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Giovanni Federico: Feeding the World

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INTRODUCTION

AGRICULTURE HAS ALWAYS been absolutely necessary for the very survival of humankind. For centuries, it has provided people with food, clothing, and heating, and it has employed most of the total active population. Nowadays, we dress mainly in artificial and synthetic fibers and heat ourselves with fossil fuels, but the primary sector still supplies all the food we need. The available projections suggest that the world population will grow further in the next decades, while the nutritional status of the world poor must improve. Thus, agricultural production has to rise, and it has to rise with little or no further environmental damage: modern agriculture has, in fact, the reputation, largely deserved, of being environment-unfriendly.

The challenges ahead, however, should not let people forget the past achievements.¹ From 1800 to 2000, the world population has risen about six- to sevenfold, from less than one billion to six billion.² Yet, world agricultural production has increased substantially faster—at the very least, tenfold in the same period. Nowadays, people are better fed than in the past: each person in the world has, in theory, 2,800 calories available, with a minimum of some 2,200 in sub-Saharan Africa.³ Famines, which haunted preindustrial times, have disappeared from most of the world. The latest survey by the Food and Agricultural Organization (FAO) estimates that 800 million people (i.e., some 10–15% of the world population) are still undernourished—but this may be an overestimation, and the proportion has drastically fallen by about a quarter since 1970.⁴ Furthermore, undernourishment and famine are caused much more by the skewed distribution of income (poor entitlements in Sen's definition) and by political events (international wars, civil wars, terrorism), than by sheer lack of food.⁵ Actually, many OECD countries have, since the 1950s, been struggling with an overproduction of food. The achievements of agriculture appear even more remarkable if one looks at employment. Agriculture employed more than 75 percent of the total workforce in traditional agrarian societies, and, as late as 1950, about two-thirds throughout the world. Nowadays, in the advanced countries, the share is about 2.5 percent—eleven million people out of 430.⁶ In the rest of the world, agricultural workers still account for almost half the labor force, with a world total of some 1.3 billion workers (775 million in China and India alone). Such a massive transfer of labor, one of the key features of modern economic growth in the past two centuries, was made possible by a dramatic increase in product per worker. In short, agriculture is an outstanding success story. Its achievements have been outshone by the even faster growth of industry and services, but the latter would have been almost impossible if the workers had not had sufficient food to eat.

The aim of this book is to describe this success, and to understand its causes. Chapter 2 illustrates the peculiarities of agriculture. Its production depends on the environment: soil, climate, and the availability of water have always determined what peasants could grow, how much they had to work, and how much they could obtain from their efforts. These constraints have been relaxed in recent times, without totally disappearing. The factor endowment, and notably the amount of land per agricultural worker, determines the intensity of cultivation. The combined effects of the environment and the factor endowment have created long-lasting and area-specific patterns of land use, crop mix, and techniques (“agricultural systems”). The next three chapters present the main statistical evidence, loosely arranged in a production-function framework. Chapter 3 deals with the long-term trends in output (which has always been growing), relative prices (increasing in the first half of the nineteenth century, then roughly constant or slowly declining), and world trade in agricultural products (increasing quite fast before 1913 and again after 1950). The focus then shifts to the proximate causes of this growth, the increase in the use of factors (chapter 4) and productivity growth (chapter 5). Historians have a fairly clear idea about the long-run change in factors. The total agricultural work force remained roughly constant all over the world, with the notable exception of Western settlement countries (North America, Australia, Argentina, and so on) during settlement process—that is, until the beginning of the twentieth century. The stock of capital grew fast beginning in the late nineteenth century, as machines substituted labor. Although this conventional wisdom is not exactly wrong, it is, however, inspired a bit too much by the experience of the Western world. The growth of land stock has been much more geographically widespread and has lasted for longer than is commonly assumed. Agricultural capital consists mainly of building, irrigation works, and the like, and thus it increased slowly but steadily throughout the period. The real process of mechanization started only in the 1950s, and the agricultural work force has gone on growing in absolute terms. Thus, the growth of inputs (extensive growth) was the major cause of worldwide growth in agricultural production until the 1930s, but after World War II, it slowed down. Consequently, most of the big increase in total output in the past half-century has been achieved thanks to the growth in total factor productivity. The available estimates, surveyed in chapter 5, suggest that its growth has been increasing over time and that it has been faster in “advanced” countries than in LDCs. In the “advanced” countries, productivity growth has accounted for the whole of the increase in agricultural output. Contrary to a common view, productivity growth has been faster in agriculture than in the rest of the economy, including manufacturing. Chapter 6 focuses on the main source of this great achievement, technical progress. It starts by describing the main innovations, and then focuses on the process of their adoption. As in the rest of the economy, innovations are adopted when profitable, and profitability ultimately depends on the expected productivity gains and on factor endowment and factor prices. However, as the chapter argues, a standard neoclassical model cannot explain all the

features of technical progress in agriculture. Agricultural innovations depend on the environment and entail a high level of risk, and many of them yield little or no financial rewards to the inventor. These features call for a greater role of the state, both in the production and the diffusion of innovations. Chapters 7, 8, and 9 deal with the institutional framework of agricultural production. “Institutions” is a fairly vague word, which resists all attempts at a general definition. Chapters 7 and 8 deal with property rights on labor and land, markets for goods and inputs (labor, land, capital), and agricultural co-operatives. Chapter 7 is, to some extent, a general introduction to these issues and to the approaches of economists and historians to institutions. It discusses how institutions work and how they might affect the performance of agriculture. Chapter 8 describes the main changes—the creation of property rights on labor and land, the trends in the average size of farms, in landownership, and in contracts, and the development of markets for goods and factors. It also puts forward some tentative hypotheses on the likely causes of these changes and on their effects on agricultural performance—although, it is fair to say, the discussion on these issues is surprisingly thin when compared to the attention they have received in the theoretical literature. Chapter 9 focuses on the effects of agricultural policies. It argues that state intervention has only really affected agricultural development since the 1930s, and that, by and large, it has reduced the aggregate welfare of the whole population. The tenth, and last, chapter shifts the focus from agriculture to the whole economy. How did the growth of agricultural output and the change in input use affect modern economic growth? This issue has been the subject of much discussion in historical perspective, and it still looms large in the debates about the optimal development strategy for less developed countries. The chapter has no ambition to solve such a controversial issue. It sketches out the prevailing theories and deals very briefly with three case studies. The book closes with some very general remarks about the future of agriculture.

The summary makes it clear that this is quite an ambitious book. It deals with many issues, and covers two centuries of agricultural history in the whole world, from Monsoon Asia to Midwest prairies. Any attempt to be comprehensive would be foolish. The potentially relevant literature spans dozens of languages, and many disciplines, from “traditional” agricultural economics and history to more “trendy” social and environmental history. Just to quote an example, the fourth volume of *A Survey of Agricultural Economics Literature, Agriculture in Economic Development*, contains more than two hundred pages of references.⁷ Assuming (conservatively) that there are twenty entries per page, the total sums up to almost four thousand entries. Some of these works may be purely theoretical, and thus outside the scope of this book, but the majority should still be considered. The survey refers only to the less developed countries, deals (almost) exclusively with the post–World War II period, lists only works in English, French, Spanish, and Portuguese published before 1990, and is probably, as with all surveys, not complete. A simple proportion suggests that there are thousands of potentially relevant references. Clearly,

no one in the world (certainly not this author) can reasonably claim to master all the literature. And even if this miracle were possible, it would be impossible to review it thoroughly and keep the book to a reasonable size. Selective reading is an imperative. Thus, I have decided to focus on more general contributions, and to favor works that frame their views in economic theory and buttress their statements with data.

This approach has some clear and often rehearsed shortcomings. Mainstream economic theory may appear too abstract to be relevant. Agriculture is a highly local activity, and specialists in agrarian history always warn against broad generalizations, which, they claim, cannot capture the peculiarities of the area that they are dealing with. Many data are missing, unreliable, or sometimes plainly wrong. Reliable “historical” (pre-1950) data are available only for some “advanced” countries (those of Western Europe, USA, Japan, etc). International organizations such as the UN, FAO, World Bank, and the OECD have made a magnificent effort to extract comparable data for all countries from the information provided by national statistical offices, which are sometimes incomplete and/or of dubious quality.⁸ However, there are some reasons for hope. Modern development economics, with its emphasis on institutions, transaction costs, information, and so on, provides powerful tools for understanding rural societies, which can also be employed to explore societies of the past. Economic historians have unearthed a great deal of new data, which, in spite of all their shortcomings, do throw light on many key issues. And, last but not least, I feel that there is no real alternative. A history of agriculture based on anecdotal evidence from local case studies would be a boundless and largely meaningless list of details. But details are sometimes fascinating and are useful for illustrating general points—to put some flesh on the bare bones of quantitative analysis, so to speak. The reader may find the selection of these examples somewhat haphazard (why—for example—discuss tenure in China during the 1930s instead of that in Guatemala during the 1970s?). It is, however, guided, whenever possible, by two principles: first, to deal with “large” countries (China, India, Russia, the USA) and, second, to focus on controversial cases. The interest of “big” countries is self-evident, while focusing on controversial issues makes it possible to give the reader a flavor of the current research and debates.