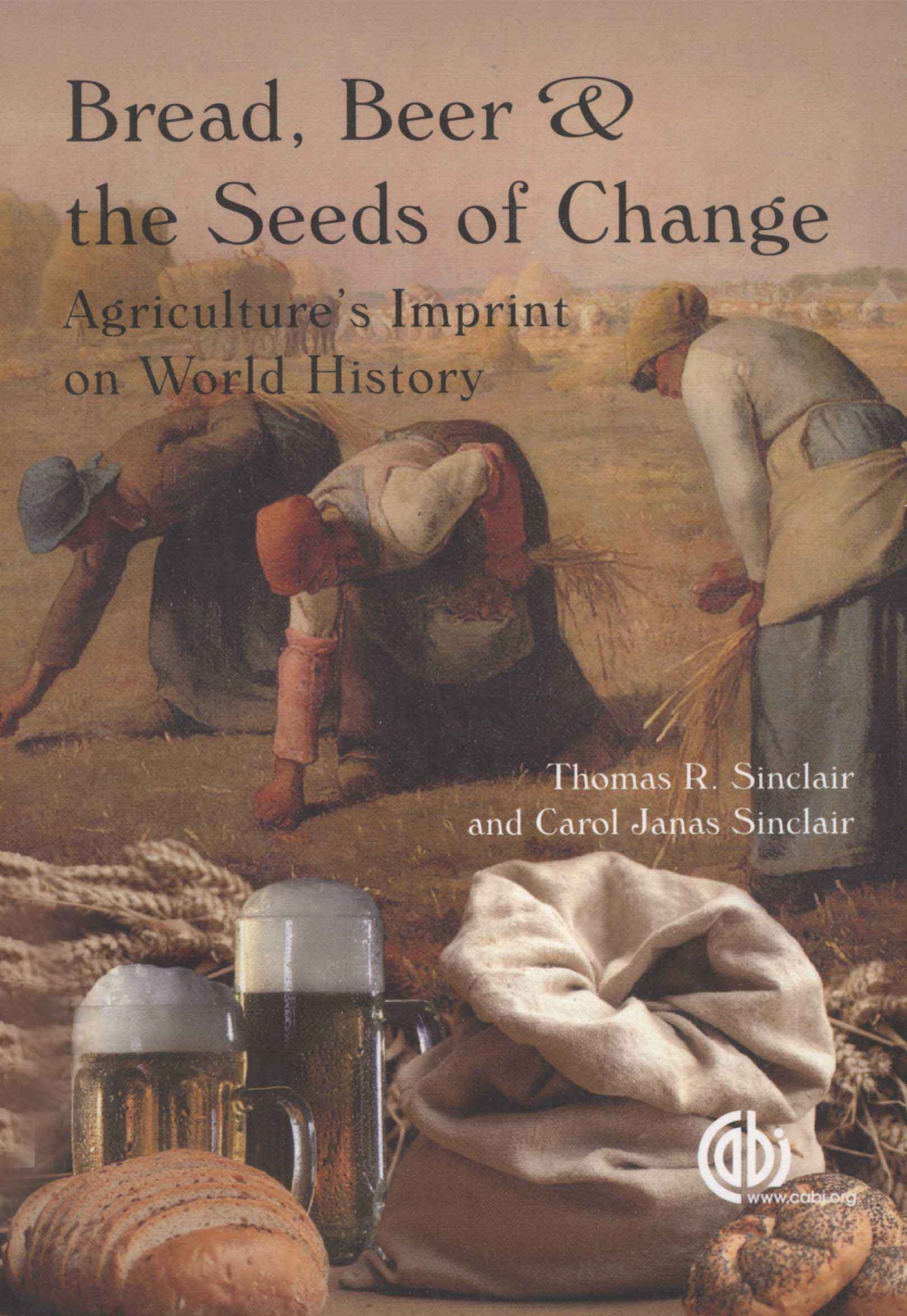
Bread, Beer & the Seeds of Change

Agriculture's Imprint on World History

Thomas R. Sinclair
and Carol Janas Sinclair



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Agriculture's Imprint on World History

"Couldn't put it down ... I'm amazed at the information ... and how [the authors] pulled it all together so nicely."

Jerry Bennett, University of Florida

"[The book] offers exciting and novel insights that make for interesting reading. ...the role that 'bread and beer' played all over the world will draw the attention of an international audience."

Larry Purcell, University of Arkansas

"A welcome and timely contribution to the growing public discussion of the role of food in our lives. Historically informative and thoroughly engaging."

Fred Gregory and Patricia Gregory, University of Florida

About the Authors

Dr. Sinclair is an international leader in Crop Science who has undertaken scientific research with cooperators on all continents. He received his BS and MS from Purdue University, his PhD from Cornell University, and an honorary doctorate from the University of Padua, Italy. He is currently on the faculty of North Carolina State University. His research has covered a wide range of cropping issues including drought, fertility limitations, climate change, and biofuels. Further, he has studied all the major crops of the world. With more than 40 years of research experience he has developed a unique perspective that allows him to understand the challenges of growing crops and to apply this information in a historical context.

Ms. Sinclair has a lifetime interest in foods and nutrition. She attended Purdue University and received her BA degree in English Literature from Ithaca College. She has lived and traveled in many countries of the world exploring local methods in food preparation and the cuisine of the countries. She has been involved in organizing menus to facilitate new experiences of a range of foods and food preparation. Exploration of historical approaches to food was a natural extension of this interest.

Tom and Carol have been married more than 42 years and currently live in Durham, NC, near their young grandson Noah Thomas Fine.

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1

Introduction

We must begin by stating the first premise of all human existence and, therefore, history, the premise, namely, that man must be in a position to live in order to be able to "make history". But life involves before everything else eating and drinking.

Karl Marx
The German Ideology

Undoubtedly the desire for food has been, and still is, one of the main causes of great political events.

Bertrand Russell

"I eat what I eat", Carol's Polish mother would respond when we urged her to try any new food. Her diet focused on meat and potatoes, and no dinner was really complete without them. Her statement, however, carried profound insight. The foods eaten early in our lives are the foods desired the rest of our lives. Perhaps it is a trick of evolution that we are "programmed" to be comforted by the foods that successfully nourished us through childhood. Individuals with adventurous DNA – who might readily explore new food sources – may well have died when they sampled too widely and encountered one of the many plants and plant tissues filled with protective poisons.

Indeed, a major component of "cultural identity" is the staple foods that a society consumes. People have proudly identified themselves as members of a group defined by the starchy staple of their diet: potato-eaters of Northern Europe, maize-eaters of the Americas, rice-eaters of Asia. We eat what we eat! From the early days of society, the seasonal cycles of crop growth determined the rhythm of life with rituals and ceremonies at sowing, harvest, and during the dark times of midwinter when food became scarce.

The need of societies for their staple food has been a powerful force through much of history. Until very recent times, the absolute focus of life for nearly all people was to produce food. We are now living in a time of historic aberration. For the first time, obesity is a much larger health problem in developed countries than lack of food. Today's fortunate people never need to consider the option that supermarket shelves will not be fully stocked with virtually any food desired. Before this very recent era, the coming harvest literally determined "feast or famine". The concern for nearly all people was not "Am I getting fat?" but "Will the harvest be large enough to hold off starvation for one more year?"

The basis for political power in the past was claimed ability within the natural world to tip the balance towards "feast". Rulers often took on the status of gods themselves or at least claimed to have intimate contact with the gods. Good yields meant that the rulers had done their job and ensured political stability. When the pharaohs "caused" the Nile to flood or the Mayan chiefs "delivered" the rain, their power was entrenched. Bad weather, disease, or insect infestations resulting in poor yields were explained away with cultural myths.

Until recently, most societies could only afford the luxury of releasing just a very few people from the drudgery of food production. Yet the usual study of history focuses on the lives of only these elite rulers. The lives of the masses of people who struggled for survival are rarely considered. However, it was the lives of these masses – and what they ate – that were the motivating ideas of this book. When visiting monuments of past civilizations we found ourselves wondering about the lives of the vast majority of people serving the powerful, rather than the powerful themselves.

Both of us grew up in the agricultural environment of rural Indiana, and we were aware of the challenges in modern food production. We saw the work of growing crops assisted by machines and chemicals, but we wondered, "How was the food grown in past societies?" "What work was required by the farmers in antiquity?" and "What foods did they eat?" One of the motivations in undertaking this book was to better understand the food production in these past societies and how this top-priority activity influenced the course of history. The interesting history for us, and we hope the reader also, is not limited to political and military conflicts, but rather how societies sustained themselves with the essentials of food production.

Of course, what became very obvious after only a little research is that the lives of most people through history were focused solely on the necessity of producing food. The labor demands in growing crops and turning the grains into food and beverage were onerous and unceasing. All hands – men, women, and children – were needed for food production. Until very recently, all or nearly all the energy required in crop production and food processing was provided by human muscle. Everyone was needed in the fields for sowing, weeding, harvesting, and threshing.

Not surprisingly, the drudgery and pain of growing crops fell to the masses of people who were by definition the lower classes. These classes were labeled as serfs or peasants, but in reality these people were slaves to the system that required their physical energy to produce crops and food. There was no future for them except the continuous labor required to produce the current crop, and then the next one. Indeed, the labor requirements were so great in some systems that a major component of the work force was actually slave labor. The only future for the slave was pain and death, resulting from the work he or she was forced to do.

Only in the last 300 years has human labor been replaced to a significant extent first by animals, and then in the last 60 to 80 years by fossil fuel energy. In industrial agriculture, the replacement of muscle by machines has, of course, had a profound impact on human life. Instead of virtually everyone being required to produce food, now in the United States growing food is the main occupation of less than 2% of the population.

This productive 2% offers modern day consumers a variety of foods that was unimaginable to earlier societies. The monotony of people's lives in past societies was not relieved by variety in the foods they ate. As discussed in Chapter 4, the hard physical labor of growing crops and producing food required that these people consume roughly twice the calories we need in our current, sedentary life style. Their large caloric requirements had to be met by foods that could be readily grown and easily digested. The need to consume large amounts of calories focused the diet on grain-based foods that provided the calories: mainly bread and beer. Diets of people in most societies were commonly centered on one or two foods, which in nearly all cases were derived from starches from grains. One clear advantage of these grains was that they were readily fermentable. We discovered that until modern times fermented grain, i.e. beer, was likely a major source of calories for men, women, and children. The attractiveness of beer was no doubt enhanced by the mood-altering benefits of the alcohol in helping people to deal with a life of monotony. While the plant species differed among societies, the fundamental nature of the diet was amazingly constant until modern times. Not surprisingly, there were major health consequences from lack of variety in diet.

In researching this book, we identified a historic time line in technological progress in food production: The Seeds of Change. Enhancing technology through the centuries allowed either expanded crop production on new lands or increased yield on existing lands. While the challenges faced by each society were unique, there were common problems in food production faced by all societies. There has always been the threat of environmental degradation resulting from growing crops. Some of the environmental problems were self-inflicted; others were results of natural perturbations. Reviewing these past societies serves as a healthy reminder that crop production is always vulnerable to environmental vagaries, and this truth has not diminished in modern times.

To examine the topics introduced above, this book is organized into three parts. The first part (Chapters 2 through 6) examines background information, which we identify as the "The Seeds", and discusses the basics of cropping and food production that had to be resolved by all societies. Chapter 2 in this section considers the fundamental question of "Why Agriculture?" While agriculture was fully engrained before the

existence of the societies discussed in this book, it is useful to understand the motivations that caused people to begin growing crops. Agriculture was an extremely demanding life, in contrast to hunting and gathering. How did it come about that people ended up growing crops? Since agriculture arose independently in a number of locations, it seems there must have been a universally compelling reason to take up agriculture.

Chapter 3 in Part I considers which plant species were selected to be the basis for food production in each society. In the societies we consider, the staple grain food was derived from seeds of a very limited number of plant species, all from the grass family. Staple species used by each society depended on the environment in which the crop had to be grown, and consequently these cropping systems often had major influences on the historical path of each society. The preparation of food as bread and beer from the grains of grasses is considered in Chapter 4. Chapter 5 examines the nutritional consequences to humans of basing a diet on a single grain crop. Finally, Chapter 6 considers the basic requirements in using grass species as grain crops: water, nitrogen, and weed suppression.

Part II is an examination of food production during the Golden Age of five ancient societies that evolved more-or-less independently, each with unique agricultural practices. Each society was influenced by the grass species available for food production, the climate in which the crops had to be grown, and the geographical constraints placed on their crop production. Societies such as the Sumerians (Chapter 7), Egyptians (Chapter 8), Chinese (Chapter 9), and Maya (Chapter 11) developed food production systems based on only one or two plant species each. The production of these crops had to be closely matched to the constraints of growing crops in their local environments. Powerful rulers rose to organize and control these societies so that food production was sufficient for a large, concentrated population. Geographical constraints of crop production tied the population to a geographical area. The contrasting case was the Bantu of Africa (Chapter 10). The Bantu had available plant species that acclimated to a wide range of environments, and they had no need to create a strong political and military empire to sustain crop production in a constrained area.

Part III examines a succession of western societies which reflected a progression in increasing technology. We consider the Golden Ages of

five societies in this sequence: Athenian and Roman Empires (Chapter 12), feudal Europeans (Chapter 13), British (Chapter 14), and Americans since 1950 (Chapter 16). Chapter 15 discusses the key scientific and technological developments that led to the revolutionary changes in crop production and food consumption in the American society. The ability to either control large areas of crop land or increase production on their existing land led to a rise to power of these societies. Local geographic constraints were less of a concern than in earlier societies because technological developments allowed water and land transport of grains over great distances. However, protecting the environments to produce food and/or defending the transportation network to import grains were critical in sustaining these societies.

The American experience since 1950 is unique in the history of crop and food production. Throughout nearly all of history, food production and preparation had been completely dependent on human labor. There were selective substitutions of some human labor by animals in previous western societies, but muscle remained the basis for food production. Scientific and technological developments in the era from 1850 to 1950 (Chapter 15) resulted in a total revolution of crop and food production using fossil fuels. The consequences of the scientific revolution are examined in Chapter 16. Tractors tilled and sowed the land, large harvesters crossed the fields to gather the crop, and grain was shipped on trucks, trains, and barges to large factories manufacturing food for an urban society. Fossil fuels could be readily used to overcome the challenges in crop production resulting from limited water, limited nitrogen, and competition from weeds. Water could be pumped onto dry lands, nitrogen fertilizer manufactured using natural gas, and chemicals synthesized from oil to kill specific weed plants. Crop yields per unit land area of agriculture rose to levels four, five, or more times than had ever before been produced in history. Simultaneously, the diversity of foods available to people exploded. Taking advantage of the luxury of fossil fuels, a few percent of the population were able to produce all food desired by the remainder of industrial societies. The resource of fossil fuels, unfortunately, is in finite supply.

2

Why Agriculture?

Then the Lord planted a garden in Eden, in the East, and there he put the man he had formed. He made all kinds of beautiful trees grow there and produce good fruit. In the middle of the garden stood the tree that gives life and that tree gives knowledge of what is good and what is bad. A stream flowed in Eden and watered the garden ... Then the Lord placed the man in the Garden of Eden to cultivate it and guard it. He told him, "You may eat the fruit of any tree in the garden, except the tree that gives knowledge of what is good and what is bad."

... The woman saw how beautiful the tree was and how good its fruit would be to eat, and she thought how wonderful it would be to become wise. So she took some of the fruit and ate it. Then she gave some to her husband, and he also ate it.

... Then the Lord said, "Because of what you have done, the ground will be under a curse. You will have to work hard all your life to make it produce enough food for you. It will produce weeds and thorns, and you will have to eat wild plants. You will have to work hard and sweat to make the soil produce anything."

Genesis, Chapters 2 & 3

Is it possible that the Genesis story might actually give insight about the progression from the hunter-gatherer stage of human development to agriculture? Before cultivation of crops began some 10,000 years ago, humans had successfully fed themselves for tens of thousands of years by hunting wild animals and gathering plant roots, leaves, berries, and seeds. Aspects of the hunter-gatherer life style were very desirable – a Garden of Eden – as compared to the life of the agriculturalists who followed them. Today, the hunter-gatherer way of life is often portrayed as a harsh and precarious existence. This image is probably fostered to some extent by television showing extant hunter-gatherer people who are relegated to some of the harshest environments in the world. The Kalahari tribesman and the Eskimo are shown struggling in their extreme environments in an existence on the edge of starvation and annihilation. Those hunter-gatherers that still exist in our modern world have been pushed to the fringe environments, where indeed the climate is severe and survival is challenging. However, even in these environments the hunter-gatherers of today have sustained a rich culture without the burden of tilling the soil.

In fact, it is likely that in ancient times those hunter-gatherer groups living in richer environments had a reasonably comfortable life. Seasonal migration by hunter-gatherer tribes took them to the areas where they knew food was likely to be available, if not abundant. It has been shown that a fairly modest amount of work was required to harvest the food from the wild. For example, a number of years ago Jack Harlan, a crop scientist at the University of Illinois, collected seeds from a wild stand of einkorn wheat growing in the Middle East using only a stick and basket. In one hour he was able to collect one kilogram (2.2 pounds) of clean grain. There was no need to cultivate the crop when grain harvests as great as this could simply be collected for a small tribe. Similarly, a hunt once or twice a week in many environments is likely to have provided the amount of meat needed by the tribe. For example, Colin Tudge (*Neanderthals, Bandits and Farmers: How Agriculture Really Began*) reported that, even in the harsh environment of the Kalahari, tribesmen could satisfy their meat needs by hunting on the average only six hours a week.

In addition to the comparative ease of obtaining food by hunter-gatherers in contrast to agriculture, there were other advantages for

hunting-gathering. Diets were likely to have been much more varied, and hence more nutritious. Hunter-gatherers would have had a mix of animal and vegetable foods from a wide range of sources through the progression of seasons. In contrast, agrarian diets were based on only one or two staple crops, augmented with few other foods, and their grain-intensive diet resulted in mineral and vitamin deficiencies. Even though protein was adequate for agriculturalists, specific amino acids were deficient because meat was rarely eaten by most people. Only the few in the elite class would have the luxury of regularly eating meat.

Hunter-gatherers also lived in smaller communities as compared to agrarian communities in which a large labor force was needed to tend the fields. A viable hunter-gatherer community was commonly an extended family of only about 50 people. As a result, the tribe was less vulnerable to disastrous food shortages. The small size of the hunter-gatherer societies was to some extent a consequence of the life style. Children of these societies were likely nursed for a longer time than in agrarian societies because mothers in hunter-gatherer tribes did not have to expend huge amounts of time and calories working the fields. Natural birth control resulted from hormone suppression in lactating women. Out of necessity, hunter-gatherer groups had to remain small so that they did not quickly exhaust the food resources in each new location. Any collapse of the available food supply would have readily decreased birth rate, and maybe increased death rate of the tribe. The population of the tribe was small and self-correcting by the nature of the hunter-gatherer food supply.

Finally, individual self-worth may have been greater in small hunter-gatherer societies where decision-making was probably more participatory. There were neither land areas to be managed nor hierarchy needed to coerce workers to the harsh labor of growing crops. No pressure existed for a stratification of society into leaders and workers. Decisions could be made communally and people could participate in gathering and hunting as their abilities allowed. Hunter-gatherer societies are likely to have provided much more agreeable life styles than those experienced by the vast majority of people in agrarian societies. Indeed, the relatively relaxed life style of hunter-gatherers often led explorers coming in contact with aboriginal peoples to the conclusion that these people were “lazy”.