

Climate change and the dispersal of Proto-Tibeto-Burman

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From a likely origin in the Majiayao Culture of what is now Gansu in China from circa 5.3K YBP, the Proto-Tibeto-Burman (PTB) community migrated and divided rapidly during times of ancient climate change. Their initial agriculture was mainly based on *Setaria* and *Panicum* millet and rice, and their domestic animals were dogs, pigs and *Bos Taurus* cows (Liu & Chen 2012). Etyma for these three crops and three domestic animals are reconstructed for PTB (Bradley 2011, 2016, 2022). Majiayao was a western offshoot of Proto-Sino-Tibetan (PST) Yangshao Culture, which flourished to the east of Majiayao from circa 7K-5K YBP during a period of favourable climate, cultivated the two millets and had domestic dogs and pigs, and later developed into Sinitic Longshan Culture. Domestic taurine cows were introduced from the west circa 5.6K YBP (Brunson et al. 2020), and the PST COW etymon * η wə supports dating the PTB/Sinitic split to after 5.6K YBP. Rice was first domesticated in the lower Yangtse area by circa 6K YBP and later spread northwest to late Yangshao and early Majiayao cultures (Fuller et al. 2007), with PTB but no earlier PST etyma.

Subsequent PTB migrations were shaped by climate change; firstly, a warm and wet climate from circa 5K YBP, which permitted cultivation of these crops at higher altitudes in eastern Tibet and western Sichuan (d'Alpoim Guedes et al. 2014, 2016). Later periods of cooling climate (Cheung et al. 2019, Chen et al. 2020) perhaps triggered further migrations beyond southwest China, with the Karenic subgroup reaching west Southeast Asia and the Central subgroup reaching northeast South Asia. Ecological changes led to shifts in crops and domestic animals, with contact introducing some new crops and animals. This discussion will trace the lexical outcomes for crop and domestic animal vocabulary and show how archaeologically documented dates for contact-introduced and newly-domesticated crops and animals can assist to date the early phylogeny of PTB.

Two crops arrived from the west circa 4.5K YBP: *Triticum* and *Hordeum*. Unlike *Setaria* and *Panicum*, these can adapt to cooler climate, so their cultivation spread and increased rapidly with cooling climate from circa 4.2K YBP. Rice was also more suitable for some new ecological niches. Two domestic animals also adaptable to cooler climate, sheep and goats, were introduced from the west circa 4.4K YBP (Liu & Chen 2012). The subgroup of PTB which on independent comparative evidence appears to have separated first from PTB, Karenic, lacks cognates of PTB etyma for WHEAT, BARLEY and GOAT; it has a cognate of the PST and PTB etymon for wild BOVID * η an, also present in Sinitic (the later Longshan Culture offshoot of Yangshao Culture in its original area and further east) and in PTB. The cognate means 'goat' in Karenic, while it means 'sheep' in the rest of PTB, and both in Sinitic; the PTB GOAT etymon is * $\text{c}^{\text{h}}\text{it}$ (Bradley 2022). Thus the split of Karenic from PTB may have preceded 4.5K YBP.

Bos grunniens (yak) was probably domesticated by 3.65K YBP (Jacques et al. 2021) and cultivation of *Hordeum vulgare* var. *nudum*, a variety of barley suitable for cold climate (d'Alpoim-Guedes et al. 2015, Zeng et al. 2015) developed in parts of the area during expansion into higher-altitude environments such as the Karuo Culture, and expanded during the cold climate period from circa 3.5K YBP. The horse was introduced from the west into China circa 3.3K YBP (Liu & Chen 2012). *Fagopyrum* (buckwheat) cultivation started in upland southwest China by circa 3.15K YBP (Xue et al. 2022). These developments are reflected by the distribution of etyma for these crops and animals among TB languages. A YAK etymon has cognates in Eastern and Western TB but not Central TB. Western TB and Eastern TB have distinct BUCKWHEAT etyma; the latter is borrowed into Chinese. The forms for HORSE are loans, with a wide variety of alternative forms, including various similar Eastern TB forms, a completely different Western TB form, also Indic loans in Central TB and some Western TB languages south of the Himalayas, and another form in Karenic languages. Overall, this suggests that the second split within PTB was Central TB, perhaps associated with the 4.2K YBP climate cooling, followed by a later split between Western and Eastern TB associated with the 3.5K YBP climate cooling, after the domestication of the yak but before the introduction of the horse circa 3.3K YBP and before the domestication of buckwheat.

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