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Crop transitions can drive economic and ecological shifts in an established farming landscape: a case study from California

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Meeting growing challenges to maintain food production and rural livelihoods while minimizing land degradation will require significant changes in the way existing farming landscapes are managed. A systemic understanding of the agroecological impacts of land-use change in established farming landscapes, and the identification of significant trade-offs or synergies, are crucial to inform farm management and land-use governance solutions. Here, we focus on land-use change impacts in an already established farming landscape. We investigate spatial and temporal dynamics of agricultural land-use change from 2002 to 2018, in Kern County, California. Our study region is one of the major agricultural production hotspots in the United States, and has undergone a recent agricultural land-use transition from annual to perennial cropping systems. In this study we analyzed parcel-level data documenting changes in the land-use footprint for individual crops, ranging from annual crops like wheat and cotton to perennial tree crops like almonds and pistachios. We assess how land-use change impacted ecosystem pressures and service indicators selected for their relevance in an agricultural context, including water-use, soil erosion, profit and carbon sequestration. Our results indicate no salient trade-offs or synergies among individual crops, and illustrate the possibility of limited economic-ecological trade-offs associated with a shift from annual to perennial crops in a well-established agricultural landscape. We further discuss the relevance of our findings in the context of land-ownership consolidation and changing export dynamics in the study area.