

WHY CARE ABOUT DIRT? TRANSATLANTIC PERSPECTIVES ON THE HISTORY OF AGRICULTURE

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Can one compare German and American agriculture? Few fields of history have a weaker comparative record than agricultural history, and for a reason.¹ Comparative history has usually been best whenever there was an enticing mixture of similarities and differences, and in the case of agriculture, it might appear that the balance is tilting excessively toward the latter. The situation of, say, a New England colonist or a nineteenth-century prairie farmer seems to bear little resemblance to that of a German peasant, who had to cope with the remnants of feudalism until well into the twentieth century. Whereas the frontier myth endowed American farming with an aura of autonomy and self-reliance, German rural affairs evoke notions of conservatism and backwardness, of “eternal peasants” and, at worst, “blood and soil.” The rural utopia of Thomas Jefferson was truly a world away, in more than one sense, from the paleoabsolutist longings of the West Prussian lord of the manor Elard von Oldenburg-Januschau, who achieved historic notoriety with his 1910 remark that the German emperor should always be in a position to decree the closure of parliament by military force.² The situation might appear even more dismal when one focuses on environmental issues. There seems to be no obvious equivalent in German agricultural history to the prodigious disaster that the Dust Bowl meant for U.S. agriculture, or to the impressive rise of a soil conservation bureaucracy that it begat. Six years after its foundation in 1933, the United States Soil Conservation Service (SCS) comprised 13,290 employees, with 20,000 additional employees working on soil conservation issues within the Civilian Conservation Corps and the Emergency Relief Administration.³ In contrast, the Dust Bowl inspired little more than a lukewarm discussion over the perils of “desertification” in the German context, led mostly as a one-man crusade by the “National Landscape Advocate” of Nazi Germany, Alwin Seifert.⁴ A group of soil specialists, set up and funded by the West German Min-

istry of Agriculture after World War II, had not grown to more than a dozen members by 1967.⁵

The prospects for comparative approaches look more promising when one takes a step back from these diverse phenomena and considers the general context of twentieth-century farming. In both countries, agriculture was increasingly driven by consumer demands since the late nineteenth century. The crucial link between rural producers and urban consumers is better known in the United States than in Germany as a result of William Cronon's influential *Nature's Metropolis*, a study of Chicago's pivotal role as a hub for natural commodities.⁶ At its root, the market revolution of the nineteenth century was a transportation revolution, and it is revealing that transportation issues figured prominently in late-nineteenth-century farm policy. In the United States, concerns over unfair railroad tariffs helped to fuel the populist revolt; in eastern Germany, grain producers successfully stalled the construction of the *Mittellandkanal*, a canal that was to connect Berlin and the eastern provinces with North Sea harbors, thus facilitating market access for cheap grain imports.⁷ But fighting the transportation revolution soon turned out to be a hopeless cause: the *Mittellandkanal* was completed during the interwar years, and farmers realized that the best way to stay in business was to increase productivity. And for German and American farmers alike, the most important way to boost agricultural productivity was to apply scientific expertise.

The rise of the agricultural sciences is still one of the most understudied fields in the history of science. Little has changed since 1990, when Deborah Fitzgerald remarked, "Just as agricultural historians have neglected the relationship between science, technology, and agriculture, so historians of science and technology have been rather reluctant to examine the origins and development of the agricultural sciences in the United States."⁸ A few years ago, German historian of science Margit Szöllösi-Janze made an almost identical remark.⁹ As a result, the immense transformative power of scientific expertise is strangely absent from many agricultural history books; for example, Ulrich Kluge's recent overview of German agricultural history in the twentieth century, for all its apparent merits, does not include a chapter on these themes.¹⁰ Yet twentieth-century agriculture saw nothing short of a scientific revolution: gradually, scientific expertise evolved into a force that challenged practically every aspect of farming. Scientific experts influenced the farmers' choice of seeds and fertilizers as well as the breeding of animals, and paved the way for the use of high-tech machinery, often determining "good practices" to such an extent that farmers became mere executioners of expert advice.

In order to understand the true extent of the challenge of “scientific farming,” it is crucial to recognize the ambiguity of the overarching goal of agricultural productivity. Farmers could pursue very different paths to profitability, and the best option was and remains anything but obvious. Farmers may boost per-acre yields by specializing in a certain crop, but that makes them more dependent on price fluctuations for this one commodity. Farmers may seek maximum yields by massive doses of pesticides and fertilizers, only to realize that the costs did not justify the results. Most importantly, the exact meaning of agricultural productivity was closely dependent on the time frame. The “suitcase farmers” of the Midwest—urbanites who bought parcels of land, put in seed in the spring, returned to their regular jobs, and then returned in the fall to see if anything had grown—could be a profitable business model in the short term, but it implied an enormous risk for soil fertility in the long run.¹¹ With market forces pushing a huge number of agricultural producers out of business over the course of the twentieth century, pressure was strong for German and American farmers alike to focus on short-term gains and neglect long-term sustainability. Therefore, a transatlantic comparison should include an environmental perspective: the history of twentieth-century agriculture is not only about farmers and scientists, commodities and machinery, but also about precarious ecological resources like land and water. While traditional agriculture, for better or worse, often took these resources for granted or modified them to a rather limited extent for lack of sufficient technology, modern agriculture has enormously increased mankind’s transformative capabilities. Much has been written about water resources in Germany and the United States.¹² But the soil deserves no less attention: after all, agriculture, and in fact any kind of plant life, is dependent on a small band of earth rarely more than a foot thick that includes organic matter in sufficient quantities. Even more, one of the essential characteristics of fertile soil is the low speed of chemical and biological processes, making the dynamism inserted into the soil by modern farming practices all the more delicate. And this situation accompanied a widespread ignorance of soil microbiology and chemistry among farmers and their experts: often, the farmers’ ability to transform their soils grew much more quickly during the modern era than the corresponding body of knowledge. Therefore, it should come as no surprise that both countries experienced a soil crisis during the twentieth century, and a transatlantic comparison of these crises tells a lot about agriculture in both countries, as well as the secular trend of the industrialization of agriculture in general.

The most obvious case of a soil crisis was, of course, the Dust Bowl that plagued the southern Great Plains in the 1930s. Given its prominence in U.S. history and (thanks to John Steinbeck) world literature, the litera-

ture on the Dust Bowl is still surprisingly small.¹³ In fact, interest in the ensuing westward migration has been much stronger than interest in the event itself: "When the story of the Dust Bowl is told, it is most often the story of those who left," Pamela Riney-Kehrberg remarked, emphasizing that this focus ignores the fact that no less than three-quarters of the residents chose to stay in the face of enduring hardships.¹⁴ With meager research and without a consensual definition of the term, the Dust Bowl continues to be a myth as much as an actual event, resulting in textbook descriptions with a notable lack of precision.¹⁵ One of the most enduring myths, most recently restated by Joachim Radkau in his world environmental history, holds that the Dust Bowl was a wakeup call for the vulnerability of the soil, inspiring global efforts to control erosion.¹⁶ However, reality was more complicated.

Dust Bowl narratives tend to move smoothly from a description of the farmers' misery on the southern plains to an outline of the efforts of the federal Soil Erosion Service, founded in 1933 and renamed the Soil Conservation Service in 1935. Led for almost two decades by the charismatic Hugh Bennett, the agency sought to promote soil-conserving farming techniques, ultimately earning a reputation as "one of the more successful agencies spawned by the New Deal."¹⁷ But such a reading is mistaken on at least two points. Bennett was far less impressed by the misery in the Midwest than conventional narratives assume. Bennett was a native of North Carolina, and the water erosion problems of the American South were always higher on his list of priorities than the wind erosion on the southern plains.¹⁸ While Bennett gave numerous speeches all over the southern states, this author was unable to identify a single speech in the Dust Bowl region during the 1930s.¹⁹ Furthermore, what has been depicted as a science-based crusade was in reality pretty much the opposite: a haphazard, improvised campaign driven far more by the wayward reactions of farmers, the lack of expert knowledge, and the law of unintended consequences than by science and planning. In an interview conducted in 1967, Walter Lowdermilk, the SCS's second in command during the 1930s, frankly admitted that soil conservation policy had not evolved according to a comprehensive master plan: "This work is like a chess game; we make a move and then see what happens to direct us to make another move. Each step leads to another step."²⁰

Hugh Bennett was eager to stress the cooperative nature of all soil conservation efforts. "Much of our success in the soil and water conservation program has been due to our ability to bring farmers and ranchers to understand that the primary responsibility for conservation is theirs, not that of the government," Bennett noted in a speech of 1951.²¹ His successor Robert Salter even chastised "compulsion by government

edict" as "the way Mr. Stalin is introducing technology into Soviet agriculture."²² These latter abjurations notwithstanding, Bennett's original intentions were very much along the lines of compulsion and government planning. In a memorandum that he wrote for the Secretary of the Interior in January 1934, some four months after the start of the program, Bennett found it "apparent that the solution lies in measures of erosion control and in certain restricted regulations of land use in the public interest."²³ As late as 1947, the Soil Conservation Service published a brochure on "Land Use Regulation in Soil Conservation Districts" in a vain effort to push the local soil conservation districts toward legal coercion.²⁴

It is a matter of debate whether there was a realistic chance to impose and enforce rules and regulations on soil conservation. However, it is clear that cooperation and education figured prominently in SCS rhetoric from its inception, and the themes of expert advice soon moved beyond soil conservation necessities, especially after Bennett's retirement in 1952. While Bennett liked to depict soil conservation as essential for the survival of American civilization, the actual SCS work drifted toward general advice in the pursuit of agricultural intensification. The new direction did not become clear until a press dispute between Bennett and his successor in the journal *Country Gentleman*, when Salter, charged by Bennett with "wrecking soil conservation," laid out his ideas. Whereas soil conservation had always ranked first and foremost in Bennett's speeches, Salter sought "to protect the soil and build up its productivity, both at the same time."²⁵ On another occasion, Salter likewise insisted that "there's more to conservation farming than controlling erosion. It involves the prevention of soil deterioration and erosion, more productive use of the rain that falls on the land, proper drainage and irrigation, rebuilding eroded soil, building up soil fertility, and increasing yields and farm income—all at the same time."²⁶ It is clear in retrospect however that the change had already been under way during Bennett's tenure. One of the signs had been a growing interest in drainage work, an activity that was far more important for productivity than for soil conservation. "There are some 31 million acres now in farms that need drainage," Bennett noted in an address of 1944, tacitly glossing over the fact that draining land would, if anything, boost farm production but increase the risk of erosion.²⁷

It is important to recognize that the key impulse in this shift of focus came from the field personnel of the SCS, the people who were trying to enlist farmers in the drive against erosion. A soil surveyor who had joined the service in 1939 later recalled that his work in Alabama was "a little like selling insurance," and that captured the dominant experience in the field.²⁸ The Soil Conservation Service was dealing with a reluctant

constituency, and converting farmers to the cause of soil conservation often required more than good expertise. This was a scarce commodity during the 1930s; in fact, soil erosion specialists were one of the few professionals in short supply during the Great Depression. The Soil Conservation Service often solved these difficulties by offering financial incentives. To give just one example, the director of the Extension Service in Stillwater, Oklahoma reported in 1935 that while his own men sought to encourage farmers to use contour plowing by offering ten cents per acre for fuel or feed, the staff of the SCS, operating a similar program across the border in Texas, presented farmers with a far more generous offer, even supplying them with free fuel for the tractors.²⁹ This kind of generosity was clearly common in the service, especially during the early years, and financial incentives became so essential to soil conservation work that they were never flushed out of the service's arsenal. In fact, it appears that no one ever seriously tried to pursue a purely consultative approach.³⁰ The results were reflected in many reports from soil conservation districts in the 1950s and 1960s, where subsidies for lime and cheap offers for the use of heavy machinery were usually the key selling points. What had begun as a soil conservation drive was now effectively a support program for the intensification of agriculture.

German agriculture had a soil crisis as well, though it is not remembered as vividly as its American counterpart for lack of spectacular dust storms. The German soil crisis was the result of World War I, when German farm production declined by about one-third. With nitrates no longer available as fertilizers due to their military importance, and organic wastes shrinking as a result of poor feed and a massive decline in the number of hogs, yields per acre declined dramatically.³¹ After the war, the general rallying cry was for an increased use of mineral fertilizers: agricultural scientists, administrators, and lobbyists from the fertilizer industry were unanimous in their opinion that with greater doses of nutrients, the situation would be remedied quickly. In fact, fertilizer use became an issue of life or death from the agricultural community's point of view. A memorandum of the Prussian Ministry of Agriculture solemnly declared in 1920, "The necessary amounts of mineral fertilizer are available, and can be purchased and put into the soil. If that does not happen, people will starve."³²

With the Haber-Bosch synthesis, mineral fertilizer became available for the first time, and farmers, encouraged by the universal propaganda, bought and used it in unprecedented quantities. The quick regeneration of agricultural soils turned out to be elusive, however: for some plants, it took more than a decade to return to pre-war average yields. Farmers were disaffected for both financial and ecological reasons. In economic terms, the pervasive call for more intensive fertilizer use resulted in mis-

directed investments. Expenditures for fertilizers were usually the greatest single item in the farmers' budgets, and with many farmers struggling to pay their mortgages in the late 1920s—a crisis immortalized in Hans Fallada's novel *Bauern, Bonzen und Bomben*—malinvestments were clearly a sensitive topic.³³ In a 1931 book, Hans Schlange-Schöningen noted that fertilizer doses were "one of the greatest sources of risk in agriculture," warning farmers that they should not "take a gamble" in this regard.³⁴ However, the ecological consequences of intensive fertilizer use were potentially even more severe: the massive use of ammonium fertilizer induced a widespread acidification of agricultural land, which in turn severely curtailed soil fertility. Acid soil was "a threat that has received insufficient attention so far," a 1923 study noted.³⁵ While precise figures on the nationwide extent of acidification were lacking, observers generally agreed that the problem was widespread; in the Prussian province of Saxony, the Chamber of Agriculture [Landwirtschaftskammer] estimated that 50 to 60 percent of the lighter soils were suffering from acidification.³⁶ Even more, quick solutions were not at hand: it took two to three years to regenerate acid soil with lime, in addition to the expenses that this remedy entailed.³⁷ In short, the agricultural science establishment was facing a massive crisis of confidence as a result of its ill-directed fertilizer propaganda, and it was no coincidence that the 1920s saw the rise of alternatives to conventional farming, most prominently in the form of biodynamic farming as defined by Rudolf Steiner in 1924.³⁸ Characteristically, many farmers were enthusiastic when they heard of the new type of organic farming, seeing the prospects of substantial savings and sensing that organic farming was actually a return to the farming practices of their venerable forefathers.³⁹

It is not possible to discuss here the full range of consequences of the acidification crisis.⁴⁰ But from a transatlantic perspective, it should be noted that it did not lead to greater awareness of the precarious nature of soil fertility among either farmers or scientists. Quite the contrary: The acidification crisis paved the way for agricultural intensification, quite similar to the role of the Soil Conservation Service in the United States. In order to detect acid soils, agricultural scientists called on farmers to conduct chemical soil analyses. The chance to learn about a dangerous condition these analyses offered made them quite popular among farmers.

Moderate costs helped encourage the farmers' interest: since 1926, the federal government sponsored a program with subsidies for chemical analysis.⁴¹ In some areas, such as the administrative region of Kassel, the Chamber of Agriculture even offered soil analysis for free.⁴² The Prussian Ministry of Agriculture reported 37,709 soil analyses for acid soils during the 1931 calendar year, with 35 percent showing a need for lime. The

same report also showed some 10,000 soil analyses for 2 other nutrients, potash and phosphorus, and these figures point to the ambiguous side effects of the drive to monitor soil acidity.⁴³ Soil analyses for these nutrients were far more unreliable than the traditional pH tests for acidity. In fact, the chair for agricultural chemistry at the Berlin Agricultural College called for "utmost caution" regarding laboratory analyses of soil in a report to the Prussian Ministry of Agriculture of 1931, noting that they could not offer more than a "general orientation" and should in no case take the place of classic field experiments.⁴⁴ But this warning, which accompanied numerous other voices pointing to the staggering lack of precision of potash and phosphate tests, did not stop the program of subsidies, or even significantly irritate the users of soil analysis. The tests for acidity had established the credibility of these tests, and farmers readily extended this sense of trust to soil analysis in general. In this way, the soil crisis of the 1920s allowed the pervasive introduction of soil analysis, an important step in the growing use of scientific expertise in twentieth-century farming.

Lack of precision remains a notorious problem of chemical soil analysis in the present; a recent handbook noted that they allow "only an approximate" description of plant nutrition.⁴⁵ But there was more to soil tests than the use of an imprecise method: By focusing on nutrients only, they presented a highly selective view on soil fertility. From the viewpoint of chemical soil analysis, a fertile soil contained nitrogen, potash, phosphate, and lime in sufficient quantities, thus rendering issues of humus and organic matter marginal. To be sure, few people argued that humus was actually unimportant for soil fertility, but soil analysis induced them to focus on other issues. Even more, soil analysis encouraged a thinking in short time spans: tests showed the need for nutrients for the next three or four vegetation cycles but ignored the fact that in the long run, soil fertility also depended on a healthy humus layer of sufficient size. As a result, the humus layer slowly moved to the margins of attention, not because someone challenged its general importance for sustainable farming but rather because the dominant knowledge system focused ever more narrowly on the here and now.

Therefore, the soil crises in Germany and the United States had a similar outcome: In the long run, the quick fixes clearly prevailed over the sustainable ones. Neither crisis led to a general change in attitude toward the soil or a popular awareness of the frailty of soil fertility, let alone a commitment to honor this precious resource through soil conservation practices. On the contrary, short-term solutions reigned supreme in both countries, and crisis management ultimately favored the process of agricultural intensification, rather than challenging it from a long-term ecological perspective. Therefore, a transatlantic perspective demonstrates

not only striking similarities in the process of agricultural intensification but also a second, more worrisome phenomenon: the enormous momentum of the agricultural revolution of the twentieth century. Even Hugh Bennett, a person with immense energy and knowledge and a well-publicized disaster at hand, was unable to stem this trend; in fact, his own agency, set up to save the soils of America from erosion, came to encourage their more intensive use. As a result, erosion continues to be a huge and widely underestimated problem. In 1997, the National Resources Inventory found that the United States is losing 1.9 billion tons of soil per year due to erosion.⁴⁶

In his widely acclaimed history of the Dust Bowl, Donald Worster saw the erosion crisis as the prodigious disaster of agricultural capitalism: "The Dust Bowl . . . was the inevitable outcome of a culture that deliberately, self-consciously, set itself that task of dominating and exploiting the land for all it was worth."⁴⁷ A transatlantic perspective might inspire some doubt about such a far-reaching indictment; after all, German peasants had been producing for urban markets since the Middle Ages. But Worster was right in sensing that the Dust Bowl was far more than an accidental event, an unfortunate incident caused by an untimely drought. The Dust Bowl was but one variant of a general dilemma of modern farming: how to bring business cycles and ecological cycles into sync. With market pressures accumulating in the wake of a global market for agricultural commodities, the tendency was strong among farmers anywhere to focus on short-term gains and become oblivious to the long-term ecological implications. It was not that the farmers on the southern plains were particularly unlucky. Rather, farmers elsewhere were lucky that their own soil crises were of a less spectacular variety.

It may be time, in agricultural history and elsewhere, to start rereading Karl Polanyi's *The Great Transformation*. In this book, originally published in 1944, Polanyi described how the market system, traditionally embedded into other social systems, emerged as the dominant system with the rise of the modern world, putting old coping mechanisms and old safety nets under stress and ultimately breaking them before new ones were developed. While markets had been one aspect of economic and social life up to the nineteenth century, they now emerged as the dominant force, reducing work and nature to mere commodities with no inherent value but market value. From an environmental history perspective, the crucial aspect is Polanyi's insistence that, pervasive free-market rhetoric notwithstanding, markets continue to be embedded in society. The history of agriculture in the twentieth century provides a showcase of the merits of the concept of embeddedness: Contrary to the myths of the market economy, agricultural soils remain an entity of nature, with their own autonomous logic. Market forces may influence the internal dy-

dynamic of soils, but they cannot determine these processes. In other words, there is no guarantee that the cycles of business and the ecological cycles of farmland can be compatible; in fact, with both proceeding according to their own rationales, it is unlikely that they will be compatible. Disasters like the Dust Bowl or the German acidification crisis may make scientists more informed about certain practices, and certainly did in both these cases. But they cannot resolve, at least by themselves, the fundamental dilemma of twentieth-century farming.

What then are the advantages of a transatlantic historical perspective? For a number of years, agriculture has been the subject of intensive discussions in both Germany and the United States. Environmentalists criticize the severe ecological toll of modern farming, while others attack the hazards of modern food production for consumers; farmers are still disaffected with their average incomes, while economists chastise the disturbing impact of Western farm commodities on rural markets worldwide. It is difficult to make sense of the current situation. On the one hand, fertilizer use is no longer growing, as it did for most of the twentieth century, but rather stagnating and even declining to a significant extent. On the other hand, the trend toward more intensive production continues unabated, with hog farms of giant proportions, for example.⁴⁸ So is industrialized agriculture finally losing its momentum and reaching its apogee, paving the way for some “new roots for agriculture?”⁴⁹ Once more, a transatlantic perspective may challenge convenient modes of perception: While German agricultural reformers continue to celebrate organic farming as the model of the future, American researchers have become more skeptical of the “agrarian dreams” of alternative producers.⁵⁰ If farming goes global, shouldn’t historians of agriculture do the same?

Notes

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¹ Characteristically, the recent handbook on German and American history during the Cold War does not include a chapter on agriculture. Detlef Junker, *Die USA und Deutschland im Zeitalter des Kalten Krieges 1945–1990. Ein Handbuch*. 2 vols. (Stuttgart and Munich, 2001).

² Heinrich August Winkler, *Der lange Weg nach Westen. Bd. 1: Deutsche Geschichte vom Ende des Alten Reiches bis zum Untergang der Weimarer Republik* (Munich, 2000), 310.

³ National Archives of the United States RG 114 Entry 1040 Box 1, Report of the Chief of the Soil Conservation Service for Fiscal Year Ending June 30, 1939, 77.

⁴ On Seifert, see Thomas Zeller, *Straße, Bahn, Panorama: Verkehrswege und Landschaftsveränderung in Deutschland von 1930 bis 1990* (Frankfurt and New York, 2002).

- ⁵ Bundesarchiv Koblenz B 116/18259, memorandum for Referat II A 2 of January 30, 1967.
- ⁶ William Cronon, *Nature's Metropolis: Chicago and the Great West* (New York, 1991).
- ⁷ Cf. Robert C. McMath, Jr., *American Populism: A Social History 1877–1898* (New York, 1993); Hannelore Horn, *Der Kampf um den Bau des Mittellandkanals: Eine politologische Untersuchung über die Rolle eines wirtschaftlichen Interessenverbandes im Preußen Wilhelms II.* (Cologne and Opladen, 1964).
- ⁸ Deborah Fitzgerald, *The Business of Breeding: Hybrid Corn in Illinois, 1890–1940* (Ithaca and London, 1990), 1.
- ⁹ Margit Szöllösi-Janze, "Die institutionelle Umgestaltung der Wissenschaftslandschaft im Übergang vom späten Kaiserreich zur Weimarer Republik," in Rüdiger vom Bruch and Brigitte Kaderas (eds.), *Wissenschaften und Wissenschaftspolitik: Bestandsaufnahmen zu Formationen, Brüchen und Kontinuitäten im Deutschland des 20. Jahrhunderts* (Stuttgart, 2002), 72.
- ¹⁰ Ulrich Kluge, *Agrarwirtschaft und ländliche Gesellschaft im 20. Jahrhundert* (Munich, 2005).
- ¹¹ Cf. Donald Worster, *Dust Bowl: The Southern Plains in the 1930s* (Oxford et al, 1979), 93.
- ¹² Cf. Rita Gudermann, *Morastwelt und Paradies: Ökonomie und Ökologie in der Landwirtschaft am Beispiel der Meliorationen in Westfalen und Brandenburg (1830–1880)* (Paderborn, 2000); Marc Reisner, *Cadillac Desert: The American West and its Disappearing Water* (New York, 1987); Donald Worster, *Rivers of Empire: Water, Aridity, and the Growth of the American West* (New York et al, 1992); Mark Fiege, *Irrigated Eden: The Making of an Agricultural Landscape in the American West* (Seattle and London, 1999).
- ¹³ Cf. R. Douglas Hurt, *The Dust Bowl: An Agricultural and Social History* (Chicago, 1981); Donald Worster, *Dust Bowl*; Pamela Riney-Kehrberg, *Rooted in Dust: Surviving Drought and Depression in Southwestern Kansas* (Lawrence, 1994); Paul Bonnifield, *The Dust Bowl: Men, Dirt, and Depression* (Albuquerque, 1979); and most recently Timothy Egan, *The Worst Hard Time: The Untold Story of Those Who Survived the Great American Dust Bowl* (Boston, 2006).
- ¹⁴ Riney-Kehrberg, *Rooted in Dust*, 2.
- ¹⁵ Cf. Harry C. McDean, "Dust Bowl Historiography," *Great Plains Quarterly* 6 (1986): 118n.
- ¹⁶ Joachim Radkau, *Natur und Macht: Eine Weltgeschichte der Umwelt* (Munich, 2000), 212.
- ¹⁷ Willard W. Cochrane, *The Development of American Agriculture: A Historical Analysis* (2d edition, Minneapolis and London, 1993), 292.
- ¹⁸ Cf. Donald Worster, "A Sense of Soil," in Worster (ed.), *The Wealth of Nature: Environmental History and the Ecological Imagination* (New York and Oxford, 1993), 72.
- ¹⁹ Cf. the collection of speeches in Iowa State University Library, Special Collections Department, Ames, Iowa, MS-164, Box 10.
- ²⁰ Walter Clay Lowdermilk, Soil, Forest, and Water Conservation and Reclamation in China, Israel, Africa, and the United States. An Interview Conducted by Malca Chall, University of California, Bancroft Library/Berkeley, Regional Oral History Office, Berkeley, 1969, vol. 1, 151n.
- ²¹ Iowa State University Library, Special Collections Department, Ames, Iowa, MS-164 Box 1 Folder 5, Statement by Hugh H. Bennett, Chief, Soil Conservation Service, Requested by the Senate Committee on Expenditures in the Executive Department, Regarding Committee Print of S. 1149 on Reorganization of the Department of Agriculture, September 24, 1951, 15.
- ²² National Archives of the United States RG 114 Entry 1039 Box 2 Folder "Speeches—Salter," The Job Ahead. A Talk by Dr. Robt. M. Salter, Chief, Soil Conservation Service, at the 6th annual meeting of the National Association of Soil Conservation Districts at Cleveland, Ohio, on February 28, 1952, 3.
- ²³ National Archives of the United States RG 114 Entry 1 Box 1 Folder "February 1934," H. H. Bennett, memorandum for the Secretary of the Interior, January 27, 1934.

²⁴ Cf. National Archives of the United States RG 114 Entry 1039 Box 8 Folder "Historical Materl. on SC Districts," U.S. Department of Agriculture, Soil Conservation Service, Land Use Regulation in Soil Conservation Districts (SCS MP-29), January, 1947.

²⁵ Cf. Hugh H. Bennett, "They're Wrecking Soil Conservation," *Country Gentleman* 72:12 (December 1952): 21, 52, 56; and Robert M. Salter, "We're Speeding Up Soil Conservation," *Country Gentleman* 73:1 (January, 1953): 40–42. Quote, 40.

²⁶ National Archives of the United States RG 114 Entry 1039 Box 2 Folder "Speeches—Salter," America's Capacity to Produce Food. An address by Dr. Robert M. Salter, Chief, Soil Conservation Service at the National Farm Institute, Des Moines, Iowa, February 15, 1952, 4.

²⁷ National Archives of the United States RG 114 Entry 1021 Box 2 Folder "Illinois," The Mission of Soil Conservation. Address by Dr. H. H. Bennett, Chief of the Soil Conservation Service, during the National Convocation on The Church in Town and Country, at Elgin, Illinois, November 16, 1944, 4.

²⁸ Iowa State University Library, Special Collections Department, Ames, Iowa, MS-198 Box 1 Folder 4, Oral History Interview with William B. Davey, 8.

²⁹ National Archives of the United States RG 114 Entry 1 Box 1 Folder "May 1935," D. P. Trent, Director, Extension Service, Stillwater, Oklahoma, to Dr. Rexford G. Tugwell, Under-Secretary of Agriculture, May 11, 1935.

³⁰ Cf. Bruce L. Gardner, *American Agriculture in the Twentieth Century: How It Flourished and What It Cost* (Cambridge, Mass., and London, 2002), 194.

³¹ Wolfgang J. Mommsen, *Die Urkatastrophe Deutschlands: Der Erste Weltkrieg 1914–1918* (Stuttgart, 2002), 93.

³² Bundesarchiv R 3602 no. 606, Denkschrift des preußischen Landwirtschaftsministers zur Frage der Volksernährung, November 1, 1920, 1.

³³ Hans Fallada, *Bauern, Bonzen und Bomben* (Berlin, 1931).

³⁴ Hans Schlange-Schöningen, *Das Wirtschaftsjahr des praktischen Landwirts* (Berlin, 1931), 23.

³⁵ Ernst Niggel, *Bedeutung und Anwendung der Kalkdüngung* (8th edition, Berlin, 1923), 5.

³⁶ Geheimes Staatsarchiv Preußischer Kulturbesitz Berlin I. HA Rep. 87 B no. 10557 p. 394r. See also Schellenberger, *Zeitgemäße Vorschläge für die Düngung der landwirtschaftlichen Kulturpflanzen* (Dresden, 1924), 17.

³⁷ Paul Wagner, "Das Thomasmehl als Frühjahrsdünger," in Verein der Thomasmehlerzeuger (ed.), *Unseren Freunden vom Thomasmehl* (Berlin, 1929), 4.

³⁸ Cf. Gunter Vogt, *Entstehung und Entwicklung des ökologischen Landbaus* (Bad Dürkheim, 2000), 98–133.

³⁹ Staatsarchiv Münster Landwirtschaftliche Kreisstellen Nr. 698, newspaper article of January 12, 1931.

⁴⁰ See Frank Uekötter, "Know Your Soil: Transitions in Farmers' and Scientists' Knowledge in the Twentieth Century," in John McNeill, Verena Winiwarter (eds.), *Soils and Societies. Perspectives from Environmental History* (Cambridge, 2006), 320–338, for a more intensive discussion.

⁴¹ Geheimes Staatsarchiv Preußischer Kulturbesitz Berlin I. HA Rep. 87 B no. 10421 doc. 29.

⁴² Geheimes Staatsarchiv Preußischer Kulturbesitz Berlin I. HA Rep. 87 B no. 10557, 400.

⁴³ Geheimes Staatsarchiv Preußischer Kulturbesitz Berlin I. HA Rep. 87 B no. 10423, attachment to Preußischer Minister für Landwirtschaft, Domänen und Forsten to the Reichsminister für Ernährung und Landwirtschaft, March 12, 1932.

⁴⁴ Geheimes Staatsarchiv Preußischer Kulturbesitz Berlin I. HA Rep. 87 B no. 10423, Institut für Agrikulturchemie und Bakteriologie der Landwirtschaftl. Hochschule to the Ministerium für Landwirtschaft, Domänen und Forsten, Berlin, October 10, 1931, pp. 2, 5.

⁴⁵ Wulf Diepenbrock et al, *Spezieller Pflanzenbau* (3rd rev. edition, Stuttgart, 1999), 86.

⁴⁶ Cf. <http://www.nrcs.usda.gov/technical/land/meta/m5852.html>. This figure does not include erosion on land uses other than cropland and land in the Federal Conservation Reserve Program which provides subsidies for the retirement of land. Also, the figure does not include gully erosion, the most severe form of water erosion.

⁴⁷ Worster, *Dust Bowl*, 4.

⁴⁸ Cf. Carolyn Johnsen, *Raising a Stink: The Struggle over Factory Hog Farms in Nebraska* (Lincoln and London, 2003).

⁴⁹ Wes Jackson, *New Roots for Agriculture* (San Francisco and Salina, Kan., 1980).

⁵⁰ Cf. Julie Guthman, *Agrarian Dreams: The Paradox of Organic Farming in California* (Berkeley, 2004).