
Symposium: Agriculture in Arid Environments: Archaeological Perspectives

Graeme Barker and David Gilbertson

Agriculture in arid environments: Archaeology and desertification

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Despite the frequency of speculation by archaeologists, historians and geographers about the long-term role of people in desertification, there have been remarkably few modern scientific studies of the problem. Many areas of the world that are now arid or semi-arid have remains of ancient farming systems. How did ancient farmers and herders exploit such environments and what impact did they have on them? Archaeology, particularly interdisciplinary landscape archaeology combining the techniques of archaeology and geography, has the potential to address such questions. The seminar will bring together specialists working in different parts of the world, investigating a wide variety of past solutions to farming deserts. By understanding the variability in past farming strategies, their successes and failures, and their short- and long-term environmental impacts, can archaeology contribute to modern debates about desertification and sustainability?

5000 years of farming and mining in the Wadi Faynan, southern Jordan

Graeme Barker

Wadi Faynan in southern Jordan, used only by nomadic Bedouin herders today, has a rich archaeological settlement history, from villages of early farmers 10,000 years ago to major settlements of the Nabatean, Roman and Byzantine periods, the latter associated with relict field systems that are prima facie evidence for sedentary farming at that time. The region is also rich in copper ores, which have been mined and smelted for over 7000 years. Floodwater farming began in later prehistory, significant developments involving sophisticated diversion barrages then took place in the Iron Age and there were further refinements in the Nabatean period. The entire agricultural landscape was managed as a more or less integral system in the Roman period, parallel with the large-scale management of mining and mineral processing, and probably supporting it. There is increasing evidence that the activities of the ancient farmers and miners of the Wadi Faynan devastated the landscape, the effects of which still impact on the present-day inhabitants of this landscape.

Ethnobotanical investigations of subsistence strategies in Highland Ethiopia

Catherine D'Andrea and Ann Butler

This paper reports some results of an ethnoarchaeological project in the highlands of northeast Ethiopia. The work is based in south-central Tigray at Adi Ainawalid, a small farming village located about 20 km northwest of Mekelle. Selected aspects of traditional farming systems have been recorded, including the cultivation and utilisation of indigenous crops such as tef, and crops domesticated in southwest Asia such as emmer and the cool-season pulses. The aim is to generate testable models on the nature and development of prehistoric agrarian societies in North East Africa, some of which may be more widely applicable. Observations of the socio-economic organisation in the household at Adi Ainawalid allow plant husbandry and crop and food-processing activities to be placed into a broader cultural context.

Territoriality, situation and environment: Floodwater farming in the ancient Libyan desert

David Gilbertson

This paper illustrates the relationships between climate fluctuations, environmental change and human activity during historic and late prehistoric times in the arid and rocky terrain of the Tripolitanian pre-desert of Libya. This region was at the southern limit of the Roman Empire, and its modern empty and stark landscapes stand in marked contrast to the impression created by the rich and dense archaeological remains there dating primarily to Roman times. Romano-Libyan farmers constructed complex networks of substantial walls, the hard-engineering that facilitated widespread flood-water (runoff) farming. Their organisation is shown to have varied according to

changes in topographic, geomorphic and hydrological circumstances, as well as factors that relate to design and settlement including land usage and territorial ownership, in a landscape where mobility and risk-management must have had priority. The long-term robustness and sophistication of these wall networks are evident when viewed against the challenges evident in the human and environmental history of this region.

Archaeobotanical approaches to subsistence agriculture in South Asia and Africa: a comparative perspective

Mukund Kajale

The paper discusses the botanical and archaeological evidence for cultigens of African origin such as sorghum millet (*Sorghum bicolor*), finger millet (*Eleusine coracana*), and pearl millet (*Pennisetum typhoides*) which were introduced into dry parts of India, possibly in multiple phases, during the protohistoric period c. 2500-1000 BC. These introductions enriched the prevailing subsistence farming based on monsoon crops of indigenous origin (rice, kodo-millet, green gram, black gram, horse gram, red gram, etc) and winter crops of west Asian origin (wheat, barley, lentil, pea, etc.). Some of the crops like sorghum millet were genetically improved in India and subsequently reintroduced into west Asia, Africa and elsewhere during historical times. Crop diversity appears to be more extensive and complex in South Asia than in the contemporary African record. Some economically important plants presently common to both continents are known primarily from archaeological contexts in India. Detailed archaeobotanical studies are required to assess the differing roles of parallel and secondary evolution vis-à-vis the cultural migration of plants back and forth during the recent past.

The archaeology of pastoral impact on African savannah environments

John Kinahan

Most archaeological studies of African pastoralism are based on the general view that savannah rangelands function as dynamic equilibrium systems. Until recently, range ecologists have believed that environments degraded by over utilisation would return to their climax state if pastoral settlement was limited, or entirely removed. Now it is apparent that savannah ecosystems are more complex and exist in near permanent disequilibrium, driven by unpredictable rainfall events, so that the effects of pastoral land use are more subtle and diverse than previously supposed. While the historical relationship between pastoral settlement and ecosystem is therefore of greater interest than before, archaeological methods to evaluate and measure these environmental impacts remain to be developed. As a first step in this process, pilot studies in north western Namibia and in central Tanzania indicate that it is possible to develop detailed models to estimate time elapsed since abandonment of both Himba and Masai pastoral encampments, using a combination of soil granulometry and dung chemistry; livestock bone taphonomy, and studies of wood boring and coprophagous insects associated with pastoral settlement. These estimates are matched with the recollections of informants to provide simple and verifiable settlement sequences with a maximum time depth of fifty years.

Prehistoric anthropogenic ecology of the Mexican Northwest/American Southwest

Paul Minnis

The prehistory of the Mexican Northwest/American Southwest has been intensively studied, and some parts of the region have a highly detailed palaeoclimatic record, so we can examine human-environment interactions with unusual precision. Human impacts on the environment increased with the introduction of farming at least 3000 years ago, especially in the more densely-occupied river valleys, but the only domesticated animals kept by early farmers were dog and turkey and the effects of human modifications were localised: the vast desert grasslands were occupied mostly by low-density hunter-gatherers and were not seriously affected. It was not until domestic herbivores, cattle and sheep especially, were introduced in the 1500s that the desert grasslands were radically altered, perhaps permanently changed.

Successes and failures in farming the Syrian Black Desert

Paul Newson

The Jebel Hawran is the largest of a chain of volcanoes that have covered much of southern Syria and northwestern Jordan with extensive lava flows. Over the millennia the flows to the east of the Jebel have been broken up into vast areas of black basalt rocks known collectively by the local Arabs as the Harra or 'burnt land'. The wadis draining seasonal floodwaters into the Harra have been the focus of attempts to develop permanent settlements based on a variety of water-management techniques, including floodwater farming, for example in the Bronze Age, Roman and

early Islamic periods. The paper will review the evidence for the different techniques of water-management used by these different societies, their purpose and function, and the extent to which they were successful.

The decline of desert agriculture: A view from the classical period Negev

Steve Rosen

The decline of the sophisticated and elaborate run-off agricultural systems of the Roman-Byzantine-early Islamic Negev desert was a result of economic and political decline in the Levantine Mediterranean zone. Traditional explanations invoking either climatic deterioration or the 'Arab Conquests' do not conform to recent survey and excavation data. These data demonstrate continued agricultural exploitation beyond the collapse of the Byzantine Empire and well into the Umayyad and even the early Abbasid Caliphates. The final abandonment of the desert agricultural systems seems to occur around the ninth or tenth centuries AD. The abandonment is accompanied by a complementary collapse of the associated pastoral nomadic systems. Thus neither the conquests nor climatic changes dated to ca. the middle of the first millennium AD can explain the agricultural decline evident in the Middle Ages in the Negev.

African agricultural systems and the terraced landscape of Nyanga, Zimbabwe

Robert Soper

Indigenous African cultivation practices, ancient and modern, are not as in popular conception limited to crude slash and burn methods, but include a wide variety of soil and water conservation measures tailored to local conditions and crops. These comprise a whole range of mounding and ridging methods and the terracing of steep stony slopes, sometimes involving irrigation, which modern methods have not been able to exploit. Some ethnographic examples show a range of intensification from permanently cultivated gardens, through more extensive fields, to occasionally exploited outlying areas. The Nyanga area of the eastern highlands of Zimbabwe and adjoining areas to the west presents the largest occurrence of old terracing and cultivation ridges in Africa, dating probably between about 1500 and 1800 AD, the main distribution covering at least 7000 square kilometres. Few terraces were irrigated, but there was provision for running supplementary water between the cultivation ridges in some cases. In the highlands many homesteads appear to have had irrigated gardens and there are strong indications of the use of manure. The entire system is necessarily moulded to the topography and had modified a large proportion of the landscape.

Engaruka: Farming an oasis in Maasailand 300-500 years ago

John Sutton

About five centuries ago the rivers and seasonal streams of Engaruka in the Eastern Rift Valley (northern Tanzania) were used to irrigate some 2000 hectares by the hill-furrow, gravity-fed method. Narrow stone-lined artery canals, divided at intervals, carried water to the terraced fields. It was an integrated system combining manure from stall-fed cattle, with sorghum as the staple crop. The extent of visible fields and irrigation works, with evidence of modifications, and the remains of associated villages, allow rough calculations of changing levels of production and population size. The paper discusses the rise and success of this specialised if rather isolated community, and the possible factors that led to its eventual abandonment in about the seventeenth century.

Islands of agricultural intensification in East Africa: The social, ecological and historical contexts

Mats Widgren

Intensive agriculture is a comparatively rare phenomenon in the semi-arid parts of East Africa, but of decisive importance to its future. This paper aims at a preliminary synthesis of a project on islands of agricultural intensification East Africa. The project emphasises empirical studies of work processes, social institutions and technology as these materialise in physical features of fields and landscapes. It is in how social systems and natural resource management are linked to each other that we may trace both how intensive systems have originated, changed over time and are maintained or abandoned. The roles of landesque capital, social capital and the wider geographical and social context of these islands are emphasised in an attempt to come to grips with the processes behind the emergence of intensified and sustainable agriculture.