How did the ideas and technology of farming spread so quickly?

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*Presentation format: regular 20min conference presentation*

Abstract

Two major hypotheses have been suggested as potential mechanisms for the global spread of plant and animal domestication (farming) among human societies. The diffusion hypothesis suggests that farming technology was shared between neighboring groups, while the takeover hypothesis suggests that farming spread through the forceful eviction and replacement of non-farming competitors. Support exists for each of these hypotheses at local and regional scales, but variation in these provincial results make it difficult to identify the dominant global mechanism that ultimately drove the spread of farming.

To disentangle the relative contribution of these mechanisms, we modeled the spatial and phylogenetic distribution of farming under four different modes of transmission: inheritance, inheritance plus diffusion, inheritance plus takeover, and inheritance plus diffusion and takeover. The resulting phylogenetic and spatial patterns were collectively used to train a random forest machine-learning algorithm to identify the most likely mode of transmission of any given simulation output. Once trained, the algorithm was used to identify which transmission mode likely led to the current phylogenetic and spatial distribution of farming seen today.

Our preliminary results suggest that the most likely mechanism behind the spread of farming was strict cultural diffusion, with very little contribution from takeover. There were several differences in the way these simulations played out across the globe, but the strongest difference between the two mechanisms was how quickly they spread. Takeover takes time and require favorable conditions to develop a takeover force. Diffusion can spread ideas quickly between neighboring societies with very limited expense.