

Supplementary Materials

1.1. Validity of the study

The interpretation of the study's results should take into account limitations in its validity. Firstly, the issues of respondents not being able to recognize individual NWFPs, that the products they were referring to came from agricultural production and that the survey did not cover all relevant products. To avoid these concerns, we marked each NWFP in the questionnaire with local and Latin name as well as with a picture, where the pre-testing feedback was that the pictures are illustrative enough for the species to be recognized. Also, the words 'wild forest products' were used in the title of each page to address products that originate from forests, as the term 'non-wood forest products' is not well known among the general public (whereas 'wild forest products' has a clear association to products coming from the forest). The terms 'forest' and 'wild' were used frequently in order to separate them from products that originate from agricultural production (e.g. 'forest nuts' for the product group and 'wild strawberries' for the individual product). In order to reach a shared understanding of the questionnaire's text, compromises had to be made when it came to strict species naming and response categories; for example, joint listing of bilberries (*Vaccinium myrtillus*) and blueberries (*Vaccinium corymbosum*) in a single NWFP category with one being wild in Europe and the other a cultivated species from North America, whereas other products in the group of wild berries are single species. Many more species are collected than reported in this study; e.g. Schulp *et al.* (2014) note 152 mushroom and 592 plant species are collected in Europe. However, respondents only indicated 'other products' infrequently and this accounted for only for 6.8% of total weight.

Secondly, there was a risk that our sample is not sufficiently large to estimate the collection rates and value, especially as the vast majority of households that collect NWFPs collected very small quantities, with a minority collecting large quantities. This is not problematic for the overall results, but is problematic for country-level estimates where there are few records per product; so a single high volume response may unduly influence the country-level estimates. In the country-by-product table of collected weight, 60% of countries have at least one data collection point in the top decile (i.e. ten or more respondents). This corresponds to 93% of total collected weight and 79% of total value. The criterion of having at least two collection points in the top decile by product by country is met by 47% of entries in the country-by-product matrix (representing 84% of total weight and 70% of total value), and the criterion of three collection points in top decile is met by 45% of entries (representing 78% of total weight and 62% of total value). These figures demonstrate the robustness of the NWFP weight estimations, as more than three quarters of total weight have been estimated with three or more data collection points in the top decile.

Thirdly, in the estimation of total NWFP value, it is assumed that the first placement prices could be attained for the entire collected weight. While this assumption cannot be tested, it can be stated that in terms of international sales, the prices per kg of NWFPs in Europe do not decrease with the increase in the volume of sales (Pettenella *et al.*, 2014) It can be argued that national food price indexes used to estimate the NWFP prices do not take into account the specifics of NWFPs, which are frequently aimed at niche markets. While this is true, it implies that estimates in this study are less variable than what the actual case might be. In terms of magnitude, only one quarter of the total value is based on estimated prices. It also has to be stated that all the presented figures reflect the collection of NWFPs in a single year and their production varies from year to year (Calma *et al.*, 2010); e.g. in Mediterranean-type forest ecosystems, mushroom yield can double in certain years (Alday *et al.*, 2017).

And lastly, we have treated the sample as if was a simple random sample. With this assumption, it is statistically representative sample (can be easily checked for example [here](#)). By representative we mean that our sample-wide results have a $\pm 0.74\%$ margin of error (or confidence interval), and that our country-level results on mean have a $\pm 4.21\%$ margin of error. It also means that in 95 out of 100 randomly drawn samples of European households, the respondents would select the answers that lie within above stated margin of error (i.e. 95% confidence level). However, there are some deviations of this sample from a simple random one. The sampling frame included those households where the respondents are over 18 years old, have access to internet, are aware of household consumption habits and are registered to the panel. The respondents are thus proxies for households. Obviously sampling frame and sample in our case are not exactly the same, but this is never the case in on-line surveys. The biggest difference is in the fact that the respondents have to be registered to the panel (i.e. have signed-up to a polling agency's registry of potential survey respondents in order to receive money for doing so). The distribution of panelists for the polling agency that has distributed it can be seen [here](#), by gender and age group. It also has to be stated that no polling agency operates on its own – they are national agencies that operate in a network of polling organizations for bigger surveys like this – so it has little effect which one you choose, as the age and gender classes are distributed in a similar way. Another bias might be that people give false identities in these type of surveys, or that heavy internet users and younger people subscribe to pools more than others. The polling agency that distributed the questionnaire deals with these biases (see [here](#)). There is no significant difference between share of rural households in the sample from the population of European households. Another factor that might complicate comparison is the size of the households – i.e. they should match in the sample and in the population, as it is likely that larger households collect more. We did this correction in post-stratification. However, all of these biases are much smaller than the bias stemming from the fact that collected weight and value have strong negative skewness of its distribution; i.e. vast majority of households collect small quantities of NWFPs and small share of households collects very high quantities. The distribution is best exemplified by the fact that the mean collected weight is three times higher than the median (60.2 kg vs. 20 kg) and that the mean is located on 83rd percentile. Such distribution creates a bias that the sample has disproportionately high probability of gathering responses on small collected weights and disproportionately low probability of gathering responses on large collected weights. It also means that our figures on collected weight and value are most likely underestimates. This shortcoming cannot be practically remedied by any research design that strives to be representative of the population of European NWFP collectors. Rather, it can be remedied by conducting studies with alternative research design, such as participatory research with snowball sampling or a partial supply-chain study on a grid of case-study areas.

According to our knowledge, our study is the first European-wide study that quantifies the economic importance of marketed and non-marketed NWFPs using a standardized methodology that allows for direct comparison between countries. Previous study that aimed to quantify the importance of NWFPs found that about 14% of the European population collect NWFPs (Schulp *et al.*, 2014), while our finding is to some degree higher (26% of households). According to latest compilation of official national statistics (FOREST EUROPE, 2015), the value of marketed plant-based NWFPs in Europe was 1.7 billion € in 2014. However, this figure focuses on formally marketed products. The more relevant comparison figure, which also takes into account informal markets (FAO, 2014), is 5.4 billion € for plant-based NWFPs, and is based on a combination of official national statistics and expert interviews. Compared to these figures, our study has reported a lower value of marketed NWFPs at 3.5 billion €. A possible explanation of this discrepancy could be that we failed to appropriately capture the commercially oriented collection of NWFPs. We also

did not take into account the value of decorative NWFPs and animal-based NWFPs. According to latest compilation of official national statistics (FOREST EUROPE, 2015), decorative NWFPs represent 47% of the total formal market value of plant-based NWFPs in Europe. Animal-based NWFPs would account for an additional 37% of value of the marketed plant-based NWFPs. When looking at individual countries, our results are in line with previous studies – see Table S1 for more extensive comparison. For example, MacDicken *et al.* (2016) estimate the value of annual NWFP removals in Spain at 35 € per hectare and 127 € per hectare in Portugal. Again, our results are similar as we estimate the value of annual NWFP removals in Spain at 34 € per hectare and in Portugal 61 € per hectare.

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Table S1. Comparison of results from this study to results by other authors

Country and reference	Results found in literature	Results found in this study
Finland (Turtiainen et al, 2012)	23% - 47% Households collect mushrooms 15.0 – 16.1 million kg of mushrooms per year in the country	37.1% Households collect mushrooms 14.9 million kg of mushrooms per year in the country
Finland (Sievänen and Neuvonen, 2011)	40% citizens collect mushrooms 58% citizens collect berries	37.1% households collect mushrooms 46.9% households collect berries
Poland (Barszcz and Suder, 2009)	50% households collect NWFPs mean weight of collected mushrooms per rural household 69.9 – 74.9 kg per urban households – 31.7 – 36.9 kg	44.5% of households collect NWFPs 14.9 kg per rural household 11.7 per urban household
Slovakia (Kovalčík, 2014)	25% - 34% citizens collect bilberries 0.61kg – 2.8kg bilberries per person that collects 66% citizens collect <i>Boletus</i> spp. 1.15 -3.51 kg of <i>Boletus</i> spp. – per person that collects total collection in the country by year berries 29,042tons mushrooms 27,488 tons	21.9% households collect bilberries 5.6 kg of bilberries per household that collects 41.8% households collect <i>Boletus</i> spp. 13.0 kg per household that collects berries 26,465 tons mushrooms 17,761 tons
Czech Republic (Sisak, et al., 2015)	75% of households collect NWFPs 10.6 kg per every household in the country for mushrooms and berries	57.7% of households collect NWFPs 18.4 kg per every household in the country for mushrooms and berries
Finland (Saastamoinen et al, 2000)	40–50 million kg of lingonberries and bilberries are collected per year	33.5 million kg per year collected in the country
Europe (MacDicken et al., 2016)	Value of NWFP removals by ha 2010 value USD – 2015 value EUR Portugal 124 - 127 Czech Republic 101 - 103 Latvia 44 - 45 Austria 43 - 44 Poland 42 - 43 Spain 34 - 35	2015 value EUR Portugal 61 Czech Republic 173 Latvia 40 Austria 90 Poland 112 Spain 34

Table S2. Collection rates by country and product group (% of households)

	All products	Tree foliage, flowers, ferns, moss	Forest nuts	Wild Mushrooms	Truffles	Wild Berries	Wild medicinal and aromatic plants	Sap or resin	Other
Austria	36.5%	17.3%	18.5%	28.8%	0.0%	27.6%	19.0%	3.4%	0.5%

Belgium	8.2%	4.2%	6.5%	4.2%	0.7%	6.5%	5.2%	0.3%	0.0%
Bulgaria	38.1%	15.5%	19.1%	18.3%	0.7%	29.9%	22.3%	2.9%	0.0%
Czech Republic	57.7%	28.9%	30.5%	49.7%	0.2%	48.7%	32.3%	0.7%	0.0%
Germany	30.0%	16.2%	15.8%	20.0%	1.7%	25.2%	12.1%	2.1%	0.3%
Denmark	14.7%	8.3%	8.0%	4.1%	0.3%	10.8%	5.9%	0.5%	0.0%
Estonia	53.6%	14.9%	14.4%	41.6%	0.4%	46.8%	23.4%	13.3%	0.0%
Greece	14.3%	7.3%	6.6%	4.8%	0.6%	5.1%	10.8%	1.5%	0.7%
Spain	18.5%	6.4%	12.4%	11.2%	1.3%	9.6%	11.5%	1.3%	0.3%
Finland	49.1%	19.7%	1.0%	37.3%	0.2%	46.9%	9.8%	2.9%	1.5%
France	26.9%	8.4%	18.0%	19.0%	2.0%	18.6%	12.6%	0.4%	0.2%
Croatia	32.7%	10.8%	24.5%	13.4%	1.6%	22.0%	20.8%	9.4%	0.1%
Hungary	10.2%	5.5%	4.8%	6.0%	0.7%	6.1%	5.7%	0.3%	0.2%
Ireland	12.0%	5.3%	4.5%	3.5%	0.0%	9.1%	4.0%	0.5%	0.0%
Italy	17.6%	6.0%	10.4%	10.6%	2.4%	10.4%	8.2%	0.6%	0.6%
Lithuania	50.4%	11.9%	19.6%	38.7%	0.2%	36.3%	27.4%	13.1%	0.2%
Latvia	68.2%	29.2%	17.1%	59.7%	0.3%	58.3%	42.3%	26.6%	0.0%
Netherlands	5.0%	2.2%	3.4%	2.2%	0.2%	3.4%	1.7%	0.5%	0.2%
Poland	44.5%	17.4%	23.6%	37.8%	1.1%	36.6%	15.9%	6.6%	0.0%
Portugal	11.0%	5.9%	6.9%	5.1%	0.2%	6.0%	6.8%	0.4%	0.0%
Romania	24.3%	12.1%	13.9%	17.1%	0.6%	19.0%	16.8%	1.7%	0.4%
Serbia	16.4%	6.8%	9.6%	6.8%	0.3%	12.3%	10.8%	2.2%	0.1%
Russia	40.2%	16.0%	18.4%	37.8%	0.4%	35.2%	19.4%	10.2%	0.1%
Sweden	34.8%	16.7%	5.1%	28.3%	0.7%	30.7%	6.3%	0.5%	0.0%
Slovenia	53.8%	25.4%	32.3%	29.9%	0.2%	47.4%	37.9%	2.6%	0.4%
Slovakia	51.9%	21.0%	20.5%	43.9%	0.9%	38.8%	30.0%	1.1%	0.5%
Turkey	21.2%	9.7%	14.1%	9.3%	2.8%	11.0%	10.1%	2.8%	0.0%
United Kingdom	7.9%	2.3%	2.4%	3.2%	0.9%	7.1%	2.1%	0.7%	0.1%

Table S3. Additional country-level results

Country	Share of collected weight that is sold	Mean no. of collected products	Median collected weight	Share of households for which NWFPs represent income contribution
Austria	3.5%	9.0	14.8	5.3%
Belgium	1.3%	7.2	6.8	2.0%
Bulgaria	24.0%	10.3	29.5	6.5%
Czech Republic	4.2%	10.1	19.0	7.2%
Germany	8.4%	8.3	13.0	9.0%
Denmark	0.3%	8.2	5.0	1.6%
Estonia	40.1%	7.8	25.5	6.8%
Greece	14.6%	6.9	14.4	5.0%
Spain	9.3%	7.2	11.0	3.3%
Finland	10.4%	6.8	23.0	3.7%
France	1.7%	6.9	13.0	6.2%
Croatia	6.6%	8.2	22.5	7.2%

