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Economic benefits of establishing honeybee hives on solar parks in agricultural landscapes

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To mitigate climate change, land take for renewable energy is accelerating at a time of increasing land use pressure and environmental degradation. Given land use change is the dominant driver of nature decline, over and above that of climate change, inclusion of local ecosystem consequences of land take for renewable energy decisions is critical. However, consideration of ecosystem impacts is hindered by lack of understanding and robust quantification methodologies. Here, we quantify the economic benefits of installing honeybee hives in solar parks by estimating the potential contribution to crop yields. We estimated that if honeybee hives were installed in all existing solar parks within England, pollination service benefits for pollinator dependent field crops, top fruits and soft fruit would have been £5.9 million in 2017, grounded in honeybee pollination crop values of £4.81-£75.04 ha⁻¹ for field crops and £635-£10,644 ha⁻¹ for fruit. If crop distributions were optimised to maximise solar park honeybee pollination, economic benefits could reach up to £80 million per year. However, this indicative of the maximum possible return and is unlikely to be viable given the other factors that influence crop distribution. Quantification of ecosystem co-benefits and costs of land take for renewable energy could inform location and management decisions, with the potential to improve ecosystem health in addition to energy system decarbonisation.