Extended Abstract
Please do not add your name or affiliation

Paper/Poster Title	*The effect of biodiversity on Hungarian farm productivity*

Abstract prepared for presentation at the 97th Annual Conference of the Agricultural Economics Society, The University of Warwick, United Kingdom

27th – 29th March 2023

Abstract	***200 words max***
Despite being situated along the Danube and Tisza rivers, Hungarian agriculture faces enormous challenges due to climate change. Some of the largest uncertainties within Europe with respect to climate projections (Szépszó et al. 2008, Olesen et al. 2011) are predicted here. On-farm biodiversity (e.g. crop diversity) provides resilient agro-ecosystems capable of better tackling environmental fluctuations (Capitano et al. 2016). In addition, there is some evidence that while single area payment schemes tend to reduce, Pillar II. payments have positive effects on crop diversity (Lazíková et al. 2019). Some Common Agricultural Policy Pillar II (Rural Development Payments), more specifically, Agri-Environmental Schemes (AES) are meant to mitigate climate change effects. In this proposal, we test two hypotheses. First, that specialised farms have higher scale efficiency but lower output mix efficiency than diversified farms, and second, that environmental changes have a lower effect on diversified farms compared to more specialised farms. Besides simple statistics such as number of crops and Shannon and Simpson diversity indices, we employ a novel database representing location specific detailed bird count data as proxies for on- farm biodiversity. Preliminary results provide evidence in favour of our hypotheses.	

Keywords	Biodiversity, Total Factor Productivity, Hungarian FADN data
JEL Code	e.g. Energy: Demand and Supply Q41 see: www.aeaweb.org/jel/guide/jel.php?class=Q)

Introduction	***100 – 250 words***

Biodiversity is a multi-layered term, difficult to define, difficult to measure. Still, it seems to play a crucial role in securing both human welfare and well-being through the maintenance of diverse ecosystem services (Kumar, 2012; Pascual et al., 2017). Halting biodiversity loss is one of the greatest challenges today; and success, besides conservation considerations, is also economic interest, due to the threat ecosystem services face (Rockström et al., 2009).

Previous experience shows that more diverse systems are more productive (Isbell et al., 2017), that may result in higher yields (Di Falco and Zoupanidou, 2017) and lower exposure to environmental risks (Cavatassi et al., 2011; Villanueva et al., 2017). Moreover, diversity may reduce market risk, too (Di Falco and Zoupanidou, 2017), as the farmers can adapt easier to market changes with the increased variety of 'products'.

Previous works in the Hungarian literature focused primarily on traditional issues such as the effect of farm size, form of organisation, technological heterogeneity and subsidies on farm technical efficiency (Bakucs et al., 2010; Baráth and Fertő, 2015; Vígh et al., 2018; Baráth et al., 2020).

Here we to study the effect of agro-biodiversity (decisions of farmers related to the use of certain species, varieties, and to different land-use patterns) on productivity using a wealth of biodiversity proxies and indicators.

Methodology *100 – 250 words*

Data derived from the Hungarian Farm Accountancy Data Network (FADN) and Agricultural Census will be used. In addition, we obtained a detailed, 10 x 10 km grid bird count database that we aim to link to specific farm locations.

In line with recent recommendations and previous experience, frontier-based methodology will be applied (where the frontier represents the maximum feasible output, every difference is due to technical inefficiency). We employ Stochastic Frontier Analysis, SFA which is based on econometric techniques in order to construct the frontier function. Being stochastic, it has the advantage of treating random shocks (that are not directly attributable to the producer or the underlying technology, e.g. weather changes, economic adversities or plain luck) separately.

Moreover, in addition to traditional inputs, we also include climatic variables (such as the amount of rainfall, temperature etc.) into the production model. Then, according to recent developments in production economics and index number theories (O'Donnel, 2018), we decompose TFP change into the effect of technological change (TCH), technical efficiency change (TEC), scale efficiency change (SEC), output/input mix efficiency change (MEC) and environmental change (EC).

Results *100 – 250 words*

At present, only preliminary results are available. These largely support our hypotheses, yet more work is needed for truly robust results.

Discussion and Conclusion *100 – 250 words*

Conducting this study on Hungarian data is important in the face of climate change as this way the potential of biodiversity in increasing system resilience can be acknowledged. Heterogeneous product structure may have positive effects from conservation point of view (as various landscape mosaics may give rise to diverse structures, habitats, and consequently more complex communities of species). For the need for biodiversity being captured through higher-level indices pointing towards ecosystem-level measures (see Benedek, 2014a). If the varieties of domestic species can be proved to have a positive effect on the economic performance of farms; this result should be relevant for conservationists, too.