



Technology and Agricultural Development in Pre-War Japan.

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Technology and Agricultural Development in Pre-War Japan. By Penelope Francks. Yale University Press, 1984. Illustrated; 322 pages. \$30.00.

THIS fascinating study of Saga Plain agriculture in the late nineteenth and early twentieth centuries by a development economist offers new insights into two important debates about Japanese agricultural history—the Japan model and the Saga stage. The first is a debate about the contributions of agriculture to industrialization and the relevance of Japan's experience to current Third World conditions, while the second concerns the shape and potential of modern Japanese agriculture itself. Francks offers a judicious perspective on both matters as well as telling an intriguing story of the interaction of technology and a regional society.

Saga Plain is a coastal plain of about 25,000 hectares that stretches from the Tsukushi Hills south into Ariake Bay in western Kyushu. While most paddy fields in Japan draw their water from gravity-flow canal networks dug from rivers, and a significant minority depend on pond networks, Saga Plain has a unique pattern that Japanese scholars have tagged 'creek irrigation', or *kuriiku kangai*. The plain was gridded by wide, bayou-like, improved natural channels that were lower than the paddy fields themselves and thus required cultivators to pump up water from the creeks to their fields. By the early nineteenth century, a highly labor-intensive rice system had emerged to exploit this hydrology. Portable waterwheels were pedal-pumped to raise water to the fields. The mud and silt on the creek bottoms were also periodically, and laboriously, hauled up to the fields as valuable fertilizer by cooperative teams of eighteen men. Skillful and time-consuming plowing and hoeing of the fields were required to minimize water drainage back into the creeks and to break up the dense clay soils. The labor demands of pumping and plowing led households to divide their fields into two sections, each of which followed a staggered rotation of early and late maturing rice varieties. This solution improved labor allocation, but unfortunately created a continuous environment for the three-brooded rice-stem borer, which took a heavy annual toll on the plain's harvests. There were few concentrations of landholdings; rather, a minority of medium-scale (1-3 hectares) households and a much larger number of smallholders were mutually bound by annual labor hiring, draft animal exchange, and cooperative dredging arrangements—a legacy of local association that would prove crucial in the following century.

Because these elements formed an integrated agrarian system, Saga cultivators could make only limited use of the package of new cultivation techniques that spread from neighboring Fukuoka in early and mid-Meiji (the so-called Meiji Agricultural Methods of better seed varieties and selection, deep plowing, commercial fertilizers, and transplanting improvements). Saga cultivators were knowledgeable and enthusiastic about the new methods, and supported a growing network of local agricultural organizations linked to the state. However, fundamental change did not occur until industrial development in adjacent northern Kyushu after the turn of the century drew off the essential underpinning of the Saga system—labor. The iron works at Yawata and shipyards at Sasebo and Nagasaki quickly attracted the young men and women who pumped the waterwheels and lifted the creek mud, and the resulting labor shortages and rising wage levels on the plain were the eventual impetus for a local 'green revolution'. Irrigation cooperatives and local government officials instituted a series of projects in the 1920s to introduce small electric pump sets, improved fertilizing regimes, and a unified late planting that finally ameliorated the past problem and

vaulted Saga to the highest yields among rice regions in the 1930s. Agricultural economists and government officials celebrated the 'Saga stage' as a breakthrough into a modern rice agriculture, in which appropriate-scale mechanization would allow both high yields *and* high labor productivity.

Told briefly, the Saga story is obvious enough, and Francks's narrative does not stray far from the voluminous secondary and local history scholarship. Her analysis, though, is subtle and penetrating—a model combination of history and social science. She explicates well the changing interactions of the special natural environment, the rice work system, and the local political economy. She is able to show how the particular forms of technological innovation (for example, the scale, design, and placement of the pumps themselves) and the organizational pathways by which new techniques were introduced and diffused resulted from a conjunction of certain state initiatives, the pattern of industrial development in northern Kyushu, and the existing configuration of local social organization. A 'Japan model' of modernization used to stress the acceleration of the rate of agricultural output in the late nineteenth century and the essential contributions of agriculture to nascent industrialization (land taxes for investment, rice for urban populations, surplus labor for new factories). Debates then raged about the actual rate of agricultural growth, and doubts surfaced about the net flow of resources from agriculture to history. Francks shares these doubts; at least for the Saga region, industrial technology and factory employment were themselves significant stimuli to agricultural transformation. Lessons of the Japanese experience are now sought not in replicating its trajectory but in using it to understand the mechanisms by which appropriate new technologies are adopted. Much favorable attention is currently given to Hayami and Ruttan's model of 'induced innovation', an argument about the efficiency of sequences of technology innovation in Japanese agriculture. Francks's study is both a demonstration of their model and, by emphasizing the contribution of local environmental and historical features, a welcome modification of their mechanistic production function analysis.

Francks is also concerned with detailing just how this new technology benefited and consolidated an expanding middle-scale cultivator population, rather than polarizing the plain. This has proved, of course, to be the irony of the 'Saga stage'. Saga's prewar electrical pumping was but a precursor of the total mechanization of Japanese agriculture in the postwar decades—a mechanization that has allowed the tenacious survival of part-time, small family farming. While the wide access and equalizing distributive effects of such mechanization are the illusory dreams of Green Revolution planners in Third World countries today, in Japan the all-too-effective Saga stage has become the policy nightmare of government officials desperately seeking to induce a large-scale, full-time, diversified agriculture.

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