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Farmer's Pride

Networking, partnerships and tools to enhance *in situ* conservation of European plant genetic resources

Public willingness to pay for agrobiodiverse-related goods and services in Europe

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Contents

Summary

Agrobiodiversity is associated with a range of important but poorly quantified public good ecosystem services, the conservation of which requires public support. With the objective of determining the general public's willingness-to-pay (WTP) for landrace conservation and to inform decision-making regarding the allocation of public funds to crop diversity conservation, 801 adult resident respondents across five EU countries[1] were interviewed in person using a stated preference choice experiment to elicit the value that the general public places on crop genetic resources conservation, using traditional wheat landraces as a case study. The data were analysed using random parameter logit (RPL) models, which permit the robust analysis of preference heterogeneity across individuals and countries.

Four conservation programme attributes plus programme cost were applied: (i) insuring against the risk of agricultural production loss, (ii) the maintenance of landscape and ecological values, (iii) protection of wheat landrace diversity, and (iv) the maintenance of traditional knowledge and cultural practices (including aspects of food culture). A full description of the attributes and their levels (selected in consultation with genetic resources and agricultural experts) can be found in Annex I. The survey was designed so that each of the four different attributes represents a component of the total economic value (TEV) of the genetic resource, such that the sum of the separate attribute values may be used as an estimate of the TEV of the public good ecosystem services associated with the maintenance of wheat landrace diversity in farmers' fields.

Table 1: Mean individual and aggregate WTP for conservation programme attributes

	Pooled sample (household estimates)	**Aggregate estimates[2]**	**Conservative (10%) estimate**
Avoid high production risk	€30.94	€3.2 billion	€323 million
Maintain/Improve landscape & ecological values	€34.09	€3.6 billion	€356 million
Support cultural aspects	€3.04	€320 million	€32 million
Maintain 100% of current extant diversity for future generations	€27.30	€2.9 billion	€290 million
Total Economic Value	€95.37	€10 billion	€1 billion

Source: Farmer's Pride General Public Survey

Results reveal strong support for the conservation of wheat landrace diversity, with average WTP amounting to just over €95 (one-off donation) per respondent (see Table 1). In particular, strong preferences were revealed for the landscape and ecological values of wheat conservation, which are associated with the presence of landraces *in situ* through on-farm conservation. We find, however, quite a high degree of heterogeneity between countries (full details below), particularly in terms of preferences for avoiding risk and for the number of varieties maintained

With an average one-time only total WTP per respondent of €95 and a total population of slightly over 100 million across the five countries, we estimate that the general public of these five countries would be willing to pay €10 billion for the conservation of wheat landrace diversity alone. Even assuming that only 10% of those individuals would actually be willing to pay in practice (to counteract any hypothetical bias experienced in our survey), we would still obtain a one-time WTP of €1 billion, equivalent to approximately Euro 80.2m per annum over a 20-year time horizon at a 5% discount rate. These findings demonstrate the significant and frequently ignored social welfare benefits associated

[1] Austria [n=100], Greece [n=200], Hungary [n=200], Switzerland [n=101] and the U.K. [n=200]

[2] Based on an aggregate five-country population estimate for 2019 of approximately 105 million, data from EUROSTAT.

with non-market agrobiodiversity-related public good ecosystem services and provide a strong rationale for further government investment in on-farm conservation of landraces in Europe.

Estimated conservation costs (€1.8m–€33m p.a.)[3] are well within the general public's willingness to pay (€80.2m p.a.), resulting in a high benefit-cost ratio (2.4 – 44.6). Given the public's levels of WTP for wheat landrace conservation, which even at the relatively low levels found in the Alpine countries and the UK is sufficient to fund critical conservation interventions, there is **potential to better align agrobiodiversity conservation funding with EU citizens' preferences for the conservation of agricultural diversity.**

[3] See findings of Drucker, A.G. *et al*. 2021. Effectiveness of existing levels of *in situ* support for landrace conservation and use in Europe. Farmer's Pride: Networking, partnerships and tools to enhance *in situ* conservation of European plant genetic resources.

1. Introduction

A number of factors including the development of improved crop varieties and the modernization of agriculture has led to a narrowing of agricultural diversity maintained on European farms. In this study, we take wheat as a case study for exploring the topic of on-farm conservation of crop diversity in the European context.

More specifically, we investigate whether the general public of five European countries (Austria, Greece, Hungary, Switzerland, and the United Kingdom) are willing to pay for various forms of value associated with the conservation of wheat diversity, namely: the avoidance of production risk (option values); cultural values; landscape and ecological values; and diversity value associated with the maintenance of varieties (existence and bequest values).

We hypothesize that the general public will have a positive willingness-to-pay (WTP) for non-market values associated with wheat landrace conservation, thus justifying public support for these activities.

2. Method

A discrete choice experiment method was used, designed to elicit the preferences of respondents by asking them to choose between different programmes featuring different attributes (see Annex II for an example of a choice card).

Data were collected via face-to-face interviews in all five countries during the summer and autumn of 2019. As far as possible, gender balance was sought amongst respondents, as well as between respondents from urban and rural areas.

We estimate a mixed logit (MXL) or random parameter logit model, which is a discrete choice model that relaxes the independence of irrelevant alternatives assumption and facilitates the analysis of preference heterogeneity between respondents. The mixed logit model relies on a random utility model in which respondent i's utility associated with choosing alternative j out of the J alternatives in a given choice task t is expressed as follows:

$$V_{ijt} = \mathbf{X}_{ijt}\mathbf{b}_i + p_{ijt}a_i + e_{ijt} \qquad (1)$$

Here, utility parameters are modelled as random instead of fixed, in contrast to the simpler conditional logit model, and follows a specified multivariate parametric distribution.

In our model, we assume all coefficients are random and freely correlated, characterized by a normal distribution, with the exception of the cost coefficient, which is lognormally distributed and enters the model with a negative sign.

Our mixed logit model regressions are estimated in WTP-space using the maximum likelihood methods.

3. Results

Table 2 presents our results in WTP-space for each conservation programme attribute across all five countries (n=801).

We find that the respondents placed the most value on avoiding high production risk, maintaining landscape and ecological values, and maintaining the extant diversity of wheat varieties for future generations. Respondents also valued supporting cultural aspects of wheat landrace conservation, but to a much lesser extent (about 1/10th of the value for other attributes).

Table 2: Mean individual WTP for values associated with wheat landrace conservation

	Pooled sample (household estimates)
Avoid high production risk	€30.94
Maintain/Improve Landscape & ecological values	€34.09
Support cultural aspects	€3.04
Maintain 100% of current extant diversity for the future/future generations	€27.30
Total Economic Value	€95.37

Source: Farmer's Pride General Public Survey

In addition to this pooled sample, we also run several country-level regressions (with the Austrian and Swiss samples merged into one, due to a low number of observations for both countries). The results are shown in Table 3.

While the country-level results are less dependable given the smaller sample sizes, these results can still provide some interesting insights into differences between the preferences of respondents from different countries. For example, it can be observed that the Greek and Hungarian respondents had a much higher willingness-to-pay for all attributes, with Hungarians willing to pay more for landscape values and Greek respondents willing to pay more for avoiding high production risks. On the other hand, we find that respondents from the United Kingdom were not willing to pay for cultural components of conservation programmes (at least with regard to thatch). Overall, the total estimated economic value of wheat conservation is found to be much greater in the Greek and Hungarian samples.

Table 3: Mean individual WTP for landrace conservation programme attributes

	Greece	**Hungary**	**UK**	**Alpine[4]**
Avoid high production risk	€ 67.28	€ 44.82	€ 12.95	€ 2.15
Maintain/Improve landscape & ecological values	€ 48.02	€ 59.52	€ 15.11	€ 3.10
Support cultural aspects	€ 17.12	€ 22.58	-	€ 2.17
Maintain 100% of current extant diversity for the future/future generations	€ 10.70	€ 7.20	€ 0.90	€ 0.40
Total WTP/ « Total Economic Value »	€ 143.12	€ 134.12	€ 28.96	€ 7.82

Source: Farmer's Pride General Public Survey

[4] Austria and Switzerland were merged into a single "Alpine" sample as the number of respondents for each country was not large enough to support country-level analysis.

4. Conclusions

The results reveal strong support across the five European countries comprising our sample for the conservation of wheat landrace diversity. Average total WTP amounts to just over €95 (in the form of a one-time donation) per respondent, with strong preferences revealed for a number of values provided by wheat conservation that are associated with the presence of landraces *in situ* through on-farm conservation.

Estimated conservation costs (€1.8m–€33m p.a.)[5] for a substantial portfolio of landraces/traditional varieties are well within the general public's WTP (€80.2m p.a.), even just for wheat landrace conservation. Given the public's levels of WTP, which even at the relatively low levels found in the Alpine countries and the UK is sufficient to fund critical conservation interventions, there is **potential to better align agrobiodiversity conservation funding with EU citizens' preferences for the conservation of agricultural diversity.** The 2021–2027 Common Agricultural Policy —and particularly the European Agricultural Fund for Rural Development (EAFRD) —provides a valuable framework for doing so[6].

[5] As described in Drucker, A.G. *et al*. 2021. Effectiveness of existing levels of *in situ* support for landrace conservation and use in Europe. Farmer's Pride: Networking, partnerships and tools to enhance *in situ* conservation of European plant genetic resources.

[6] As described in Drucker, A.G. *et al*. 2021. Effectiveness of existing levels of *in situ* support for landrace conservation and use in Europe. Farmer's Pride: Networking, partnerships and tools to enhance *in situ* conservation of European plant genetic resources.

Annex I
Description of Choice Experiment Attributes and Levels

	Attribute	Options	Description
	Landscape Conservation	Increase / Decrease / Stable	The cultivation of landraces / traditional varieties of wheat can be important for the maintenance of the landscape. The loss of genetic diversity can negatively impact ecological processes and the appearance of the landscape, for example leading to different types of vegetation growing, affecting water flow, reducing soil quality and potentially having negative impacts on wildlife.
	Risk of loss of agricultural production	Low / Moderate / High	The lack of genetic diversity in agricultural systems can increase the vulnerability of crops to extreme events such as hail, wildlife, diseases, etc, resulting in lost agricultural production and negatively impacting regional food security. Conservation of traditional wheat varieties will make sure that plant breeders and farmers have the option to use these varieties in the future to increase the resilience of wheat production in your country.
	Wheat diversity for future generations	10% / 50% / 90% (Percentage of currently existing numbers of landraces / traditional varieties in 50 years)	Market pressures for certain types of wheat have increased the risk of extinction for other varieties with lower market values. Your donation to a conservation program will help to ensure that a given proportion of traditional wheat varieties will still be in existence in the future (regardless of their use) and also that they will remain available for the benefit of future generations.
	Maintaining traditional knowledge, cultural practices and special food products	Yes /No	Biodiversity is an important cultural asset. Different varieties of wheat are often associated with local cultural events and special food products. For example (specify example relevant for country context)……..
	Cost of Program	0 / 5 / 10/ 20 / 35 / 75 (Euro)	Each program is associated with a payment level that reflects the cost of implementing the conservation option under consideration. These payments represent your single individual contribution.

Annex II: Example of Choice Card (Continental Europe)

Attribute	Programme A	Programme B	Current situation
Cost of Programme Management (single individual donation from you)	10 EURO	50 EURO	0 EURO
Landscape Conservation 	Landscape health and appearance likely to **remain stable**	Landscape health and appearance likely to **improve**	Landscape health and appearance likely to **decline**
Risk of loss of agricultural production 	Low	High	High
Wheat diversity for future generations 	50% of currently existing numbers of landraces / traditional varieties left in 50 years	90% of currently existing numbers of landraces / traditional varieties left in 50 years	10% of currently existing numbers of landraces / traditional varieties left in 50 years
Maintaining traditional knowledge, cultural practices, and special food products 	Yes	No	No