DEVELOPMENTAL HISTORY OF PADDY RICE AND ARID AGRICULTURE IN ANCIENT CHINESE CIVILIZATION

CHEN, Chun

Abstract (F. Bayerl): The lower Yellow and Yangtze Basins are seen as two independent origins of Chinese agriculture. The Yellow offers arid conditions, while the Yangtze has an aquatic environment, the former favourable to maize, millet and sorghum, and the latter to paddy rice. The two main theories of agricultural origins are Optimal Foraging and Competitive Feasting. The differing environments of the Yellow and Yangtze Rivers reflect these two theories, paddy rice origins relating more to Competitive Feasting, and arid agriculture more to Optimal Foraging. Lower crop yield in the Yellow Basin led to slower population growth, but the people had to rely on technology and warfare to survive, thus leading to a more advanced civilization than in the Yangtze Basin.

The origin of agriculture is a revolutionary process in the history of human evolution. Not only does it reflect increased manipulation of nature and the environment, but more importantly, increased land yield in the agricultural economy. It allowed a larger population to live in a community environment. People could combine their collective intelligence and effort to improve and invent new techniques to increase yield for improving society. The urban and industrial revolutions could not have happened (Childe, 1951) without agriculture.

In mankind’s long slow two million years of history, economic agriculture only began about 10,000 years ago, with animal and plant domestication appearing 8000-9000 years ago in widespread parts of the world (western Asia, Central America, China). These beginnings indicate a similar catalytic mechanism in major economic progress. Although little is known about its overall process, one thing is very obvious: countries with the earliest civilization had the earliest agriculture, leading to much faster social progress.

Based on the available archaeological evidence, the Yellow and middle and lower Yangtze Valleys are seen as two independent origins of Chinese agriculture. Although they were both very early, their domesticated plants differed vastly. In central China, agriculture was mainly foxtail millet, pinnacle millet, common millet and sorghum, and in the middle and lower Yangtze, mainly paddy rice, i.e., arid and aquatic agriculture, respectively, with obviously different motivations and paths in plant domestication.

Two of the principal theories of agricultural origin are Optimal Foraging and Competitive Feasting. Optimal Foraging, first used by Boserup (1965) and later thoroughly discussed and substantiated by Cohen (1977), considers animal and plant domestication as a reaction to food shortage from massive population increase, i.e., the food chain was greatly disturbed by drastic postglacial environmental change, with some animals moving away or disappearing. In the long Palaeolithic period, slow population increase forced people to all corners of the world except Antarctica. With this population growth and low hunter-gatherer yield due to large animal extinctions, people faced food shortages and hunted smaller animals and gathered fruit, widespread activities needing more time and effort for consumption. When large ungulates were abundant, these lower-grade seeds, mollusks, snails, fish, fruit, etc., were ignored. Their gathering and processing required new tools and methods, with labour investment and improved methods becoming more intense. To assuage hunger, lower-grade foods were harvested, with
some of them unavoidably domesticated. This foraging change is regarded as common in the Palaeolithic, with many very reliable examples in the study of optimal foraging theory.

In contrast to Optimal Foraging, Canadian academic Brian Hayden (1992) coined Competitive Feasting Theory. He believes when agriculture began, domestication of animals and plants was not very effective in solving food shortages. As these foods were limited and their harvest potential unreliable, they were not important food staples. Some animals and plants were domesticated solely for broadening food variety even when supply was abundant and had nothing to do with assuaging hunger, e.g. grain to make wine, plants as herbs and condiments, gourds as drinking and eating vessels, dogs used for hunting as well as tasty food.

While these two theories contrast greatly regarding agricultural origin, both are very reasonable and indicate different agricultural origin stimuli in diverse areas. Along the Yellow and Yangtze Rivers of China, arid agriculture and aquatic agriculture originated in completely different environments, reflecting these two theories.

In American Great Plains research on ancient cultural change, Madson (1982) found hunter-gatherers spread out when wildlife became sparse, becoming nomads in their food search. This change made the beginnings of agriculture very unlikely due to difficulties in settling and dealing with unpredictable agricultural experiments. Where wildlife was abundant, they spent little time trying unpredictable experiments in animal domestication. Thus, agriculture originated mainly in areas where wildlife was generally available, people traveled less frequently, and seasonal food shortages existed. Survival required people to understand the necessity of animal and plant domestication to counter hunger from an uncertain wildlife supply. Agriculture did not dominate the economy until after long experimentation, when harvesting far exceeded domesticated animal yield.

Modern data is still limited regarding the origins of arid agriculture in China, especially on the ecology of ancient foxtail millet, pinnacle millet, common millet and sorghum ecology, and the relationship between it and human survival. From the viewpoint of agriculture involving barley and wheat, motivation for countering seasonal shortages greatly affected the onset of cultivation.

Paddy rice is an aquatic crop, its ecology distinct from arid crops. Madson’s Great Basin research indicates wet environments like marshland have abundant food. When a large basin became a shallow flooded lake the surrounding areas usually have dense remains sites. When lakes grew or decreased, there followed an obvious decrease in the number of remains sites. This indicates marshland is not only ideal for aquatic animals and plants, but attracts many land animals and birds. Thus, this type of environment tends not to have potential food shortages.

Paddy rice is a swamp grass growing in marshland where various other foods enrich the diet. The Hemudu site (south of Shanghai – ed.) had abundant excavated rough rice and animal bone, indicating an environment rich in wildlife. Thus, the explanation for the origin of paddy rice agriculture relates more to Competitive Feasting Theory, meaning rice was collected and domesticated because it tasted good.
Different motivations and the yield of arid and aquatic crops greatly affected the growth of civilization in north and south China. While histories of agricultural origins in the Yellow and middle and lower Yangtze Basins are equally long, their civilizations evolved differently. China’s great Central Plains was center stage for a bright ancient civilization, with many generations of heroes fighting and creating epic scenes after epic scenes for 5000 years. Except for the mighty Chu, Wu and Yue kingdoms, southern kingdoms along the lower Yangtze Valley remained barbaric, far from the strong Central kingdoms. Why did equally long civilizations and economies grow so differently? We will search for political and social reasons in the economic differences based on arid and aquatic crop yields.

Arid crop yield is considerably lower than aquatic crop yield. Even though we do not know the full potential of foxtail millet, pinnacle millet, common millet and sorghum, each hand-plowed acre produced about 550 kg (Allen’s 1972 estimate) of food for 12 people/sq. km. Canada’s greatest pre-European yield occurred with the south Ontarian Huron Indians growing maize supplemented with hunting-gathering and fishing, supporting 25-50 people/sq. km (Butzer, 1990). Early maize, pinnacle millet, millet and sorghum yield was likely at this level.

Paddy rice has the highest yield of the five grains. Each big southeast Asian delta harvest can support 500 people/sq. km (Allen 1972), with biannual harvesting taking this to 1000 people/sq. km. We see the magnitude of middle and lower Yangtze Valley yields in the Song Dynasty saying “the whole world is fulfilled when the rice harvest is abundant near the lakes in the Suzhou lake area” (regions in Jiangsu and Zhejiang Provinces – BCG ed.). Furthermore, Yangtze paddy rice yield accounted for 70% of that of all China in the Ming Dynasty (Tong, Ping Yeh, 1979). The yield of paddy rice, much higher than that of arid grain, played an important economic role and indicated a physical influence over political growth.

American academic Cohen believes countries and governments were created to balance population and lands. When a population exceeded land yield, government grew to balance the two (Cohen, 1981).

Assuming Yellow and middle and lower Yangtze Early Neolithic populations were similar and growing at the same rate, crop yield in the Yellow Basin was lower and the agricultural economy was unable to bear the same population pressure as in the lower Yangtze. People constantly battled to survive and grow. As ancient technology outgrew agriculture and animal husbandry, Bronze Age technology was not tied to an agriculture-based economy. When technology raced from the Stone to Bronze Ages, bronze was mainly used to make ceremonial vessels and weapons instead of farming tools for raising crop yield. As the agricultural economy still relied on manual labour and arable land expansion rather than on bronze technology, there was little increase in land yield.

While government and society grew, extra provisions were needed to support the lifestyles of noble and ruling classes, as well as many supporting officials, workers and soldiers. Rather than developing new technology to increase crop yield, powerful states invaded weaker neighbours, kidnapping them and annexing their land. War initiated by land and labour fights motivated an evolution of society from primitive to complex. Such conflict-based progress occurred from the Spring and Autumn Periods to the Qin and Han Dynasties.
In contrast, middle and lower Yangtze paddy fields had much higher yields than those of the Central Plains arid agriculture. The agricultural richness of the many middle and lower Yangtze lakes plus little social and military growth in nearby provinces, were major reasons for this area to assume a comparatively secondary role in the growth of Chinese civilization. The flat Central Plains offered easy cultural exchange between distant places, but also an ideal battlefield, setting the stage for the evolution of civilization.

The above paper analyzed the reasons for the different processes in developing the Yellow and Yangtze civilizations from the perspectives of their agricultural base and environmental differences, plus social change. To further our understanding of the origin and development of China’s ancient civilization, we should, by rising above these analogies, focus future research on the major elements and conditions leading to the historic changes and review the prehistory and its development from a more profound scientific level.

**Bibliography**


