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THE EMERGENCE OF AGRICULTURE - REVIEW OF RECENT RESEARCH

“He did something never seen before¹” – Agriculture as a Cultural Innovation

Domestication of plants and animals² meant a significant change in human utilisation of the nature. The Biblical story of banishing man from the Garden of Eden tells this process mythically³:

Cursed is the ground because of you;
through painful toil you will eat of it
all the days of your life.

It will produce thorns and thistles for you,
and you will eat the plants of the field.

By the sweat of your brow
you will eat your food
until you return to the ground.⁴

This Biblical story is quite controversial with other myths concerning the origins of agriculture. Other stories around the world see that it was a gift from gods but the Berešit⁵ story sees it as a curse. By doing this, the Berešit predates the puzzling question that archaeologists and anthropologists have pondered: why hunter-gatherers would bother to take the more time consuming and less beneficial task of agriculture instead of easier foraging the nature.

¹ Sumerian proverb (ETCSL 6.1.01 line 36)

² There is some variation in terminology used on the emergence of agriculture. According to Ehud Weiss, Mordechai E. Kislev and Anat Hartmann (2006, 1608) “[h]uman domestication of plants can be divided into three stages: ‘gathering,’ in which people gathered annual plants from wild stands; ‘cultivation,’ in which wild plant genotypes were systematically sown in the fields of choice; and ‘domestication,’ in which mutant plants with desirable characteristics were raised.” Augusta McMahon (2005, 22) gives a bit different list. According to her, “[e]conomic stages can be defined: ‘Foraging’ implies opportunistic exploitation of resources; ‘intensive foraging’ indicates strategic decisions to focus on a few species or to exploit a wide range. ‘Cultivation’ means manipulation or taming of individual animals, while ‘agriculture’ involves domestication of species, with dependency of plants and animals on humans for reproduction and protection.” Dorian G. Fuller and Sue Colledge (2007), in turn, argues that “[a] key distinction must be made between *cultivation* which is something that people do, and *domestication*, which is a quality or set of attributes of a plant... Cultivation is an activity; domestication is a genetic status, and this has evolved on account of cultivation.”

³ There is an interesting new science called geomythology. It takes ancient myths seriously and sees them as attempts to explain significant climato-geological events. Thus, this Biblical story can be taken as a Stone Age explanation how humans became agriculturalists and pastoralists.

⁴ Gen 3:17-19 (NIV).

⁵ Berešit (Hebr. “Beginning”) is the name of the Book of Genesis in the Hebrew Bible. I intend to use aboriginal names as much as possible. Thus, Mesopotamia is Matum, ancient Egypt is Kemet, Greece is Hellas, etc.

In today's world, agriculture is self evident. However, in the light of human history, agriculture is an anomaly in the human behaviour. As Ezra B.W Zubrow describes:

Of the approximately 80 billion people who have lived since the emergence of our species, Homo sapiens, over 90 percent have lived as hunters and gatherers. For more than 99 percent of the duration of human occupation (broadly defined since the time of Homo habilis), people made no use of domesticated plants and animals. Agriculture appears for the first time in archaeological contexts about ten millennia ago. Only 6 percent of this broadly defined human population ever living has been agricultural.⁶

The issue becomes even more puzzling when, contrary to previous evolutionist views, it has been realised that early hunter-gatherers did not live in subsistence level but actually had better nutrition and health with a smaller amount of work than agriculturalists⁷.

The Berešit story continues with a mythical answer: God forced people away from the Paradise and “[a]fter he drove the man out, he placed on the east side of the Garden of Eden cherubim and a flaming sword flashing back and forth to guard the way to the tree of life⁸.”

This, in turn has indirectly sparked the imaginary of scientists who have presented several theories to explain why people abandoned the hunter-gatherer lifestyle. It would not be difficult to translate “flaming sword” as the heat of the desert from where people had to flee. For long time, the dominant paradigm in archaeology and anthropology was V. Gordon Childe's “oasis theory.” According to Childe, during the dry climatic period, both people and animals had to seek liveable conditions from oases. After that, the closeness led to the domestication⁹.

The Berešit story continues further: after the expulsion of humans from Paradise, “Abel kept flocks, and Cain worked the soil¹⁰.” Hunter-gatherers had become pastoralists and agriculturalists – and had waged a war against each other as the story tells a bit later.

Following Gordon Childe¹¹, this change of subsistence has usually been called *Neolithic revolution* and it occurred circa 9,000-7,000 BC¹² in the Fertile Crescent¹³ - a green belt that

⁶ Zubrow 1986, 210.

⁷ Wadley & Martin 1993 (following Cohen 1989); Zubrow 1986. Contra them, economists Douglass C North and Robert P. Thomas (1977) argue that hunting is more labour intensive than agriculture and herding. However, their argument stands or falls whether the human population was stable (as anthropologists argue) or growing (as they argue).

⁸ Gen 3: 24 (NIV).

⁹ Childe 1928.

¹⁰ Gen 4:2 (NIV).

¹¹ Childe 1928.

¹² In this work I use the classical expression BC (before Christ) to denote years. In direct quotations there are sometimes expressions BP (before present) or ‘cal PB’ (calibrated before present). Expressions refer to convention in radiocarbon dating where the ‘present’ is 1950 AD when the radiocarbon dating was invented (Currie 2004, 190). In indirect quotations I translate BP to BC by reducing 2,000 years to get the BC time scale and round the numbers in hundreds. Usually, in prehistoric dates, there is + - 200-400 year error marginal.

¹³ Some scholars, like Carl O. Sauer (1952), Donn T. Bayard (1970), Wilhelm G. Solheim (1970) and Chester F. Gorman (1971) have argued for the primacy of South East Asia as the birth-place of agriculture.

reached from Kemet (Egypt) via eastern coast of Mediterranean and Taurus Mountains to the valley of Purattu (Euphrates) and Idigna (Tigris) and Zagros Mountains¹⁴.

Domestication of plants and animals was not just choice what to eat today. It changed human existence fundamentally. Michael Mann, in his analysis of *Sources of Social Power*, states that cultural innovations have caused “power-leaps”. Of the nine innovations, that he mentions, five first occurred in South-West Asia:

- 1) Animal domestication, agriculture, bronze metallurgy – prehistory
- 2) Irrigation, cylinder seals, the state, - ca 3000 B.C.
- 3) Cursive cuneiform, military commissaries, corvée labor – 2500 – 2000 B.C.
- 4) Written law codes, the alphabet, the spoked wheel on fixed axle – c.a. 2000 – 1000 B.C.
- 5) Iron smelting, coinage, the naval galley – ca. 1000 – 600 B.C.¹⁵

A significant addition to Mann’s list deals with the organisation of the society. While Max Weber argued that it was the irrigation-farming that led to co-operative cultures¹⁶, Karl Polanyi, in his arguments on redistribution, pointed that already hunting required high degree of co-operation. According to latter, organisation of the hunting required division of labour, since – unless it was a one-time project – the game had to be stored by the chief and distributed from his storage to the tribe. Polanyi also argued that individual household economy was a latecomer compared to redistributive economy.¹⁷

In spite of the first sight controversy, both theorists may have been right. The difference in these theories lies in the numbers and concentration. Charles K. Maisels note that hunter-gatherers live in small groups¹⁸, move around a lot, accumulate few possessions and social arrangements are very flexible. Cultivators, instead, live in large groups, do not move much, tend to accumulate possessions, and therefore have highly regulated social arrangements.¹⁹ Thus, while the hunter-gatherer tribe system served evidently as a model for sedentary life, the latter had so many new problems that this model was not enough and new organisation models had to be developed.

If we follow Polanyian line of thought, the society of the first agriculturalists and herders already had a significant level of co-operation, knowledge of tools and idea how to storage the crop before they started sowing seed and harvesting the crop. According to Roux,

¹⁴ Van Zeist 1986; Bar-Yosef and Kislev 1989; Watkins 1992b; Lieberman 1993.

¹⁵ Mann 1986, 525. The last three major innovations are located in Europe and from Roman time on.

¹⁶ Weber 1976, 84.

¹⁷ Polanyi 1944, 47-53; 1968, 10-16; 1977, 40ff. Joy McCarriston (1997, 522f.) also points that harvest of flax (that had been utilised already in 7000 B.C.) high labour inputs and must be done communally. Moreover, it is difficult to imagine how cultivation by clearing and burning-over woodland of which Henry T. Lewis (1972) writes, could be done without at least village-level co-operation.

¹⁸ Henry T. Wright (1981, 325) estimates Ubaid phase population that “[i]t is unlikely that southern Sumer as a whole contained more than 2,500 to 4,000 persons, or about 20 persons per square kilometre of enclave.”

¹⁹ Maisels 1993, 228.

the Mesolithic period was a time of settlement and slow but tremendous advance in several fields. During these crucial millennia, not only were the chipped stone techniques perfected to produce very fine tools for all kinds of household purposes, but the house-building technology was acquired and, above all, innumerable experiments were performed to ensure permanent supply of vegetable and animal foods, available in all seasons in the vicinity of the settlement.²⁰

Then, as he continues, “around 7000 B.C. in Anatolia and in some other parts of the Near East man ceases to be a wandering hunter depending for his living upon his luck and skill and becomes a farmer attached to the small piece of land from which he obtains a regular food supply²¹.” Neolithic transition paved way to the civilisation.

“... teach and admonish one another...”²² Theoretical Approaches on the Emergence of Agriculture

There is a disagreement why the change to sedentary life happened²³. The emergence of agriculture has been one of the major issues in anthropological and archaeological research of the prehistoric South-Western Asia. On the other hand, agreement exists, as Wadley and Martin put it, that “every civilisation that came into being had cereal agriculture as its subsistence base, and wherever cereals were cultivated, civilisation appeared²⁴.” Major cultural, political and economic innovations have been made by agricultural societies.

One note has to be remembered. Kent V. Flannery, in his review of agricultural origins, reminds that

[b]ecause most early centers for seed-crop farming were in arid regions with good archaeological preservation, a great deal is known about early farming there. Moreover, morphological changes in the seeds following domestication can usually be detected. On the other hand, most early centers for vegiculture were humid tropical regions with poor archaeological preservation; and since many of these crops are planted by cuttings, roots, or some other vegetative part which shows little or no morphological change after domestication, we know much less about early vegiculture.²⁵

Thus, our archaeological data is biased to favour wheat, barley and maize and downplay manioc, yams, banana and taro. This leaves open the possibility that humans could have cultivated vegetables long before they turned to seeds as Car Sauer has argued²⁶. However, we have to agree with Flannery who said that on this issue “I have little concrete data to offer²⁷.”

²⁰ Roux 1992, 42f.

²¹ Roux 1992, 45.

²² Col 3:16 (NIV)

²³ On various theories on the emergence of agriculture, see, e.g., Wright (1992) and Zubrow (1986).

²⁴ Wadley & Martin 1993, sub-chapter: *Problems explaining civilisation*.

²⁵ Flannery 1973, 273.

²⁶ Sauer 1952, 28.

²⁷ Flannery 1973, 273.

In reviews, the various theoretical traditions have been lumped together differently. This is because the circles of paleo-archaeology and –anthropology are, after all, so small that scholars are, in practice, intertwined that they trace ideas from each other. Thus, the division of traditions below is not carved in the stone.

Environmental Determinism

Oasis (or desiccation or propinquity) theory was originally presented by Raphael Pumpelly in 1908²⁸ but popularised by V. Gordon Childe in his *The Most Ancient East* in 1928²⁹. Childe adopted Lewis Henry Morgan’s idea of three ethnic periods; savagery, barbarism and civilization – as well as Marxist view of historical stages. Childe’s theory is basically Marxian in the sense that society’s economic basis is the determinant of culture. For him, Neolithic revolution was the transition from hunter-gathering to agriculture. As noted above, Childe’s theory sees the dry climate coming to Orient and North Africa after Wurm as the trigger for domestication:

a stimulus towards the adoption of a food-producing economy. Enforced concentration by the banks of streams and shrinking springs would entail a more intensive search for means of nourishment. Animals and men would be herded together in oases that were becoming increasingly isolated by desert tracts. Such enforced juxtaposition might promote that sort of symbiosis between man and bent implied in the word "domestication."³⁰

Robert Braidwood started to test Childe’s theory. He noted that there had been at least three previous interglacial periods and asked “Why didn’t domestication happen earlier, too?”³¹ Later Braidwood altered his opinion and admitted that climatic change might have been one factor. He proposed his own version of oasis calling it “Natural Habitat Zone.” According to him, it was “a region with a natural environment which included a variety of wild plants and animals both possible and ready for domestication.” This zone was formed of the piedmont areas of the Fertile Crescent.³²

Social Determinism

This environmentalist determinism has been denied by those who emphasise social factors. Carl O. Sauer was one of the first to see human as “ecologic dominant.” For him, inventors of agriculture were already sedentary utilising mostly fish and other sea life as well as roots, bananas,

²⁸ Pumpelly 1908.

²⁹ Childe 1928. See also Childe (1937).

³⁰ Childe 1952, 25.

³¹ Braidwood 1948, 86.

³² Braidwood 1958; 1967, 94.

sugar cane, etc. in South-East Asia. This would have given people stable subsistence basis to allow enough leisure time for experimentation.³³

Lewis R. Binford saw population growth and migration as causes of agriculturalism. His “density equilibrium model” postulated that most hunter-gatherers are well adapted in their environment. This adaptation would change if there is a disturbance in this equilibrium – either a change in physical environment or a change in population density.³⁴

Binford has a partial point since features of epi-palaeolithic Natufian culture were, according to Trevor Watkins: “increased sedentism, increased community size, an increase in the density of occupation sites and increased interest in storable plant food³⁵. However, it seems that it was not so much migration but stopping migrating and settling in one location that caused the population growth. Robert W. Sussman has argued that among hunter-gatherers the population was rather stable because the wandering lifestyle required mothers to carry children below four years. This, in turn, put a heavy pressure to four year birth intervals. When most female died in the age of 30, there was only 16 year fertile period meaning four children of which two normally reached adulthood. Sedentary village life did not impose similar restrictions and even a child every second year would double the offspring.³⁶

Thus, instead of population growth because of people migrating to same location, villages were able to grow by baby-boom. Watkins notes that “there is agreement that population growth, whatever the cultural controls which might be employed, follows the adoption of a sedentary life-style and a diet more oriented to cereals and legumes. Thus, the sequence of events was different from Binford’s thesis. Moreover, here, again, is the question: Why at this moment and why not earlier?

Brian Hayden, in turn, argues for human vanity and yearn for prestige as the reasons for agriculture³⁷. According to him, it was not grain for food but grain for drink – beer – that triggered the transition. Hayden argues that people have always wanted to show off – whether it is with Bugattis or Armani clothes like today, with *potlatch*³⁸ or with seashell beards in the inlands like in Blombos Cave in ancient South Africa³⁹ – or with beer in early Matum. His point is that humans tend to show their wealthy in order to get prestige. Along with prestige artefacts also food has been

³³ Sauer 1952.

³⁴ Binford 1968.

³⁵ Watkins 1992a, 69.

³⁶ Sussman 1972.

³⁷ Hayden 2003, 459, 464ff.

³⁸ Mauss 1990, 6f., 12f., 38f.

used as prestige item. He reminds that most of our everyday food items have been luxury delicatesses restricted to elite consumption or to festivals in some time of our history. Hayden lists white bread, chocolate, out-of-season fruits and vegetables, fat-rich meats, and wines and spirits⁴⁰. Accordingly, he argues that grain was first used as rare prestige item for festivals where members of elite wanted to show off – and the connection of festival and grain is evidently beer⁴¹. Thus, at first, the beer was a rarity since the collection of wild grain was hard work. On another delicates he notes in an interview that “[l]entils, for example, usually grow just two per wild plant and would have been terribly finicky to harvest. A hungry person could have filled his belly quicker with any number of other plants, yet lentils are among the first crops of the near East⁴².” The prestige theory, according to Haydes, also explains why first crops “remained such a minor part of the diet for so long⁴³.”

Greg Wadley and Angus Martin see the role of cereals a bit differently. They argue that cereals and diary food contain such opiate-like contents that humans became ‘hooked’ in them⁴⁴. Thus, it was not so much prestige but enjoyment.

Cultural Ecology

While environmental determinism postulated that forces of nature determine culture and environmental passivism – or social determinism – sees human as sole actor in passive environment, cultural ecologists see humans in interaction with their environment like Marshall Sahlins has said “It is an idea of reciprocity, of a dialogue between cultures and their environments⁴⁵.” Basically, this school resembles game theorists in social sciences: environment sets the scene but humans make decisions what to do.

Kent V. Flannery, starting from Binford’s equilibrium theses, has argued that “[t]he Near East is a mosaic of ‘favourable’ habitats (e.g. oak-pistachio woodland) and ‘marginal’ habitats (e.g. gravel deserts); the wild cereals have definite ‘optimum’ zones in which they grow densely and marginal zones in which they do poorly.” He argues that “farming might have begun first, not in the

³⁹ Douglass 2004, 26ff.

⁴⁰ Hayden 2003, 459.

⁴¹ On the role of alcohol in ancient Matum, see Joffe (1998). Note also Jacobsen’s (1976, 62) notion that in some Dumuzi-myths the fertility-god has been placed in the brewery.

⁴² Holmes 2004, 30.

⁴³ Holmes 2004, 30.

⁴⁴ Wadley & Martin 1993

⁴⁵ Sahlins 1964, 132.

optimum area of wild cereal growth (where, as Harlan and Zohary^[46] point out, wild wheat already does as well as it would in a cultivated field), but around the margins where it was necessary to raise the available food per capita.”⁴⁷

Flannery also reminds that hunter-gatherers “divide their resources into ‘first choice’, ‘second choice’, and ‘third choice’ foods, turning to the latter only when they run out of the former.” Thus, there might have been some sort of environmental pressure because, “[o]n the basis of archaeological data, virtually all the important seed-crop cultivars were derived from species which were originally ‘third choice’ foods.”⁴⁸

Henry T. Lewis continued Flannery’s argumentation and studied the stimulus for animal and plant domestication. He noted that while a hunter-gatherer had a wider base for his nutrition than an agriculturist, he also faced “more exaggerated fluctuations between periodic extremes of natural abundance and scarcity.” In this situation the impact of fire in ecosystems changed humans’ opportunities in predation of food. Lewis argues that fire changes ecosystems so that it favours some species and disfavors others. From man’s perspective it is significant that a burnt environment creates a new favourable niche to hard-grained grasses and animals that could eat them. At some moment during the Neolithic period (in Zagros Mountains, Aššurian steppe and Jericho) humans learnt to burn forests in order to change the environment so that it was favourable to cereals. Along with cereals, also sheep and goats benefited from this new environment and since they were more adaptive to other environments than gazelle and aurochs, humans started to domesticate them. According to Lewis, “thus, domestication would have begun not as a ‘revolution’ but, rather, as an attempt to extend and stabilise the existing subsistence strategy.”⁴⁹

Co-evolution

David Rindos has approached the problem of agriculture from co-evolutionary perspective and argued that “domestication is *the result of the evolution of symbiosis between man and plant.*” His point is that like harvester ants, humans ‘naturally’ domesticate plants. Rindos sees that there are

⁴⁶ Harlan and Zohary 1966.

⁴⁷ Flannery 1973, 283f.; 1969.

⁴⁸ Flannery 1973, 307. Flannery (1969, 77) argues that the broad spectrum revolution took place in the upper Palaeolithic period, before 20,000 B.C., and amounted to a considerable broadening of the subsistence base to include progressively greater amounts of fish, crabs, water turtles, molluscs, land snails, partridges, migratory water fowl (and possibly wild cereal grains in some areas?)... This ‘broad spectrum’ collecting pattern characterised all subsequent cultures up to about 6,000 B.C., and I would argue that it is only in such a context that the first domestication could take place.

⁴⁹ Lewis 1972, 217.

three different domestication processes: incidental, specialised and agricultural. The first is just harvesting the existing natural resources. The second is intensification of the first but humans are not anymore just scavengers but also protectors of the planted/gathered species. The last form is, then, complete control of the environment. Thus, he strongly denies any ‘revolution’ in the rise of agriculture.⁵⁰

Rindos’ perspective is in par with several studies on multiple subsistence basis. In these studies it is shown that pre-agriculturalist and early agriculturalist people utilised both the wildlife of their environment and domesticated species. For example, David R. Harris argues that next to predating game, humans have protected their potential game from other predators⁵¹. This same is true with some special plants. Harris mentions that “especially in tropical savannah and temperate grassland and forest environments, hunter gatherers have systematically fired vegetation during the driest season of the year to promote fresh plant growth which, in turn, attracts the herbivores that are the hunters’ prey⁵².” Another form of human-animal interaction, nearer to pastoralism, is ranching or free (or open) range management of (semi)wild animals. Typical modern examples are the cattle ranches of the American Wild West and today’s reindeer economy. In these forms of interaction, the flock is collected only for marking and butchering. There is also a widespread custom to let some wild animals freely live around human habitants because they do some useful tasks like eating the wastes (dogs), keeping rats and snakes away (hedgehogs), pollinate orchards (wasps). Finally, a fourth way is to allow already domesticated animals wander freely in forest (like pannage of pigs in Mediaeval Europe).⁵³

Trevor Watkins uses the concept of co-evolution a bit differently. While Rindos understands it as human-plant interaction Watkins sees it as human’s biological-cultural evolution. Watkins combines Richard Dawkins’ idea of memes to the co-evolutionary idea and, if I use computer jargon, argues that human software took time to develop after hardware was ready. According to him “[i]f all the mental tools existed in the minds of the people of the upper Palaeolithic, it was only in the turn of the Palaeolithic to the Neolithic period in south-west Asia that people had learned how to use those tools to create a fully symbolic culture of a kind with which our minds, too, can work⁵⁴.” This theory of memes is a bit similar to path dependency theory⁵⁵ that historical

⁵⁰ Rindos 1980 (quotation from 752ff. – italics in original); 1984.

⁵¹ Harris (1996, 450f.) mentions as an example the North American Inuits who “kill wolves that prey on the herds of wild caribou on which the people depend.”

⁵² Harris 1996, 450.

⁵³ Harris 1996, 450-453; Clutton-Brock 1994, 381.

⁵⁴ Watkins 2000, 3.

⁵⁵ On path dependency, see Muukkonen (2005).

sociologists have started to apply during the last decade. However, unlike in the story of the lost kingdom because of the missing horse-shoe nail, the cause for the agriculture may never be found with these types of theories.

Mental revolution

Mental revolution has its roots in those 19th century theories that Lewis R. Binford has called ‘Idealistic Approach.’ In these theories agriculture was a ‘great idea’ or ‘innovation’. For example, Charles Darwin wrote in 1875 as follows:

The savage inhabitants of each land, having found out by so many and hard trials, what plants were useful... would after a time take the first step in cultivation by planting them near their usual abodes... The next step in cultivation, and this would require a little forethought, would be to sow the seeds of the useful plants.... Then an unusually good variety of a native plant being grown on manured soil near the abode might attract attention resulting in the transplanting of superior seeds.⁵⁶

Like its 19th century predecessor, current cultural approach underlines the cultural impact on the emergence of agriculture. The re-emergence of this theoretical stream arose from the findings that those characteristics that were said to be results of agriculture actually preceded it.

According to Jaques Cauvin “mental revolution⁵⁷” preceded agriculture and civilisation. Cauvin criticises Childe’s “simplified ‘historical materialism’, according to which the emergence of an economy of production represented *a priori* the sole fundamental change that was the basis for all the others.” He argues that “The Neolithic Revolution... no longer appears to follow the expected sequence in the succession of changing components: cultural transformations in particular refuse to keep their place in a ‘superstructure’ based on economic changes.”⁵⁸

Steven Mithen, similarly, urges us to “compare our cultural achievements over the last 10 000 years with those of the Neandertals⁵⁹ throughout the entire 250 000 years of their existence – remembering that the two species have equivalent size brain⁶⁰.”

⁵⁶ Darwin 1875, 326f.

⁵⁷ Speaking of mental revolution follows in the footsteps of V. Gordon Childe whose “neolithic revolution” and “Urban revolution” have been part of the anthropological vocabulary since the 1930’s. Childe’s language, in turn, was influenced by his fascination on Marxism and its view that progress happens through revolutions. However, on the basis of current evidence, there was no cultural revolutions but slow try and error progress. The more one digs, the earlier to the past any revolution seems to escape.

⁵⁸ Cauvin 2007, 1-8 (quotations in pp. 5, 7 - italics in original)

⁵⁹ The question of Neanderthal abstract thinking is a disputed one. One theme in the discussion is the Neanderthal art. Even if it had existed, the debate is whether it was original for them or just imitation of *Homo Sapiens*’ art (see Appenzeller 1998). Some scholars (e.g. Kuhn & Stiner 2006; Mithen 2007; Wynn & Coolidge 2008) argue that Neanderthals were incompetent for abstract thinking. Thus, in that case, it could be doubted whether there were any “cultural revolution” if *H. Sapiens* had always had these mental capabilities.

⁶⁰ Mithen 2007, 705, see also Kuhn & Stiner (2008, 956-959). Mithen (2007, 705) further argues that “Neanderthals appear to have been very constrained in their range of behaviours and showed limited, if any, signs of creative intelligence: no visual art; no architecture; no body ornaments.”

In “mental revolution”, tool-making has been seen as indicator of abstract thinking. Tool-making (digging sticks with weights and stone hand axes and cleavers) requires a mental vision of the end-product already in the beginning of the process. This is, however, so far in the prehistory (1-1.5 million years⁶¹) that it hardly can be seen as a “mental revolution” but rather, a biological quality of *homo* species. Along tools, art and personal ornaments are seen as the most significant indicators of conceptual thinking. According to Richard Klein

[t]here was a kind of behavioural revolution [in Africa] 50,000 years ago. Nobody made art before 50,000 years ago; everybody made it afterward.⁶²

This art was, however, zoomorphic. Cauvin argues that during the Khiamian period (10,500-9500 BC), still hunter-gatherer subsistence based, there emerged a ‘revolution of symbols’. First, for the first time in Levant, there emerge human female figurines in Jordan valley. Second, in the zoomorphic representations, the Bull gains prevalence. According to him

[f]rom that time on, about 9500 BC, in a still unchanged economic context of hunting and gathering that is just on the eve of its complete disruption, what we see dawning for the first time in the Levant are two dominant symbolic figures, the Woman and the Bull. They will keep their leading roles throughout the whole of the Near Eastern Neolithic and Bronze Age periods, including the religion of the pre-hellenic eastern Mediterranean.⁶³

Cauvin also argues that during the sedentary settlement life of the pre-agriculturalists during the Natufian phase changed their view on the death. It is this phase when we find the first cemeteries.⁶⁴

Watkins, similarly, argues that there was an ideological shift between the Epi-Palaeolithic and Neolithic periods. As material indicators of this shift he mentions the differences in burial practices, concept of home, development in projectile points and the abovementioned increased sedentism and focus on storing the food as well as investment in preparatory labour.⁶⁵

“...since I myself have carefully investigated everything from the beginning⁶⁶” A Look at the Existing Data

There has not been a consensus on the dominant theoretical paradigm. Flannery even doubted that any “one model could explain origins of agriculture in all four regions [South-West Asia, South-East Asia, Mesoamerica, Peru] discussed” since nomadic lifestyle continued in Mesoamerica

⁶¹ Smith 1999, 384f.

⁶² Quoted in Appenzeller 1998, 1451. See also D'Errico 2003.

⁶³ Cauvin 2007, 29.

⁶⁴ Cauvin 2007, 20.

⁶⁵ Watkins 1992, 68ff.

⁶⁶ Lk 1:3

and South-East Asia “for thousands of years after farming began” in South-West Asia and Peru. Thus, global environmental change would not be the cause.⁶⁷

Below I will look at the existing data to see how the theories fit into the reality. I start from quite early in order to see, on one hand, what features seem to be biological characteristics of humans in general and *Homo sapiens* in particular and, on the other hand, what phenomena are significantly part of the cultural evolution just before Neolithic.

Origins in Africa

According to Steven Oppenheimer, first walking apes in Africa “were followed by the famous ‘Lucy’ family, *Australopithecus afarensis*” some 3-4 million years ago. Homo genus emerged some 2.5 million years ago. *Homo habilis*, one of the first human tool-makers came to existence some 1.9 million years ago. Almost at the same time, 1.95 million years ago, *Homo ergaster* was the first human to leave Africa and to become Asian *Homo erectus*. During the next 700,000 years the brain size of homini more than doubled.⁶⁸

Homo helmei (possible ancestor of *Homo neanderthalensis*), spread throughout Eurasia 250,000 years ago and our own species, *Homo sapiens*, born 170,000 years ago, came Levant some 120,000 years ago but did not survive the next ice age. Finally, some 70,000-80,000 years ago modern humans spread to the rest of the world. European Neandertals survived up to 30,000 years ago living in the same areas with modern humans.⁶⁹

Looking at the time-scale of in the previous paragraphs, it is evident that many human innovations are preceded *Homo sapiens*. Domesticated use of fire reaches down to Middle Pleistocene (500,000 BC or even 790,000 BC⁷⁰) and it both enabled humans to enter to the cooler latitudes and to extract better nutrition from their food⁷¹. The invention of weapons some 400,000 BC indicates a shift from scavenger-gatherer to hunter-gatherer. Only ballistic weapons occurred at the time when *Homo sapiens* existed (150,000-200,000 BC) with the Levallois or prepared core technique. Here, as Andrew B. Smith reminds,

the envisioned end-product must already have existed as a mental template, as conceptualization, but now mapping was paired with the flint-knapping skills that prepared the core before knocking off the desired flake: a Mousterian point, which could be hafted to a wooden shaft and used as a stabbing or throwing weapon.⁷²

⁶⁷ Flannery 1973, 207.

⁶⁸ Oppenheimer 2003, 5-14.

⁶⁹ Oppenheimer 2003, 15f.

⁷⁰ Goren-Inbar & al 2004.

⁷¹ On invention of fire, see, for example, Taylor (1976) and Pyne (2001).

⁷² Smith 1999, 385f.

Food collecting led often to innovation in tools as well. According to Hole, “[b]y 20 000 to 30 000 years ago, people already had knives⁷³ that could be used for reaping grain and also mortars and grinding stones for crushing paint pigments and smashing nuts that later were adapted to the milling of cereals⁷⁴.”

In addition to weapons, hominids had some level of organisation at least in hunting: driving a flock of game over cliffs does not succeed without planning and co-operative execution.⁷⁵

Although art can be traced to shell beads and decorated ochre of Blombos Cave in South Africa circa 74,000 BC⁷⁶ and in Tsodilo Hills in Botswana circa 70,000 years ago⁷⁷, it became widespread after 50,000 BC among *Homo sapiens* in Africa. When *Homo sapiens* moved to Eurasia⁷⁸, they brought their skills with them and the real boom of art occurred in Europe during the few thousand years after 40,000 BC⁷⁹. Along with cave paintings in Altamira in Spain and in Lascaux in France⁸⁰ from 25,000 to 10,000 BC⁸¹, unbaked clay reliefs were created in French caves Tuc d'Audoubert (bison), Cap Blanc (horse) and Montespan (cave bear), from circa 14,000 to 11,000 BC⁸².

According to Stephen Mithen,

[s]tone flakes are no longer mere tools for killing or butchering animals – they are invested with symbols and emblems, they embody memories and become social currency; the cave paintings tell us that animals are no longer just for eating – they are kindered spirits withing an ice age world.⁸³

The emergence of art in Europe is linked to the increasing of *Homo sapiens* occupied sites (indicating population increase) as well as the extinction of Neanderthals. According to Mithen, during those 10,000 years of cohabitation in the same areas, *Homo sapiens* developed surviving strategies which enabled the species to survive when Neanderthals disappeared. Mithen thinks that

⁷³ On development of stone knives, see Lacaille 1953.

⁷⁴ Hole 1994, 374.

⁷⁵ Smith 1999, 385f.

⁷⁶ Henshilwood & al 2002; 2004; D'Errico & al 2001.

⁷⁷ Vogt 2006.

⁷⁸ There are currently two competing theories on the dispersion of *homo sapiens* from Africa. Both accept that humans were born in Africa but the leading paradigm, “Out of Africa” or “Eve” theory, states that it happened ~60,000-50,000 years ago (for example, Paul Mellars, 2005, argues that there was a demographic expansion in Africa ~80,000-60,000 years ago which was followed by similar boom in Eurasia ~60,000-40,000 years ago). In this process *homo sapiens* colonised other continents and replaced the earlier *homo* populations. (on Out of Africa theory, see Oppenheimer 2003) The competing “multiregional theory” states that modern humans developed parallelly from archaic humans (including Neanderthals) and this explains also present racial differences among *homo sapiens*. This theory denies any colonisation process but sees the emergence of *homo sapiens* in different continents as parallel evolutionary processes. (See, e.g., Wolfpoff & Caspari 1997; Wolfpoff, Hawks & Caspari 2000; Trinkaus (2007).

⁷⁹ Appenzeller 1998, 1452.

⁸⁰ Shaw & Jameson 2002, 38, 138ff., 352

⁸¹ *New Dating Method* 2008

⁸² Shaw & Jameson 2002, 357; Bahn 1998, 104.

⁸³ Mithen 2007, 706.

abstract thinking was characteristic to modern humans and it was evidently one of these skills that gave *Homo sapiens* an advance in the survival game.⁸⁴

However, if multiregional evolution hypothesis⁸⁵ is right, the difference between Neanderthals and modern humans are not so big. . According to it, there was no real difference between Neanderthals and *homo sapiens* and that the smaller Neanderthal population was simply absorbed by modern humans by interbreeding⁸⁶. Thus, today's humans are, according to them, partly Neanderthal descendants.

Along with hunting and (semi)permanent habitation emerged the need for social organisation. According to Steven L. Kuhn and Mary C. Stiner, a significant difference in Neanderthal and *Homo sapiens* bands was the division of labour (according to gender and age) of the latter⁸⁷. This partial specialisation enlarged the know how of the band as a whole. However, it was not just this specialisation but flexibility to utilise different resources that, according to authors, played for the favour of the *homo sapiens*: Neanderthals were large game hunters (mammoths) while modern humans had a wide range of food from various fauna (fruits, nuts, cereals, tubers, berries) to seafood (clams, mussels, crabs, fish, turtles) and from small game (rabbits, foxes, birds, snails) to large game (deer, horses, gazelles)⁸⁸.

This flexibility could be seen also in various food collecting techniques. The traditional scholarly view has been that different modes of subsistence were stages of cultural evolution and people developed from savagery via barbarism to civilisation⁸⁹. According to newer data on both contemporary world and pre-historic artefacts, the picture is not as black and white.

First, modes of subsistence are not exclusive. Modern humans switch rather easily from one mode to another – depending the availability of resources⁹⁰. Second, there is no reason – but the

⁸⁴ Mithen 2007,705ff.

⁸⁵ See note 78 in page 13.

⁸⁶ On modern human and Neanderthal interbreeding, the late Björn Kurten presented an interesting hypothesis in his paleo-science fiction novel *The Black Tiger*. According to him, there was a similar tendency than when Europeans colonialised Africa: European males could copulate with African women but the breeding of European women by Africans was strictly prohibited. Kurten's point is that the offspring of modern and Neanderthal humans were 'mules' – unable to have children. This, according to Kurten led to the extinction of Neanderthals.

In general Neanderthal – modern human interaction is, as Timothy C. Champion (1994, 592) notes, difficult. He summarises that “possible explanations include total replacement of Neanderthals by modern populations, interbreeding with an immigrant modern population, or Neanderthals as ancestors of modern humans.”

⁸⁷ Kuhn & Stiner 2006.

⁸⁸ Hole 1994, 373, 375; Fuller & Colledge 2007, ch. “The Ohallo Warning.”

⁸⁹ On European thinking on evolutionary stages and hunter-gatherers, see, for example, Harris (1996, 437-441), Barnard (1999); Wright (1992, 114f.)

⁹⁰ Even today, picking wild berries and mushrooms – as well as fishing – is important part of the subsistence of modern Finnish farmhouses. Even I, as ‘a full-breed urbanist’, pick every summer wild berries circa 60 kilos from the near by forest and process them to juice and jam for the winter. For some Finns, elk and bird hunting as well as capturing

European evolutionist tradition – to think that agriculture and pastoralism are “higher stages” than hunting and gathering in cultural evolution. For example, if hunting and gathering is defined as collecting undomesticated plants and prey, most fishing in modern world is one form of hunting since it focuses on natural resources and not on domesticated ones. In addition to this, during the history, there has been shifting not only from gathering to cultivation but also vice versa. This happened, for example, during the Younger Dryas people in the Levant returned to mobile hunter-gatherer life after a long period of sedentary cultivation⁹¹. However, this kind of transition has also happened in modern times – during the occupation of the American continent by many Europeans from 16th to 19th centuries.

On the light of this data, the major problem of the cultural revolution theories is that many of the mental improvements happened too early to explain change to agricultural life. Why Neolithic revolution did not happen before? Cauvin’s thesis of symbolic revolution (Woman and Bull) around 10,000 BC has similar problems. One has to remember that *Dolni Vestonice Venus* found in Czech Republic is from circa 24,000 BC⁹². Although unique being of ceramics it was but one example of “hundreds of bone and stone ‘Venus figurines’ found at sites across Eurasia beginning about 30,000 years ago” as Michael Balter summarises the findings⁹³. In similar way, bull art was not any novelty as can be seen in the famous Hall of the Bulls in Lascaux cave in France⁹⁴. Thus, neither of these Cauvin’s major arguments is valid as triggers of the Neolithic.

On cemeteries the data is similar. *Homo sapiens* graves with offerings have been found in Levant from as early as 90,000 to 100,000 years ago⁹⁵. Thus, graves as such were no novelty. The novelties were merely in mortuary practices⁹⁶ but they themselves are hard to prove to be a trigger to the birth of agriculture. Concerning religion in general, theorists in this tradition may have a point. Findings in Göbekli Tepe and Çatalhöyük in Anatolia point that the ability of hunter-gatherers to build sacred monuments was more developed than previously thought. Jericho already in 9,000 BC

crabs are important seasonal activities – not to mention fishing. Every year Finnish authorities complain how much wild berries are left to forest and urge people to go and pick them either for own use or for industry. There are even companies which bring Vietnamese and Thai workforce to pick them for the market. Gathering is definitely not a cultural stage of the past – at least in Finland.

⁹¹ Munro 2003; 2004.

⁹² Vandiver & al 1989.

⁹³ Balter 2009. Moreover, if the Venus of Tan-Tan (from 300,000-500,000 year ago) found in Morocco (Bednarik 2003) or Berekhat Ram object (from 250,000 years ago) from Golan Heights (Marshack 1997; D’Errico and Nowell 2000) are really female figurines, the whole question of mother goddess becomes a pre-*Homo sapiens* issue.

⁹⁴ See *The Cave of Lascaux* n.d.

⁹⁵ Clottes & Lewis-Williams 2007, 15.

⁹⁶ On Pre-Pottery Neolithic (11,700-8,250 BC) mortuary practices, see Kuijt (2008).

had a room that might have been a shrine⁹⁷. Göbekli Tepe, dating ca. 8,000 BC, is the oldest found sanctuary in the world and Çatalhöyük was already in 7,000 BC an 8,000 inhabitant centre with significant religious cult⁹⁸.

In general, Cauvin is right in his critique on the traditional sequence of events. Neolithic period did not create art or religion. They existed long before Neolithic “revolution.” However, Cauvin and others fail to show how these phenomena that had existed tens of thousands years before would just then cause the turn to agricultural and pastoralist lifestyle.

Similarly, social determinant theories have valid points in details and how some sequences happened. For example, Sauer, along with cultural ecologists, is right in seeing that different tools and skills preceded agriculture. Hayden’s prestige theory is an interesting possibility but fails to show why getting alcohol did not happen long before with other drinks. Easiest way to extract alcohol is from fermented fruits and berries⁹⁹. Rindó’s co-evolution is possible but, again, it is more a description how domestication happened than why it happened.

Emergence of Agriculture

In light of the current paleobiological evidence, agriculture emerged first time rather simultaneously around the world and, so, the environmental determinists have a point. It seems that they have been right but, paradoxically, for the wrong reasons. The trigger was not drought but opposite of that – warm wetness. Peter J. Richardson, Robert Boyd and Robert L. Bettinger may have found the connection between climate and agriculture. They argue that

Agriculture was impossible during the last glacial. During the last glacial, climates were variable and very dry over large areas. Atmospheric levels of CO₂ were low. Probably most important, last glacial climates were characterized by high-amplitude fluctuations on time-scales of a decade or less to a millennium. Because agricultural subsistence systems are vulnerable to weather extremes, and because the cultural evolution of subsistence systems making heavy, specialized, use of plant resources occurs relatively slowly, agriculture could not evolve.¹⁰⁰

Thus, climate was not a *determinant* but it definitely laid down the opportunity structures. In this sense, cultural ecologists seem to have a point. Seed plants emerged in a large scale during the Bølling-Allerød period and were utilised by Early Natufian hunter-gatherers.

Earliest known data on harvesting and collecting wild grain is from some 11,000 BC. Then, there was a long pause and cultivation and agriculture restarts at circa 8,000 BC – again in multiple

⁹⁷ Gates 2003, 19.

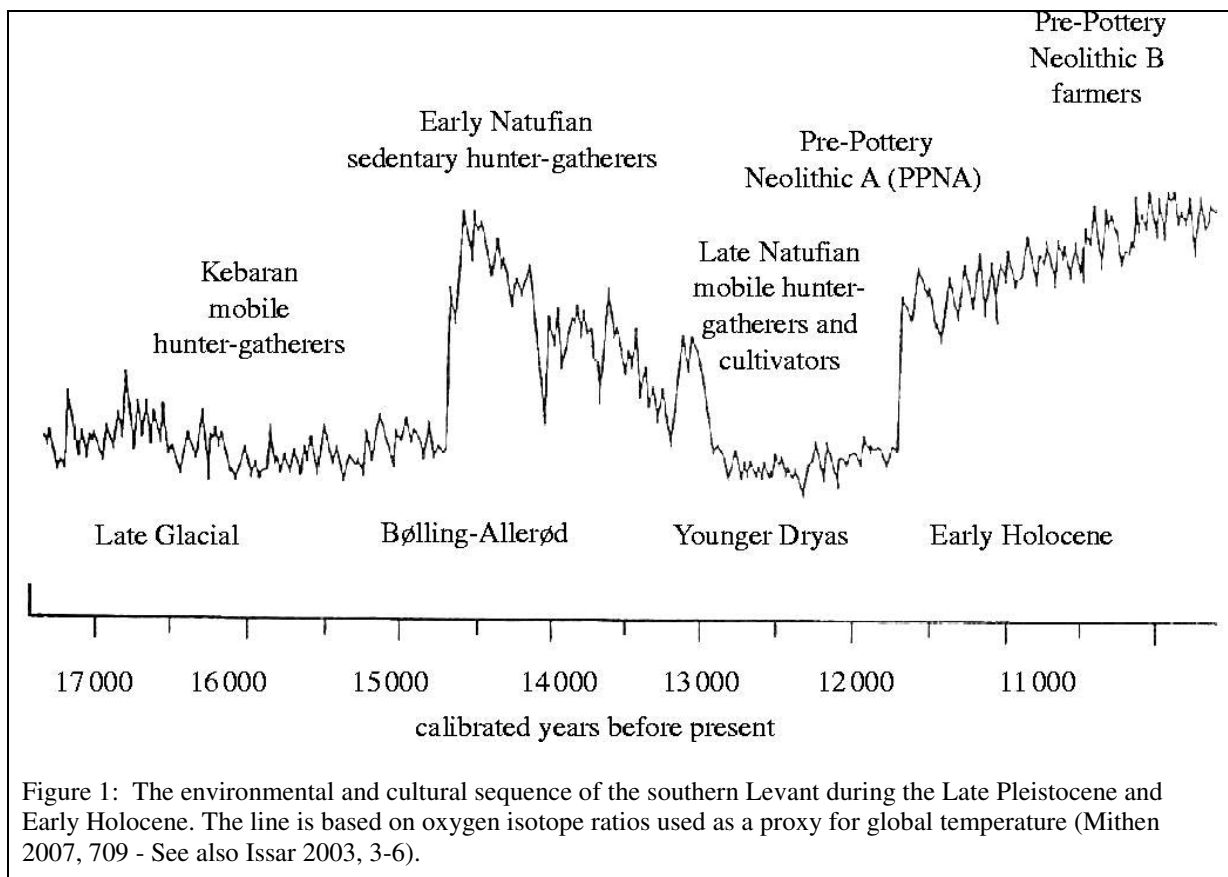
⁹⁸ On Göbekli Tepe, see Schmidt (2001), Balter (1998; 2005), Thomas (2007) and Curry (2008). On Çatalhöyük, see bibliography in *Çatalhöyük homepage* (2008).

⁹⁹ In almost every winter I see little birds that are obviously drunken from eating fermented rowanberries from trees.

¹⁰⁰ Richerson, Boyd & Bettinger 2001, 5.

locations. During the Younger Dryas¹⁰¹ (11,500-9,500 BC) the temperature was almost the same as during the Last Glacial. Then, again, in the beginning of Early Holocene (9,500 BC) the climate suddenly warmed and, after a jump, continued to slowly warm (Figure 1). Dorian G. Fuller and Sue Colledge note that the warming and increasing rainfall

led to expansion of the moisture-dependent vegetation zones and the retreat of desert and steppe zones... What can be clearly seen is the dramatic increase in forest cover.¹⁰²



Steven Mithen has shown (Figure 1) how Kebaran mobile hunter-gatherer culture in Levant was prevalent during the Late Glacial (up to 13,500 BC). Then during warm Bølling-Allerød period (13,500-11,500 BC),

a period of increased rainfall and warmer temperatures, substantial settlements consisting of circular stone dwellings appeared, along with major technological developments, the creation of cemeteries and art objects.

¹⁰¹ Recently Richard B. Firestone with his colleagues (Firestone & al. 2007) have argued on the basis of North American evidence that the rapid cooling of the Younger Dryas was caused by a comet impact north of the Great Lakes. However, this has also been heavily criticised by Briggs Buchanan, Mark Collard & Kevan Edinborough (2008). See also the followed (online only) discussion in the *Proceedings of the National Academy of Sciences* 105, 2008, 50, December 16, E 107-114.

¹⁰² Fuller & Colledge 2007, ch "Situating domestication..."

This is referred as the Natufian culture which some archaeologists interpret as sedentary hunter-gatherers, exploiting rich plant and animal resources that arose from the mixed oak woodland.¹⁰³

These Early Natufian settlements did not survive the cold Younger Dryas (10,800 – 9,600 BC) and Late Natufians returned to mobile hunting-gathering lifestyle. After Younger Dryas, marks of cultivation appear with again warming climate during the Pre-Pottery Neolithic A (PPNA) from circa 9,600 – 8,500 BC. The early Levantine cultivating villages, like Jericho, Netiv Hagdud and Jerf el Ahmar are from this phase. Typical to these villages are the circular stone structured houses.¹⁰⁴

Once the agriculture had been established in the Jordan Valley, it spread to North Africa, Anatolia, Europe¹⁰⁵ and Northern Syria¹⁰⁶ from where it spread to the Zagros Mountains and Matum. Sue Colledge, James Conolly and Stephen Shennan argue that in Anatolia

[g]iven the sudden appearance of large PPNB-like villages using domestic crop species common to the Levant and no evidence for settlement equivalent in form to the PPNA. The most parsimonious explanation for the origins of farming in central Anatolia is that there was an influx of farmers during the first half of the ninth millennium BC.¹⁰⁷

After that, in Pre-Pottery Neolithic B (PPNB) heralds also the genuine domestication of plants instead of planting wild species. Houses turn to rectangular. Çatalhöyük and Çayönü, for example, are from this period.¹⁰⁸

In Matum, the most important excavated sites are Shanidar Cave of which B-level is from circa 10,000 – 9000 BC and open air site Zavi Chemi Zadinar from the same period¹⁰⁹. Other sites from this period are Karim-Shehir and Mlefaat¹¹⁰. Sites like Tell Maghzaliyeh, Nemrik and Qermez Dere (some 60 km west from present day Mosul) are from the period between 8,000 to 6,000 BC¹¹¹.

Arie Issar shows that there were temporal fluctuations in climate but generally cool and humid up to the 5,000 although there was a difference between north and south because of the monsoons that brought rain to the south. “Thereafter the climate became drier, reaching a peak between 6.5 ka

¹⁰³ Mithen 2007, 711.

¹⁰⁴ Mithen 2007, 710f.

¹⁰⁵ On the spread of agriculture in Eastern Mediterranean, see Colledge, Conolly & Shennan (2004). According to Ammerman and Cavalli-Sforza (1971) spread the spread in Europe was some one kilometre per year although the spread along the waterways was supposedly faster than in the inlands.

¹⁰⁶ George Willcox and Sandra Fornite (1998) have found cultivated wild barley, einkorn and rye in the 8th millennium BC Jerf el Ahmar and Mureybet on the banks of westward curve of Purattu.

¹⁰⁷ Colledge, Conolly & Shennan 2004, S42.

¹⁰⁸ Mithen 2007, 710f.

¹⁰⁹ Solecki Ralph 2004, 5; Solecki Rose 1980. Earlier layers of Shanidar Cave are from 34,000-25,500 BC (level C) and 60,000-46,000 BC (level D) representing the earlier Neandertal occupation.

¹¹⁰ Roux 1992, 41; Smith 2005, 60f.

¹¹¹ Watkins 1992b.

and 5.5.ka BP [=4,500¹¹²-3,500 BC¹¹³].” Moreover, because of the melting of the ice sheet, sea level started to rise¹¹⁴ and this caused severe floods. After 2,000 BC climate cooled and moistened but had great periodical variations.¹¹⁵

Harvey Weiss, in turn, following the same path, argues that

[t]he population and socioeconomic complexity of these early agricultural settlements increased until about 6400 B.C., when a second postglacial climatic shock altered their developmental trajectory... In the Middle East, a ~200-year drought forced the abandonment of agricultural settlements in the Levant and northern Mesopotamia.¹¹⁶

One factor in this temporary warming was, according to Daniel T. Potts, that there was a slight shift in earth’s orbit. This “was responsible for solar radiation values c. 7000 BC which were 6-7 per cent higher than those of the present day¹¹⁷.”

Later, when the climate again turned moister, people returned to these dry-farming zones but focused on flexible subsistence. Instead of focusing only on agriculture, people in northern Matum utilised also their herds as well as wildlife.¹¹⁸

While warming was a global phenomenon, there were some environmental opportunities or restraints that set the scene in Fertile Crescent. Cauvin sees that the speciality of the Levant as a birth place of agriculture lies in that the area was

sheltered from the most severe variations of temperature, from destructive marine transgressions which elsewhere accompanied the rise in sea-levels, because the coastal chain of hills of the Levant protected the hinterland, and they were protected from the persistent aridity of the Middle East.¹¹⁹

Similarly, H.E. Wright jr. sees that the southern Levant was the locus of these first steps toward plant domestication because it was located in a climatic transition zone that was sensitive to the key

¹¹² Also Daniel T. Potts (1997, 4. See also Wright 1993) sees that the region was significantly wetter during the Holocene period but that “the mid-Holocene wet phase seems to have ended c. 4000 BC with the onset of hyper-aridity and the retreat of the summer monsoon to its present position... [T]his warming trend continued to gain momentum over the next two millennia, reaching approximately modern levels of aridity around 1000 BC.”

¹¹³ For example, Simo Parpola (1982, 149f. - my translation from the original Finnish text) argues that this had significant consequences for the emergence of Matumian civilisation:

“During circa 3500, after the ice stopped its melting, the climate turned to more dry and the amount of waters in the great rivers diminished. This had significant consequences. When the incoming amount water was reduced, some leads of Euphrates, in particular its easternmost main reach, dried totally leaving tens of villages and tens of thousands of people without water. These people, in order to survive, had to leave their land and move to areas where the water supply was guaranteed.”

¹¹⁴ According to Issar (2003, 9, Fig 1.3.), the level of the Mediterranean in 5,000 BC was some 4-5 meters below the present and reached the present level around 2,500 BC. Similarly Paul Blanchon, Brian Jones and Derek C. Ford (2002) argue for the rapid 6m sealevel rise c. 5,500 BC on the basis of their studies in Grand Cayman.

¹¹⁵ Issar 2003, 12-20.

¹¹⁶ Weiss 2001, 609.

¹¹⁷ Potts 1997, 4. On solar radiation and its effect on global climate, see Raspopov & al. (2007).

¹¹⁸ Zeder n.d.; Ristvet 2003.

¹¹⁹ Cauvin 2007, 13. Sic. Cauvin (p. xv) defines Near East as Levant + Anatolia and, thus, Matum belongs to Middle East.

controls of seasonality, and the plants that were domesticated were those adapted to summer drought.¹²⁰

Thus, on the basis of existing data, Neolithic seems not to have been a revolution but a slow process of try and error. Heather Pringle represents results of several archeobotanists in her article in *Science* and states that “many [researchers] now view the switch to an agrarian lifestyle as a long, complex evolution, rather than a dramatic revolution¹²¹.” Already some thirty years earlier, Robert McC. Adams argued that “the Food-Producing Revolution was a ‘process’ and not an ‘event’, in that it developed gradually or by small steps over a considerable period¹²².” Vladimir Kabo had been in the same lines. He criticised Gordon Childe’s thesis of Neolithic Revolution and argued, in the case of Near East that “the sedentary agricultural economy of Çatal Hüyük (7th-6th millennium B.C.) developed a complex economy combining hunting, gathering, and agriculture¹²³.” His comparative data from other people in such lifestyle shows that agriculture may supply some 50-80 percent of livelihood and hunting, gathering and fishing provides the rest¹²⁴. Melinda A. Zeder on Halafian Umm Qseir data notes that

bones of domestic animals comprise less than half of the bone sample. Wild species dominate!¹²⁵

Zeder shows how domestic animals and plants were utilised in seasons when wild species were not available¹²⁶. Thus, domestic species formed some sort of reserve utilised in need.

Sumer

Some time after 5500 BC, there emerged a new culture in the middle of Digtat river course. This Samarra culture is the first known society that practised primitive irrigation agriculture¹²⁷. As seen from the data above, it was a time when the climate got dryer and dry-farming was in danger. Perhaps someone noticed that in some fields where floodwaters moistened, the crop was better than elsewhere. The idea, anyway, emerged and a new form of agriculture was born.

From Samarra, the idea spread to Sumer as the legend *How grain came to Sumer* tells:

Men used to eat grass with their mouths like sheep. In those times, they did not know grain, barley or flax. An¹²⁸ brought these down from the interior of heaven. Enlil¹²⁹ lifted his gaze around as a stag lifts its horns

¹²⁰ Wright 1993, 466f.

¹²¹ Pringle 1998.

¹²² Adams 1966, 41.

¹²³ Kabo 1985, 608.

¹²⁴ Kabo 1985, 604.

¹²⁵ Zeder n.d.

¹²⁶ Zeder n.d.

¹²⁷ Roux 1992, 53f.

¹²⁸ An, the sky, was the highest god in Sumerian pantheon.

when climbing the terraced hills. He looked southwards and saw the wide sea; he looked northwards and saw the mountain of aromatic cedars. Enlil piled up the barley, gave it to the mountain. He piled up the bounty of the Land, gave the innuha barley to the mountain. He closed off access to the wide-open hill.

Then Ninazu, and said to his brother Ninmada: "Let us go to the mountain, to the mountain where barley and flax grow; the rolling river, where the water wells up from the earth. Let us fetch the barley down from its mountain, let us introduce the innuha barley into Sumer. Let us make barley known in Sumer, which knows no barley."¹³⁰

Thus, Sumerians borrowed the idea of agriculture from the northern mountains. Although the legend does not tell anything about irrigation, it is clear that because southern Matum was below the 300mm annual rain zone dry-farming was not possible there. Therefore Samarran type irrigation agriculture was the only possibility. *The Royal Chronicle of Lagaš* describes the importance of irrigation to Sumer as follows:

At this time [=after people had survived the Flood but before kingship had been established], water was short in Lagaš, there was famine in Girsu. Canals were not dug, vast lands were not irrigated by a shadoof, abundant water was not used to dampen meadows and fields, because humanity counted on rainwater. Ašnan did not bring forth dappled barley, no furrow was plowed nor bore fruit! No land was worked nor bore fruit!¹³¹

Writer of the chronicle clearly sees that without irrigation, there would not be crop and the country suffers famine. The text continues: "In order to dig the canals, in order to dredge the irrigation ditches, in order to irrigate the vast lands by a shadoof, in order to utilize abundant water so that the meadows and fields were moistened, An and Enlil put a spade, a hoe, a basket, a plow, the life of the land, at the disposal of the people¹³²." After this, in the list of the deeds of kings, digging canals was so frequently mentioned that it evidently was a theme to boast of.

In Sumer, irrigation agriculture proved its utility during the millennia – especially when the climate started to become cooler and dryer ca. 3500 BC. Southern Matum became the refuge for people whose plots in dry farm areas couldn't produce food for them. However, concentration of population in relatively small area led to the need of extensive irrigation – especially at the end of the fourth millennium, when the effects of drier climate hit the southern Matum as it had earlier done in the North. In this situation, as Roux describes,

[m]any villages disappeared, their inhabitants regrouping themselves within and around the larger centres, which rapidly grew to the size of towns. To extend the areas of cultivable land artificial irrigation was developed, but the enormous common effort required to dig and maintain big canals and the need for an equitable distribution of water considerably reinforced the authority of the traditional town chiefs, the high priests.¹³³

¹²⁹ Enlil, god of air, was An's son and his "vizier" managing the world on his father's behalf.

¹³⁰ ETCSL t.1.7.6, 1-12.

¹³¹ *The Royal Chronicle of Lagaš (Mesopotamian Chronicles 2006)*

¹³² *The Royal Chronicle of Lagaš (Mesopotamian Chronicles 2006)*

¹³³ Roux 1992, 67.

“To further the well-being of the mankind¹³⁴” - Legacy of Sumerian Agriculture

As Weber’s (1976, 84) stated, in Matum “canal construction is necessarily a large-scale operation, demanding some sort of collective social organization.” However, the more we move towards north, the more agriculture was based on rainfall and “relatively individualistic activity of clearing virgin forest.” Thus, for Sumerians co-operation was a question of life and death: with out canals, there would be no food. This necessity was seen in their social order as well as in their pantheon. Kingship was given from gods in order to ensure the co-operation. Humans were created as slaves or servants of gods to free them from digging canals.

Since all humans were basically slaves of gods, the culture emphasised responsibilities. Thus, while representing his people in front of gods, the king was responsible for the welfare of them to gods. Like any minister of a impatient dictator, the king had to fulfil the orders of his master. If he did not and someone complained, his punishment could be fatal. The same was valid for other rich and powerful as well. If a successful merchant did not take care of his kinfolk, the clan-god could be angry and cause misfortunes.

Sumerians passed this co-operative culture to their successors, Akkadians and Babiluans, who, in turn, passed the doctrine of co-operation to Jews and, through them, to Christians and Moslems. Thousands of years later, Martin Luther adopted the same Oriental values and, after him, German Pietists in Halle University started first modern welfare projects.

Contrary to South Matumian co-operative culture, dry-farming areas did not require similar co-operation. There, the *oikos*, household, was fully capable to take care of all needs of its members. Consequently, in this area, co-operation was based on contracts – it was not similarly “organic” as in Matum. This is most evident in ancient Hellas where alliances were constantly made and broken. Hellene *kyrios* of an *oikos* was a master on his own right who did not bow his head in front of nobody – including his gods. Hellene culture was much more competitive than its Oriental predecessors.

Along Christianity, these two cultures were merged but trough the European history, there has been a tension between Oriental co-operative values based on irrigation agriculture and Hellene competitive values based on dry-farming. This distinction can be seen even today between different

¹³⁴ *Code of Hammurapi*, Prologue.

Western welfare models. Nordic model follows the Oriental pattern, Anglo-Saxon follows the Hellene competitive ideology and Central European is in between these¹³⁵.

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