New Lives for Ancient and Extinct Crops

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In this edited volume, Paul E. Minnis and the chapter authors successfully illustrate how archaeological, ethnohistorical, and ethnobotanical data can be effectively synthesized to provide a detailed account of how ancient and extinct crops were used, as well as the potential they hold for diversifying global food stocks. The authors explore the ancient uses and contemporary large scale agricultural potentials of maygrass, goosefoot, sumpweed or marshelder, agave, little barley grass, chia, arrowroot, leren, and sama (or bitter vetch). Minnis suggests that by looking to the past, researchers can "pre-screen" species in terms of looking for genetic material from ancient taxa that could be incorporated into new domesticated taxa. Some of the crops discussed in this book, such as goosefoot, are no longer domesticated and used in agriculture and have reverted to their wild forms. Other crops, such as chia and agave, are still cultivated today but not on enough of a scale to impact global food markets.

The book is divided into an introduction and nine chapters. In the introductory chapter, Minnis provides an excellent overview of why researchers and the general public should be interested in ancient crops and agricultural practices. The goal of this book is to make archaeological and ethnobotanical data about each taxa available for developing a global sustainable food base. This goal is achieved by constructing plant profiles of specific taxa, in which the authors: 1) describe the physiology, morphology, and ecology of the crops, 2) provide detailed archaeological and ethnohistoric data about their domestication (if known), widest distributions, and eventual disappearances, and 3) details of their potentials as major sources of food.

In the first chapter, Gayle J. Fritz describes how maygrass (*Phalaris caroliniana* Walter Poaceae.) was an important North American grass that was a part of the Eastern Agricultural Complex for at least 3,000 years. The earliest evidence for maygrass is found during the Late Archaic in Illinois, Tennessee, and Kentucky. Eventually this crop spread out of its native range and encompassed an area from Wisconsin and Pennsylvania, in the north, to Texas and Georgia, in the south. This very small seeded grass was an important component of the ritual feasts that took place at Cahokia, as evidenced by the abundant remains recovered from sub-Mound 51. The agricultural potential for maygrass lies in its ability to grow in poorly drained soils as an early-season crop in non-Mediterranean climates. The marketing success of canary grass (*Phalaris canariensis* Linnaeus Poaceae.), a close relative of maygrass, suggests that a similar market may exist for maygrass as alternative source of protein.

In the second chapter, Kristen J. Gremillion frames a discussion of the Eastern North American domesticate goosefoot (*Chenopodium berlandieri* Moquin-Tandon Amaranthaceae ssp. *jonesianum* Smith & Funk) within a larger discussion about the use of the *Chenopodium* genus within the Americas. Goosefoot is related to the popular quinoa (*Chenopodium quinoa* Willdenow Amaranthaceae) and *kañawa* (*Chenopodium pallidicaule* Aellen Amaranthaceae), crops that are still grown today. Goosefoot was a small seeded grass that thrived in disturbed habitats along riverbanks and on floodplains. Domesticated *Chenopodium*, a term that the author uses interchangeably with goosefoot, was found as early as the Late Archaic period (ca 1,000–300 BC) and rose to prominence as a major cultivar in Kentucky, Illinois, Tennessee, and Ohio. Eventually this crop was replaced by maize during Middle

Woodland period (AD 400–1000) and slowly disappeared altogether. Gremillion then delves into the commercial success of quinoa in the Western world, suggesting that the redomestication of goosefoot may have a similar popularity.

Gail E. Wagner and Peter H. Carrington detail another eastern North American crop, sumpweed or marshelder (*Iva annua* Linnaeus Asteraceae), in the third chapter. Sumpweed is a large oily seed annual that thrived in disturbed habitats alongside other crops such as sunflower and maygrass. Native Americans ate wild versions of sumpweed starting in the Middle Archaic (cal 5970–4945 BC) and eventually domesticated it by the Late Archaic (cal. 3640–2880 BC). During its heyday in the Late Woodland (AD 300–1200) and Early-Middle Mississippian/Middle Ceramic periods (AD 700–1400), sumpweed was grown from the Mid-Atlantic states westward to the Great Plains and until as late as the 1800s. Exactly why this crop disappeared remains unknown. The value in redomesticating wild varieties of sumpweed rests in its ability to grow nutritionally valuable fruit/seeds in high salt environments that can no longer support most crops.

In the fourth chapter, Suzanne K. Fish and Paul R. Fish describe how agave (*Agave* spp. Linnaeus Agavaceae) disappeared from the archaeological record in the border region of the Southwest U.S. and Northwest Mexico. Agave is a hardy succulent that thrives in very arid conditions and was widely cultivated during the prehispanic period among the Hohokam of southern Arizona. These taxa were grown at the edges of irrigated fields and in rock pile fields as a source of food, fiber, and alcohol. However, agave disappeared as a large-scale crop by the time of the Spanish arrival. The authors suggest the Hohokam were most likely growing *Agave murpheyi* Gibson Agavaceae; although they acknowledge that numerous other agave taxa, such as *Agave delamateri* Hodgson & Slauson Agavaceae, may have also been cultivated in the region. The more recent interest in agave is the result of a growing popular demand for agave-based products such as tequila and agave syrup. The potential for agave to have an impact on the global food supply rests with its high productivity combined with an ability to thrive in degraded and arid environments.

In chapter five, Karen R. Adams describes the importance of the small seeded, cool-season little barley grass (*Hordeum pusillum* Nuttall Poaceae). Little barley was grown throughout the Southeast, Midwest, and Southwest U.S. from the Terminal Archaic up until the late prehispanic period. The majority of this chapter is focused, however, on exploring the archaeological record surrounding its domestication and use in the U.S. Southwest—Arizona in particular. The chapter touches on such topics as its taxonomy, evidence for domestication, geographical distribution in the prehispanic period, preparation and use, and nutritional value. The chapter also provides an interesting theoretical model for how it was originally domesticated. Little barley holds great potential as a major source of food because the wild variety thrives throughout most of North America in many different ecosystems, making the domesticated variety more resistant to biotic and environmental changes than non-native crops.

Turning our attention southward towards Mexico, in chapter six Emily McClung de Tapia, Diana Martínez-Yrizar, and Carmen Christina Adriano-Morán discuss the physiology, chemical properties, and archaeological, historical, and ethnobotanical evidence for prehispanic production and use of chia (*Salvia hispanica* Linnaeus Lamiaceae). Although the origins of chia domestication remain unknown, the earliest evidence for *Salvia* species dates to around 3,000 B.P. at Cerro Juanaqueña in northwest Chihuahua, Mexico. Chia is most widely known as a major component of the tribute made to the Aztec empire. The authors, however, strive to move beyond discussions about its ceremonial importance within Aztec society. Chia is thought to hold great potential as an industrial product, an additive, or as a food product unto itself.

Continuing southward, Deborah M. Pearsall describes the taxonomy, distribution, and archaeological, historical, and ethnographic evidence for arrowroot (*Maranta arundinaceae* Linnaeus Marantaceae) and leren [*Calathea latifolia* (Willdenow ex Link) Klotzsch Maranthaceae]. Arrowroot and leren are members of the Marantaceae family and fall into the category of fleshy underground crops, a departure in discussion from earlier chapters that focus on seed crops. These two taxa were grown throughout the lowland Neotropics of Central and South America and the Caribbean and are still cultivated today, albeit at a small scale when compared to other root crops such as manioc (*Manihot esculenta* Crantz Euphorbiaceae), yam (*Dioscorea* Linnaeus Dioscoreaceae), or sweet potato (*Ipomoeae batatas* Linnaeus Convolvulaceae).

The origins of domestication for these crops remains a mystery with the earliest evidence for Marantaceae root crop use coming from San Isidro, Colombia, 9,250–8,500 cal B.C. Leren and arrowroot were often considered to be "minor" crops in the past and were grown alongside "main" crops such as manioc and, later, maize (*Zea mays* Linnaeus Poaceae). Pearsall suggests that arrowroot and leren have the potential to contribute to sustainable agriculture in the lowland neotropics because they do not require processing to remove toxins (as is the case with many other fleshy underground crops), are pest resistant, and are fairly easy to grow within mixed farming systems.

In chapter eight, Steven A. Weber and Arunima Kashyap discuss the evolution and decline in use of the small seeded crop *Panicum sumatrense* Roth ex. Römer. & Schultes Poaceae in South and Southeast Asia. *P. sumatrense*, also known as little millet or *sama*, is a fast growing, early-maturing species that thrived particularly well in regions associated with summer monsoons such as Gujarat, India. The earliest evidence for *sama* cultivation comes from the Indus valley site of Harappa (3,000–1,900 B.C.), Pakistan. However, the origin of *sama* domestication remains unknown, as the authors note, because of the relatively new incorporation of archaebotanical recovery techniques into recent archaeological excavations. *Sama* is recorded in the historical record as having a wide range of cultivation stretching from the Himalayan foothills to the southernmost point of India. Poorer farmers in the semiarid and mountainous regions of India grew it widely until as recently as forty years ago. However, it has since seen a decline in cultivation having been replaced by cash crops such as cassava, pineapple, and coffee. *Sama* holds great potential as a significant food source because of its high nutritional value, low demands for management, and good productive returns.

Naomi F. Miller and Dirk Enneking discuss in chapter nine the basic physiology, agronomy, and cultivation of bitter vetch [*Vicia ervilia* (Linnaeus) Willdenow Fabaceae] in the Near East. Bitter vetch was one of the original crops domesticated in the Fertile Crescent around the tenth millennium cal B.C. This important crop is often forgotten when discussing its more famous domesticated cohort members, such as wheat and barley. This legume is characterized by rapid germination, high protein content, and nonshattering pods, making it an appealing domesticate. This crop originally was grown throughout the the Mediterranean, Balkan, and Caucasus regions, but has subsequently declined in use. Currently, it is grown as source of fodder rather than a source of food for human consumption. Bitter vetch is stress tolerant and pest resistant, making it a suitable candidate for agricultural revival. Focused plant breeding efforts to improve crop yield combined with explorations of its pharmacological and qualitative properties may help bitter vetch go from a "boutique" health food item to a larger mainstay crop.

Overall, there are very few criticisms that I can offer of this book. The book is an excellent example of how archaeologists and ethnobotanists can lend their knowledge and expertise to ongoing discussions regarding crop diversity and sustainable agriculture. It provides a starting point for researchers interested in the ancient use and cultivation of maygrass, goosefoot, sumpweed or marshelder, agave, little barley grass, chia, arrowroot, leren, sama, and bitter vetch. It provides basic botanical and ecological information regarding each taxa crop, how each taxa was used in the past, and how these taxa may yet be used to diversify global food stocks. In addition, the book sets up a model for future collaborative publications that could bring together scholars to synthesize data about often forgotten about taxa from other parts of the world. Overall, *New Lives for Ancient and Extinct Crops* is a valuable resource for archaeologists, ethnobotanists, agricultural scientists, and anyone interested in sustainable agriculture and how ancient plants might play an important role in the global food supply.