

APPENDIX A. Shannon diversity index at the farm level

Like several previous studies (see, for example, Pacini et al., 2003; Paracchini and Britz, 2010), we use an index of crop diversity (i.e., Shannon diversity) to represent land use diversity associated with each farm. This simple approach is based on the principle that monocultural agriculture is associated with a decline in diversity of habitats and plant species, which leads to a corresponding decline in diversity of insect, bird, and mammal species (Bàrberi and Moonen, 2020). Thus, crop diversity measured as both the number of cultivated crops and the respective shares is also a good proxy for the diversity of all other species (OECD, 2003).

The Shannon diversity index is applied here to cultivated rather than spontaneous species, and the shares are calculated based on cultivated areas instead of individual numbers (as in Pacini et al., 2003). This index is a proportional abundance index that reflects both the evenness and richness of species computed from the species shares in each vegetal assembly. The index is monotonically increasing with respect to biodiversity: it takes the value of zero under monoculture and increases with the augmentation in the number of crops and with their more uniform proportion on the total crop surface.

Therefore, the Biodiversity Index of the i -th unit at time t is defined as follows:

$$BI_{it} = - \sum_c share_{it,c} * \log(share_{it,c}) , \quad \forall i, \forall t, \forall c \in C \quad (A1)$$

where c indicates a generic crop of the set of all observed crops C , where set C includes the forest area.

References

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