ORIGINS OF AGRICULTURE - ASB 547
FALL 2014 - MICHAEL BARTON

COURSE OBJECTIVES, ORGANIZATION, AND GRADING

The emergence and dispersal of agricultural socio-ecological systems has transformed the human species in profound ways culturally, socially, and biologically. A suite of culturally mediated social and economic behaviors created, new human niches to which we very rapidly adapted. The cascade of social and ecological transformation initiated by agriculture continue to transform our world at global scales. In many ways, we are not the same species that lived as successful foragers at the beginning of the Holocene.

Archaeology has long recognized the significance of the agricultural transformation of humanity, and has long focused considerable effort on documenting this transformation and understanding its causes.

The goal of this course is to review recent research bearing on the emergence and spread of agricultural socio-ecological systems, and their consequences. Because agricultural practices and domesticates began independently in different parts of the world, during the holocene, and because the agricultural way of life rapidly spread from these multiple centers of origins to replace almost all other human subsistence systems on earth, this class takes a global perspective to agricultural origins. We will look at a series of topics from this perspective:

- overarching conceptual issues,
- the social and environmental context in which agriculture first emerged,
- case studies of the initial appearance of agriculture,
- case studies of the subsequent dispersal of agricultural systems,
- elaboration of agroecosystems that came with increasing human dependence, and
- long-term consequences of agriculture on earth's social and ecological systems

This course adopts an advanced seminar format, in which we will read and discuss published reports of current research. The papers papers for discussion are listed in the Syllabus and Reading List, along with additional papers for those who want to delve more deeply into a topic. Students will lead these discussions. Participation in weekly discussions, and a term paper focused on issues relevant to this course will be the basis for grading.

ADDITIONAL RESOURCES (NOT ONLINE)

Bellwood PS (2005) First Farmers: the origins of agricultural societies. Blackwell Pub, Malden, MA

Kennett DJ, Winterhalder B (2006) Behavioral ecology and the transition to agriculture. University of California Press

Simmons AH (2011) The Neolithic Revolution in the Near East: Transforming the Human Landscape. University of Arizona Press

Zeder MA (2006) Documenting Domestication: New Genetic and Archaeological Paradigms. University of California Press

STUDENT ACADEMIC INTEGRITY STANDARDS

Student Standards: Students are required to read and act in accordance with university and Arizona Board of Regents policies, including:

- The Academic Integrity Policy: https://provost.asu.edu/index.php?q=academicintegrity
- The Student Code of Conduct: Arizona Board of Regents Policies 5-301 through 5-308: https://students.asu.edu/srr/code
- The Computer, Internet and Electronic Communications Policy: http://www.asu.edu/aad/manuals/acd/acd125.html

Cheating and Plagiarism are unethical and represent serious violations that will be dealt with as harshly as University procedures permit. Cheating means presenting others work as your own. Plagiarism is using information and or original wording in your writing without giving proper credit to the source. If you follow an argument closely or quote a source directly, you *must* provide a citation to the publication, including the author, date and page number. If you directly quote a source, even in an assignment, you must use quotation marks and a page number citation for each quoted sentence or phrase.

You may work with other students on assignments, however, all work that you do and writing that you turn in must be done independently. If you have any doubt about whether the form of cooperation you contemplate is acceptable, ask the instructor ***in advance of turning in an assignment*.**

Syllabus and Reading List

8/26 Introduction - agriculture and its consequences

Cohen MN (2009) Introduction: rethinking the origins of agriculture. Current Anthropology 50:591–595. doi: 10.1086/603548

Diamond J (2002) Evolution, consequences and future of plant and animal domestication. Nature 418:700–707. doi: 10.1038/nature01019

Rindos D (1980) Symbiosis, instability, and the origins and spread of agriculture: a new model. Current Anthropology 21:751–772.

Zeder MA, Smith BD (2009) A Conversation on Agricultural Origins: Talking Past Each Other in a Crowded Room. Current Anthropology 50:681–690. doi: 10.1086/605553

9/2 Concepts and methods

Ackland GJ, Signitzer M, Stratford K, Cohen MH (2007) Cultural hitchhiking on the wave of advance of beneficial technologies. Proceedings of the National Academy of Sciences 104:8714 –8719. doi: 10.1073/pnas.0702469104

Denham t (2009) A practice-centered method for charting the emergence and transformation of agriculture. Current Anthropology 50:661–667. doi: 10.1086/605469

Fuller DQ, Asouti E, Purugganan M (2012) Cultivation as slow evolutionary entanglement: comparative data on rate and sequence of domestication. Vegetation History and Archaeobotany 21:131–145. doi: 10.1007/s00334-011-0329-8

Winterhalder B, Kennett DJ (2009) Four Neglected Concepts with a Role to Play in Explaining the Origins of Agriculture. Current Anthropology 50:645–648. doi: 10.1086/605355

For further reading:

Bowles S (2011) Cultivation of cereals by the first farmers was not more productive than foraging. Proceedings of the National Academy of Sciences 108:4760–4765. doi: 10.1073/pnas.1010733108

Gremillion KJ, Piperno DR (2009) Human Behavioral Ecology, Phenotypic (Developmental) Plasticity, and Agricultural Origins: Insights from the Emerging Evolutionary Synthesis. Current Anthropology 50:615–619. doi: 10.1086/605360

Vigne J-D (2011) The origins of animal domestication and husbandry: A major change in the history of humanity and the biosphere. Comptes Rendus Biologies 334:171–181. doi: 10.1016/j.crvi.2010.12.009

9/9 Concepts and methods

Bramanti B, Thomas MG, Haak W, et al. (2009) Genetic Discontinuity Between Local Hunter-Gatherers and Central Europe's First Farmers. Science 326:137 –140. doi: 10.1126/science.1176869

Gupta AK (2004) Origin of agriculture and domestication of plants and animals linked to early Holocene climate amelioration. Current Science 87:54–59.

Lemmen C, Gronenborn D, Wirtz KW (2011) A simulation of the Neolithic transition in Western Eurasia. Journal of Archaeological Science 38:3459–3470. doi: 10.1016/j.jas.2011.08.008

Zavodny E, McClure SB, Culleton BJ, et al. (2014) Neolithic animal management practices and stable isotope studies in the Adriatic. Environmental Archaeology 140412045953005. doi: 10.1179/1749631414Y.0000000021,

For further reading:

Ammerman AJ, Pinhasi R, Banffy E (2006) Comment on "Ancient DNA from the First European Farmers in 7500-Year-Old Neolithic Sites."Science 312:1875a. doi: 10.1126/science.1123936

Davison K, Dolukhanov PM, Sarson GR, et al. (2009) Multiple sources of the European Neolithic: Mathematical modelling constrained by radiocarbon dates. Quaternary International 203:10–18.

Haak W, Forster P, Bramanti B, et al. (2005) Ancient DNA from the First European Farmers in 7500-Year-Old Neolithic Sites. Science 310:1016–1018. doi: 10.1126/science.1118725

Ottoni C, Flink LG, Evin A, et al. (2013) Pig Domestication and Human-Mediated Dispersal in Western Eurasia Revealed through Ancient DNA and Geometric Morphometrics. Mol Biol Evol 30:824–832. doi: 10.1093/molbev/mss261

Zeder MA, Emshwiller E, Smith BD, Bradley DG (2006) Documenting domestication: the intersection of genetics and archaeology. Trends in Genetics 22:139–155. doi: 10.1016/j.tig.2006.01.007

9/16 Background to agriculture: foragers and environmental context

Balter M (2010) The Tangled Roots of Agriculture. Science 327:404 –406. doi: 10.1126/science.327.5964.404

Freeman J, Anderies JM (2012) Intensification, Tipping Points, and Social Change in a Coupled Forager-Resource System. Human Nature 23:419–446. doi: 10.1007/s12110-012-9154-8

Smith EA (2001) Low-level food production. Journal of Archaeological Research 9:1–43.

9/23 Background to agriculture: foragers and environmental context

Hunt CO, Rabett RJ (2014) Holocene landscape intervention and plant food production strategies in island and mainland Southeast Asia. Journal of Archaeological Science. doi: 10.1016/j.jas.2013.12.011

Innes JB, Blackford JJ, Rowley-Conwy PA (2013) Late Mesolithic and early Neolithic forest disturbance: a high resolution palaeoecological test of human impact hypotheses. Quaternary Science Reviews 77:80–100. doi: 10.1016/j.quascirev.2013.07.012

Munro, N. D. (2004). Zooarchaeological measures of hunting pressure and occupation intensity in the Natufian: implications for agricultural origins. Current Anthropology 45(S4): S5-S33.

For further reading:

Kealhofer, L. (2003). Looking into the gap: land use and the tropical forests of southern Thailand. Asian Perspectives 42(1): 72-95.

9/30 Agricultural origins in southwest Asia

Asouti E, Fuller DQ (2012) From foraging to farming in the southern Levant: the development of Epipalaeolithic and Pre-pottery Neolithic plant management strategies. Vegetation History and Archaeobotany 21:149–162. doi: 10.1007/s00334-011-0332-0

Conolly J, Colledge S, Dobney K, et al. (2011) Meta-analysis of zooarchaeological data from SW Asia and SE Europe provides insight into the origins and spread of animal husbandry. Journal of Archaeological Science 38:538–545. doi: 10.1016/j.jas.2010.10.008

Hillman G, Hedges R, Moore A, et al. (2001) New evidence of Lateglacial cereal cultivation at Abu Hureyra on the Euphrates. The Holocene 11:383–393. doi: 10.1191/095968301678302823

Zeder MA (2011) The origins of agriculture in the Near East. Current Anthropology 52:S221–S235.

For further reading:

Zeder MA (2008) Domestication and early agriculture in the Mediterranean Basin: Origins, diffusion, and impact. Proceedings of the National Academy of Sciences 105:11597 –11604. doi: 10.1073/pnas.0801317105

10/7 Agricultural origins in east Asia

Barker G, Richards MB (2013) Foraging–farming transitions in island southeast Asia. J Archaeol Method Theory 20:256–280. doi: 10.1007/s10816-012-9150-7

Bettinger RL, Barton L, Morgan C (2010) The origins of food production in north China: A different kind of agricultural revolution. Evol Anthropol 19:9–21. doi: 10.1002/evan.20236

Jones MK, Liu X (2009) Origins of Agriculture in East Asia. Science 324:730 –731. doi: 10.1126/science.1172082

Lu H, Zhang J, Liu K, et al. (2009) Earliest domestication of common millet (Panicum miliaceum) in East Asia extended to 10,000 years ago. Proceedings of the National Academy of Sciences 106:7367 –7372. doi: 10.1073/pnas.0900158106

10/14 Fall Break

10/21 Agricultural origins in Africa

Hildebrand EA (2009) The Utility of Ethnobiology in Agricultural Origins Research: Examples from Southwest Ethiopia. Current Anthropology 50:693–697. doi: 10.1086/605569

Marshall, F. and E. Hildebrand (2002). Cattle Before Crops: The Beginnings of Food Production in Africa. Journal of World Prehistory 16(2): 99-143.

Manning K, Pelling R, Higham T, et al. (2011) 4500-Year old domesticated pearl millet (Pennisetum glaucum) from the Tilemsi Valley, Mali: new insights into an alternative cereal domestication pathway. Journal of Archaeological Science 38:312–322. doi: 10.1016/j.jas.2010.09.007

Pereira F, Queirós S, Gusmão L, et al. (2009) Tracing the History of Goat Pastoralism: New Clues from Mitochondrial and Y Chromosome DNA in North Africa. Mol Biol Evol 26:2765–2773. doi: 10.1093/molbev/msp200

For further reading:

Gifford-Gonzalez, D. (1998). Early pastoralists in east Africa: Ecological and social dimensions. Journal of Anthropological Archaeology 17(2): 166-200.

10/28 Agricultural origins in the Mesoamerican Neotropics

Arnold III, Phillip J. 2009 Settlement and Subsistence Among the Early Formative Gulf Olmec. Journal of Anthropological Archaeology 28(4). Elsevier Inc. 397–411.

Hastorf CA (2009) Rio Balsas most likely region for maize domestication. PNAS 106:4957–4958. doi: 10.1073/pnas.0900935106

Piperno DR (2011) The Origins of Plant Cultivation and Domestication in the New World Tropics: Patterns, Process, and New Developments. Current Anthropology 52:S453–S470. doi: 10.1086/659998

Ranere AJ, Piperno DR, Holst I, et al. (2009) The cultural and chronological context of early Holocene maize and squash domestication in the Central Balsas River Valley, Mexico. PNAS 106:5014–5018. doi: 10.1073/pnas.0812590106

Thornton EK, Emery KF, Steadman DW, et al. (2012) Earliest Mexican Turkeys (Meleagris gallopavo) in the Maya Region: Implications for Pre-Hispanic Animal Trade and the Timing of Turkey Domestication. PLoS ONE 7:e42630. doi: 10.1371/journal.pone.0042630

For further reading:

Jones, John G. 32. 1991 Pollen Evidence of Prehistoric Forest Modification and Maya Cultivation in Belize. Texas A&M University. 33. 1994 Pollen Evidence for Early Settlement and Agriculture in Northern Belize. Palynology 18(1): 205–211.

Iriarte J (2009) Narrowing the Gap: Exploring the Diversity of Early Food-Production Economies in the Americas. Current Anthropology 50:677–680. doi: 10.1086/605493

Kennett DJ, Piperno DR, Jones JG, et al. (2010) Pre-pottery farmers on the Pacific coast of southern Mexico. Journal of Archaeological Science 37:3401–3411. doi: 10.1016/j.jas.2010.07.035

Neff H, Pearsall DM, Jones JG, et al. (2006) Early Maya Adaptive Patterns: Mid-Late Holocene Paleoenvironmental Evidence from Pacific Guatemala. Latin American Antiquity 17:287. doi: 10.2307/25063054

Voorhies, Barbara. 2004 Coastal Collectors in the Holocene: The Chantuto People of Southwest Mexico. University Press of Florida, Gainesville.

11/4 Agricultural dispersals - Europe

Conolly J, Colledge S, Shennan S (2008) Founder effect, drift, and adaptive change in domestic crop use in early Neolithic Europe. Journal of Archaeological Science 35:2797–2804. doi: 10.1016/j.jas.2008.05.006

Rowley-Conwy P (2004) How the West was lost: a reconsideration of agricultural origins in Britain, Ireland, and southern Scandinavia. Current Anthropology 45:S83–S113.

Shennan S, Downey SS, Timpson A, et al. (2013) Regional population collapse followed initial agriculture booms in mid-Holocene Europe. Nature Communications. doi: 10.1038/ncomms3486

Turney CSM, Brown H (2007) Catastrophic early Holocene sea level rise, human migration and the Neolithic transition in Europe. Quaternary Science Reviews 26:2036–2041. doi: 10.1016/j.quascirev.2007.07.003

For further reading:

Bellwood P (2009) The Dispersals of Established Food-Producing Populations. Current Anthropology 50:621–626. doi: 10.1086/605112

Cortés Sánchez M, Jiménez Espejo FJ, Simón Vallejo MD, et al. (2012) The Mesolithic–Neolithic transition in southern Iberia. Quaternary Research 77:221–234. doi: 10.1016/j.yqres.2011.12.003

Fort J, Pujol T, Linden MV (2012) Modelling the Neolithic Transition in the Near East and Europe. American Antiquity 77:203–219.

Shennan S, Edinborough K (2007) Prehistoric population history: from the Late Glacial to the Late Neolithic in Central and Northern Europe. Journal of Archaeological Science 34:1339–1345. doi: 10.1016/j.jas.2006.10.031

11/11 Veteran's Day – No class

11/18 Agricultural dispersals – North America

Speller CF, Kemp BM, Wyatt SD, et al. (2010) Ancient mitochondrial DNA analysis reveals complexity of indigenous North American turkey domestication. Proceedings of the National Academy of Sciences 107:2807 – 2812. doi: 10.1073/pnas.0909724107

Hart JP, Brumbach HJ, Lusteck R (2007) Extending the Phytolith Evidence for Early Maize (Zea mays ssp. mays) and Squash (Cucurbita sp.) in Central New York. American Antiquity 72:563–583. doi: 10.2307/40035861

Merrill WL, Hard RJ, Mabry JB, et al. (2009) The diffusion of maize to the southwestern United States and its impact. Proceedings of the National Academy of Sciences 106:21019–21026. doi: 10.1073/pnas.0906075106

Smith BD, Yarnell RA (2009) Initial formation of an indigenous crop complex in eastern North America at 3800 B.P. Proceedings of the National Academy of Sciences 106:6561 –6566. doi: 10.1073/pnas.0901846106

For further reading:

Blackman BK, Scascitelli M, Kane NC, et al. (2011) Sunflower domestication alleles support single domestication center in eastern North America. PNAS 108:14360–14365. doi: 10.1073/pnas.1104853108

Smith BD (2006) Eastern North America as an independent center of plant domestication. PNAS 103:12223–12228. doi: 10.1073/pnas.06043351

11/25 Agricultural intensification and extensification

Bevan A, Conolly J, Colledge S, et al. (2013) The Long-Term Ecology of Agricultural Terraces and Enclosed Fields from Antikythera, Greece. Hum Ecol 41:255–272. doi: 10.1007/s10745-012-9552-x

Erickson CL (2006) Intensification, Political Economy, and the Farming Community; In Defense Of A Bottom-Up Perspective Of The Past. In: Marcus J, Stanish C (eds) Agricultural Strategies. Cotsen Institute, Los Angeles, pp 233–265

Ladefoged TN, Kirch PV, Gon III SM, et al. (2009) Opportunities and constraints for intensive agriculture in the Hawaiian archipelago prior to European contact. Journal of Archaeological Science 36:2374–2383. doi: 10.1016/j.jas.2009.06.030

Porter BW, Routledge BE, Simmons EM, Lev-Tov JSE (2014) Extensification in a Mediterranean semi-arid marginal zone: An archaeological case study from Early Iron Age Jordan's Eastern Karak Plateau. Journal of Arid Environments 104:132–148. doi: 10.1016/j.jaridenv.2014.01.015

For further reading:

Fisher CT (2009) Abandoning the garden: the population/land degradation fallacy as applied to the Lake Pátzcuaro Basin in Mexico. In: Fisher CT, Hill JB, Feinman, Gary M (eds) The Archaeology of Environmental Change. Univ. of Ariz. Press, Tucson, pp 209–231

Janusek JW, Kolata AL (2004) Top-down or bottom-up: rural settlement and raised field agriculture in the Lake Titicaca Basin, Bolivia. Journal of Anthropological Archaeology 23:404–430. doi: 10.1016/j.jaa.2004.08.001

Wilkinson TJ (1989) Extensive Sherd Scatters and Land-Use Intensity: Some Recent Results. Journal of Field Archaeology 16:31.

12/2 Long term impacts

Barton CM, Ullah IIT, Bergin SM, et al. (2012) Looking for the future in the past: long-term change in socioecological systems. Ecological Modelling 241:42–53. doi: 10.1016/j.ecolmodel.2012.02.010

Kaplan JO, Krumhardt KM, Zimmermann N (2009) The prehistoric and preindustrial deforestation of Europe. Quaternary Science Reviews 28:3016–3034. doi: 10.1016/j.quascirev.2009.09.028

Lambert PM (2009) Health versus Fitness: Competing Themes in the Origins and Spread of Agriculture? Current Anthropology 50:603–608. doi: 10.1086/605354

Smith BD, Zeder MA (2013) The onset of the Anthropocene. Anthropocene. doi: 10.1016/j.ancene.2013.05.001

For further reading:

Hill JB (2004) Land Use and an Archaeological Perspective on Socio-Natural Studies in the Wadi Al-Hasa, West-Central Jordan. American Antiquity 69:389–412.

Fisher CT, Hill JB, Feinman GM (2009) The Archaeology of Environmental Change: Socionatural Legacies of Degradation and Resilience. Univ. of Ariz. Press, Tucson

Gage TB, DeWitte S (2009) What Do We Know about the Agricultural Demographic Transition? Current Anthropology 50:649–655. doi: 10.1086/605017

Kutzbach JE, Ruddiman WF, Vavrus SJ, Philippon G (2010) Climate model simulation of anthropogenic influence on greenhouse-induced climate change (early agriculture to modern): the role of ocean feedbacks. Climatic Change 99:351–381. doi: 10.1007/s10584-009-9684-1

McClure SB (2013) Domesticated animals and biodiversity: Early agriculture at the gates of Europe and long-term ecological consequences. Anthropocene. doi: 10.1016/j.ancene.2013.11.001

Pohl, Mary D., Kevin O. Pope, John G. Jones, et al. 61. 1996 Early Agriculture in the Maya Lowlands. Latin American Antiquity 7(4): 355– 372.

Redman CL, Fish PR, James SR, Rogers JD (2004) The archaeology of global change: the impact of humans on their environment. Smithsonian Books, Washington

Ruddiman WF (2003) The Anthropogenic Greenhouse Era Began Thousands of Years Ago. Climatic Change 61:261–293. doi: 10.1023/B:CLIM.0000004577.17928.fa

Woodbridge J, Fyfe RM, Roberts N, et al. (2012) The impact of the Neolithic agricultural transition in Britain: a comparison of pollen-based land-cover and archaeological 14C date-inferred population change. Journal of Archaeological Science. doi: 10.1016/j.jas.2012.10.025