The agricultural dilemma, by Glenn Davis Stone, New York, NY, Routledge, 2022, 246 pp., £29.59 (paperback), ISBN 9781032260457

While teaching Langdon Winner's landmark 1980 paper, '*Do Artifacts Have Politics?'* to a group of undergraduate students, I discussed his example of the mechanical tomato harvester developed by publicly funded researchers at the University of California in the 1960s. The repercussions of the harvester on agrarian social relations are now well-known: displacing labor, dispossessing small farmers, and concentrating land with big agri-business. As I recounted these consequences, students appeared incredulous, asking, 'But … does that mean they shouldn't have created this machine?' In other words, surely the gains of efficiency and productivity outweighed the costs. Like many others around the world, my students were also convinced of the importance – the *necessity* – of these technologies to address urgent global problems of hunger and scarcity. *Don't we need to produce more food? Isn't technological development vital to human progress? Shouldn't innovators be allowed to profit from their hard work and investment?*

Glenn Stone's new book answers these queries with rich empirical detail, but also seeks to reframe the question entirely. Refusing the technological fetishism that dominates approaches to development, Stone instead asks – following Lenin – who stands to gain? At its core, *The Agricultural Dilemma* is a magisterial exposé and incisive critique of the depredations of industrial agriculture, uncovering how business interests have captured public wealth and externalized socio-ecological costs, all *in the name of* producing more food for a hungry planet.

A book-length exercise in un-thinking, Stone begins from the premise that 'we misunderstand agriculture' (xiv). Contrary to popular neo-Malthusian imaginaries of food shortages and growing populations, Stone's sharp analysis reveals 'a world perennially contorting itself to manage industrial agriculture's overproduction' (74). He brilliantly upends commonsensical assumptions about agriculture that continue to this day, whether in debates around Golden Rice or the purported benefits of AI-driven agriculture. These diverse projects are haunted by the ghosts of Thomas Malthus, Norman Borlaug, and their many intellectual ancestors and heirs, who insisted that the intertwined 'problems' of population growth and food scarcity could only be resolved through industrialized production. While this story is quite familiar to social scientists, the unique strength of this book lies in its combination of historical depth, attention to conjuncture, and lively storytelling. Beginning from the problem of *over*-production rather than under-production, Stone's account traverses scientific developments in chemistry and plant genetics, agricultural policymaking and industry lobbying from the US to India, and the legacies of imperialism and militarism to fundamentally rewrite mainstream narratives of agrarian change.

The book is rich with detail – sometimes overwhelming, always insightful – into the history of our agrarian present in which farms around the world are organized as consumers of industrial inputs. The field is now a funnel for new and expensive products – tractors, fertilizers, credit, and more. This fundamental shift occurred in the nineteenth and twentieth centuries, heralding a 'reconceptualization of agriculture as running on external resources' (92). At present, dominant efforts at feeding the planet have little to do with hunger or scarcity and 'everything to do with the financial interests of individuals and institutions of science and of industrial capital' (106). Consequently, the book offers a trenchant critique of this 'industrialized agriculture' whose distinctive feature is not that it is modern, or efficient, or even especially productive but rather that it runs entirely on external inputs created by industrial actors, subsidized by governments, and sold to farmers.

In particular, the book focuses on two specific agricultural inputs: fertilizers and seeds. Fertilizers, Stone argues, are not necessarily feeding hungry people as much as they are feeding hungry crops (Chapter 4). Key to its functioning is a 'pulling away of natural grounds' (56) – the transformation of agricultural processes into industrial activities that are then reincorporated into agriculture (or what Stone calls 'appropriationism'). Put simply, what was previously produced on the farm (manure) is now sold to farmers at a high price (chemical fertilizer). Despite the well-documented harms of producing and consuming nitrogen-based fertilizers (industrial accidents, pollution, depleted soil fertility, and more), the often delayed, diffuse, and distant nature of these social and environmental harms facilitates its continued use. Herein lies one of Stone's central arguments: that government permission of this externalization of costs constitutes a downstream subsidy enjoyed by industry, but whose real price is immeasurable and ultimately paid by the public.

Indeed, Stone emphasizes that the real force behind agricultural innovations is the capture of public value. New agricultural technologies, he writes, are 'actually congealed value that capital has harvested from the government' (58). Without state subsidies for research, market infrastructures, prices, and lobbying, none of these inputs could have been cheap or profitable and therefore, neither widely produced nor consumed. Governments (particularly the US government) support these subsidies for a range of administrative, political, social, and even personal reasons (Chapter 3). Following James Scott, Stone maintains that industrialization helps make agriculture 'legible' to the state since 'external inputs can provide a range of avenues for control and monitoring' (64).

Across the chapters, Stone emphasizes the crucial – and self-serving – role of scientific disciplines and institutions (particularly, chemistry and plant breeding) in shaping and being shaped by industrial interests. The intricate and pernicious entanglement of science, state, and market is stark and revelatory – such as when state agriculture departments are charged with both regulating fertilizers and promoting their use to farmers (101).

A crucial effect of input-intensive agriculture has been a 'transfer of resources from the practice of agriculture to the science of agriculture' (132), and by the wresting of decision-making control away from farmers to professional scientists and agri-business. Farmers are therefore transformed from autonomous *generators* to dependent *appliers* of knowledge produced elsewhere, either in the lab or the experiment station. The chapter on seeds and crop breeding through the case of hybrid corn (Chapter 5) exemplifies these dynamics. Not only were farmers reduced to passive recipients of new technologies but also made into consumers of inputs. As public sector breeders in mid-twentieth century USA were mandated to prioritize practical (read: commercial) applications of their work, 'new knowledge produced by agricultural science would increasingly reach the farmer not as a public good but as commodities' (145). The effect of this commodification has not only been the loss of self-sufficiency in seeds but also a process of agricultural deskilling in which farmers lose the ability to discern between seeds or clearly identify their properties.

While much of the book is centered on the US, the specter of the Green Revolution looms large. How these technologies traveled to the global South, and with what effects, is a central element of the story of industrial agriculture (Chapter 6). While debunking the myths of impending famine and agricultural imports that justified intervention into Indian agriculture, Stone demonstrates that it was not Borlaug's famous high-yielding varieties of wheat that boosted productivity. He argues that this popular seed-centric narrative is 'a classic tale of how we find a way to attribute productivity to a piece of technology in the farmer's field rather

than to the external resource and policies that actually cause change' (163). Stone retells the story of India's Green Revolution with fertilizers, not seeds, as its central protagonist. But fertilizers are not simply an innocent accompaniment on the road to greater productivity – here too, the author emphasizes that the primary objective was the expansion of fertilizer production and markets in the subcontinent. Apparent 'self-reliance' on food grains was paradoxically built on an increased dependency on the import of fertilizers.

If Stone begins with Lenin's inquiry around 'who gains?', he concludes with another, better-known question posed by the Russian revolutionary: 'what is to be done?'. The final chapter (Chapter 7) explores one actually existing alternative, what Stone labels 'intensive agriculture'. Interestingly, he points out that this model allows for agricultural growth, but without reliance on industrial technologies. Here, production grows by 'changing practices, labor, and local technology' (195). Taking us to the Kofyar homeland in Nigeria, Stone counters portraits of African agriculture as backward and unproductive, instead outlining how local farming practices have improved productivity and soil fertility. Drawing on the pioneering work of Ester Boserup and Robert Netting, as well as his own ethnographic research, Stone inverts Malthus' logic, showing that population growth prompts agricultural developments, rather than the other way around. This section delves into the minutiae of intensive agriculture, from labor arrangements to fertilizer use, and in doing so, highlights the wondrous variability of agricultural practice and the creative innovations of ordinary farmers. In a decidedly unromantic and highly practical fashion, Stone argues that the hallmark of intensive cultivation is its 'dynamism and ability to change' (213) – contrary to popular imaginations of such farming as static and its farmers as ignorant.

Running through the entire text are the racial underpinnings of the productivist ideal as well as its imagined 'other', the lazy and unproductive peasant. Improving crop qualities and increasing yields are practices embedded within racialized logics that tie into projects of human improvement and the perpetuation of social hierarchies, whether through eugenics movements or the association of particular grains with particular racial groups. Malthus' own musings on the 'indolence' of English laborers, and neo-Malthusian accounts of the alleged relationship between population, poverty, and famine attests to the deeply elitist and racist logics guiding mainstream debates on food and agriculture (Chapter 2). How racial ideologies continue to shape agricultural science and technology is a subject worthy of further exploration for researchers.

In another vein, we might ask why so many farmers adopt these input-intensive technologies and indeed, why so many people continue to be deeply invested in the industrial model of agriculture. The book explores the significance of environmental (observation of effects) and social (emulation for prestige and conformity) learning, as well as 'didactic learning' (propaganda and marketing) in shaping farmers' decisions to adopt these inputs. While significant, these explanations do not fully engage with the agency, aspirations, and inequalities among farmers that shape their imaginative and material investments in productivism. And despite the meticulous unpacking of the overpopulation/underproduction myth by activists and scholars, its continued hold on popular discourse cannot be explained away in terms of profit and propaganda. Industrial agriculture, it would seem, has not only captured the state and its machinery but also the public imagination of what agriculture is and what it could be. As Stone admits, part of the blame lies with social scientists like himself who have not (yet) adequately disseminated their ideas to broader audiences.

This book is Stone's worthy contribution to this urgent endeavor. It deserves to be widely read by development practitioners and policymakers who continue to think and act (often unknowingly) on these false assumptions and vested interests. The book is also essential reading and an exceptional teaching resource for scholars across the fields of critical agrarian studies, political ecology, and science and technology studies. To return to the student questions with which I began this review, this monograph offers a treasure of nuanced answers and indeed, a portal to asking different questions and imagining alternative agrarian futures.

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