find a positive effect of age rather than negative, which would point to older people enjoying higher benefits from these PGBs, thus entailing to some extent a counterintuitive result. However, it is an open question whether this somehow results from correlation with other variables (e.g. income effects, as older respondents usually have higher incomes) or not. In any case, the results strongly suggest that the influence of respondents' age on the benefits stemmed from PGBs provided by AFS is case-specific.

[5] As well as the previous deliverables of the project (especially Komossa *et al.*, 2016; Marconi *et al.*, 2016; Schaller *et al.*, 2017; Villanueva *et al.*, 2017c; Villanueva *et al.*, 2017d), where detailed descriptions of the HSs and PGBs provided are included.

Table 10. Results of determinants of benefits derived from the PGBs analysed the CSR/HS[1].

Variable (code)	1. Rural landscape (incl. recreation)	2. Farmland biodiversity	3. Water availability and quality	4. Air quality	5. Soil functionality	6. Climate stability	7. Resilience to flooding, landslide and wildfire	8. Rural viability/vitality and cultural heritage	9. Food, energy and timber security and quality	10. Farm Animal health/ welfare	Bundle of PGBs	No. of HS showing significant effect (controlled)
GENDER =male	NL+, CZ+, BG-		BG-						BG-		IT-	**4 (9)**
AGE	AT+, NL-, CZ+, BG+	UK+	AT-, BG-			AT-			BG+		AT+, IT+, ES+, RO+	**7 (9)**
EDUCLEV	RO-, CZ+/-	ES+, UK+									ES-, UK+	**4 (8)**
INCOME	CZ-, BG-		BG-						BG-			**2 (8)**
CHILDREN	CZ+	UK-			ES+							**3 (6)**
RELATAGR	RO-				ES+						AT-	**3 (6)**
PLACERES	CZ+, BG-		BG-						BG-			**2 (5)**
DISTANCE	CZ-	UK+			IT+	IT-		IT-				**3 (6)**
FREVISIT	BG+		BG+		IT+				BG+		ES+	**3 (7)**
ENVIAWA	BG+	UK+	UK-, BG-			AT+			BG-		ES+, RO+	**5 (7)**
POLSCA												**0 (3)**
POLPUPR											ES-	**1 (3)**
FARMER											AT+, IT+	**2 (3)**
FAAREA	AT-	UK+	AT-								AT-, UK+	**2 (2)**
SCALE						AT+						**1 (2)**
LINKAFS												**0 (2)**
OBLIGATION	RO+										ES+, RO+	**2 (3)**
SUBSIDIES											ES+	**1 (3)**

[1] '+' and '-' mean positive and negative significant influence on the benefits from PGBs ('+' means an effect towards higher benefits). '+/-' means mixed positive and negative effects found.

Source: Own elaboration from partners' demand-side reports (see Annex 1).

The case-specificity found for *AGE* is also encountered in other socioeconomic factors like *GENDER*, *EDUCLEV*, *CHILDREN*, *RELATAGR*. For instance, with regards to *GENDER*, among the four case studies where this variable was found to be significant, two (NL1 and CZ2) show that men enjoy greater benefits (specifically stemmed from scenery and recreation) than women, while the other two (IT1 and BG1) show the other way around. A similar example is found for *EDUCLEV*, for which positive effect is found for UK1, negative effect is found in RO1, while both positive and negative effects are found in ES1 and CZ2. However, with regards to *CHILDREN* and *RELATAGR* the effect seems to be mostly positive and negative, respectively.

With regards to **lifestyle**, the frequency of visits to the countryside (*FREVISIT*) is clearly found to be positively influencing the benefits derived from PGBs provided by AFS (it has been found to be a significant determinant in IT1, ES1, and BG1). Behind this result, the use value attached to these PGBs is visibly evidenced. With regards to **attitudes and opinions** towards these goods and the related governance, the variable *ENVIAWA*, representing the degree of environmental awareness, has shown to be a significant determinant of benefits in 5 out of 7 HSs. This is in keeping with previous evidences which indicate an important role of respondents' environmental attitudes with regards to their WTP for PGBs provided by AFS (Rodríguez-Entrena *et al.*, 2012; Rodríguez-Entrena *et al.*, 2014). However, again the effect of this determinant seems to be PGB- and HS-specific, as it is positive for three HSs (AT1, ES1, and RO1), and positive or negative depending on the PGB at play in the rest of the HSs (UK1 and BG1) where this variable has been controlled.

Finally, from a method-wise perspective, it is worth commenting on that, whereas several different methods were used to assess determinants of benefits, the stakeholders were generally confident on the outcomes, easily interpreting them as well. This applies for more rudimentary (e.g. direct correlations) to more sophisticated methods (especially, choice experiments), with both of them showing abundant determinants of benefits. With regards to the latter, the results confirmed what was anticipated in the first deliverable (Villanueva *et al.*, 2017d), that is, the fact that choice experiments can provide more robust and accurate results (as can be visualised, for instance, in Table 11), but at a higher expense (training, time, etc.). However, as it will be further commented, there also serious issues that have to be carefully handled to avoid biased estimates in demand-side valuation assessments, which at the same time can be amplified for this more sophisticated method.

Table 11. Mixed logit model (example of AT1, model including interactions with INVOLVED IN FARMING[1]).

	Mean		Std. Dev.	
	Coef.	*se*	*Coef.*	*se*
Ground water quality (change from groundwater which is only potable after treatment to groundwater which is potable without treatment)	1.302***	0.113	1.563***	0.179
Scenery and recreation (increase by 1%-point in hedges and flower strips)	0.148***	0.025	-0.124*	0.056
Climate stability (increase by 1%-point of arable land which is managed in a climate-friendly manner)	0.012***	0.002	0.018***	0.003
Costs (increase in €1)	-0.021***	0.002		
ASCsq	-3.533***	0.421	3.567***	0.437
Interactions and covariates				
Ground water quality × INVOLVED IN FARMING	-0.323	0.422		
Scenery and recreation × INVOLVED IN FARMING	-0.144	0.091		
Climate stability × INVOLVED IN FARMING	0.007	0.007		
ASCsq × INVOLVED IN FARMING	1.436**	0.713		
McFadden Pseudo R^2		0.315		
AIC/N		1.394		
Observations (individuals)		1224 (204)		

[1] INVOLVED IN FARMING defined as a dummy variable which takes the value 1 if the respondent is a farmer.

*, **, and *** reflect significance level of 5%, 1%, and 0.1%, respectively.

Source: Results reported by A. Niedermayr, L. Schaller, and P.R. Kieninger (BOKU) for this deliverable.

3.3 DETERMINANTS OF COSTS (SUPPLY-SIDE HS-SPECIFIC VALUATION ASSESSMENTS)

Table 12 shows the results of determinants of costs of provision of PGBs for the 14 HSs where supply-side valuation assessments have been carried out, while Table 13 includes an example of identification of determinants using mixed logit models for the case of ES1.

As for the demand-side, it can be highlighted the numerous factors influencing these costs of provision, as all the variables but one of the common set have been found to significantly determine them. Determinants include farm and producer characteristics, as well as producer attitudes and knowledge. Likewise demand-side, results suggest that some determinants influence the costs of provision of PGBs regardless of the PGB considered and others influence the costs of provision of certain PGBs. Also, some impacts seem to be PGB- and HS-specific, but to a lesser extent than what shown for the demand side (i.e. there is a higher level of agreement among HSs and PGBs, especially on the sign of the effects). Following, the main determinants of costs of provision of PGBs identified are commented.

Table 12. Results of determinants of costs of provision of the PGBs by the HS under consideration[1].

Variable (code)	1. Rural landscape (incl. recreation)	2. Farmland biodiversity	3. Water availability and quality	4. Air quality	5. Soil functionality	6. Climate stability	7. Resilience to flooding, landslide and wildfire	8. Rural viability/vitality and cultural heritage	9. Food, energy and timber security and quality	10. Farm Animal health/ welfare	Bundle of PGBs	No. of HS showing significant effect (controlled)
FSIZE	BG-	UK+	UK+, BG-, CZ1+					RO-	BG-		DE+, PL+, ES+, BG-	**7 (9)**
FSPECI	AT+/-, BG+/-	UK+/-, ES+/-	UK+/-, BG+/-, FR1+/-, CZ1+/-			AT+/-			BG+/-		DE+/-, PL+/-, BG+/-	**8 (9)**
PRODLAB		ES-										**1 (6)**
FAMLAB												**0 (4)**
FINTLEV	AT+/-, BG-	ES-	BG+, FR1+/-		ES-	AT+/-			BG+		DE-, ES-, BG+	**5 (7)**
FEXPER	RO-	UK+, ES+	UK+, BG+								PL+, BG+	**5 (6)**
FTECHN	BG+	UK+/-, ES+	UK+/-, BG+						BG+		DE+, BG+	**4 (5)**
GENDER=male	BG+										BG+, FI+	**2 (10)**
AGE	BG-	ES-	BG-, CZ1-		ES-						DE-, PL+/-, BG-	**5 (9)**
CHILDREN											DE+, ES-	**2 (7)**
EDUCLEV											DE+, PL+/-, ES+	**3 (8)**
TRAINING											DE-, ES-	**2 (6)**
FINCOME		UK+/-, ES-	UK+/-, BG+					RO-			PL+/-, BG+, FI+	**6 (10)**
PRODKNO		ES+			ES+						DE+, ES+	**2 (4)**
ENVIAWA	BG-	ES+	BG-, RO-						BG+		PL+/-, ES+, BG+	**4 (5)**
FUTURE		ES-	BG+		ES-						BG+	**2 (5)**
FREQADV	BG+										BG+	**1 (2)**

[1] '+' and '-' mean positive and negative significant influence on the provision of PGBs (i.e. '-' means higher costs of provision). '+/-' means mixed positive and negative effects found.

Source: Own elaboration from partners' supply-side reports (see Annex 2).

The higher number of determinants encountered relates to **farm characteristics and management**, with the following five standing out: farm size (*FSIZE*), farm specialisation (*FSPECI*), farm intensification level (*FINTLEV*), previous experience on the GM under assessment (*FEXPER*), and main production technique (*FTECHN*). With regards to *FSIZE*, according to the results it can generally be stated that the larger the farm the lower the costs of provision of PGBs (i.e. there is a positive relationship between farm size and the provision of PGBs for seven different HSs, as shown in Table 12 using '+'). This is clearly revealing the effect of economies of scale in the provision of these goods, as previous literature has widely evidenced (Ducos *et al.*, 2009; Ruto y Garrod, 2009).

Regarding *FSPECI* in a large number of HSs (eight) it has been shown that the specialisation in certain farming systems very much influences the costs of provision of PGBs. Depending on the type of farming system, farm specialisation can have positive or negative effects (that is why it appears '+/-' in Table 12). For example, in PL1 the specialisation in crop or livestock production very much (positively) determine the adoption of certain agri-environmental practices. Another example of specialisation positively influencing PGBs provision is found in ES1, where farms more specialised in mountain olive groves can provide biodiversity at lower costs. One example of farm specialisation negatively influencing PGBs provision is found in UK1, where specialisation in vegetables was seen to make it more difficult to implement particular environmental measures. As shown in Table 12, sometimes this factor influences the provision of just certain PGBs and sometimes it does for a bundle of them.

FINTLEV is another factor importantly determining the costs of provision of PGBs. The intensification level usually determines the opportunity costs of providing PGBs, with the higher the intensification level, the higher the opportunity costs (and thus the higher the costs of provision of PGBs) (Villanueva *et al.*, 2017b). This is clearly the case of ES1 and DE1, although in AT1, BG1, and FR1 it is not that clear. For the latter three, it seems that other variables (in particular, those related to farming system and production techniques, as well as farmer level of professionalisation) may be shadowing this effect.

FEXPER very much determines the producer's provision of PGBs, as shown in five different HSs. This result mirrors previous evidences found in the literature (Espinosa-Goded *et al.*, 2010; Hynes y Garvey, 2009), finding that prior experience in the GM on offer positively influences its adoption, thus positively influencing the provision of PGBs.

With regards to *FTECHN*, this variable has been found to be determining costs of provision of PGBs in a handful of HSs. The results suggest that the use of conventional techniques negatively

influences the provision of PGBs. This typically reflects higher departures from the current level of provision of biodiversity to the levels targeted by the scheme.

As mentioned, **producers' socioeconomic characteristics** also play a relevant role as determinants of costs of AFS' provision of PGBs. Particularly, producers' age (*AGE*), income dependence from farm (*FINCOME*), and education level (*EDUCLEV*) stand out as important factors influencing these costs. *AGE* is undoubtedly related to lower willingness to provide PGBs, as older producers are to a lesser extent in the mood to learn new farming techniques and practices. Not surprisingly, there is a consensus on this negative effect among all the HSs where this variable has found to be a significant determinant. On the contrary, the factor *FINCOME* shows mixed results, with some HSs (BG1 and FI1) showing positive relationship the provision of PGBs, others (ES1 and RO1) showing a negative relationship, while the rest (UK1 and PL1) showing either positive or negative depending on the context. Clearly, further research is needed here. With regards to *EDUCLEV*, as the literature evidences (Espinosa-Goded *et al.*, 2010; Grammatikopoulou *et al.*, 2016; Villanueva *et al.*, 2017a), this is usually positively related to lower costs of provision of PGBs, especially due to producers with higher level of education can more easily learn new practices, understand the commitments included in the GMs they participate in, etc.

Finally, also **producers' attitudes, opinions, and knowledge** seem to play a role on their costs of provision of PGBs. Although there are many HSs where this type of variables has been found to be significant (see, for example, reports for PL1, ES1, and FI1, included in Annex 2), the only one that has been commonly found to be significantly influencing these costs in different HSs is *Producers' environmental awareness* (*ENVIAWA*). This variable is usually found to have a negative relationship with the costs (i.e. positive relationship with the provision of PGBs), but there are a few HSs (especially RO1) where it does not seem to be the case.

Concerning a method-wise perspective, as for demand-side assessments, while several different methods were used to assess determinants of costs, the stakeholders found the results to be reliable and usually interpreted them without difficulty. This applies for more rudimentary (e.g. expert-based) to more sophisticated methods (choice experiments), with both of them showing abundant determinants of costs. As commented for the demand side, the results also confirmed what was suggested in the first deliverable (Villanueva *et al.*, 2017d), that is, the fact that choice experiments can provide more accurate results (as can be visualised in Table 13) but at a higher cost.

Table 13. Error component random parameter logit model (example of ES1, model including interactions with FINCOME[1,2]).

	Mean		SD	
	Coef.	*se*	*Coef.*	*se*
CAR (1% of cover crops area)	-0.066 ***	0.013	0.068 ***	0.010
CMA-R (Cover crops management-Restricted)	-1.180 **	0.433	0.452	0.343
CMA-O (Cover crops management-Organic)	-1.370 ***	0.343	0.472	0.371
CMA-N (Cover crops management-No mgmt.)	-2.599 ***	0.425	2.337 ***	0.359
PHY-R (Insecticides treatments: Restricted)	0.068	0.367	1.163 **	0.360
PHY-O (Insecticides treatments: Organic)	-1.429 *	0.583	3.967 ***	0.458
PHY-N (Insecticides treatments: No treatment)	-1.988 ***	0.453	3.206 ***	0.374
BON (Bonus for results)	0.147	0.149		
PAY (Yearly payment)	0.018 ***	0.001		
ASCsq	-0.763	0.630		
Error component	4.365 ***	0.469		
Interactions and covariates				
CAR × FINCOME	0.000	0.000		
CMA-R × FINCOME	0.001	0.007		
CMA-O × FINCOME	-0.003	0.006		
CMA-N × FINCOME	-0.005	0.007		
PHY-R × FINCOME	-0.013	0.007		
PHY-O × FINCOME	-0.022 *	0.010		
PHY-N × FINCOME	-0.031 ***	0.008		
ASCsq × FINCOME	-0.007	0.009		
McFadden Pseudo R^2		0.464		
AIC/N		1.212		
Observations (individuals)		1648 (254)		

[1] FINCOME is the share of farm income over total household income.

[2] Attributes CAR and CMA directly relate to the provision of PGBs biodiversity and soil functionality, while attribute PHY just relates to the PGB biodiversity.

*, **, and *** reflect significance level of 5%, 1%, and 0.1% respectively.

Source: Results reported by A.J. Villanueva and J.A. Gómez-Limón (University of Córdoba) for this deliverable.

4 Results: Value transferability

4.1 BENEFITS (DEMAND-SIDE VALUATION ASSESSMENTS)

The results obtained from the demand-side valuation assessments are seen to have a high potential for transferability, not only by the analysts but also by the stakeholders. This is observed in Table 14 which outlines the main options for benefit transfer in each HS where demand-side valuation assessments were carried out. As shown in this table, in general, the transferability is much more likely to yield reliable results when there are similarities with regards to the PGB provided, the AFS provider, and context of consumption and provision.

Table 14. Potential for transferability of benefits stemmed from the PGBs provided by AFS estimated in the demand-side assessments.

CSR	Potential for transferability
AT1	Other CSRs characterised by a very intensive agricultural system, similar to that in the Marchfeld region and also show similar problems regarding low (ground) water quality, an intensively managed agricultural landscape with a lack of structural elements and predominantly no climate-friendly agricultural management practices on the agricultural area.
UK1	Other semi-intensive agricultural areas in Scotland, which display a similar context and similar environmental problems with respect to the case study under assessment. As stated by stakeholders, easier to transfer values for water than for birds (biodiversity), given that birds differ more between regions and landscapes.
ES1	Higher potential for areas with extensive AFS (especially those with permanent crops as main AFS) would be likely to have more similarities on the benefits attached to PGBs provided by these systems compared to other areas.
FR1	High potential for transferability but there should be taken into account the following: - for water quality, as costs accounted for (especially depollution costs) are quite similar among regions, although they should be weighted by local consumption, i.e. the size of the population in the watershed. - for biodiversity and carbon sequestration, as the method relies on the political consensus to pay (budget allocation) for PGBs, some adjustments should be made depending on the country, for example by weighting by the public implementing institution budget.
IT1	Potential for transferability depending on the PGBs. In this regard, estimates of benefits for: - carbon sequestration, as related to a global PGB, can be more easily and widely transferred; - soil functionality can be better transferred to regions with problems of soil erosion, as this (and its consequences) is much more localized; - rural vitality can be more difficultly transferred as it is a local PGB often subject to many case-specific features (e.g. relationship between citizens and rural areas).
CZ2	Some estimates (e.g. the relationship between distance to forest and housing values) could be transferred, but this should be managed with care (especially providing that similar forest systems and housing markets are involved). The same applies for environmental facilities (i.e. the same type of facilities should be at play if these estimates want to be used).

Table 14. Potential for transferability of benefits stemmed from the PGBs provided by AFS estimated in the demand-side assessments (Cont.).

CSR	Potential for transferability
NL1	Low room for transferability as it is a very localised HS with an *ad hoc* assessment very much adjusted to it. Some potential transferability would relate to tourist tax implementation to similar recreation areas, providing that information about recreation facilities and users is gathered.
RO1	There is room for benefit transfer, especially when close mountainous areas (such as Ozana and Trotus river valleys and Moldova region) are under analysis. Also, estimates of benefits may have potential for transferability to urban peripheral areas in Romania.
BG1	Low potential for transferability as there is still no culture of relating AFS to the provision of PGBs.
FI1	Reliability of benefit transfer using tourist-based companies' private benefits has not been analysed yet. However, apparently it is not far-fetched to use the estimates for target areas and contexts similar to Ruka-Kuusamo (e.g. forest areas in cold regions).

Source: Own elaboration using the information provided by the partners.

We can go further into details with regards to the information shown in Table 14. For example, for ES1 it seems that estimates of WTP for the PGBs provided by mountain olive groves (MOG) could be transferred to other similar cases, i.e. extensive agricultural systems providing biodiversity and rural vitality but negatively affecting soil functionality under high risk of abandonment. The case of MOG very much mirrors other agricultural systems (especially with permanent crops) located in mountain areas, with particular likeness to those located in Mediterranean regions. The same applies to the results from IT1, in which benefits were estimated for carbon sequestration, rural vitality, soil functionality in extensive and mountainous AFS in Emilia-Romagna (northern Italy). Likewise, results would be useful to estimate PGBs provision by intensive (AT1), semi-intensive (UK1), and extensive (FR1) agricultural systems, as well as mountainous AFS of Eastern Europe (RO1). However, there are other CSRs for which low to moderate potential for transferability is identified. These include more specific assessments (due to either the approach considered or the case study) such as CZ2, NL1, BG1, and FI1. The first two are very much focused on certain recreation facilities, for which benefits may be very much case-specific. In BG1 it was found that respondents were not familiar with PGBs provided by AFS (which is something highlighted to some extent over and above all the case studies –we will come back to this), thus the analysts do not recommend transferring the estimates obtained. With regards to FI1, it is the approach what makes results transfer not recommendable. As they state, reliability of benefit transfer using tourist-based companies' private benefits (of a specific area) has not been analysed yet.

Besides, there are some issues commonly underlined by the involved stakeholders and analysts, such as the relative and absolute values associated with certain PGBs when several PGBs are provided by the same AFS; the existence of non-linearities in the demand of these PGBs; the

magnitude of changes assessed in both the "recipient" and the "donor" studies of the benefit transfer assessment; the extent to which there are substitutes (especially, PGBs provided by other AFS) in both the "recipient" and the "donor" studies; jurisdiction issues with regards to local and global PGBs, particularly when it is not clear whether the PGB is local or global; among others.

4.2 COSTS (SUPPLY-SIDE VALUATION ASSESSMENTS)

There is a general agreement among HSs and among stakeholders on the limited transferability of estimates of costs of provision of PGBs. As mentioned in previous documents of the Project, the joint provision of private and public goods by AFS is very much specific, being attached to the specific biophysical and socioeconomic context. Therefore, it is very unlikely that a benefit transfer assessment would successfully estimate the costs of provision of other AFS based on the estimates made elsewhere. As highlighted in the HSs reports, even if we wanted to transfer the results to a similar AFS of the same CSR, we would find too many differences on their joint provision of private and public goods that would originate too much biased cost estimates. These results are novel to the extent that exercises of benefit transfer for costs of provision of PGBs by AFS are generally lacking.

However, if we do not expect to precisely estimate the costs of provision but to identify determinants influencing them (hence, anticipating farms/producers with higher and lower costs of provision of certain PGBs associated with specific factors), then it could be said that there is a high potential for transferability. For example, previous studies focused on other regions/countries and agricultural systems have identified the same abovementioned determinants influencing producers' costs of provision of environmental PGBs (Defrancesco *et al.*, 2008; Ducos *et al.*, 2009; Espinosa-Goded *et al.*, 2010; Hynes y Garvey, 2009; Villanueva *et al.*, 2017b; Wynn *et al.*, 2001). However, as often noted, benefit transfer assessment should be made on the condition that AFS and contexts are similar. As our results show, a further condition should be included here, relating to the likeness with regards to the GM under study. Thus, the results add to the cited studies by showing numerous specificities for a wide range of AFS included in the 14 HSs under analysis. In this regard, Table 15 sums up to what extent the results of each supply-side valuation assessments can be useful for transferability purposes.

Table 15. Potential for transferability of costs of provision of PGBs estimated in the supply-side assessments.

CSR	Potential for transferability
AT1	Calculations are transferable to other regions, on condition that similar agricultural production conditions, similar crop rotations and a similar cost and price regime exists, which is comparable to the CSR Marchfeld. Especially the results can therefore be meaningful in rather intensive large-scale agrarian landscapes with a distinctive focus on arable production. Possible regions for value transfer: in Austria, e.g. the Tullner, Eferdinger or Klagenfurther Becken; and outside of Austria, e.g. the big arable lands of the Magdeburger and Hildesheimer Börder in Germany, big parts of France (e.g. Île-de-France), or the Po plain in Northern Italy.
DE1	The transferability of results to other peatland areas seems feasible, especially in Central Europe. However, it is highly recommended to consider farming intensity to more accurately transfer the results.
PL1	Limited transferability of valuation results (magnitude of costs of PGs provision), especially due to low costs of provision estimated for the case study compared to areas from other countries. However, transferability of determinants of costs has much higher potential of success.
UK1	The values as such are not transferable to other areas or other PGBs or even to other agri-environmental measures aiming at the same PGBs. However, the main factors influencing farmers' willingness to accept and to participate at all, are likely to be more widely applicable to other PGBs and to other case studies.
ES1	Low potential for transferability. Much higher potential if determinants rather than magnitude of costs of provision of PGBs are focused.
FR1	Transferability of our results should be considered very carefully, as the results are compromised by the lack of sufficient information on farm/farmer characteristics.
CZ2	Easily transferable if geomorphological conditions are similar, although different price levels among regions have to be taken into account. However, it is uncertain to what extent the fact that most of the forests of the HS are publicly owned would impact benefit transfer estimates.
NL1	Low room for transferability as the costs for nature management and maintenance for recreation use very much vary from case study to case study.
BG1	Low potential for transferability of estimates of costs of provision, however higher if the analysis focuses on their determinants.
CZ1	Results (both on magnitude and determinants) are well transferable to other regions with similar soil, climate and geomorphological conditions in the Czech Republic and to other countries with similar price levels.
FR2	High degree of transferability when focusing on the determinants on the condition that detailed data on land cover for agricultural purpose at municipal scale are available; on the contrary there is a low degree of transferability for the magnitude of cost of PGBs provision.
RO1	Moderate room for transferability, especially to similar mountainous areas throughout the North-East region of Romania.
EE1	Low room for transferability (especially due to specificity regarding forest land ownership), additionally hindered by the lack of representativeness of the sample used.
FI1	The results might be transferred to other forestry regions in the country. However, certain specificities (especially with regards to the special characteristics and historical development of the HS) make it difficult to use benefit transfer to obtain accurate estimates of costs of provision

Source: Own elaboration using the information provided by the partners.

5 Discussion

5.1 DETERMINANTS OF BENEFITS

The results show that benefits stemmed from PGBs provided by AFS are highly heterogeneous. This is underlined both at EU and HS level, as different groups of consumers of PGBs can be derived according to their benefits at both levels. Thus, although the results shown here still reflect a high intensity of preferences, similarly to that shown in the previous deliverable (Villanueva *et al.*, 2017c), they broaden the picture by showing that this intensity very much varies throughout the society. For example, the EU exercise evidences different groups of citizens according to their preferences towards PGBs as priorities of CAP, with three groups (Clusters 1, 3, and 4, summing 89% of the total sample) asserting high and medium priorities for most of the PGBs, but two more groups with mixed and generally low preferences. Although these results advocate for a CAP promoting multifunctional AFS, the fact that there are some population which clearly prioritised the provision of just a few PGBs (Cluster 1) together with another group of people prioritising none, must be considered if some tailoring and targeting (PGB- and/or HS-wise) of governance implementation would like to be made.

With regards to the HS level valuation assessments, the results point to a wide variety of determinants influencing benefits stemmed from PGBs provided by AFS. These include respondents' socioeconomic characteristics, as well as those related to lifestyle and attitudes and opinions (especially towards the PGBs and its related governance implementation). However, we find that in many cases the (positive or negative) effect of the determinant is very much context-specific. This would suggest that the high level of comparability of benefits stemmed from PGBs anticipated in Villanueva *et al.* (2017c) would not always be as such. In effect, if this high presence of context-specific effects is corroborated, then the comparability among results of different HS would be seriously hindered. Undoubtedly, further research is still needed on this.

In any case, the results related to determinants are useful from the governance-making side. In particular, the decision-maker could use it to identify groups of consumers and/or areas where benefits are higher, thus recommending a special focus on them when implementing GMs. This would lead to a more efficient implementation of GMs by maximising the achievement of net gains.

5.2 DETERMINANTS OF COSTS

As anticipated in previous results obtained during the PROVIDE Project (Marconi *et al.*, 2016; Villanueva *et al.*, 2017d), we find a very high heterogeneity of costs of provision of PGBs by AFS. This is so due to several sources of heterogeneity at different levels, including the biophysical basis, the actual AFS, the production techniques used for the overall farm management, and the specific practices used (Villanueva *et al.*, 2017d). As a result, a wide variety of determinants related to farm structural characteristics and management and producer characteristics and attitudes and opinions have been identified. Particularly, most of the determinants identified relate to farm (size, specialisation, intensification level, etc.) and producer characteristics (age, education level, farm income, etc.), for which information can be easily gathered by the governance decision-maker. This means that, in principle, the decision-maker can moderately estimate the costs of provision of PGBs among farms, which also can lead to design more efficient GMs to promote that provision. In this regard, it would be of much use to confront this information with the estimates of benefits stemmed from PGBs to identify priority regions for governance implementation. An example of priority region would be that where PGBs are provided at low costs and citizens highly benefit from consuming them.

In any case, it is worth remarking that the results draw a complex picture of how the PGBs are provided by AFS. For example, results suggest that some determinants influence the costs of provision of certain PGBs and others influence the costs of provision of PGBs regardless of the PGB considered. In addition, some impacts seem to be PGB- and HS-specific, but to a lesser extent than what was shown for the demand side (i.e. there is a higher level of agreement among HSs and PGBs). Although specific explanation of why these two results might be so is provided in partners' reports (see Annex 2), it is an open question to what extent a factor generally/specifically determines costs of provision of PGBs. Surely, further research is needed to shed light on this.

5.3 BENEFIT TRANSFER: BENEFITS

There is an extensive literature showing the potential for value transferability regarding the benefits derived from the PGBs provided by AFS (Brouwer *et al.*, 2015; Colombo *et al.*, 2007; Glenk *et al.*, 2015; Johnston *et al.*, 2015; Martin-Ortega *et al.*, 2012). Our results join these works by suggesting that there is room for benefit transfer using benefit estimates from a wide range of areas, especially when similar contexts and AFS providers are at stake. However, several issues are worth commenting with regards to this.

First, an important issue encountered relates to the lack of knowledge of the general public with regards to the PGBs provided by AFS. This entails a high risk of obtaining biased estimates, which can eventually jeopardise a meaningful support to governance decision-making. Not surprisingly, there is a growing body of literature analysing the role of information given to respondents on the final estimates obtained (Barkmann *et al.*, 2008; Braga y Starmer, 2005; Glenk y Colombo, 2011, among others). However, to control the role of information on demand-side valuation assessments was beyond the research scope, and had to be left for future investigation. In particular, one of the main points related to this is to find adequate options/methods for the unaware respondents to robustly build their own preferences towards different PGBs or the same PGBs but provided by different AFS. In this regard, our results point to the usefulness of actively involving stakeholders to design valuation assessments which carefully handle this issue.

Another important issue refers to comparability of benefits. Whereas this is often overlooked in value transfer due to the low number of studies available, based on our experience, it is shown that this topic needs to be addressed upfront in valuation studies. This implies considering explicitly both the economic context and the role of the PGB to be valuated with respect to potential determinants (e.g. potential homogeneity of likely sign of the effects of a variable) and of attributes considered, or their interplay. The fact that many valuation studies may be determined by the interaction of multiple goods also hint at the relevance of comparing across cases in which the PGB to be valuated has a similar general relevance and/or similar connections with other major PGBs. These considerations may for example recommend using more qualitative means, such as importance scoring, in the policy side to check the profile of PGB perception to determine what is actually comparable and what is not.

The third main issue relates to the results obtained from the analysis of determinants. A general remark abovementioned is that benefits stemmed from PGBs provided by AFS are much more context specific than expected beforehand. Indeed, the fact that many determinants differently influence the benefits, either inter-HSs or inter-PGBs (i.e. intra-HS), may a priori hamper the transferability of results with regards to determinants of benefits. However, it must be acknowledged that there are certain limitations to compare among the results of our valuation assessments (especially referring to the use of different methods and approaches) that recommend taking this result with caution. In any case, it has to be highlighted that, as generally stated in the workshops, and in keeping with the literature, there are some determinants, such as income (Mørkbak *et al.*, 2010) or distance to the production place (Schaafsma *et al.*, 2013), that unavoidably will play a role when transferring estimates of benefits stemmed from PGBs provided by AFS. Taking

into account the strong influence of determinants on these benefits, the use of function transfer would be preferable.

The abovementioned issues clearly raise up the need for careful use of the ("donor") studies supporting the benefit transfer assessment. In effect, during the valuation assessments a lot of micro-choices (e.g. the scale of valuation, measurement unit, number of PGBs under study, etc.) have to be made, all of them affecting the final outcome. Therefore, in order to use the benefit estimates of a certain study, the analysts have to deconstruct as much as possible the valuation process used in each "donor" study. This also goes in the direction of identifying a minimum list of information about the valuation process of past studies to ensure the usability for a transfer exercise.

In terms of benefit transfer techniques, these results would generally translate in asserting that function transfer is recommended instead of simple adjusted transfer or even unadjusted transfer. However, the results of our study go beyond this, rather hinting to the need to devise clear criteria for upstream phases of the benefit transfer procedure, namely the identification of studies in comparable contexts and the understanding of the bundle of goods under analysis and of their potential interaction.

5.4 BENEFIT TRANSFER: COSTS

As expected, the stakeholders and project analysts agree on recognising the difficulties to transfer estimates of costs of provision of PGBs by AFS to other AFS and/or areas. The main reason relates to the different joint production of private and public goods characterising each AFS, which results from different biophysical conditions, farming systems, production techniques, and use of practices. In addition, practices to affect the provision of public goods are often based on detailed differential prescriptions that would anyway be highly different in diverse contexts and sometimes entailing negligible costs with respect to the overall profitability. All this gives rise to a very high uncertainty, hampering any exercise of results transfer. Consequently, it is very problematic to model all these variables and transfer them to other cases.

That said, our results suggest that there is room for transferability with respect to determinants of costs of provision of PGBs. In effect, the general agreement encountered among HSs with regards to the factors significantly determining these costs supports the idea of the existence of certain common determinants in the provision of PGBs by AFS, which has also been highlighted by the specialised literature (Falconer, 2000; Ruto y Garrod, 2009; Siebert *et al.*, 2006; Uthes y Matzdorf, 2013). In particular, our results especially hint at some farm structural (such as farm size, farm specialisation, intensification level, and production technique) and producer characteristics

(producer age and education level, farm income), as representing common determinants of costs of provision of PGBs by these systems. Therefore, if an inter-regions comparison among estimates of these costs is made, information related to these variables should be taken into account.

In addition, unlike for benefits, cost assessments are usually related to the kind of policy instrument considered. Thus, as stakeholders underlined, policy parameters should also be considered explicitly in the adjustment process, as this may be highly relevant and in turn locally dependent. Given the transcendental importance of determinants of costs, the transferability of determinants among GMs should also be investigated, in order to identify possible issues specifically related to GM implementation. In this regard, although the use of function transfers would make sense, it seems that it would be of especial use when the same GM is under assessment.

6 Conclusions

This deliverable aims at showing the results related to determinants of value and value transferability obtained from the demand-side and supply-side valuation assessments included in WP4 of PROVIDE Project, which add to the initial results shown in the previous deliverable within this work package (see Villanueva *et al.*, 2017c). In particular, analyses of determinants of benefits and costs associated with the provision of PGBs by AFS have been carried out in 10 different HSs for demand-side assessments and 14 HSs for supply-side assessments, using common sets of variables for both types of assessments as reference. This approach, using common sets of variables for a variety of case studies, has made it possible to cross-compare their results, allowing us to draw the following conclusions.

With regards to the demand side, while we find high intensity of preferences towards PGBs provided by AFS both at EU and HS level, our results show there is a wide range of factors determining benefits stemmed from these goods. These include respondents' socioeconomic characteristics (particularly age, gender, education level), as well as those related lifestyle (e.g. frequency of visits to the countryside) and attitudes and opinions (especially those towards the PGBs and its related governance implementation –e.g. respondent's environmental awareness). However, we find that their effects are often case-specific, depending on the HS and the PGB considered. With regards to benefit transferability, although it seems that there is high potential to transfer the estimates obtained, this case-specificity suggests to carefully evaluate to what extent both the case for which benefits were estimated and the case for which they want to be transferred mostly share not only characteristics (as literature highlights) but also determinants with similar types of effects.

With regards to the supply side, we also find that there is a high heterogeneity of costs of provision of PGBs by AFS connected to certain common determinants. The main determinants encountered relate to farm (size, specialisation, intensification level, etc.) and producer characteristics (age, education level, farm income, etc.), with most of them showing a similar effect (i.e. same sign) inter-HSs and inter-PGBs. Regarding transferability, although there is little room for transferring estimates of costs of provision of PGBs among AFSs and regions, the high level of agreement found for the determinants suggests that transferring information on heterogeneity of costs would not be as unreliable as initially anticipated.

The valuation assessments made also hint at different fields for further research. For instance, the role of certain determinants (of both benefits and costs) and to what extent they are

affected by context specificities should be further investigated. In particular, with regards to demand-side assessments, it is important to advance in our understanding on how the respondents' lack of knowledge impacts estimates of benefits stemmed from PGBs provided by AFS, and how to handle this. Regarding supply-side assessments, although abundant determinants of costs of provision have been identified, further investigation should shed light on whether they represent such determinants regardless of the GM considered or not.

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Annex 1. Partners' reports for the demand-side valuation assessments

This annex includes partners' reports of the demand-side valuation assessments carried out in each Case Study Region (CSR). See pdf attached.

Annex 2. Partners' reports for the supply-side valuation assessments

This annex includes partners' reports of the supply-side valuation assessments carried out in each Case Study Region (CSR). See pdf attached.

Annex 3. Pending reports not included in Deliverable D4.2.

This annex includes PL supply-side report for Deliverable D4.2 which, due to reasons beyond the control of the analysts, could not be included in that deliverable. Thus, it is incorporated in this deliverable.