Summary for public

Increasing demand for food production is one of the main concerns in nature conservation and agronomy. There are different theoretical strategies from applied spatial conservation planning trying to solve the problem of feeding 9 billion people by 2050 and preserving biodiversity. One of them is land sharing or land sparing framework proposed by researchers from Cambridge University in Nature magazine in 2005.

Two concepts were proposed to resolve this problem**: 1) land sparing** and **2) land sharing** (Green et al 2005). Land sparing is if one intensifies agriculture in cropland and protect intact, natural or restored areas (so called spared land). Land sharing is if one improves the quality of the agricultural landscape by increasing crop mosaic that is extensively managed thus it may be suitable for many wild species. Should we use land sparing which assumes intensification of agriculture on one hand and protection intact remnant areas or release areas from agriculture and leave it for natural succession? Or should we improve the quality of the agricultural landscape for biodiversity by increasing share in landscape of mosaic, more extensively managed crops (land sharing)? The land sharing/sparing dilemma has been mostly studied on intact, pristine, tropical forests. Recent studies in the pristine, intact regions (mostly tropical forests) suggest that land sparing is a better strategy for sustaining species diversity and also agricultural production (Phalan et al 2011, Kamp et al, 2015). However, in the Anthropocene few pristine intact areas have been left on Earth to be spared. In lowland Europe most of areas are managed to some extend with little pristine area remaining. Therefore, in many regions where human – wildlife relationships had been formed in cultural landscapes with long agricultural tradition, new areas for nature conservation may be created from abandoned postagricultural land.

There are some ideas, such as newly proposed "rewilding" strategy in Europe to set new areas for nature conservation by agricultural land abandonment or using already abandoned postagricultural land (Navarro, Pereira 2012, Sylven, Windstrand 2015, Pereino et al 2019). UE has also advised abandoning at least 5% of farmland for conservation purposes ("Greening policy"). Not all such ideas propose buffer zones to control colonization of invasive species, especially that sometimes areas for nature conservation may be too small to create the buffer zones. *In our project we adjust the land sharing/sparing concepts to fully managed landscape, which could be abandoned or is abandoned for nature conservation, as proposed in the "rewilding" and "greening" strategies*. Thus, in this proposal we define *land sparing* as intensification of agriculture in cropland and abandonment of fields for nature conservation. *Land sharing* is if one increases crop mosaic that is extensively managed.

Many researches proved that the abandoned agricultural or left set-aside land is highly threatened by invasions of alien plant species that often create monocultures (Lenda et al 2021). Such species disturb natural succession (Gusev 2015) and decrease biodiversity (Moroń et al 2009; Skórka et al 2013). This is important because biodiversity in agricultural ecosystems has practical functions of ecosystem services such as pollination, pest control or nutrient cycling. **Invasive alien plant species colonize abandoned farmland globally (Cramer et al 2008) but the risk of plant invasions has never been addressed in the land sharing/land sparing conceptual framework**. I predict that *land sharing* may be profitable policy for sustaining biodiversity when risk of invasion is high. It could be because land management like ploughing, cutting, grazing, even if extensive, usually prevents from invasions by damaging populations of invasive alien species. Whereas *land sparing* policy may be a threat to biodiversity if invasion risk is high, because spared land, which in this project is abandoned postagricultural land may be colonized by alien species. They may remain uncontrolled in early invasion stages thus alien invasive species may benefit from the land sparing strategy. **Therefore, the aim of this project is to verify which strategy - land sparing or land sharing is better for biodiversity, conservation of nature and yield production in regions under varying risk of invasion of alien species.**