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PAPESHE

Deliverable 5.2.2
Deliverable 5.6.4
Report on market demand for dairy and meat products from Pelagonia sheep farms

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Key information

Authors of this Report	**Athanasios Ragkos[1] Alexandros Theodoridis[2],** [1] *Agricutlural Economics Research Institute – ELGO (RIAS)* [2] *Aristotle University of Thessaloniki (AUTH)* *Correspondence: ragkos@agreri.gr*
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Abstract

This report is the Deliverable 5.2.2 and 5.6.4, which has been drafted jointly by RIAS and CRD. Its objective is to analyze societal preferences regarding Pelagonia sheep and its production system. The outcomes of the survey show that Pelagonia sheep production systems have multiple effects on the socioeconomic activity in the cross-border area. Nevertheless, there are significant differences in societal preferences regarding specific attributes, both between the public in Greece and North Macedonia as well as across societal groups with common characteristics. The results of the analysis show which groups can be particularly affected by strategies to change Pelagonia sheep production systems as well as which directions these strategies can take in order to fulfil societal expectations.

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1. Introduction

This report is the Deliverable 5.2.2 and 5.6.4, which has been drafted jointly by RIAS and CRD. Its objective is to analyze societal preferences regarding Pelagonia sheep and its production system. For this reason, the Choice Experiment method is employed, which is particularly applicable to the valuation of goods and services with multiple important characteristics which are not valued properly in markets. In the case of Pelagonia breed, the small population of the breed in the CBA, conducted with the important sociocultural, economic and environmental roles that it can play are all reasons pointing towards the implementation of this method.

The conceptualization and the survey design was done by RIAS, as well as data analysis and commenting of results. CRD contributed in translating the questionnaire in Macedonian, adapting attribute levels to the socioeconomic circumstances of North Macedonia and conducting the survey. The report describes the background of the survey, including the experimental design and the survey administration process. Results are presented jointly for Greece and for North Macedonia, but in Separate Section. The report closes with a brief discussion of implications yielded by this study for future actions regarding the valorization of Pelagonia sheep.

2. Methodological approach

As already explained in the project AF, the analysis is based on an application of the Choice Experiment (CE) method. CE is a non-market valuation method which is very helpful in valuing goods and services which are normally not priced in competitive markets or whose values are distorted. The design of a CE is based on Lancaster's (1966) theory of consumer preference, which states that goods and services can be described and evaluated in terms of their specific characteristics – attributes. A CE experimental design requires, therefore, the choice of attributes that describe the good or service – in this case the production system of Pelagonia sheep. Each attribute can assume specific levels, which can be either numeric (scale) or qualitative (nominal or ordinal), depending on their nature and on research objectives (Hensher et al, 2015). The researcher adds a monetary attribute that corresponds to an amount that a hypothetical 'consumer' of the good/service would be willing to pay in order to achieve the attribute levels they desire. The possible combinations of attributes and levels yield 'alternatives', which are then organized in pairs formulating the 'choice sets'. Each respondent is presented with a specific number of choice sets (Louviere et al., 2000) and in each one he/she is asked to mark the alternative he/she prefers. This method is particularly useful in market research, especially in cases of novel products with attributes which are unknown to consumers or are of interest for specific market segments.

2.1 Choice of attributes and levels – Experimental design

Table 1 presents the attributes included in the experimental design and the levels they assume. These attributes were chosen based on an extensive review of literature, in the domain of non-market valuation of sheep values; literature regarding the contributions of local breeds; literature

about the provision of ecosystem services from livestock production; literature regarding the livestock sector in the CBA; and finally policy documents and the RIS3 specialization strategy of the Regional of Western Macedonia. This review led to a list of possible attributes, which was shown to 10 stakeholders in each country, who were then asked to rank them. The attributes ranked higher in both countries were included in the survey design. They are explained in what follows

Table 1. *Attributes describing the production system of Pelagonia sheep and their levels*

Attributes	**Brief description**	**Levels**	
		Greece	*North Macedonia*
Traditional production	Prevalence of production patterns which pertain to traditional practices in the CBA	1. Pelagonia sheep will be kept in facilities with sufficient space 2. Pelagonia sheep will be kept in facilities with sufficient space and will also be reared without antibiotics	
Rural development and employment	Provision of employment to rural families	1. 50 families 2. 140 families 3. 300 families 4. 500 families	
Protection of pastures and of the environment	More acreage of pastoral land grazed in a sustainable way by Pelagonia sheep	1. 500 ha[1] 2. 1.500 ha 3. 3.000ha	
Culture	Undertaking various actions to promote the cultural role of Pelagonia sheep for the benefit of the CBA	1. Production of a certified specific product from Pelagonia sheep (eg cheese or meat) 2. Organizing an annual awareness and information event in Florina 3. Establishing a Museum on the promotion of Pelagonia sheep in Florina	1. Production of a certified specific product from Pelagonia sheep (eg cheese or meat) 2. Organizing an annual awareness and information event in Bitola 3. Establishing a Museum on the promotion of Pelagonia sheep in Bitola
Payment amount	Annual payment to support the Pelagonia production system	10€, 30€, 50€, 80€	200MKD, 600MKD, 1000MKD, 1500MKD

[1] In Greece they were expressed in stremma, where 1 stremma = 0,1ha

Traditional production

In the past few years both countries have seen a gradual intensification in production. This is more evident in Greece, where farms modernize constantly and adopt more intensive practices

to improve production. In North Macedonia, the modernization process is ongoing and farmers strive to increase their level of farm management to achieve higher levels of performance. Discussions with producers and other stakeholders have demonstrated that this modernization has two main dimensions, which are of interest to society. The first involves the more and more widespread use of antibiotics to tackle common illnesses of animals. If antibiotics are not used in a rational and organized way, viruses become more resistant to them, while their residues can also pass to milk or meat and thus to food products. The second dimension concerns the confinement of livestock within barns, not only during harsh winters but sometimes throughout the year. This type of livestock management can lead to increased productivity but also reduces animal welfare. In both these dimensions, the local Pelagonia breed has the advantage of increased adaptability, while if it becomes extinct, the possibilities for more traditional production patterns will be reduced. Therefore, this attribute assumes two levels: (1) Pelagonia sheep will be kept in facilities with sufficient space; (2) Pelagonia sheep will be kept in facilities with sufficient space and will also be reared without antibiotics

Rural development and employment

The sheep sector in the Cross-Border Area (CBA) respresents an important activity with significant socioeconomic and environmental contributions. Sheep production is the main source of livelihood for numerous families in rural areas. Sheep and goats account for more than 60% of the livestock sector value in Western Macedonia while in the area of Florina almost 100.000 sheep are reared. In North Macedonia, Pelagonia and Southwestern regions account for almost 27000 sheep (more than 37% of the country). The sheep sector in the CBA has equal importance for both countries and can equally contribute to sustainable development, including employment and income to large parts of the rural population. On-site research demonstrated that although many farms – especially in Greece – actually rear crossbreeds and imported breeds, there are significant opportunities to shift towards Pelagonia sheep. This could entail the emergence of more farms, which will be well-adapted to local conditions. Previous research in Western Macedonia (highlands of Grevena) (Ragkos et al., 2020) showed that traditional farming can yield up to 471 new jobs and an increase in the number of animals reared. By discussing these results with stakeholders, they were adapted to the conditions of Florina Regional Unit and levels were defined to (a) 50 families; (b) 140 families; (c) 300 families; (d) 500 families. Subsequent consultation with stakeholders in North Macedonia showed that these levels are relevant also to the Macedonian setting, therefore they were maintained.

Protection of pastures and of the environment

Extensive production systems provide important environmental goods and services in the form of Ecosystem Services (ES). To a large extent, this is due to sustainable grazing, which is based on practices that have been developed as a result of traditional knowledge and practical experience of local livestock producers. Pelagonia sheep have a critical role to play in this pattern, as the fact that they are integrated in the landscapes of the CBA and adapted to local conditions renders them ideal to support production systems based on sustainable grazing. Therefore, the support of extensive sustainable production of the CBA – which will ensure environmental benefits – requires that the local Pelagonia breed is protected and strategies are delivered to support its

integration in sheep farms of the CBA. It has been estimated that this expansion of sustainably grazing sheep farms can occur at various scales. A conservative estimation foresees that additional 500 ha can be sustainably grazed by Pelagonia sheep in each part of the CBA, while with relevant measures this can be increased to 1500 ha or to 3000ha.

Culture

Pelagonia breed bears important cultural characteristics, closely linked to the cultural identity of the CBA. These sheep are integrated to local landscapes, while their raw products (milk and meat) have been consumed - either raw or processed - by local people for generations. Apart from its role in the diets of local people, Pelagonia breed is connected to the development of local habits and customs, related to folklore events in the CBA. Cultural features related to local sheep farms and rearing Pelagonia sheep include songs, dances, traditional practices, customs.

Nowadays, however, these multiple sociocultural roles are disregarded or declining. The consumption of locally produced dairy and meat products is lower than its considerable dynamics and this is partially due to the lack of certified local products, which will bear and valorize the identity and unique characteristics of the CBA. In addition, local awareness events for the sheep sector are missing – contrary to the continuation of events relating to other local farm products. Furthermore, the modernization of the sheep sector has reduced the importance of some traditions and norms that characterized the social life and habits of pastoral communities in the CBA. As an alternative to these developments, this attribute includes three (qualitative) levels, each one of which relates to a scenario for valorizing the cultural heritage of Pelagonia sheep and of their production systems: (a) the production of a **certified specific product** from Pelagonia sheep (eg cheese or meat), or (b) organizing an **annual awareness and information event** in Florina (for Greece) or in Bitola (in North Macedonia), or (c) establishing a **Museum** on the promotion of Pelagonia sheep in Florina (for Greece) or in Bitola (in North Macedonia)

Payment amount

Apart from the attributes describing the Pelagonia sheep production system, another alternative is added in the experimental design, which refers to the amount that respondents will have to pay if they choose one alternative. Two of the payment options (10€, 30€, 50€) were chosen as indicative of the membership fees commonly paid for participation to Associations and Groups. They were presented to stakeholders during pre-testing, who were asked to confirm whether they reflect realistic and feasible payment options. In North Macedonia, these amounts were adapted to the socioeconomic conditions of the country with the help of experts and stakeholders. Also, following a recommendation in literature, two more payment options were added, one very low "that most respondents would not decline" (10€) and one high "that few respondents would accept to pay" (80€). These amounts were tested for their feasibility also during the pilot questionnaire survey with farmers and respondents.

2.2. Elaboration of choice sets – Experimental design

Based on alternatives and levels in Table 1, the full factorial was designed and included 288 combinations in total (2X4X3X3X4 = 288). The full factorial was reduced to a main effects

experimental design using the Orthogonal Design procedure in SPSS v.24. The main effects included 16 combinations (alternatives) in total. The 16 alternatives were combined in pairs and with the addition of an opt-out (status-quo) alternative, 8 choice sets were yielded. It was decided, however, not to include all eight choice sets in each questionnaire, but to divide them into two groups of four choice sets and include each group in a separate version of the questionnaire. Therefore, two versions were generated, each one containing 4 choice sets. Each respondent would have to see only these choice sets and choose between Alternatives A and B – which entailed some type of management – or the Alternative C ('opt-out') and thus to continue the existing situation. As will be explained in Section 3, the design of two versions of the questionnaire had implications on the sampling strategy. Sample choice sets are presented in Tables 2 a-c in Greek, English and Macedonian.

Table 2a. Choice set sample in Greek

Ωφέλειες	**Επιλογή Α**	**Επιλογή Β**	**Επιλογή Γ**
Παραδοσιακή εκτροφή	Ελεύθερος σταβλισμός χωρίς αντιβιοτικά	Ελεύθερος σταβλισμός	Εντατική εκτροφή
Επιπλέον απασχόληση	50 οικογένειες	500 οικογένειες	0
Βοσκότοποι σε καλή διαχείριση	5.000 στρ.	5.000 στρ.	0
Πολιτισμός	Τοπικό προϊόν	Τοπικό προϊόν	Απώλεια
Ποσό πληρωμής (ανά έτος)	10€	80€	0
	❑	❑	❑

Table 2b. Choice set sample in English

Benefits	**Alternative A**	**AlternativeB**	**AlternativeC**
Traditional production	Free in the barn and no antibiotics	Free in the barn	Intensive production
Additional employment	300 families	300 families	0
Well-managed pastures	500 ha	3.000 ha	0
Culture	Museum	Local product	Loss
Payment (per year)	1500mkd	200mkd	0
	❑	❑	❑

Table 2c. Choice set sample in Macedonian

Придобивки	**Алтернатива А**	**Алтернатива Б**	**Алтернатива В**
Традиционално производство	Слободни во трлото	Слободни во трлото	Интензивно производство
Дополнителни вработувања	50 семејства	140 семејства	0
Соодветно управувани пасишта	1.500 ha	500 ha	0
Култура	Годишен настан	Музеј	Загуба
Плаќање (на годишно ниво)	1.500 мкд	200 мкд	0
	❑	❑	❑

2.3. Questionnaire design

In CEs the survey vehicle is a carefully designed questionnaire which follows specific and strict standards. The CE survey questionnaire, for this survey includes two parts, although the common recommendation in literature is two include three parts (Mitchell and Carson,1989; Arrow et al., 1993; Boxall et al., 1996). Indeed, the usual approach is that in the first part respondents are asked general questions to detect their attitudes for the issue of the survey of for relevant issues. In the second part, the payment scenario is presented, followed by the choice sets. In the third part, sociodemographic characteristics are recorded.

For this application, it was decided to merge parts 1 and 3 and to place this merged part after the main valuation exercise (Part 2). This was deem as the preferred option because more time would be needed to explain to respondents the issue about protection of Pelagonia breed. This was particularly important for North Macedonia, as the initial pilot survey showed that people required more time to understand the nature of the survey, as they were generally not used to participate to such questionnaire surveys.

Therefore, in the final version of the questionnaire, which was used for the survey in both countries, in the first part respondents were presented with general information about the project and then with information about Pelagonia breed. Then the attributes were described in a clear way, avoiding to provide too much information which would cause confusion. The appendix includes the questionnaire in Greek, Macedonian and English, where the interested reader can see the exact quotations.

The payment scenario involves the establishment and operation of a 'Fund for the Protection of Pelagonia Breed' in the Cross-Border Area. This Fund will have the form of a Non-Government Organization. Respondents were informed that the Fund would require the financial contribution of interested individuals in order to pursue strategies for the protection of the breed and implement scenarios as presented in the choice sets. An important feature of the design of the questionnaire was the inclusion of a "cheap-talk" part. This approach is increasingly used in CE studies and aims to reduce hypothetical bias. Indeed, it has been documented that respondents tend not to reveal their true preferences and to exaggerate their actual Willingness-to-Pay or their preferences regarding specific attributes because they will not be asked to actually take and action or pay the specific amount. With "cheap talk" respondents are informed that the payment is hypothetical, but they are urged to respond as if they were to really pay the specific amount of money, as their sincerity os important for the research. The specific quotation used in as follows

"The establishment of the Agency requires funds that can be raised through the financial contribution of those interested in becoming members. These members will ***hypothetically*** *pay an annual subscription to help achieve the following benefits …. It is important to remember that* ***the questions are hypothetical*** *and you will not be really asked to pay something.* ***But please answer as if you were actually paying this amount.*** *Your sincerity is very important for drawing reliable conclusions".*

After the description of the payment scenario, respondents were presented with the choice sets. They were explained how they should read them and where to note their choice and then they were given time to examine them and respond. After noting their choices, they were presented with a follow-up question, where they were asked why they had chosen the alternative C (opt-

out) – if they had done so. This question included 5 choices which were designed in order to detect 'protest votes' i.e. zero responses which were given because of disagreement with the payment scenario or with the survey. It is not certain that these responses are 'true' zero's, because respondents might place some value on the valuation issue but choose not to disclose it because of their disagreement. Common responses relating to protest votes are 'The State should pay for that' or 'It is not my responsibility to pay for that'. Protest votes, when detected, are removed from the sample because they constitute a source of bias.

In the second part of the questionnaire, respondents were asked about their attitudes and personal characteristics. First, they declared their level of agreement or disagreement to a set of items concerning the multifunctional roles of sheep production in the CBA. Then they were aksed about their demographic and personal characteristics, as presented in Table 3.

Table 3. Variables used in the analysis as interaction terms

Variable name	Description	Measurement (scale)
Importance	How important is the sheep sector for your area?	1. Very important 2. Moderately important 3. Not at all important
Gender		1. Male 2. Female
Age	When were you born?	Age = 2020 – (year of birth)
Size	How many people live in your household (including yourself)?	Number of household members
Education	Highest level of formal education achieved	1. Primary school 2. High school 3. Technical school 4. University degree 5. Postgraduate studies
Profession	Type of profession	1. Employee 2. Self-employed 3. Farmer/Fisherman 4. Pensioner 5. Household 6. Student 7. Unemployed 8. Other
Income	Annual household income after taxes (available for consumption) scale/category	1. <6000€/<30.000мкд 2. 6001 – 12000€/30.001–50.000 мкд 3. 12001 – 18000€/50.001–70.000 мкд 4. 18001 – 24000€/70.001– 90.000 мкд 5. 24001€ - 30000€/90.001–120.000 мкд 6. >30000€/>120.000 мкд
Municipality	Only for Greece	1. Florina 2. Thessaloniki

Initially the questionnaire was drafted in Greek and then was translated in English by RIAS by the project team. Close care was taken to translate all details in the most accurate way so as not

to deviate from the Greek version. Then the English version was translated to Macedonian by CRD. The pre-testing (see Section 3) was done in national languages and some small amendments were made to make the phrasing more understandable. This caused small deviations from the original wording and some slight differences between the Greek and Macedonian versions. However, these differences were pointed out and were deemed as not important, as it was preferred to make the wording more understandable to the public compared to sticking to the same exact wording in both languages.

2.4. Econometric analysis of data

The econometric analysis of CE data uses Random Utility Models (RUM) where utility (U_{ij}) is distinguished in an observed (V_{ij}) and an unobserved (εi_j) part. Based on RUM, in the probability distribution function of specific model specifications (2), the probability (Pij) that respondent i chooses alternative j over all other k alternatives in choice set B equals the utility derived from this alternative over the utility derived from all other alternatives. Observed (systematic) preference heterogeneity can be captured in respondents' social and economic characteristics, which enter the model as interaction terms. Random Parameters Logit (RPL) models (Revelt and Train, 1998) are based on these distributional and behavioural grounds, but in these, a separate linear utility function is introduced for each respondent and the estimated standard deviations for random coefficients account for unobserved heterogeneity. Hence, utility from choosing an alternative in a choice set is itself a random variable. The probability distribution function is (3), where η_i is the random factor in the utility function.

$$P_{ij} = \frac{e^{\mu V_{ij}}}{\sum_{k=1}^{J} e^{\mu V_{ik}}} \forall j, k \in B \qquad \text{(b2)}$$

$$P_{ij} = \frac{e^{Z_{ij}(\beta+\eta_i)}}{\sum_{k=1}^{J} e^{Z_{ik}(\beta+\eta_i)}} \forall j, k \in B \qquad \text{(b3)}$$

In their simplest forms, RPL include only attributes as variables explaining the behaviour of respondents. However, it is very useful that other variables can enter the model, in order to explain public preferences in terms of personal attitudes, sociodemographic or behavioural characteristics. RUM do not permit to include such variables directly, however it is possible to integrate them and assess their impact as interaction terms with attributes.

In CEs the experimental design allows for the estimation of the Marginal Willingness to Pay (MWTP), for marginal changes in the level of each attribute, which is the trade-off between income and a marginal change in the level of the attribute. In particular, for RPL models, MWTP is estimated for each attribute using logit estimates. The monetary value of the good or service under consideration is reflected in the compensating surplus (CS) (Hanemann,1984), using Formula (4) (Hanemann, 1989) where Vi0 and Vi1 are the utilities of individual i before (status-quo situation) and after the implementation of the proposed valuation scenario (i.e. the specific levels of attributes in a choice set) and β_payment is the coefficient of the monetary attribute, which stands for the marginal value of income.

For attributes with fixed coefficients in RPL models trade-offs are estimated by means of Formula (5) where 1. . . n are the coefficients of interaction terms S1. . .Sn which include the specific

attribute. It is obvious that Formula (5) takes into account the observed part of preference heterogeneity. Usually, MWTP is estimated through a statistical method (δ technique), because MWTP thus calculated is a random variable itself, as the quotient of the utility function of the attribute and of the payment attribute, as can be seen in Formula 5. The WALD procedure in NLOGIT 6.0 provides a useful platform to derive such estimated in a straightforward way.

For attributes with randomized parameters, the method changes. Still Formulae 4 and 5 hold, however it is necessary that the standard deviation of the randomized coefficient needs to be included in the estimation process (Hensher et al., 2015). The technique of Hensher et al. (2015) uses the population moments to simulate the unknown distribution of MWTP. Then it is possible to estimate means, medians and standard deviations, depending on the distributional assumptions of the random coefficients. For this particular application, since the random coefficient follows a normal distribution, 3300 random draws from a normal distribution n~(0,1) were taken and then used to make consequent calculations for each draw using Formula 5.

$$CS = \frac{\ln \sum_{i=1}^{I} e^{V_{i1}} - \ln \sum_{i=1}^{I} e^{V_{i0}}}{\beta_{\text{payment}}} \quad (4)$$

$$MWTP = -\frac{\beta_{\text{attribute}} + \beta_1 S_1 + \ldots + \beta_n S_n}{\beta_{\text{payment}}} \quad (5)$$

3. Survey administration

The survey was carried out in Greece and in North Macedonia almost in parallel. The steps taken were as follows

1. Preliminary (pilot) interviews). Pilots were conducted in both countries using a common protocol. At first, the final version of the questionnaire was presented to ten farmers in each country, who took the survey and were then asked to provide feedback regarding the feasibility of the scenarios and of the levels of the attributes. After small changes were incorporated in the questionnaire, a second pilot was run to 20 respondents in each country with personal interviews. After receiving feedback, the final version of the questionnaire was delivered.
2. Since two versions of the questionnaire were designed, each one containing only four choice sets, the sample size would have to be increased. This is because each respondent would only see a part of the choice sets and thus the data acquired would be limited. Hensher et al. (2005) mention that – as a rule of thumb – the sampling strategy should foresee that each alternative should be chosen by at least 50 persons. This was the main criterion for sampling in the two countries
    a. In Greece the sample consisted of an equal number of respondents from Florina and Thessaloniki. The reason for that was to examine whether local populations were more interested in supporting conservation and protection actions, as Pelagonia breed is

characteristic for Western Macedonia and for the Regional Unit of Florina in particular. Therefore, the sample consisted of 200 respondents from Florina and 200 from Thessaloniki.

b. In North Macedonia the sample was larger, as it was expected that respondents would be less willing to participate to the survey. Therefore the initial sample was set to 500 respondents in total.

3. In both countries, the survey administration was as similar as possible. Enumerators in North Macedonia were trained by the Greek team (RIAS). They were given specific instructions on how to approach respondents and how to describe attributes, levels and the payment scenario. After receiving information, respondents were shown the choice sets and were asked to study them and mark their preferred alternative by themselves. Questions in the second part of the questionnaire were filled by the enumerator. On average each interview lasted about 10 minutes, but duration varied from 6-7 minutes to over 20.

In total, the survey in Greece yielded 294 valid questionnaires (1176 responses to choice sets) and in North Macedonia 352 valid questionnaires (1488 responses to choice sets). This demonstrates that the response rate to the survey was very satisfactory (73,5% in Greece and slightly lower in North Macedonia (70,4%)). After removing protest votes, the final sample consisted of 1100 valid responses for Greece and 1340 valid responses for North Macedonia.

Data were input in an MS Excel spreadsheet. Responses to Likesrt-scale questions were analysed using SPSS v.24 and the CE data with Limdep v.11/NLOGIT 6.0.

4. Results

4.1. Results of the survey in Greece

Table 4 presents the results of descriptive analysis of questions regarding respondents' opinions towards the main roles that sheep farming plays in the Greek side of the CBA. In general, respondents demonstrate a high level of acknowledgement of the importance of the multiple roles of sheep farming. The most popular items presented to respondents (median value = 5) were the ones regarding the importance of environmental protection (97,5% sum of 'Agree' and 'Strongly agree' responses) and the one concerning the need to tackle unemployment in rural areas (89,8%). Other popular items (Median = 4) were the ones involving the need to remunerate farmers well (81,8%) and the preference for locally produced food (76,4%). The items concerning interest in folklore (33,5%) and recreational values of rural areas (43,3%) achieved lower levels of agreement (Median = 3). Two more questions were presented to respondents which also deal with the roles of the sheep sector, but with opposite wording (negative meaning). The statement that local festivals are old-fashioned received a total of 41,1% of negative responses ('Totally disagree' and 'Disagree') (Median = 3), while only 13,1% of respondents stated that they do not consume meat or dairy products (Median = 1).

Table 4. Respondent attitudes towards the sheep sector for the sample from Greece

	Strongly disagree [1]	Disagree [2]	Not agree/ Not disagree [3]	Agree [4]	Strongly agree [5]	Total	Median
Farmers and livestock producers should be remunerated well	3	2	45	117	108	**275**	4
The environment is the most precious thing we have	1	0	6	39	229	**275**	5
Local festivals are old and old-fashioned	66	47	75	51	36	**275**	3
I visit rural areas for recreation	25	48	83	82	37	**275**	3
Unemployment in rural areas should be reduced	3	3	22	75	172	**275**	5
I don't eat meat or dairy products	145	39	55	19	17	**275**	1
I am interested in folklore	21	63	99	64	28	**275**	3
I prefer to buy locally produced food	3	14	48	85	125	**275**	4

Table 5 presents the RPL model which was estimated for the dataset from Greece. After removing protest votes, the total sample size consisted of 1100 valid responses. Various model specifications were tested, including the estimation of models where the coefficients of one or more attributes were allowed to vary. The model presented in Table 1 provided the best fit. In this model, the coefficient of "Payment" variable was found to have a statistically significant standard deviation, which reveals that Greek respondents have heterogeneous preferences for the payment amount and this heterogeneity cannot be captured by the variables included in the model. McFadden R-square is satisfactory (0,2540) compared to the ones reported in other similar studies. Respondents personal characteristics are included in the model as interaction terms, which yields the following considerations regarding observed preference heterogeneity

- *Traditional production*. The interaction term between "Traditional production" and "Importance" has a positive sign. This shows that the more respondents deem that sheep sector in the CBA is important, the more important they consider traditional production patterns.
- *Employment and rural development*. The interaction term between "Employment" and "Importance" has a positive sign. This shows that the more respondents deem that the sheep sector in the CBA is important, the more important they consider the generation of additional jobs for rural families. This consideration shows that the public believe that more employment in the sector will ensure its maintenance to play its important roles, while also that the farming sector can be significant in job creation and reducing unemployment.
- *Sustainable rangeland management*. For this attribute, two interaction terms were found to have significant coefficients. In particular, the interaction term "Rangelands*Income" has a positive sign which implies that respondents with higher incomes tend to prefer an expansion of

extensive ranging flocks to ensure sustainable environmental management. On the other hand, a negative sign is reported for "Rangelands*Education", as it seems that lower education levels are connected with a preference for more sustainably grazed rangelands. It should be stressed that the magnitude of these two coefficients is very small.

- *Culture*. This attribute was effects coded in the dataset, therefore each level of the attribute is included as a separate variable. For level 1 (production of a typical product) two interaction terms were found significant. The coefficient of "Typical product*Municipality" is negative, which implies that respondents from Thessaloniki do not prefer this alternative compared to those from Florina. Note that also the same stands for level 2 (local awareness event), as the coefficient for the interaction term "Event*Municipality" is also negative. On the other hand, the coefficient of "Typical product*Size" is positive, which shows that respondents with larger households prefer this option compared to respondents with smaller households. For the third level of the attribute, the interaction term "Museum*Education" is negative, showing that individuals with lower education levels would prefer this level.

Table 5. RPL model with interaction terms for the sample from Greece

Variables/Interaction terms	Coefficient	Standard error
Constant	3,48743***	0,61112
Payment	-0,01691***	0,00645
Payment – Standard Deviation	0,01408*	0,00785
Payment*Gender	0,01095***	0,00309
Payment*Education	-0,00553***	0,00146
Payment*Income	0,00226**	0,00112
Rangelands*Income	0,23428D-05*	0,1325D-05
Rangelands*Education	-0,22511D-05**	0,1129D-05
Employment*Importance	0,00039***	0,00012
Tradition*Importance	0,11017***	0,03170
Museum*Education	-0,16111***	0,04187
Event*Municipality	-0,25508***	0,09107
Product*Municipality	-0,32261***	0,09689
Product*Size	0,10860***	0,03931

** Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level*
McFadden R-square 0,2540; Log-Likelihood function -901,53555; Draws 300 Halton; The coefficient of "Rangelands" follows a normal distribution; Chi squared [14](P= .000) 613,87594; Observations 1100

- *Payment amount*. The coefficient of the attribute was found significant with a significant standard deviation. In addition, three interaction terms with "Payment amount" were found significant. Therefore, preferences regarding this attribute are highly heterogeneous, with significant observed and unobserved heterogeneity. Firstly, the coefficient of the attribute is negative, which demonstrates that increases in the payment amount have negative effects on the probability of choosing an alternative and this happens regardless of other respondent characteristics. This finding confirms the rationality in the behaviour and preferences of respondents. In addition, a further confirmation is derived from the positive sign of the "Payment*Income" interaction term, which implies that respondents with higher incomes have

higher probabilities of paying a specific amount. The term "Payment*gender" has a positive coefficient, showing that women are expected to be willing to pay higher amounts than men, while the coefficient of "Payment*Education" is negative, showing that persons with higher education levels are expected to pay lower amounts. When it comes to unobserved heterogeneity – the type that is not captured by terms and characteristics included in the experimental design – the significant standard deviation shows that individuals are affected in different ways by the proposed payment amounts. Since the coefficient follows a normal distribution, there is a non-trivial percentage of respondents with preference reversals i.e. they would correspond positively if I higher payment amount was presented to them.

Based on the results of the RPL model, MWTP estimates are calculated for all attributes. For the estimation, the mean values of all individual characteristics included as interaction terms were used, therefore the estimates reflect the preferences of the "average" respondent. Table 6 presents these results. The most important finding is that MWTP varies significantly across attributes. First of all, there is a significant positive MWTP for Traditional Production, which shows that the Greek public in the CBA would be willing to pay 12,82€ annually to support policies towards more traditional production patterns. This would involve marginal changes from the status-quo situation to keeping animals to more spacious establishments and to stopping the use of antibiotics. On the other hand, the MWTP for employment is positive but considerably lower, as the average respondent would contribute only 0,05€ to support the generation of employment for one additional rural family. The same largely stands for rangeland management, as the MWTP for an additional stremma of land grazed sustainably is negative but trivial (0.000062€). It is also important to notice that MWTP for all levels of "Culture" attribute are negative, so none of the three levels presented to the public constitute choices that would increase their utility. Nevertheless, in discussing these findings, preference heterogeneity is a very important factor that needs to be taken under consideration. Standard deviations for all MWTP estimates are large, due to the high unobserved preference heterogeneity for payment amounts. Therefore, for all attributes there is a part of respondents which has opposite MWTP.

Table 6. Mean Willingness to Pay (MWTP) estimates for the sample from Greece

	Attributes/Levels					
	Traditional production	*Employment (€/additional family)*	*Rangelands (€/additional stremma)*	*Culture*		
				Local product	Awareness event	Museum
MWTP (€)	12,82	0,05	-0,000062	-6,96	-19,37	-28,36
Standard deviation	41,17	0,14	0,000196	22,15	61,62	90,19

The effects of observed preference heterogeneity are illustrated in the differences between the MWTP for respondents from Thessaloniki and from Florina (Table 7). For these estimations, the means for respondent characteristics from each city were used. The results reveal that the average respondent from Florina has slightly higher MWTP for almost all attributes. It is particularly important to notice the discrepancy between MWTP for a "Local product" in Florina and Thessaloniki. Although respondents from Thessaloniki have a negative MWTP, for respondents

in Florina this is marginally positive, showing that this option if valued much more positively by the local population.

Table 7. Mean Willingness to Pay (MWTP) estimates for the Florina and Thessaloniki

	Attributes/Levels					
	Traditional production	*Employment (€/additional family)*	*Rangelands (€/additional stremma)*	*Culture*		
				Local product	Awareness event	Museum
Thessaloniki						
MWTP (€)	11,94	0,04	-0,000017	-14,26	-25,36	-27,39
Standard deviation	39,73	0,14	0,000057	47,44	84,38	91,13
Florina						
MWTP (€)	13,12	0,05	-0,000100	1,06	-11,92	-27,54
Standard deviation	43,45	0,15	0,000347	3,52	39,45	91,20

4.2. Results of the survey in North Macedonia

Table 8 presents the results of descriptive analysis of questions regarding respondents' opinions towards the main roles that sheep farming plays in the Macedonian side of the CBA. As in the case of Greece, responses demonstrate a high level of agreement regarding the importance of the multiple roles that the sheep and goat sector plays. The median score of responses in the six statements with positive meanings was 4. The most popular one were also – like in the Greek sample – the one regarding environmental protection (96,7%), followed by good remuneration for farmers (85,7%); consumption of local food (84,2%); reduction of unemployment in rural areas (82,7%); recreation in rural areas (77,6%); and interest in folklore (74,0%). The two items with negative meanings both achieved medians equal to 2. The statement that local festivals are old-fashioned received a total of 63,0% of negative responses ('Totally disagree' and 'Disagree'), while only 5,7% of respondents stated that they do not consume meat or dairy products.

Table 9 presents the RPL model which was estimated for the dataset from North Macedonia. After removing protest votes, the total sample size consisted of 1340 valid responses. Various model specifications were tested, including the estimation of models where the coefficients of one or more attributes were allowed to vary. The model presented in Table … provided the best fit. In this model, the coefficient of "Rangelands" variable was found to have a statistically significant standard deviation. Therefore, there is significant unobserved preference heterogeneity and this fact yields important considerations regarding the modernization process of sheep production in North Macedonia, as will be discussed below. McFadden R-square is satisfactory (0,2330) compared to the ones reported in other similar studies. Respondents personal characteristics are included in the model as interaction terms, which yields the following considerations regarding observed preference heterogeneity

Table 8. Respondent attitudes towards the sheep sector for the sample from North Macedonia

	Strongly disagree [1]	Disagree [2]	Not agree/ Not disagree [3]	Agree [4]	Strongly agree [5]	Total	Median
Farmers and livestock producers should be remunerated well	0	5	43	180	107	335	4
The environment is the most precious thing we have	0	0	11	200	124	335	4
Local festivals are old and old-fashioned	43	168	86	22	16	335	2
I visit rural areas for recreation	6	31	38	190	70	335	4
Unemployment in rural areas should be reduced	8	7	43	183	94	335	4
I don't eat meat or dairy products	93	195	28	12	7	335	2
I am interested in folklore	3	32	52	174	74	335	4
I prefer to buy locally produced food	2	8	43	191	91	335	4

- *Traditional production*. The interaction term 'Tradition*Education' is negative, which shows that respondents with higher education levels are less interested to support traditional production in the form of less confined animals or less use of antibiotics. On the other hand, the positive sign of the interaction term with Income shows that higher income levels can be associated with preferences towards such traditional practices.
- *Employment and rural development*. The interaction term between 'Employment' and 'Gender' has a negative sign. This shows that women are less interested than men to support the generation of more jobs in the sheep sector.
- *Sustainable rangeland management*. Preferences for this attribute are heterogeneous, with significant observed and unobserved heterogeneity. In particular, two interaction terms were found to have significant coefficients. The interaction term "Rangelands*Importance" has a positive sign which implies that respondents who deem that the sheep sector is important for their area have a preference towards larger areas grazed sustainably. On the other hand, a negative sign is reported for "Rangelands*Size", as it seems that members of larger households are not in favour of the expansion of grazed areas. Apart from these considerations, however, the coefficient of 'rangelands' is positive, which shows that when observed preference heterogeneity is not taken into account, the public has a general preference towards larger areas sustainably grazed by sheep. The significant estimated standard deviation of this coefficient, however, illustrates that there are also other factors that affect preferences, which are not taken into account in the experimental design. In fact, the standard deviation is larger than the coefficient and, given that it follows a normal distribution, there is a very significant part of the population with reverse preferences.

- *Culture*. This attribute was effects coded in the dataset, therefore each level of the attribute is included as a separate variable. the coefficient of 'Product*Education' is positive, which implies that respondents with higher educational backgrounds would support this option compared to the existing situation. For level 2 (local awareness event) the positive coefficient of "Event*Gender" shows that women are more inclined than men to support this type of valorization of the cultural heritage related to Pelagonia breed. On the other hand, the coefficient of "Museum*Size" is negative, which shows that respondents with smaller households prefer this option compared to respondents with larger households.
- *Payment amount*. The coefficient of "Payment*Importance" was positive, which shows that persons who deem that the sheep sector is important for the area are more inclined to pay larger amounts to support actions about protecting and valorizing Pelagonia sheep.

Table 9. RPL model with interaction terms for the sample from North Macedonia

Variables/Interaction terms	Coefficient	Standard error
Constant	0.34429	0.57089
Rangelands	0.00071***	0.00022
Rangelands – Standard Deviation	0.00096***	0.00024
Rangelands*Importance	0.00023***	0.7430D-04
Rangelands*Size	-0.00018***	0.5084D-04
Tradition*Education	-0.07512	0.04869
Tradition*Income	0.23759***	0.05226
Employment*Gender	-0.00145***	0.00027
Product*Education	0.11321**	0.04749
Event*Gender	0.53980***	0.20825
Museum*Size	-0.12221**	0.04755
Payment*Importance	0.00049***	0.7953D-04

** Significant at the 10% level; ** Significant at the 5% level; *** Significant at the 1% level*
McFadden R-square 0,2330; Log-Likelihood function -1129,15963; Draws 350 Halton; The coefficient of "Rangelands" follows a normal distribution; Chi squared [12](P= .000) 685,96168; Observations 1340

Based on the results of the RPL model, MWTP estimates are calculated for all attributes. For the estimation, the mean values of all individual characteristics included as interaction terms were used, therefore the estimates reflect the preferences of the "average" respondent in North Macedonia. Table 10 presents these results. The most important finding is that MWTP varies significantly across attributes, much like in the case of Greece, although different preferences are revealed. A notable difference from the Greek sample is that the MWTP for Traditional Production is negative (-327,80MKD). The public of North Macedonia does not seem to support an extensification pattern of sheep farming, which would reverse the modernization trend of the sector. On the other hand, the MWTP for employment is positive and almost equal to the MWTP estimated for the Greek sample. Taking into account the significant income differences between the populations of the two countries, the Macedonian sample places more importance on this attribute, although the MWTP is still low. The same largely stands for rangeland management, as the MWTP for an additional stremma of land grazed sustainably is negative but trivial (-

0.51MKD). However, as explained above, preferences for this attribute are quite heterogeneous, therefore there are societal groups with increased and positive MWTP. This reflects the diversity of opinions regarding the modernization of the sector in North Macedonia: intensification/confinement or extensive traditional production? Regarding 'Culture' the most preferred alternative is the establishment of a museum, for which MWTP is quite high (458,96MKD), while the other two options are linked to negative MWTP. It is worth to note that for the Greek sample, the 'Museum' was the least preferred option and received negative MWTP.

Table 10. Mean Willingness to Pay (MWTP) estimates for the sample from North Macedonia

	Attributes/Levels					
	Traditional production	*Employment (MKD/additional family)*	*Rangelands (MKD/additional hectare)*	*Culture*		
				Local product	Awareness event	Museum
MWTP (MKD)	-327,80**	2,43***	-0,51	-354,50**	-908,00***	458,96***
Standard error	135,36	0,357	0,997	159,858	351,603	160,41

5. Conclusions

The results of the Choice Experiment demonstrate that Pelagonia sheep breedhas important roles to play in the CBA, despite the fact that preferences are heterogeneous. Public awareness regarding the protection of genetic diversity is rather low, but there are societal groups favouring this option. The CE method has yielded important considerations which need to be taken into account in the design of policies and strategies for the sheep sector, in general, and for the protection and valorization of Pelagonia breed, in particular. A common consideration is that the designation of a certified local product is not an option which is supported by the public in both countries, with the exception of respondents in Florina. In addition, the opposing preferences of populations in North Macedonia and Greece regarding traditional production demonstrates that each country/region should focus on supporting different production patterns for their sheep farming sectors. Support in employment in the sheep sector is an option positively evaluated in both countries but the MWTP was very low, indicating that the public is not willing to pay large amounts to support sheep producers directly, like in the example of farm income support measures. Also, preferences for rangelands demonstrate that extensification, with more animals grazing sustainably, is not an option that the public in the CBA would support. However, in both countries preferences are quite heterogeneous, with specific societal groups supporting this option.

References

Arrow, K., Solow, R., Portney, P., Leamer, E., Radner, R., Schuman, H., 1993.Contingent valuation methodology report, report of the NOAA panel oncontingent valuation. Fed. Regist. 58 (10), 4602–4614.

Boxall, P.C., Adamowicz, W.L., Swait, J., Williams, M., Louviere, J., 1996. Acomparison of stated preference methods for environmental valuation. Ecol.Econ. 18, 243–253.

Hanemann, W.M., 1984. Welfare evaluations in contingent valuation experimentswith discrete responses. Am. J. Agric. Econ. 66, 332–341.Hanemann, W.M., 1989. Welfare evaluations in contingent valuation experimentswith discrete response data: reply. Am. J. Agric. Econ. 71, 1057–1061.

Hensher, D.A., Rose, J.M and Greene, W.H. (2015). Applied choice analysis. Cambridge University Press, Second Edition.

Lancaster, K., 1966. A new approach to consumer theory. J. Political Economy 74(2), 132–157.

Louviere, J.J., Hensher, D., Swait, J., 2000. Stated Choice Methods: Analysis andApplications in Marketing, Transportation and Environmental Valuation.Cambridge University Press.

Mitchell, R.C., Carson, R.T., 1989. Using Surveys to Value Public Goods: TheContingent Valuation Method. John Hopkins University Press, Baltimore, USA.

Revelt, D., Train, K., 1998. Mixed logit with repeated choices: households' choice ofappliance efficiency level. Rev. Econ. Stat. 53, 647–657.

Appendix – Sample questionnaire in English

Appendix – Sample questionnaire in Greek

Appendix – Sample questionnaire in Macedonian