

Agriculture and sedentism: What really happened

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- What we want to know about the origins of agriculture
 - Basic facts of what happened (culture history)
 - Where and when agriculture began
 - With what crops
 - By people with what cultures, traditions, technologies, etc.
 - Explanation: How and why did people start farming?
 - Why did agriculture seem like a good deal at the time?
 - That is, what processes, pressures, etc. led people to start farming and eventually to depend on it in any given case?
- This means we will be looking at the beginning and spread of the **Neolithic** period
 - **Neolithic**: two meanings
 - 1. A stone tool technology that emphasizes grinding, rather than flaking
 - This results in a more durable cutting edge (although not as sharp)
 - good for axes needed to cut trees to clear farmland in forested places like Europe
 - 2. More importantly for us, the period in which agriculture came into use and was the main source of food
 - so called because in some places (like Europe), ground-stone tools came into use at about the same time as agriculture became important
 - so they serve as a convenient marker and term for early agricultural periods
- There are several ways we can recognize the advent of agriculture in the archaeological record
 - **Domestication** = genetic modification of a wild plant or animal due to human involvement with its reproduction
 - Not necessarily intentional - but a plant or animal is not domesticated unless it has evolved under human influence
 - If we can identify remains of domesticated plants or animals (ones that differ from wild forms), we have direct evidence of agriculture or pastoralism
 - Canals or fields (indicated by furrows, ditches, regularly placed small mounds, etc)
 - Rarely preserved, but occasionally we get lucky
 - Lots of tools used for agricultural tasks (smaller quantities might just have been used for specialized foraging)
 - Hoes or digging tools (identifiable by form and rounded wear)
 - Sickles used for harvesting grain (identifiable by sickle gloss)
 - Grinding stones used for grinding grain
 - Large, permanent settlements are a strong hint that people were supported by agriculture
 - but are not proof in themselves
 - Storage structures for crops
 - again, specialized foragers might have these to a lesser extent
- How could domestication and the practice of agriculture come about?
 - Example: a possible process of domestication of wheat (other grains may have been similar)

- wild wheat
 - seeds have brittle rachis [RAY-kis] (attachment to the stem), so they fall off easily
 - seeds are narrow and have a rounded point that lets them penetrate cracks in the ground
- people start collecting wild wheat, probably by tapping the heads of wheat against the edge of a basket to make the ripe seeds fall into the basket
 - those seeds that happen to have a more brittle rachis fall off the stems more easily.
 - Plants that happen to have a slightly tougher rachis lose fewer seeds to the harvesters.
 - These seeds that are NOT harvested are the ones that remain to naturally sow the next generation of plants
- this process selects for plants with a tough rachis, gradually producing a kind of wheat more like the domesticated form, in which the seeds stay on the head and have to be removed by threshing
 - this evolution of the plants is caused unintentionally by people collecting the looser seeds
- an increasing fraction of the seeds do not fall off easily when ripe
- and those that do are less successful at working their way into the soil because the broken rachis is wider and more angular, less pointed
- so the wheat becomes less effective at sowing itself naturally
- as the seeds stick more tightly to the head, people shift their harvesting method
 - they start using sickles to cut off and collect the whole head, and then later thresh (beat) the heads to knock the seeds off
 - this allows more effective harvesting of most of the wheat
- between the reduced effectiveness of the wheat at sowing itself, and the efficient harvesting of most of the seeds, the wild stands no longer replenish themselves as well
- so people start “helping” the wheat by sowing part of the harvest
 - the seeds are those that stayed on the heads long enough to be collected by threshing
 - so the wheat is still growing from seeds with a tough rachis
- eventually people start intentionally selecting seeds to sow that have the desired qualities: fat, large grains
 - now the evolution of the plants is intentionally guided by people
 - the result is domesticated wheat, with large grains that tend to stay on the head
- the details are still being evaluated, but something like this is probably right
- probably some process like this, starting with unintentional selection due to the methods used by foragers, followed by intentional selection for favored characteristics
- similar processes probably happened with other domesticates, both plants and animals
- So, what is the archaeological evidence about the adoption of agriculture? What actually happened?
 - People adopted agriculture independently in many different places and times, with different crops
 - (these are current estimates; a lot of research is going on to better define these cases)
 - 9,000 - 8,000 BC: the Levant (Jordan valley of Palestine and Israel, nearby areas)
 - wheat, barley, rye, lentils, peas, etc.
 - sheep, goats, pigs, cattle

- 8,500 - 7,700 BC: the rest of southwest Asia (Anatolia, Egypt, the Fertile Crescent, reaching out towards India)
 - wheat, barley, lentils, peas, etc.
 - sheep, goats, pigs, cattle
 - that is, mostly similar plants and animals adopted by groups not far from the Levant
 - did they pick up the crops, animals, and practices of the Levant for some reason?
 - this would be called “diffusion” of the practice of agriculture
 - or did they go through similar processes independently?
- 10,000? - 6,500 BC: southern China, southeast Asia
 - yams maybe earliest; rice
 - water buffalo, pigs
- 6,500 - 5,000 BC: north-central China
 - millet (a grain), etc.
 - pigs
- 9,000 - 3,000 BC: Andean South America (especially Peru, some of Ecuador)
 - beans, peppers, squash, quinoa (a grain-like plant that produces lots of tiny edible seeds), potatoes, gourds
 - guinea pigs (for food), llamas
 - many apparently fairly independent processes of domestication of different plants at different times in different places in a highly variable, patchy environment
 - generally a much more gradual shift to agriculture, with long periods of mixed foraging and agricultural adaptations
- 7,000 - 4,000 BC: Papua New Guinea
 - tubers such as yams or taro
- 5,000 - 3000 BC: Mexico
 - maize (corn), beans, squash, peppers, gourds
 - turkeys, dogs
- after 2000 BC: Sub-Saharan Africa
 - rice, sorghum (a grain), millet (another grain)
- by 1000 BC: Midwest North America
 - marsh elder (small, oily, edible seeds), sunflower, goosefoot (close relative of quinoa)
 - once thought that beans and squash were adopted later from Central America, but now looks like they may have been independently domesticated in North America, too
- The processes leading to farming were probably different in different cases
 - The transition was often a gradual increase in dependence on plants that were encouraged by sowing, simple irrigation, burning off competing grasses, etc.
 - making it hard to pick a specific date when farming “started” or became important
 - Depending on where you draw the lines, most of the world’s major independent agricultural traditions began between about 10,000 BC and 3,000 BC
 - many people continued to forage during this time, and on almost to the present
 - others developed mixed arrangements where they foraged but also herded animals, traded hunted meat, made long trading trips, etc., becoming dependent on farmed food they got through exchange

- others developed mixed arrangements where they both foraged and farmed
- others adopted agriculture later, picking up crops, animals, and practices developed earlier by other groups, responding to other circumstances
- On a gross scale, all of these independent inventions of agriculture happened at about the same time in human existence.
 - that is, humans existed for several hundred thousand years, then independently developed agriculture in many different places in “just” a few thousand years
- What was special about this time that many different cultures began farming then?
 - *Homo sapiens* evolved mostly during the Pleistocene (ice ages)
 - For several thousand years leading up to about 10,000 BP (about 8000 BC), the Pleistocene tapered off and the climate warmed, ice retreated, sea level rose, wild plant and animal communities changed...
 - within a few thousand years of the shift to the modern (Holocene) climate, humans were farming in many places around the world
 - in the broad scheme of things, these independent inventions of agriculture all happened in the same post-Pleistocene time frame, reflecting the same general processes
 - they presumably had something to do with the climate changes
 - and possibly with the gradually rising populations of humans around the world
 - at a more detailed level, thousands of years separated the adoption of agriculture in different regions
 - and each case happened in ways specific to the environment and cultures of the area
- The case of the classic “western” agricultural complex
 - crops and animals:
 - Wheat and barley
 - plus rye, lentils, peas, and other minor crops
 - the term “pulses” in the reading refers to legume seeds (beans, peas, lentils, etc.)
 - Sheep and goats
 - plus cattle and pigs
 - Spread throughout Southwest Asia (Mesopotamia, the Levant, Anatolia [modern Turkey]); Egypt; Europe; and the Indus region (Pakistan and northwestern India)
- The earliest well-documented transition to a significant dependence on agriculture was in the Levant, lapping into the upper Euphrates valley
 - this is the western side of the "fertile crescent"
 - Prior to about 11,000 BC, the Levant was occupied by small, mobile bands of foragers
 - around 11,000 BC, some of these settled down in a very rich region
 - mixed oak and pistachio woodland
 - and grassland with wild cereals and legumes
 - These people are called Natufians
 - they were highly specialized foragers
 - intensively harvested wild grains
 - as shown by abundant grinding stones
 - sickles with sickle gloss

- lots of wild wheat, barley, lentils, vetch (a legume), peas, chickpeas (garbanzo beans) found in cooking pits at various sites, carbonized accidentally
- also collected nuts such as almond, pistachio, acorn
- also hunted herds of gazelles that migrated through the region seasonally
- The region was so favorable that they could be semi-sedentary or even fully sedentary
 - as indicated by hamlets of circular houses with stone foundations
- they stored the cereals and nuts in pits
 - storage is a necessary part of this specialization
 - since the cereal seeds and nuts are only available seasonally
 - so they had to collect large quantities and store them for the rest of the year
- these storage pits were associated with individual houses
 - rather than serving multiple houses or the whole settlement
 - and each house also had its own grinding stones and other tools
 - suggesting that each family harvested, stored, and processed its own grain and looked after its own needs
 - rather than working together in larger groups where more people would depend on each other for a variety of different tasks
 - so economically, these sedentary Natufians were organized similarly to mobile foragers
- they began accumulating wealth, as settled people are prone to do
 - elaborately carved sickle handles
 - beads and figurines made from bone, shell, stone
- The Levant experienced a wet period from about 12,500 to 9,000 BC
 - this expanded the area of good patchy woodland
 - allowing the Natufian adaptation of specialized sedentary foragers highly focused on wild grains to become widespread
- around 10,000 BC, the climate began to turn cooler and drier
 - the area of rich woodland contracted
 - for example, the Natufian site of Tell Abu Hureyra was gradually stranded as the woodlands pulled back some 60 miles away
 - this kind of change probably happened at other sites, too
 - the plant foods found in hearths and garbage gradually shifted, with the ones that need the most water fading away first
 - but wild wheat continued to be stored and consumed in great quantities
 - even though it would not naturally have grown nearby anymore
 - Natufians evidently encouraged it to grow nearby, by planting, watering, tending, etc.
 - this was not a major change for them
 - instead, it was a way of maintaining the way of life that they already had
 - they already knew how to harvest, store, and use the grains and were accustomed to doing that
 - in this sense, they were "pre-adapted" to become farmers
- at about the same time, an apparently domesticated form of rye appeared

- apparently the earliest detectable case of plant evolution due to humans meddling with the plant's reproduction
- later, lentils and other legumes reappeared in the garbage
 - the climate was still unfavorable for them to grow wild nearby
 - so they were presumably starting to farm these plants, too
- the change was gradual, but by 8500 BC at Abu Hureyra, cultivated cereals and legumes were a major part of the diet: they were committed to farming
 - although wild foods also remained important for 2500 years
 - sheep and goats were being domesticated by 8500 BC, but hunted wild gazelle still comprised much more of the meat in the diet
- reliance on domesticated animals came later at Abu Hureyra, around 7500-7000 BC
 - there was a fairly rapid drop in bones of hunted gazelles
 - replaced by more sheep and goats, which had been domesticated considerably earlier
- Chronology break!
 - the term Natufian is used for people up to about 9000 BC
 - after that, there was a transitional period
 - followed by the Pre-Pottery Neolithic “A” period, or PPNA, from about 8500-7000 BC
 - "Neolithic" means that they were early farmers
 - "Pre-pottery" means that they did not make ceramics yet
 - "A" labels this early part of the pre-pottery Neolithic, versus a later part, called "B"
 - so during the PPNA (8500-7000 BC), Abu Hureyra was a farming village
 - PPNA villages like Abu Hureyra, Jericho, and many others consisted of clusters of round houses and apparently fairly simple, egalitarian social organization
 - the PPNB was about 7000-6000 BC
 - for unknown reasons, people switched to rectangular houses
 - there was greater concentration and inequality of wealth, more elaborate ritual practices, figurines, etc.
- so the transition to farming was made gradually by the last Natufians and the first Neolithic cultures of the Levant (PPNA)
 - sites often have a lower layer with Natufian remains, covered by a PPNA layer
- Back to Abu Hureyra...
- Abu Hureyra eventually grew in the PPNB to over 11 ha (hectares)
 - (1 ha = 100 x 100 m; 1 ha = 2.5 acres)
 - with 2000 to 3000 people
 - probably one of the biggest settlements of its time
 - most villages of the PPNB (between 7000 and 6000 BC) were less than half this population
 - Abu Hureyra was eventually abandoned around 6000 BC
- Abu Hureyra is just one particularly well-known site
 - others probably went through roughly the same process
 - with local variations, and not at exactly the same time
 - some cases may have been like Abu Hureyra, where the changing environment seems to have been a key factor pushing them into farming

- others may have been pushed more by population growth
- the effect would have been the same: people had to produce more food from the land around them
- another example of a large early Neolithic village: 'Ain Ghazal
 - 7000-6000 BC (Pre-pottery Neolithic B, or PPNB)
 - about 12 ha (similar to Abu Hureyra at its peak)
 - rectangular houses, plastered floors, central hearth
 - more evidence of accumulation of wealth
 - a cache of 84 flint blades in a hole below the floor of a house
 - implies that someone had accumulated more blades than they or their family was likely to need themselves
 - suggests that someone was storing goods for later use or exchange
 - beads made from shells that came from the Red Sea (150 miles away) and the Mediterranean Sea (70 miles away)
 - ideas about the supernatural
 - small ceramic figurines, usually female
 - large standing figurines, mostly male, of plaster on a core of bundled twigs and straw
 - four human skulls with faces modeled in plaster, buried in a pit, all facing southwest
 - the large standing figurines resemble the plaster-coated skulls; is this all part of some form of ancestor worship?
 - if so, could ancestor worship suggest the development of a system in which prestige was based on descent from particular ancestors, that is, an ideology that legitimized higher status for certain lineages like chiefly families?
 - does this imply ritual specialists?
- From roughly 8500 BC to 3500 BC, and even later in many places, most people in Southwest Asia lived in farming villages generally like Tell Abu Hureyra or 'Ain Ghazal
 - Most villages ranged from several extended families to a few hundred people; a few probably reached into the 2000s.
 - A tremendously stable, successful lifestyle of small-scale, traditional farmers
 - Lasted at least 5000 years with only relatively minor changes in most places
 - That is, agriculture did *not* lead directly to cities or civilization
 - instead, it led to a village farming lifestyle that worked fine for thousands of years, and in some places still does
- this example of the Levant region is just one of many; we will look at other places where agriculture was adopted throughout the rest of the course
- This kind of transition from foraging to farming made settled village life possible almost everywhere in the world
 - and paved the way for some villages to grow into larger towns.
- We will move quickly on to more complex societies
 - but don't forget that in most regions, this relatively simple Neolithic village lifestyle lasted for several thousand years before cities and "civilizations" began to appear