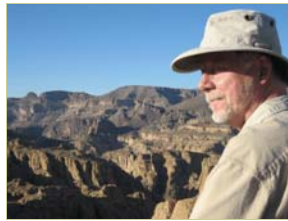


Agricultural Past a Key to Arizona's Future

by Michael Barton

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In H.G. Well's famous book, *The Time Machine*, the central character travels into the future to witness the long-term consequences of the actions of human civilization. Alas, we have no time machine to aid us in trying to make wise decisions and sound public policies that will shape the world we live in.

But my colleagues and I in the School of Human Evolution & Social Change at Arizona State University are seeking new ways to learn from the long record of decisions and actions from the past, and from their consequences, to help us better anticipate the outcomes of the complex ways in which our actions may impact the world around us.

Many times, both the desirable and the undesirable (from a human point of view) consequences in our past were the result of well-intentioned decisions. But whether the results of those decisions were positive or negative became apparent only over the course of decades and centuries. This is all the more reason to wish for a time machine to allow us to glimpse the future.

Fortunately, emerging computer technology, combined with scientific study of past societies (archaeology) and ecosystems (paleoecology),

offers an exciting new opportunity to study the interactions between human activities and environmental consequences.

Agriculture (including animal herding) has been the most significant way we have altered our environment for thousands of years. Although absolutely essential for maintaining human life on this planet, agriculture has led to deforestation, soil loss and salinization, desertification, water pollution, and species extinction.

With support from the National Science Foundation, the Mediterranean Landscape Dynamics project (<http://medland.asu.edu>), which I direct, is creating a cyber-enabled laboratory that uses new computer-simulation tools to study the effects of agricultural practices on arid landscapes over the course of decades and centuries.

We are using agent-based modeling, similar to technology used in video games like *SimCity* and *Oblivion*, to simulate human land-use decisions and practices. We couple this modeling technique to realistically changing digital landscapes, created from computer-mapping technology called geographic information systems.

We are testing and refining this laboratory by simulating the ancient land-use practices that combined with natural changes in climate over the course of thousands of years to produce the Mediterranean landscapes we see today. We hope to use this technology to create scenarios of the outcomes from current land-use practices, not only in the Mediterranean but elsewhere in the world.

For example, we are simulating the effects of two generations of different forms of village agriculture and herding on Near Eastern landscapes. We are comparing swidden cultivation (often called "slash and burn"), where farmers repeatedly cleared new fields and fallowed old fields, with intensive cultivation where farmers continuously farm the same fields. We are also comparing the effects of pasturing domestic animals close to settlements with the effects of regularly moving a herd through a landscape.

Re-creating the activities of ancient farmers in this way is almost like having a time machine to study the decisions that led to the results we see in the archaeological record.

More importantly, using archaeological research to improve the reliability of our simula-

tion laboratory will help us look into the future to anticipate the long-term environmental and social consequences of our own land-use decisions.

The question remains: Will we have the wisdom to use this knowledge to make decisions that will leave our children a better world?

Michael Barton is a professor in the School of Human Evolution & Social Change and a leader in the Center for Social Dynamics & Complexity at Arizona State University.