

BLACK WALNUT ALLEY CROPPING IS ECONOMICALLY COMPETITIVE WITH ROW CROPS IN THE MIDWEST USA

Kevin J. Wolz  and Evan H. DeLucia

Study Description

Row crops dominate the Midwest USA and degrade many ecological functions. Black walnut (*Juglans nigra*) forestry and alley cropping are alternative land-uses that can enhance productivity and restore ecosystem services. To test whether profitability could drive adoption of these alternatives, we used a high-resolution spatial analysis to identify where they can outcompete row crops. We show that alley cropping could be more profitable than row crops on 23.4% of Midwestern cropland. Contrary to the common assumption that agricultural alternatives should be adopted on “marginal” cropland, results suggest that integrating trees could increase profitability on both marginal and productive cropland.



Photo 1. Alley cropping of trees with winter cereals can allow for strong complementarity in the timing of tree and crop growing seasons. This photograph, taken in December in the south of France, shows dormant hybrid walnuts (*Juglans regia* × *nigra*) with a recently planted crop of durum wheat (*Triticum durum*). The wheat grows throughout the winter and spring with minimal competition from the trees for light, water, or nutrients. Photo credit: Kevin J. Wolz.



Photo 2. Alley cropping of hybrid walnuts with durum wheat is shown again in the south of France. This photograph was taken in June, just after wheat harvest and about one month after walnut bud burst. Alley width between tree rows is 13m in this system, allowing for two passes of the farmer's equipment. Photo credit: Kevin J. Wolz.



Photo 3. While the various walnut species are the most common trees used in temperate alley cropping, there is strong potential to use nitrogen-fixing trees to further enhance crop yields. Here, black locust (*Robinia pseudoacacia*) is paired with barley (*Hordeum vulgare*) in a young alley cropping system in the south of France. In the early years, the trees have a negligible effect on the crop, although area-scaled crop yields are reduced due to the uncropped area within tree rows. Research is needed to understand how the contrasting effects of nitrogen fixation and light/water competition will impact the crops as the trees grow larger. Photo credit: Kevin J. Wolz.

These photographs illustrate the article “Black walnut alley cropping is economically competitive with row crops in the Midwest USA” by Kevin J. Wolz and Evan H. DeLucia published in *Ecological Applications*. <https://doi.org/10.1002/eap.1829>