

A Reply to Bellezza

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We are grateful for the insightful comments provided by Dr. Bellezza on our paper. He raises vital points about the nature of climate and continentality. We agree with Bellezza that the low density of available weather station data from the central and western Tibetan Plateau would result in a lower degree of accuracy in any modeled reconstruction. Our analysis focused, for these reasons, on the better-understood eastern Tibetan Plateau, where higher numbers of available weather stations improve the accuracy of reconstructions. We hope that in the future more weather data from the central and western Tibetan Plateau, both areas crucial to modern Tibetan agriculture, will be made available to foreign researchers so that researchers can create a more accurate picture of changing cropland across this area.

In his comment Bellezza scrutinized our definition of the altitudinal boundary of the Tibetan Plateau and how this affects interpretations of percentage of cropland allotted to agriculture. In our paper we followed the methods used by Chen et al. (2015b), who defined the northeastern Tibetan Plateau as having a lower altitudinal limit of 1,500 m asl. We agree that this lower altitudinal limit is problematic. As Bellezza points out, setting the altitudinal limit this low includes large tracts of agricultural land such as the Qaidam Basin and Xining on the northeastern Tibetan Plateau. We have recreated the analysis in our supplemental information by setting the altitudinal limit at 2,700 m asl to eliminate these areas of lower altitude. According to GLC-SHARE, only ~770 km² of cropland-dominant land on the Tibetan Plateau is above 4,000 m asl, or ~4.7% of cropland-dominant land is above 2,700 m asl (~16,500 km²). Figure 1 presents a revised empirical cumulative probability density distribution of the elevations of cropland-dominant land on the Tibetan Plateau above 2,700 m asl; 95% of crop-dominant land above 2,700 m asl is below 3,980 m asl. If we constrained the area in our analysis to east or west-central Tibet as suggested by Bellezza, this might change these figures further.

Regardless of how one defines the Tibetan Plateau, Bellezza's call to ground truth contemporary and ancient agricultural cropland data is well warranted. On the archaeological front, we have argued that it is necessary for archaeologists to move beyond the assumption that seeds found in sites represent in situ cultivation, as this neglects the fact that early Tibetans likely engaged in extensive networks of trade much as they do

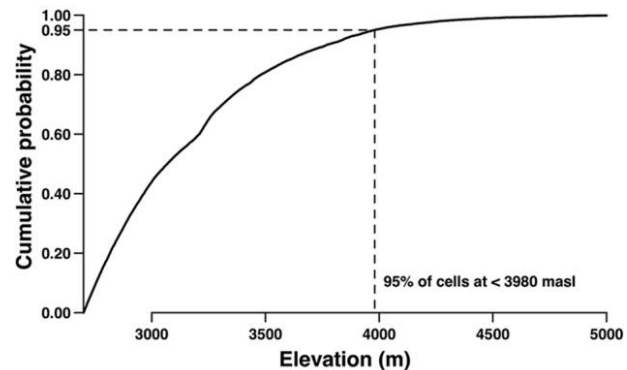


Figure 1. Elevation of cropland on the Tibetan Plateau. This graph presents the empirical cumulative probability density distribution of the elevations of cells in the Global Land Cover–SHARE Cropland database (Latham et al. 2014) that are identified as having cropland-dominant land cover. The dashed line indicates the 95% probability level. The lower limit is set at 2,700 m asl.

today (d'Alpoim Guedes 2015; d'Alpoim Guedes, Bocinsky, and Butler 2015; d'Alpoim Guedes, Manning, and Bocinsky 2016). To ground truth crop niche models, archaeologists working on the plateau should develop methods to identify ancient fields through radiocarbon dating and phytolith and chemical analyses so that we are able to identify where humans actually practiced agriculture in the past.

The call to ground truth the extent of contemporary agriculture is also timely. The Tibetan Plateau is experiencing climate change at a much higher amplitude than lower-altitude locations. Temperatures in the Tibet Autonomous Region have soared by 0.4°C per decade since 1960—at nearly twice the rate of the global average (Chen et al. 2015a). Indeed, the last 100 years on the Tibetan Plateau represent the warmest years in the last 2,000 years of history on the Plateau (Chen et al. 2015a). It is urgent for ethnographers to document the current and historic boundaries of crops before our understanding of where these once lay is lost. These boundaries are fluctuating and will continue to fluctuate in a rapidly warming world.

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