Supporting Information

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SI Text

Information Related to Fig. 1. Each of the eight macroregions listed below correspond with the named regions in Fig. 2. The regions are then subdivided into the subregions represented on the map in Fig. 1. The references following each region name represent key recent studies and good starting points and are not meant to be comprehensive. In addition to these references, we are indebted to a large volume of older, prominent, and foundational literature on early agriculture around the world (1–22). For each region, a list of key domesticates is given, followed by selected references in which more extensive literature sources can be found. Importantly, not all of the crops listed in reach region were taken under cultivation and domesticated simultaneously.

North America. 1. Eastern North America (middle Holocene): squash (*Cucurbita pepo* ssp. *ovifera* var. *ovifera*), sunflower (*Helianthus anuus*), pitseed goosefoot (*Chenopodium berlanderi*), marshelder (*Iva annua*). Few of these crops become global crops. Larger scale agriculture developed later with the diffusion of maize (from Mesoamerica, below) (23, 24).

Mesoamerica. 2. Mesoamerica, lowlands and highlands (early Holocene): maize (*Zea mays*), common bean (*Phaseolus vulgaris*), sieva lima bean (*Phaseolus lunatus*), squashes (*Cucurbita pepo* ssp. *pepo*, *C. argyrosperma*), avocado (*Persea americana*), chili pepper (*Capsicum annuum*), *Guaje* tree bean (*Leucaena esculenta),* hogplum (*Spondias mombin*), jicama (*Pachyrhizus erosus*), chayote (*Sechium edule*) (25–31).

South America. 3. Northern Lowland South America (early Holocene): squash (*Cucurbita moschata*), leren (*Calathea allouia*), achira (*Canna edulis*), cocoyam (*Xanthosoma sagittifolium*), sweet potato (*Ipomoea batatas*). The extent of early cultural connections or differences with Northwestern Lowland South America (Northwestern Lowland South America, below) deserves further investigation, but independent origins of cultivation in one or both of these areas in the early Holocene is widely accepted (28, 32, 33).

4. Northwestern Lowland South America (early Holocene): squash (*Cucurbita ecuadorensis*), sea island cotton (*Gossypium barbadense*), jackbean (*Canavalia ensiformis*), cocoa (*Theobroma cacao*). The extent of early cultural connections or differences with Northern Lowland South America (above) deserves further investigation, but independent origins of cultivation in one or both of these areas in the early Holocene is widely accepted (28, 32, 34–36).

5. Central/Southern Andes (middle Holocene on current evidence): potato (*Solanum tuberosum*), quinoa (*Chenopodium quinoa*), Andean grain amaranth (*Amaranthus caudatus*), oca (*Oxalis tuberosa*), Ulluco (*Ullucus tuberosus*), common bean (*Phaseolus vulgaris*), lima bean (*Phaseolus lunatus*) (probably northern Andes), squash (*Cucurbita ficifolia*), guinea pig (*Cavia porcellus*), llama (*Lama glama*), alpaca (*Vicugna pacos*) (11, 37–39).

6. Southwestern Amazonia: manioc (*Manihot esculenta*), peanut (*Arachis hypogaea*), peach palm (*Bactris gasipaes*), chilis (*Capsicum baccatum, Capsicum chinense*), squash (*Cucurbita maxima*). Although the domestication processes in this region have not yet been documented archaeobotanically, some crops that originated here diffused to other regions in the early Holocene, suggesting that early Holocene evidence should be sought in this region (28, 32, 40–42).

Africa. 7. West African Savannah/Sahel (middle Holocene): pearl millet (*Pennisetum glaucum*), fonio (*Digitatia exilis*), black fonio (*Brachiaria deflexa*), African rice (*Oryza glaberrima*), cowpea (*Vigna unguiculata*), bambara groundnut (*Vigna subterranea*), baobab tree (*Adansonia digitata*), kenaf (*Hibiscus cannabinus*). Pastoralism based on cattle, sheep, and goat may have arrived before plant cultivation in this region, but there is no evidence for introduced crop cultivars (43–45).

8. West African tropical forest: oil palm (*Elaeis guineensis*), African yam (*Dioscorea cayenensis*), hausa potato (*Plectranthus rotundifolius*), dazo (*Plectranthus esculentus*), kola nut (*Cola nitida, Cola acuminata*). Historical linguistic evidence points to tree crops and tubers being important before the introduction of savannah cereals, like millet, although processes of diffusion of pearl millet from the north (from West African Savannah) are clear from archaeology (43, 45–48).

9. Sudanic Savannah (probably middle Holocene): sorghum (*Sorghum bicolor*), hyacinth bean (*Lablab purpureus*), roselle (*Hibiscus sabdariffa*), donkey (*Equus asinus*), African cattle (*Bos africanus*). African cattle likely result from introgression from a native African *Bos* into West Asian *Bos taurus*. Plant domestication processes are poorly documented in this zone (43, 45, 49).

10. Ethiopian plateau (probably middle Holocene): tef (*Eragrostis tef*), finger millet (*Eleusine coracana*), Ethiopian oat (*Avena abyssinica*), enset (*Ensete ventricosum*), yam (*Dioscorea cayenensis*), Ethiopian pea (*Pisum abyssinicum*), achote (*Coccinia abyssinica*), noog (*Guizotia abyssinica*), coffee (*Coffea arabica*). Historical linguistic evidence points to enset and tubers being important in the southwest of Ethiopia before the introduction of northern plateau cereals, like tef or finger millet. It is plausible that pastoralism and sorghum cultivation was first introduced from the Sudanic savannahs (above). Archaeobotanical and archaeozoological evidence are largely lacking in this zone (45, 50–52).

Southwest Asia. 11. Fertile Crescent (early Holocene): wheats (*Triticum* spp.), barley (*Hordeum vulgare*), lentil (*Lens culinaris*), pea (*Pisum sativum*), chickpea (*Cicer arietinum*), broadbean (*Vicia faba*), flax (*Linum usitatissimum*), sheep (*Ovis aries*), goat (*Capra hircus*), taurine cattle (*Bos taurus*), pig (*Sus scrofa*), cat (*Felis domesticus*) (53–57).

South Asia. 12. Savannahs of Western India (middle Holocene): water buffalo (*Bubalus bubalis*), chicken (*Gallus gallus*), little millet (*Panicum sumatrense*), sesame (*Sesamum indicum*), urd bean (*Vigna mungo*), horsegram (*Macrotyloma uniflorum*) and mungbean (*Vigna radiata*), melon (*Cucumis melo*). These domestications may postdate the arrival of domesticated animals, wheat and barley in the Indus region to the west, and thereby derive inspiration from West Asia (Fertile Crescent, above) (58–60).

13. South India (middle Holocene): browntop millet (*Brachiaria ramosa*), mungbean (*Vigna radiata*), horsegram (*Macrotyloma uniforum*). The crop domestications may occur after the arrival of sheep/goat, cattle, but appear to precede introduced crops.

14. Ganges and eastern Indian plains: rice (*Oryza sativa* ssp.), sawa millet, pigeonpea (*Cajanus cajan*), cucumber (*Cucumis sativus*), and numerous cucurbits (*Luffa* spp., *Momordica charantia*, *Praecitrullus fistulosus*, *Trichosanthes cucumerina*, *Coccinia grandis*) (58, 59).

East Asia. 15. Chinese loess plateau (early Holocene): broomcorn millet (*Panicum miliaceum*), foxtail millet (*Setaria italica*), soybean (*Glycine max*), hemp (*Cannabis sativus*), peach (*Amygdalus*

persicus), apricot (*Armeniaca vulgaris*), pig (*Sus scrofa*). Some authors regard these regions as incorporating multiple independent centers of millet domestication (61–66).

16. Western Yunnan/Eastern Tibet: buckwheats (*Fagopyrum esculentum* and *Fagopyrum tartaricum*), yak (*Bos grunniens*), inferred from wild progenitor ranges. Possibly secondary domestications under influence of millets from Chinese loess plateau (above) (63, 67–70).

17. Lower-Middle Yangtze (middle Holocene): rice (*Oryza sativa* spp. *japonica*), ramie (*Boehmeria nivea*), silkworm (*Bombyx mori*), melon (*Cucumis melo*), pig (*Sus scrofa*). Some authors have argued for early cultural connections between early millet cultivators in Chinese loess plateau and the early rice cultivators in Lower-Middle Yangtze (62, 63, 66, 71).

18. Lingnan (tropical south China): yams (*Dioscorea* spp.), taro (*Colocasia esculenta*), sago palms (*Metroxylon sagu*), ducks (*Anas platyrhynchos*), Asian geese (*Anser anser*). Evidence for vegecultural crops has been found from the middle Holocene before the arrival of rice, although evidence for cultivation is ambiguous and could be regarded as inspired by earlier rice cultivation to the north (66, 72–74).

19. Japanese islands (middle Holocene): barnyard millet (*Echinchloa utilis*), azuki bean (*Vigna angularis*), soybean (*Glycine max*), Perilla (*Perilla frutescens*), burdock (*Arctium lappa*). Few of these crops became global crops, and soybean was separately domesticated in China. Larger scale agriculture developed later with the diffusion of rice and millets from China (from Chinese loess plateau and Lower-Middle Yangtze, above) (75–77).

New Guinea. 20. New Guinea (middle Holocene): banana (*Musa acuminata*), taro (*Colocasia esculenta*), giant taro (*Alocasia macrorrhiza*), breadfruit (*Artocarpus altilis*), yams (*Dioscorea* spp.), sago (*Metroxylon sagu*), sugarcane (*Saccharum officinarum*). Exploitation of some of these species is documented back to the early Holocene, although unambiguous evidence for cultivation systems is present only in the middle Holocene from the highlands. Archaeologically documenting morphological changes associated with domestication in many of these species has proven difficult (78–80).

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Table S1. Additional details and references to support the table shown in Fig. 2

Region/taxa	Exploitation before domestication		Management and predomestication cultivation		Domestication change		Sources
	Start	Finish	Start	Finish	Start	Finish	
Southwest Asia							
Wheat	12,000	11,250	11,250	11,000	11,000	9,000	(1–3)
Barley	12,000	11,250	11,250	10,500	10,500	9,000	(1–3)
Lentil	12,000	11,000	11,000	10,500	10,500	9,000	(1, 3)
Pea	11,500	11,000	11,000	10,000	10,000	8,500	(1, 3)
Chickpea	11,000	10,500	10,500	10,250	10,250	8,250	(1, 3, 4)
Broadbean	x	x	x	x	10,500		(1, 4)
Flax	12,000	9,500	x	x	9,500		(1, 5)
Olive	10,000	6,000	x	x	6,000		(6)
Sheep	12,000	10,500	10,500	9,750	9,750	8,000	(7–12)
Goat	12,000	10,500	10,500	9,750	9,750	8,000	(7–13)
Pig	12,000	11,500	11,500	9,750	10,250	9,000	(9, 10, 12, 14)
Cattle, taurine	11,500	10,500	10,500	10,250	10,250	8,000	(9, 10, 12, 14–16)
Cat	x	x	10,500	4,000	4,000		(17–19)
South Asia							
Tree cotton	8,500	4,500	x	x	4,500		(20, 21)
Rice (*indica*)	8,000	5,000	5,000	4,000	4,000	2,500	(3, 22, 23)
Little millet	x	x	x	x	4,500		(23)
Browntop millet	x	x	x	x	4,000		(23)
Mungbean	x	x	4,500	3,500	3,500	3,000	(3, 23)
Pigeonpea	x	x	x	x	3,500		(23)
Zebu cattle	9,000	8,000	x	x	8,000	6,500	(24)
Water buffalo	6,000	4,500	x	x	4,500		(25)
East Asia							
Broomcorn millet	10,000	8,000	x	x	8,000		(26–28)
Foxtail millet	11,500	7,500	x	x	7,500		(28, 29)
Rice, *japonica*	10,000	8,000	8,000	7,500	7,500	5,000	(3, 22, 30)
Soybean	8,500	5,500	x	x	5,500	3,500	(3, 31)
Ramie	x	x	x	x	5,250		(32, 33)
Melon	7,000	4,000	x	x	4,000	3,500	(3, 34)
Pig	12,000	8,500			8,500	6,000	(35, 36)
Silkworm	7,000	5,250	x	x	5,250		(32, 37, 38)
Yak	x	x	x	x	4,250		(39)
Horse	7,500	6,750	6,750	5,500	5,500	4,000	(40–43)
Bactrian camel	x	x	x	x	4,500		(44–46)
Duck	2,500	1,000	x	x	1,000		(47, 48)
Chicken	6,000	4,000	x	x	4,000		(49–51)
New Guinea							
Banana	10,000	7,000	7,000	4,000	4,000		(3, 52–54)
Taro	10,000	7,000	7,000	4,000	x	x	(3, 52, 53)
Yam	10,000	7,000	7,000	4,000	x	x	(3, 52, 53)
Africa and Arabia							
Date palm	7,000	6,000	x	x	5,000		(55, 56)
Sorghum	8,000	4,000	x	x	4,000		(56, 57)
Pearl millet	x	x	x	x	4,500	3,500	(3, 58)
Fonio	x	x	x	x	2,500		(57)
Cowpea	x	x	x	x	3,750		(59)
Hyacinth bean	x	x	x	x	3,750		(56, 57)
Rice, African	3,500	2,000	x	x	2,000		(57, 60)
Oil palm	9,250	3,500	x	x	3,500		(57, 59)
Cattle, African	x	x	9,000	7,750	7,750	6,500	(61–70)
Donkey	9,000	5,500	x	x	5,500	3,500	(71–76)
Dromedary camel	6,500	3,000	x	x	3,000		(56, 77–82)
Guinea fowl			2,500	1,500	1,500		(83–85)
North America							
Squash	6,500	5,000	x	x	5,000		(3, 86, 87)
Sunflower	6,000	4,750	x	x	4,000		(3, 86, 87)
Sumpweed	6,000	4,500	x	x	4,000		(3, 86, 87)
Pitseed goosefoot	4,750	3,750	x	x	3,750		(3, 86, 87)

Table S1. Cont.

Region/taxa	Exploitation before domestication		Management and predomestication cultivation		Domestication change		Sources
	Start	Finish	Start	Finish	Start	Finish	
Meso-America							
Squash (pepo)	x	x	x	x	10,000	9,500	(3, 86, 88)
Maize	10,000	9,000	x	x	9,000		(89, 90)
Foxtail millet-grass	x	x	x	x	6,000	4,000	(91)
Common bean	x	x	x	x	3,000		(92)
Avocado	x	x	x	x	3,000		(93)
Chile pepper	x	x	x	x	3,000		(93, 94)
Turkey	x	x	x	x	2,000	x	(95)
South America							
Chili pepper	x	x	x	x	6,000		(96)
Peanut	x	x	8,500	6,500	5,000		(97)
Cotton	x	x	x	x	6,000		(97)
Coca	x	x	x	x	8,000		(98)
Now-minor root crops (arrowroot, leren)	x	x	x	x	9,000		(99, 100)
Squash (moschata)	x	x	x	x	10,000		(97)
Common bean	x	x	x	x	5,000		(92)
Lima bean	x	x	8,250	x	6,000		(92, 101)
Manioc	x	x	x	x	7,000		(3, 102, 103)
Sweet potato	x	x	x	x	5,000		(104)
White potato	7,000	4,500	x	x	4,500		(105)
Quinoa	5,000	x	x	x	3,500		(106)
Yam	x	x	x	x	5,500		(107)
Llama	10,000	6,000	x	x	6,000	4,000	(108, 109)
Alpaca	10,000	5,000	x	x	5,000	3,000	(108, 109)
Guinea pig	x	x	x	x	5,000	4,000	(110, 111)
Muscovy duck	x	x	x	x	4,000	2,000	(112, 113)

Dates (in calibrated years before present) listed in each of the three categories: exploitation before domestication, management and predomestic cultivation, and phenotypic change associated with domestication have been gleaned from the literature and rounded to the nearest 250 y. Cells with an "x" indicate there is no evidence as yet available for that specific category of management or change. Where there is a date for the start time for domestication change but the finish time has been left blank, this means that the date in the start time column represents a conservative time by which the organism had been domesticated, although there is yet no evidence for size or other morphological change following domestication. In addition, the missing end dates for quinoa and lima bean reflect gaps in the archaeobotanical records of these species. Because the domestication process operates over a continuum, defining categories and break points during the process is never clear-cut. The precision of numbers provided here should therefore be interpreted as estimates based upon the best available information, and many may shift as additional archaeological and genetic evidence is collected. Finally, there remain significant uncertainties and debates regarding whether many of the plants and animals (e.g., African cattle) listed here were domesticated independently in more than one region (114). In these cases, the listed dates represent those for the earliest domestication episodes in each region, although the processes may not have been truly independent.

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