{essays in history}

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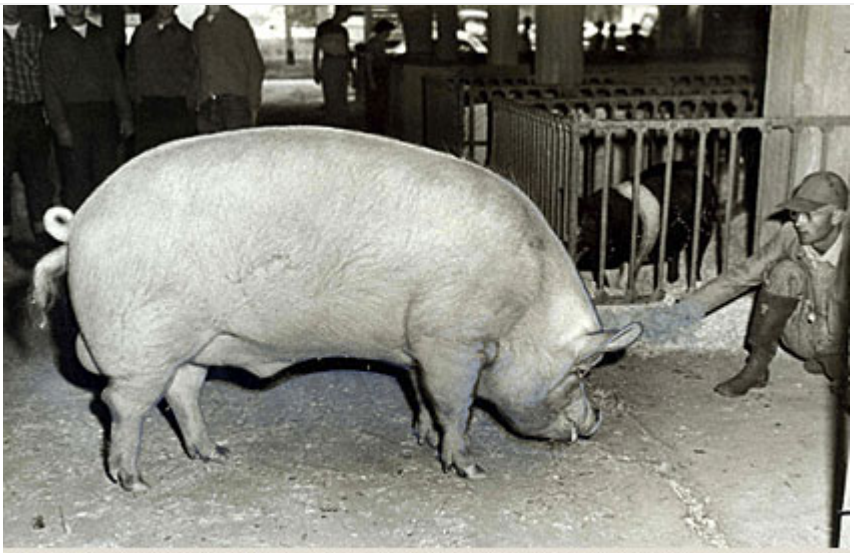
Making Bacon: Death, Mechanization, and the Ecology of Pig Breeding in the United States, 1900-1960



A large championship hog from the 1950s. As consumer preferences changed, what judges rewarded changed. The man's hand has been painted out for newspaper use. [NSHS]

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"The hog is the most plastic of all farm animals. In his wild state he is of unflinching gameness, an intrepid fighter, fleet as a race horse, and almost as cunning as a fox. Our ancestors transformed him into a domestic animal, and adapted him to their use, by breeding, selection and feeding." – F. D. Coburn, *Swine in America* (1910)[1]

E. B. White, author of beloved children's book *Charlotte's Web*, once described hog slaughter as "a tragedy enacted on most farms with perfect fidelity to the original script. The murder, being premeditated, is in the first degree." All the same he acknowledged that, whether or not it was murder, the bacon still tasted exceptionally good.[2]In the past, humans have even considered pigs as "crops," reducing a living being, by process of slaughter, to a marketable commodity.[3] Pigs cannot be sheared for wool like lambs, they are not effective draft animals like mules, they cannot be ridden like horses, and they are not useful as herders like border collies.[4] Thus short of the ability to find truffles, a specialized talent of pigs that, while important in the culinary arts, is fairly uncommon, modern pigs are only useful to humans when they are dead. As one old English adage says, "The hog is never good save when he is in the dish."[5]

But it is precisely this tension between life, death, and the "purpose" of a living organism that makes studying pigs interesting and worthwhile. Harriet Ritvo argued that animals are increasingly more common in environmental histories because "many of the difficult issues at the intersection of academic studies of the environment (historical or otherwise) and environmental politics have an animal dimension, or even an animal-triggered flashpoint."[6] As a part of this *danse macabre*, humans have used breeding and feeding techniques to sculpt pigs' bodies into something that will produce a better product after their death. The interaction between breeding and feeding has been an essential, yet understudied part of the process of turning a living creature into meat.

This paper examines expert advice in the United States from 1900-1960 and the ways those professionals conceived improved breeding and feeding could make better pigs, particularly focusing on themes of death, mechanization, and ecological roles. During the first half of the twentieth century, humans used the transformative techniques of controlled reproduction and improved nutrition to morph pigs, both physically and in the perceptions of their creators, from foraging creatures that cleaned

up ground waste into modern industrial animals that generate an enormous amount of effluence and are valued mostly in death. As part of a profit-seeking mindset, humans changed the way they idealized the ecological role of the pig. This means that as humans reimagined how pig bodies should function in relation to the natural world that reimagining led to an actual change in how pigs functioned in ecosystems—pigs' relationships between both human and non-human nature changed dramatically as they ceased being foraging creatures of fields and forests and developed into animals with much more regimented lifestyles in pens and enclosures. Industrial and market relationships to pigs were not new at the turn of the century, but the ways humans thought of breeding and nutrition were new and deserve study. Understanding how U.S. experts reconceptualized pig breeding and feeding lends insight into the human relationship with this farm animal and what we conceive of as the purpose of porcine bodies.

These changes in idealized pigs occurred nationwide, but it is important to remember that such large-scale changes frequently happen as the sum total of individual actions. Local stories and regional stories also matter and should not be overshadowed by the overarching national narrative. To aid in telling that story, this essay will use North Carolina as a case study to better understand the importance of individual, local actors in this national story. By the twentieth century, pork long had been a staple in the Southern food supply and North Carolina, but though it ranked as the second-leading pork-producing state in the 1990s, it can only be considered average for and representative of the South in 1900.[7] Even before World War I, the Division of Animal Husbandry of the United States Department of Agriculture (USDA) worked with state level extension agencies to help get information out to individual farmers and especially desired to improve livestock production in the South, showing a national governmental interest in the region.[8] Examining one state's extension agency helps show the tremendous importance that local, individual actors could have and grounds national discussions of pig breeding and feeding in the actual people who effected the small changes that led to national transformation.

It is clear that humans need plants and animals to survive in this world, but the particular ways humans have used those beings shows more about human culture than it does the biological entities at hand. Edmund

Russell phrased this succinctly when he called plants "biological factories," noting that humans have yet to uncover "how to transform sunlight, carbon dioxide, and a few nutrients into grain—except by subcontracting the job to plants."[9] Once those "biological factories" have converted sunlight into useable nutrition, animals then can turn that plant energy into work and, for the purposes of this essay, into flesh for human consumption. Humans have capitalized on this process by devouring animals for as long as we have been a species. At several times in recent history, however, humans dramatically altered this process of meat consumption by rearranging the ways that we turn, for example, pigs into pork.

Incredible innovations in both the nineteenth and twentieth centuries fundamentally changed our relationship to animal bodies by using technology to more efficiently produce meat. In the nineteenth century, mechanized meat production in Midwestern cities like Cincinnati and Chicago helped commoditize meat, and, consequently, as William Cronon argued, liberated meat from both nature and geography.[10] In the second half of the twentieth century, humans further industrialized meat production with "environmental control, genetics, nutrition, and disease management." As a result, as William Boyd showed, humans blurred "the distinction between nature and technology."[11] Even though economists Alan L. Olmstead and Paul W. Rhode pushed for the idea of "biological innovations," reminding scholars of the distinctly biological aspect of farm production, it is clear we still need thoughtful considerations of the mechanization of food production and also of the ways humans have treated animal bodies like meat-producing machinery.[12]

The pig provides an excellent vehicle for examining early-twentieth century shifts in U.S. meat production.[13] Before this change, experts all but took for granted that the essence of a pig involved foraging and cleaning up ground waste in forests and fields. By 1960, literature espoused that pigs should be raised in concreted dwellings and belonged in feeding pens. This process involved a swing away from focusing on breed ideals toward pigs that put on a profitable weight as quickly and efficiently as possible through improved notions of feeding and breeding, which were interconnected. Without better feeding, breeding was academic; without breeding, feeding did not maximize profits.

[14]Pigs became idealized less for fitting a breed paradigm and were instead judged by metrics of efficiency and cost. [15]

Of course pigs have been in the Americas for far longer than the first half of the twentieth century and a cursory examination of pre-twentieth-century history is prudent. Pigs first arrived at the land that would become the Americas as part of Christopher Columbus' second voyage and subsequent Spanish expeditions. The Jamestown settlement firmly established pigs in North America in 1607.[16] Since European colonization, pigs have occupied a notable place on the continent. [17] Pigs held most notable ubiquity as foraging, grazing animals, and this is seen especially in the legal conflict such activities created.[18] Pork can even be considered the most important meat in the United States during parts of the nineteenth century.[19] Even though their absolute importance may have declined by the twentieth century, pigs have been a significant part of history in the Americas since first European contact and remain an important part of the U.S. diet, economy, and culture to this day.

During these several centuries pig breeding in the Americas never held much significance until the nineteenth century. Prior to that century, humans had allowed many pigs to become feral creatures that foraged for their food, particularly eating mast—nuts and other ground matter—in forests.[20] During the 1800s, however, modern breeds started to develop in the United States, particularly through the importation of foreign purebreds (these pigs came from Europe, but had a great deal of Chinese ancestry).[21]Breeding functioned in the nineteenth century to domesticate wild pigs and cross them with these European-imported purebreds and in doing so developed the current breeds.[22] Nineteenth-century breeders wrought such changes that, by 1910, F.D. Coburn described the process, "Intelligence used in his breeding and care has raised the hog from the plane of the veriest savage, unsought except when hunted like any other wild beast, to that of a benefactor, contributing a wide variety of meats, among them the most toothsome known to the epicure, and other products essential to the best tables, to commerce and to the trades."[23]

The USDA as an organization, however, has not always placed emphasis on pig breeding, and its early lack of focus is representative of the paucity of printed references focusing on pig breeding at the turn of the

century. In 1900 the only mention in its *Yearbook* on the subject pertained to lists of breeders' associations in the appendix.[24]The *Yearbook* functions as a combination of the Department's year-end report and general information it wants to get across to the public interested in agriculture. It is important, though, when reading the *Yearbook* to remember historian Deborah Fitzgerald's words about the relationship between science and farmers. "Science was rarely something that was 'done to' farmers," Fitzgerald noted, "rather, it developed as a compromise between theory and necessity."[25] The USDA and extension agencies neither fully represented farmers nor fully were ignored by them. The organization's influence lay somewhere in the middle, and its publications remain a valuable source for understanding general intellectual trends in U.S. agriculture. At the turn of the century the *Yearbook* focused more on pig feeding, disease prevention, and lowering costs. A brief 1905 section mentioned a study of Poland China sows' fecundity, but it was quite small and a fairly atypical topic.[26] Breeding found itself during these decades consigned to yearly appendices of purebred breeders. The USDA did not make any significant reference to pig breeding for many years.

In a broader context, however, the USDA did summarize breeding trends in a 1901 article on "Progress in Plant and Animal Breeding." Though focused on other animals, it mentioned some poor choices made in breeding Poland China hogs and stressed the importance of keeping detailed records and data for determining the best breeding parents.[27] But pigs clearly had not achieved the status among breeders as other animals such as cattle had. The assertion of one agriculturist, Willet Hays exemplified this idea. Hays claimed "To add 25 per cent to the lean meat of hogs of a particular breed will not require greater changes in these animals than have been wrought in some varieties of pigeons."[28] During the nineteenth century pigeons became famous for the incredible variations produced by fanciers' careful breeding. Charles Darwin spent a great deal of time discussing pigeons in his own work, *On the Origin of Species*, and even based his term "natural selection" on the idea of "artificial selection" of such breeders.[29] This statement, therefore, is an assertion of pigs' incredible plasticity and also an assertion of the great heights that pig breeders could achieve. Just as pigeons had been dramatically changed by fanciers, pigs, though the animals had not yet been, could be sculpted to fit human desires.

Instead of focusing on breeding pigs, the *Yearbook* paid much more attention to other livestock breeding. Cattle especially received consideration, but horses, sheep, and poultry also found places of prominence.[30] And yet, pigs went mostly unnoticed in discussions of livestock breeding. Perhaps this is because pigs breed much more quickly and required less capital investment than other animals or, less likely, because pork was considered a less valuable product (certainly false in the nineteenth century). More likely, cultural notions of pigs' value and the amount of effort they required versus other farm animals explain this phenomenon. Nonetheless, improving pigs through breeding did not receive the same emphasis in the *Yearbook* as that of other animals.

This is not to say that the variety in breeds of pigs went unrecognized. Especially outside the USDA, many authors deliberated on the differences between the many breeds of pigs.[31] But these works focused much more on describing the individual breeds than on any way to improve them. In a way, describing pig breeds acted as a way to describe what an ideal pig should look like. Different breeds exhibit different characteristic, and selecting the best breed depended on a farmer's preferences and the geographic location in which the pigs would be raised. But once a farmer had made this choice, experts provided little advice on how to improve the chosen individuals.[32] This is not to say that encouragements toward breeding improvement never occurred, evidenced by agricultural husbandry professor George Day's suggestions about breeding for "utility."[33] Utility, of course, most concerned a pig's economic value. But more often breeding recommendations stopped with the selection of the breed and did not offer a suggested course of action after farmers decided on a breed. The breeds themselves constituted the ideal.

One aspect of raising pigs that did seem to attract attention was feeding, especially letting the animals forage. A 1901 article on forestry attested to the commonness of mast feeding pigs, which meant letting the animals root on their own for nuts, ground matter, and various other chow laying about forest floors. It claimed that in "in most small Southern communities, the ranging of cattle and hogs in the forest is customary." To improve their pig foraging, residents frequently burned away the forest litter to encourage grass growth and uncover nuts. The article contended that the conflagrations proved detrimental to both the forest

and the practitioners, and therefore needed to stop.[34] The forester's comments made it clear that many people conceived of pigs as foraging animals, not ones meant to be penned up and only fed corn. One article in the 1902 *Yearbook* claimed that in a textbook "general live-stock farm," that as "much of the growth of pigs as may be is made on pasture."[35] Two years later, the same author wrote, "The general method which has been found most practicable for raising hogs in the South is to provide abundant green pasture, with shade and water adjacent, and to feed about one-third of a full grain ration to hogs on these pastures."[36] Highlighting this focus on roaming, foraging pigs, farmers bought permits to graze their herds in national forests and thousands of the animals did so each year in the early part of the twentieth century.[37] Many farmers seemed most focused on the pig's environment and how herds should be fed, and any talk of breeding centered on breed ideals.

Few pig experts publicly showed interest in exploring ways to improve pigs outside of breed ideals. F. D. Coburn, the man who called pigs "the most plastic of all farm animals," can be considered part of that small group.[38] University of Wisconsin professor W. A. Henry claimed Coburn's *Swine Husbandry* (1877) was "the best book we have had on swine husbandry."[39] In his 1910 work, *Swine in America*, Coburn devoted most of his discussion of breeding pigs to selecting particular individuals for reproduction. The book did not mention specific methods to improve pigs, but made it clear that some made better breeders than others. The author cautioned his readers, "The prettiest hog, after all, is the one that is most profitable," and seemed more interested in short-term financial gains than long-term work toward a better pig.[40] The idea of improving breeding stock typically was not a serious topic of discussion, at least not in public printed works.

Other authors seemed to offer little in practical help, advice, or ideas about what constituted the best pig. One pig farmer, Henry Clay Dawson, wrote in 1911 that improving breeds was left to the hands of a few men even though "they do not work in harmony toward an ideal type." He counseled his readers, "Nature's unaided manner of mating is generally to be preferred to any other." Dawson continued, "no matter what or how much you read, study, hear, or see, the hard knocks of practical experience and close association with Mother Nature are the makers of

successful swine raisers."[41]Appealing to the authority of nature aside, improving pigs was not a real focus for most of the literature directed at pig farmers.

In North Carolina, expert advice mirrored national trends. In 1910, the NC Agricultural Experiment Station produced a circular for public consumption entitled *Hog Raising in North Carolina*. It contended pork production in North Carolina should be more significant and profitable. [42] The circular cited low grade breeding stock as the number one reason why the "swine industry in the State [was] held in check." Beyond an insistence in feeding pigs by pasture because they are "naturally a grazing animal," the circular deemed selection of a good breed and animals with good characteristics of that breed the most important factors in improving the state's pig production.[43] Just as national experts believed pigs occupied a certain ecological niche as grazers and thought farmers needed to select good breeds to improve their pig production, so too did North Carolina experts counsel their readers.

By 1915, pig breeding started to receive more national emphasis in the *Yearbook*. A section on boys' pig club work claimed that for years the USDA urged farmers to try community breeding with little success, owing to the difficulty of convincing a community of men to agree to raise only one breed of stock.[44] Boys' pig clubs were agricultural groups that not only tried to teach adolescent boys about agriculture and pig farming, as their name implied, but also how to build communities through working toward a common goal. Thus community breeding, where members of an agricultural community all raised the same breed so that they could share the best sires and work toward a common breed ideal, fit the clubs' goals well. Ideally this would have allowed for everyone to benefit from better herds, leading to greater success and profit for all. However in practice, convincing farmers to give up their own breed preferences for the good of the community, and supposedly themselves in the long run, proved difficult.

In 1916 the *Yearbook* ran an article on "Meeting the Farmer Halfway" that incorporated familiar Progressive Era language concerning efficiency into ideas about breeding. Along with good feeding, housing, and disease control, the article argued to achieve truly efficient production farmers needed to breed for both quality and quantity.[45] To help achieve this improved efficiency, the *Yearbook* encouraged farmers to seek better

breeding stock. The use of purebred pigs found especial importance in this regard. Boys' pig clubs continued to focus in part on breeding and helped increase demand for purebred breeding stock. Pig clubs also were significant vehicles through which the USDA pushed community breeding, along with breed standardization to a degree.[46]

By the end of World War I, breeding took on more emphasis as an important part of producing pork. The USDA noted that since farmers realized "swing growing is perhaps the most profitable phase of live-stock production," many had started giving particular attention to their herds. This caused those farmers to select "for breeding purposes a better quality of stock, in point of prolificacy and marketable variety." In practicality, this meant choosing the animals that brought "the greatest and quickest returns for money invested."[47] Thus the ideal hog might have had specific features, but most importantly it was one that brought in a great deal of money at a good rate of return. It had to be efficient with the farmer's time and money and could be conceptualized as an investment in future profit.

Breeding not only became a way to manipulate living organisms to change their physical features, but also a way to tap better into markets for increased profit. Clearly farmers bred pigs to make money in markets many years before World War I, but at this juncture national experts started to focus more on how their constituents might better do so for their own good and that of the nation. D.S. Burch of the USDA's Bureau of Animal Industry, in an article titled "Harnessing Heredity to Improve the Nation's Live Stock," claimed, "like gravitation and heat, heredity is a definite force that can be utilized to serve those who understand its laws and principles." The article stressed that, while in earlier years poorer breeds could be used, economic pressure of the times required "reduced costs of production and a quicker turnover on money and labor invested." The article even claimed, "Better Breeding Will Save a Billion Dollars."[48] Such language conceptualized pigs less as animals and more as investments. Farmers increasingly emulated businessmen investing in a pork producing company where pigs functioned like pork-producing machinery. In North Carolina, the same trends happened, but an increasing focus on nutrition over breeding showed clear influence from a particular individual.

In 1914, the Smith-Lever Act had established the Office of Swine Extension in North Carolina, and that extension service first became a significant organization in the aftermath of World War I with the appointment of William W. Shay as head of the office.[49] One expert explained that before and after World War I, "the Division of Animal Husbandry […] promoted better breeding, feeding, and management of swine through collaboration with extension agencies. With swine […] large results may be obtained in a relatively short period because of the short time required to develop the animal from birth to maturity."[50] State-level extension offices became an important part of the USDA mission to help farmers produce better pigs, for without hard work by extension agents to get knowledge into the hands of farmers who could put that information into practical use, no amount of national writing campaigns would matter.

For North Carolina, William Shay easily represents the most important figure in pig farming at the time. Whereas the 1910 circular focused on the importance of breeding, William Shay brought with him an interest in pigs' diets that he firmly imprinted on the state extension service.[51] Shay hailed from the Midwest where corn was always "the major item on the menu" for pigs, but this was not necessarily the case in the South.[52]In fact in the mid-1890s, several deputies destroying an illegal liquor still in Montgomery County, NC, related a story. After their raid, the deputies reported "a monstrous squealing was heard about twenty feet away from the still, in the bushes. Upon investigation it was found that the noise proceeded from a large pen in which were 25 large specimens of swine that had reached a splendid state of perfection from a steady diet of that nourishing article, 'moonshine' beer."[53] This, however, should not be considered a common feeding practice at the time, even in the rural South.

Figure 1. "Can Ten Thousand Men Be Wrong?"—Particularly striking are the class centered ideas embedded within this cartoon. The preferred method of feeding is championed by a strong looking businessman in a natty suit while a poor farmer in overalls unhappily watches his economically fed herd. To make sure the message got across, the pigs are content looking in the top half, while the poor farmer's pigs are frowning and looking plaintively at him, perhaps for some delicious corn. From "Results of Hog Feeding Demonstrations Covering Five Years," February

1931, Swine Extension—Annual Report, 1931, UA # 102.002, Box 37, Folder 1, NCSUL.

But Shay, for all the good he did for the state's pig raising industry, never put significant emphasis on improving pigs through breeding and instead focused on showing farmers the "Shay method" of feeding.[54] As Shay explained, "The problem of promoting the hog raising interests of the state, as we see it, is not one of rapidly increasing the swine population, but rather of improving the methods of care and feeding of the hogs already on the farms of the state."[55] Shying away from previous recommendations of grazing pigs on whatever might be found, Shay brought Midwest regional values to the South and stressed feeding pigs corn and nearly corn alone.

Shay and the extension service ran feeding demonstrations of the "Shay method" across the state for years.[56] Their most important focus was less on economical production, but on getting the highest profit margin from pigs. That is to say, the extension service did not advise producing as cheaply or efficiently as possible, but instead encouraged farmers to spend more money along the way in return for a greater profit at the end. The extension service pushed farmers to feed mostly with corn and stressed the idea that pigs should be thought of as a more profitable way to store corn. One of Shay's pamphlets called "Save the Brood Sow" showed on its front cover a smiling pig and asked farmers, "How many bushels of corn will she be worth in 1925?" The pamphlet emphasized the connection between corn and pigs by saying, "Both Profits Are Yours," implying that by feeding corn to pigs farmers would profit from selling both their corn and pigs.[57]

In contrast, on a national level the focus on breeding over particular feeding techniques held into the 1920s. To show its commitment to good breeding, the USDA began a "Better Sires—Better Stock" campaign in 1919. Secretary of Agriculture E. T. Meredith explained the project: "Its purpose is to bring about the elimination of scrub stock from our herds, thus increasing their producing capacity. It costs as much to raise a poor animal as it does a good one, and more to keep it, so that better live stock makes for increased production and greater profits."[58] Breeding constituted such an important part of successful hog farming in the USDA's estimation that a photograph caption of two pigs called them "Purebred Profit Makers."[59] The link between raising pigs for pork

production and profit was so strong that the 1921 *Yearbook* included a table that measured the production, labor, and material requirements of raising pigs not by the number of pigs, but per hundred pounds of pork. [60] Furthering the introduction of how producers co-opted market logic in their efforts to change idealized pig bodies, this table abstracted pigs into the meat they would produce with their demise and commoditized their bodies to only have value within the production process. Such an abstraction highlighted that the payoff for improving pigs only occurred once the animals had been slaughtered and condensed from messy, living creatures into a marketable product—meat.

The "Better Sires" campaign lasted until the mid-1920s, and breeding continued to be important. In 1926 the Secretary of Agriculture wrote, "Well-bred animals are the basis of a profitable livestock industry and an ample supply of good-quality meat and products."[61] It was around this time that the Bureau of Animal Husbandry conducted breeding experiments with pigs to determine the value of purebred sires when paired with less desirable sows. The criteria for determining success came from weight gains of the progeny.[62] By embracing the idea that better breeding could help farmers become more efficient and earn more money out of their feed, breeding and feeding became interconnected. Breeding operations and the improvement of breeding stock had proven so successful that by this point purebred hogs became not just breeding animals but in some cases were also sold to slaughter. [63]

Without ever directly using the language of scientific management, the *Yearbook* nonetheless wrote about pigs in a way that treated them as machines that could be controlled and modified. One of the most important measures of a good hog at this time was how well it could "utilize" feed.[64] Just as a machine has inputs and outputs, hogs also had inputs of feed and outputs of pork (their smellier outputs typically went unmentioned). Instead of being humans raising a live animal, farmers and pig breeders became, as the USDA described, "artisans" who carefully crafted the pigs they desired.[65] Breeders were not concerned with creating something new, but instead improving upon what they had. In some instances authors made the comparison between pigs and machines directly. One contemporary article in the January 1930 issue of the *Journal of Farm Economics* compared hog breeding operations with

"the purchases of raw materials and the manufacturing operations of many small concerns" in that they were both based more on past performance than "probable future developments."[66]

Though North Carolina's William Shay remained convinced that pigs should be fed mostly corn, on a national level the sort of feed that pigs should be utilizing remained an unsettled question among many experts. The 1917 *Yearbook* presented peanuts and leftovers from the cheesemaking process as good rations.[67] In the same issue, another author commented on the good work done by pig clubs in promoting better feeding methods, writing, "the use of a balanced ration by a club member caused the farmers in his neighborhood to realize that corn alone is a poor and expensive hog feed, or that grazing crops or good pastures are essential to economical gains on swine." And yet, he reminded readers that the "quality of pigs to be fed is equally as important as the feeding methods."[68] In 1923, describing early hog raising, one expert said, "Hogs required a minimum amount of care and attention from their owners" because farmers allowed the animals to roam free. Yet, it was clear that the author believed mast-fed hogs produced less desirable meat, and thus feeding habits had to be changed.[69] Reinforcing the foraging idea, though, one *Yearbook* recommendation was that breeding sows should get a lot of exercise, and to "accomplish this a good plan is to require the sows to roam over a field to obtain part of their feed."[70] It remained clear that what hogs ate affected their bodies and the meat they produced, but what that feed should be remained an open discussion. Either way, the beginning of considerations that pigs needed a more regimented diet than can be provided as grazing animals is evident.

Efficiency continued to be important during the Great Depression as pig prices dropped to their twentieth-century nadir. Farmers realized they could not control prices, but knew they could control their own production expenses. A 1933 *Yearbook* article titled "Trend in Hog Production is Toward Efficiency and Quality of Product" urged, "In attempting to improve swine the breeder must keep production costs in mind. These costs can be lowered only by increasing efficiency or reducing losses [of pigs]."[71]Breeding functioned as an inexpensive way to help farmers improve their pigs and reduce their costs and perhaps could be aided by science.[72] Whereas efficient production had been a

desired goal for quite a while, during the Depression it became a necessity, especially with poor market prices.

Prices during the Depression dropped so low that in August and September of 1933 the federal government implemented a "pig purchase program." Through this program the government purchased from farmers and then slaughtered six million young pigs and 200 thousand pregnant sows in an attempt to raise prices.[73] This "pig purchase program" recognized that overproduction was part of the problem. Farmers would need to produce on a smaller scale and do so at a lower cost per pig in order to have the most success with market prices. To help with this efficiency, producers needed to know the characteristics of a better pig.

The 1933 *Yearbook* article was also quite clear about what constituted an ideal pig. Both sows and boars were to be selected on the basis of their weight gain under similar styles of feeding and housing. The article prized large, uniform litters, and the best sows would have twelve to fourteen "well-placed" teats to help nurse those desired large litters. The pigs needed to be free of defects, of course, and also have good feeding efficiency. The very best parents would be able to produce "ton litters," or litters that reached a combined 2,000 pounds of live weight at 180 days.[74] Indicative of the emphasis placed on increasing the efficiency of these commodity producers through breeding, in 1937 the USDA established the Regional Swine Breeding Laboratory in Ames, Iowa. The laboratory's objective was "to discover, develop, and test procedures of breeding that will result in improvement of swine."[75] Pig breeding was not only important to the Department in theory, but clearly in practice as well after the establishment of the regional laboratory.

In contrast to the national level, in North Carolina a focus on feeding continued even through the early Great Depression but began to change in the mid-1930s. For one, the prices in pork markets became so bad that it no longer made sense to encourage farmers to put so much money into pig production.[76] At that point the bottom line became less important than reducing production costs. Also, in January 1936 William Shay became ill and was no longer able to continue working at the extension agency.[77]Signaling a change in personality, the extension's annual reports started to pay more attention to pig breeding, especially

with purebreds, after Shay's departure. A change in personnel meant big changes in the advice offered to farmers by the extension office.

In addition to purebreds, the idea of "thrifty pigs" became more important to the North Carolina Swine Extension Office. "Thrifty pigs" were those that thrived and grew vigorously, but the term had a context related to how efficiently they turned feed into meat. The extension service cited fast growing pigs as the best breeders, and the new head, H. W. Taylor, told farmers that since the best breeders came from the heaviest pigs, weighing litters at breeding time was a good way to select breeding stock.[78] By 1938 getting farmers to use purebred pigs took on even more of an emphasis, and Taylor said that "progressive swine breeders" used purebreds "to strengthen their herds."[79]The extension service encouraged farmers to be much more careful in their selection of a breeding herd, and one circular went as far as to tell farmers that purchasing a bad boar was a waste of money.[80] Another contributing factor to this emphasis was the reminder to pig farmers that low purchase prices meant a good time to improve breeding stock.[81] This focus on purebred pigs continued through World War II, and purebred animals were supposed to breed truer and produce more profitable pigs.[82]

In contrast to North Carolina, which had just started again to stress the importance of breeding after Shay left the extension service, the Department of Agriculture continued its concentration on the matter. For quite a while, the USDA encouraged breeders to find animals that were "superior in feeding qualities," but as time passed they began to promote more nuanced criteria for selection.[83] Unlike earlier ideals, by the end of World War II the *Yearbook* warned farmers not to use show ring standards as a method of selecting breeding stock, cautioning "Undue attention is often given to so-called fine points of little or no economic importance." Instead, one *Yearbook*article counseled farmers to focus more on the weight of pigs at 180 days of age, or even weight gain from 85-112 days when more of a pig's weight gain is in valuable muscle and not fat.[84] Efficient and prolific weight gain not only showed how quickly a pig could be ready for market, but also showed the breeding quality of its parents. Such an emphasis on weight gain helps emphasize that a farmer's determination as to whether a pig was a good breeder or not rested truly on the amount and quality of meat its

progeny produced in death. In general, advice encouraged postwar farmers and breeders to be more precise in their breeding choices and smarter in their production.

Figure 2. Developed from the show ring, scorecards such as these helped tell breeders exactly what about a hog was to be prized and valued. Lists like this are emblematic of what farmers later would try to get away from after World War II when examining a pig's worth, as breed ideals lessened in importance in comparison to weight and other economic factors. From Extension Circular No. 97, September 1919, Swine Extension—Annual Report, 1920, UA # 102.002, Box 36 Folder 6, NCSUL.

After World War II, producing pigs more effectively through breeding took on many forms. While genetic modification through advanced techniques like gene splicing was not yet possible, early understandings of genetics showed that it could be harnessed to improve breeding. [85] By including genetics, a superior pig became one that both produced a commodity efficiently and had the best genetic makeup—an efficient and profitable producer on both macro and micro levels. Other research encouraged even more careful selection of sows, suggesting that a sow should have from eight to twelve piglets, and never fewer than six. [86] Artificial insemination was a topic of interest, but the technique could not be effectively implemented at the time due to problems with boar semen containing too great a proportion of accessory fluids that made keeping the sperm alive for very long difficult.[87] Technology, combined with better understandings of which aspects of pigs should be improved, may have helped conduct the breeding process more efficiently, but the biggest changes were conceptual, not technological. [88]

By 1940, pig experts had abandoned ideas that the animals were grazing animals, or at least that they should be fed exclusively by forage. That year, one *Yearbook* article expressed the idea that mast feeding could be harmful to pigs. It said that if pigs on the U.S. frontier "were left to feed on the forest mast alone, […] besides putting on flesh that was soft and difficult to preserve, they became untractable [sic] and without the stamina to survive the rigors of severe winters." The article further explained that corn was necessary to help correct this problem. [89] Grazing was not entirely negative, though, as John H. Zeller

counseled in 1948 that some real gains could be made by putting the animals out "on good, clean hog pastures." He stressed, however, that grazing should be a supplement, not a replacement, and used in conjunction with dry-lot feeding.[90] Thus by the time World War II began, agricultural experts underscored a conception of pigs that removed them from forests and fields and placed them into pens with regimented feeding. When this happened, the ecological role of a pig stopped being that of a creature that cleaned up forests and instead became something much closer to current, industrialized beings.

Pig producers continued to refine their ideas of what a pig should be. Also in 1948, one producer explained that the ideal pig not only is "as efficient as possible in producing food for the best market from the raw materials available, [but also] must 'breed true' so that they will retain that efficiency."[91] In 1950, one expert said, "Growers continue to make hogs better through improvement in breeding and feeding methods," stressing that these two facets of producing pork were related. [92] Reflecting this trend, by the mid 1950s preferred pigs had moved toward a "meat-type."[93] This mirrored a desire for efficient production not just in weight gain, but how that weight was gained. Pigs who gained meaty muscle over fat were considered more efficient producers than those that, even if they gained more weight, did not do so in profitable meat. The *Yearbook* encouraged farmers to market pigs at lower weights so they had less fat, and at least one breeder at the time thought, "The meat-type hog, specially bred to produce pork with less internal fat, appears to be another answer to the problem."[94]

Mirroring the 1950s rise in consumer spending power, the price of pigs stayed high after World War II even with fluctuations (see Figure 4). [95] And the optimism found in the U.S. economy was also present in the prospects of pig breeding. The 1959 *Yearbook* claimed, "Swine breeding is destined to go further. Scientists think improvements in carcass quality will result from selection from pure breeds on the basis of accurate performance records combined with some form of crossing inbred lines. The result is a kind of 'hybrid vigor.' Men at the Iowa Agricultural Experiment station have estimated that crossbreeding gives an increase of 5 to 8 percent in growth rate and economy and even more in fertility."[96] Breeding improved not just the pig, but especially improved the product that the pig produced. But by the end of the

decade changes occurred in more than pigs, and a paradigm shift came about in the entire pork producing industry.

It is clear that by 1960, even if it had not been implemented on a wide scale, the logic of modern confined animal feeding operations (CAFOs) had taken hold within the USDA. The United States Environmental Protection Agency (EPA) defines current animal feeding operations as "agricultural operations where animals are kept and raised in confined situations. [CAFOs] congregate animals, feed, manure and urine, dead animals, and production operations on a small land area. Feed is brought to the animals rather than the animals grazing or otherwise seeking feed in pastures, fields, or on rangeland."[97] Gradually arising over the second half of the twentieth century, this new system of production required different inputs and fundamentally changed the structure of how farmers raised animals. Using the modern definition of CAFOs is a bit problematic in an historical discussion as it takes a current idea and assumes that it is static across time. Nonetheless, the beginnings of this shift toward modern CAFOs can be seen at the start of the 1960s. As the logic of CAFOs arose, developed over time, and altered farms, notions of how pigs should be improved also likely changed, as pigs would now need to thrive in a new environment with new feeding patterns. Not only did a shift occur in porcine bodies, but also in human bodies, as the animals stopped being grazers that cleaned up field and forest waste and instead became penned animals whose own waste became a consistent problem.

The 1960 *Yearbook*, subtitled "Power to Produce," presented several examples of this developing CAFO logic. One writer argued, "A person cannot judge 'comforts' of livestock by his own reactions in a given environment. He reacts for the most part in an entirely different way."[98] Another article highlighted the importance of using machines to help with chores around the farm. It contended that "concreted swine production" offered the potential to substitute machines for humans. These machines would save labor and also improve profits.[99] In general the language underlined not only an industrial ideal where pigs remained part of the farm factory, but also a reordering of the farm so that it used more machines—both biological and mechanical.[100]

This is not to condemn CAFOs automatically, because it is dangerous to make moral judgments that assume pre-industrial methods always were

better than their industrial counterparts. As Richard White cautions, "The demonization of modern machines and the sentimentalization of archaic forms of labor allows a bifurcation of work into the relatively benign and even instructive, and the modern and destructive."[101] It does mean, however, that to study how humans conceived of pig improvements through breeding changed after 1960 and would require an entirely separate study than this one, as post-1960 corporate producers, like Murphy Farms in North Carolina, dramatically changed the pork industry and the issues surrounding it.[102]

It is difficult, however, to identify clearly what sparked the decisive shift in idealized physical pig features over the studied period—proving the "why" is always more difficult than the "what." It is easy to chalk up changes to "market logic" or "a desire for efficiency," but perhaps delving into census data can help supply quantitative reasons for qualitative explanations. In comparing the number of hogs slaughtered each year from 1900-1960 to the production of pork over the same time it is clear that pigs in 1960 produced more pork than those in 1900. In 1900, each pig produced an average of 122 pounds of pork. This number remained fairly constant until 1935 when it began to rise. Between 1950 and 1960, each pig produced an average of between 132 to 138 pounds of pork. These figures may not seem like much, but the numbers reflect an increase of approximately 10% that would have certainly been reflected in the ledgers of pig farmers. If pigs were like machines, their output significantly increased over the period studied. It is very possible that increased production showed pig farmers that improved breeding and feeding did increase production and profits, strengthening ideas about the importance of weight as a factor for breeding.

Seemingly more important to this study than raw production numbers are the prices between 1900-1960 of the most significant input and output in pig farming—corn and pork. Other than the period from World War II to the first few postwar years, there seems to have been little relation between pork prices and the production of pigs. It is clear, however, that pork and corn prices fluctuated violently during most of the period under consideration, and the two prices mirrored each other. Economist Marc Nerlove once argued that farmers "in fact do not respond, as is neo-classically assumed, to *all* price changes, but only to those that they expect to be permanent."[103] With prices as volatile as

those exhibited, it seems unlikely that farmers would have been able to expect any price trend in pork or feed costs to be permanent. If Nerlove is to be believed, then farmers in all likelihood typically did not change their production of pigs because of price. This does not mean that they were left without any responses to market vagaries, perhaps even responding to the instability of prices in making their decisions.

Figure 3 Production of Pigs, 1900-1960, and Figure 4 Pig Price vs. Corn Price. Data compiled from: U.S. Bureau of the Census, Historical Statistics of the United States: Colonial Times to 1970, Bicentennial Edition, Part 2 (Washington, D.C. 1975), K505, 589-591

While the prices of pork and corn proved fairly constant for most of first two decades of the twentieth century, the years around 1920 saw intense price fluctuations. This also happens to have been roughly the same time that breeding became more important in the studied literature. Facing such price instability, one of the few things that farmers would have been able to control was the quality of their herds. Whether corn was expensive or cheap, or pork was selling at a high or a low price, such factors were out of farmers' control. But the amount of meat that each pig produced and the time it took to reach market weight could have been within the control of farmers with improved breeding. Faced with a fickle market, it seems logical that those raising pigs would have focused on what they could control and therefore put their efforts into improving the efficiency of their operation by improving the ways pigs turned their feed into meaty profits. A rising focus on how pigs could be improved toward this efficient ideal makes sense in this context.

Where an earlier ideal had prized pigs that fit particular breeds, from 1900-1960 a shift occurred that valued more explicit economic factors. Specifically, by 1960, many of the studied writers in essence considered pigs to be pieces of machinery that produced pork; machinery that breeding could improve. Breeding helped define the quintessential pig entirely on how well the animal produced a product—pork. Of course pigs raised for meat had a relationship with the market long before the twentieth century.[104] But this relationship—namely how pigs ceased being viewed and valued as living animals, but instead as commodity producers—continued and evolved.

In the case study of North Carolina, breeding also became important over the studied period, but with some key differences from the national story. The NC swine extension service spent most of its early years focusing on pig feeding due to the leadership of William Shay. Shay's Midwestern background led him to believe that feeding, much more than breeding, was the most important part of raising pigs. This clashed with regional values and ways of life that had previously encouraged farmers to graze their pigs cheaply on things like mast, peanuts, and soybeans instead of feeding them expensive corn. Therefore, Shay used the extension service's scant resources to encourage farmers to break from common statewide practices and follow the "Shay method." After Shay left the extension service, taking his strong personality with him, breeding slowly became more important.

Breeding discussions came later to North Carolina than they did on a national level, likely because of Shay. Efficiency also was important in the state through the idea of "thrifty pigs," and the extension service tried to make sure that farmers understood the link between breeding, pigs, and profit. Thus what a brief case study of North Carolina can show is the importance of individual actors to changing conceptions of how breeding and feeding being pushed by the USDA might construct better pigs. However, because of Shay's leadership, the North Carolina extension service convinced its constituent farmers to feed their pigs a mostly corn diet much earlier than the USDA did the rest of the nation. The rising importance of breeding and feeding did not happen evenly across the entire country, but instead with starts and stops depending on the particular culture and history of each region and locale and also the local leadership. Even though the USDA might have recommended a course of action, it was up to local farmers to take that advice, compare it to their own experiences and situations, and make their own decisions.

The final lesson to be taken from the described changes in breeding and feeding techniques involves ecological roles, market forces, and finding meaning in death. Experts during the studied time keyed in on ideas of efficient production and in doing so started to treat pigs like pieces of machinery in a factory in some ways. Historian Deborah Fitzgerald describes the process of rising industrial logic in agriculture at the time, "Although the individual technologies, particular pieces of legislation, new sorts of expertise, and the availability or disappearance of credit

opportunities are all key to understanding what happened in twentieth-century agriculture, it is essential to grasp the overarching logic of change that was taking place in bits and pieces and the industrial system that was being constructed around the country."[105] Farmers became more efficient in order to deal with markets the best they could with the tools available, and improving their pigs through breeding and using certain feeds to bring out those improvements were some of the best tools they had.

What was necessary for that transformation to occur in pig production, though, was a conceptualization of pigs that valued their bodies only in death for the meat they produced. When the only thing that mattered in raising pigs was the amount and quality of meat those animals would produce after slaughter, breeding ideals shifted to value only features in pigs bodies that would improve this meat production. Thus while pigs during the studied period changed in physical form, perhaps what is more important is that conceptions of what a pig should be changed. Pig producers stopped considering the animals as foraging creatures, meant to be in out in fields and forests, because only higher quality diets could best bring out the changes breeding had wrought. These farmers began to treat pigs like machinery with specific inputs and outputs—corn and pork—as they sought to be as successful as possible at their business of agriculture.

It was in this business model that farmers, seeking profit, radically altered the ecological roles of the pigs on their farms. This transition morphed pigs from foraging, forest-bound creatures (or at least creatures that belonged in the liminal spaces between forests and fields) into animals that best served their purpose by being bred and fed in very particular ways so that their death would be most profitable. Such changes did not lead directly into modern CAFOs, but the transformations did provide an environment where CAFOs made sense and fit as an improvement of existing production methods. The changeover from conceptualizing pigs as foragers into pork-producing machines happened at the same time and for the same reasons. Edmund Russell claimed that humans long have held "an assumption about the relationship between technology and nature: technology replaced or modified nature, but nature was not technology," even though most machines are made from wood, metal, rubber, and other products from

nature.[106] Pig breeding exemplifies this assumption as humans came to treat pigs like machines, even if they would not have identified them as such.

In the end, reflection upon changes in idealized pig breeding is necessary to better understand the ways we so easily abstract animal bodies (and other nature) into commodity producing machines in our daily lives, something that clearly happened long before confined animal feeding operations. It is not new that humans bred these animals, and then fed, raised, took care of them, and assured their welfare until the proper moment for the pigs' death arrived. While this seems like an unduly harsh description of the process, that sequence has occurred ever since humans domesticated animals. No, what is new is that humans took that process and, with the help of expert advice, sped up biological dictates with improved techniques and mindsets, hastening pigs to an ever-quicker death in the most efficient fashion possible.

Ruminating on what this means for the animals we consume is useful, but what is likely more useful is considering what this means for how we order nature around us to create the most efficient lives possible and what this means for humans' place in the world. It is one thing to use the natural world to build good lives for human beings and quite another to completely transform or skew nature for the sake of profits and industrial ideals. At its essence, this story about pigs and their deaths provides us information about how we humans should fit into non-human nature, especially in how we conceptualize biological and ecological ideals. A series of logical decisions may have led to modern industrial meat production, but does that mean that system is entirely built on a sound logic? Perhaps what we really need is a new logic that more holistically incorporates ecological thought and recognition of what animals' deaths mean into our decisions about how we look to carve out and define our own ideal lives and human bodies in the natural world.

If it takes a village to raise a child, then it takes at least half of one to get anything published. Greg Cushman, Sara Gregg, and especially Donald Worster all read drafts, gave exceedingly helpful comments and encouragement, and generally helped make the essay much better than

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[1] F. D. Coburn, *Swine in America: A Text-Book for the Breeder, Feeder & Student* (New York: O. Judd, 1910), 20-21.

[2] This quotation comes from an article where White recalls staying up for several nights with an "ailing pig" and his emotional response and that of the community to caring for the pig while it slowly died. E. B. White, "Death of a Pig." *The Atlantic* (Jan 1948), 30.

[3] For example: "This Year's Pig Crop 24% Past '41 Record." *New York Times*, December 24, 1942, 25.

[4] Even the other animals most commonly eaten in this country, cows and chickens, can be useful when kept alive for their milk and eggs. Pigskins and innards are also valued, but a pig's primary value is in the meat it produces.

[5] Merrill K. Bennett, "Aspects of the Pig" *Agricultural History* 44, no. 2 (April 1970), 223.

[6] Harriet Ritvo, "Animal Planet." *Environmental History*, Volume 9, Issue 2 (April 2004), 204.

[7] Historian Sam Bowers Hilliard contended pork's "place in the nation's economy during the early nineteenth century certainly was notable, but its importance in the domestic economy of the South was overwhelming." Sam Bowers Hilliard, *Hog Meat and Hoecake: Food Supply in the Old South, 1840-1860* (Carbondale and Edwardsville: Southern Illinois University Press, 1972), 92.

[8] On this insistence that the Division of Animal Husbandry put efforts into collaborative efforts with extension agencies see: Carleton R. Ball, *Federal, State, and Local Administrative Relationships in*

Agriculture, Volume I (Berkeley: University of California Press, 1938), 444. For example, one USDA publication actively encouraged pig production in the South: "There is at the present time room for a large development in the production of live stock in the Southern States." W. J. Spillman, "General Farming," in *Yearbook of the United States Department of Agriculture*, 1904, (Washington: Government Printing Office, 1905), 189. Spillman worked as an Agrostologist for the Bureau of Plant Industry. Agricultural Secretary James Wilson echoed that sentiment in 1911 when he wrote, "There is no doubt that the South affords a favorable field for increasing the country's meat supply." James Wilson, "Report of the Secretary," *Yearbook of the United States Department of Agriculture*, 1911 (Washington: Government Printing Office, 1912), 44.

[9] Edmund Russell, "The Garden in the Machine: Toward an Evolutionary History of Technology," in *Industrializing Organisms: Introducing Evolutionary History*, ed. Susan R. Schrepfer and Philip Scranton (New York: Routledge, 2004), 8.

[10] William Cronon, *Nature's Metropolis: Chicago and the Great West* (New York: W. W. Norton and Company, 1991), especially pages 225-230, 255-259. Giedion's *Mechanization Takes* Command is still one of the best works on the subject and argued that men's hands at Midwestern slaughterhouses were "trained to function like machines," and the "greater the degree of mechanization, the further does contact with death become banished from life." Sigfried Giedion, *Mechanization Takes Command: A Contribution to Anonymous History* (New York: W. W. Norton and Company, 1948), 217, 242.

[11] Boyd used the industrial broiler chicken as a case study and argued that the modern broiler's creation "must be seen as part of a larger process of agro-industrialization, which has not only transformed the social practices of agriculture, food production, and diet in twentieth-century America but also facilitated a profound restructuring of the relationship between nature and technology." William Boyd, "Making Meat: Science, Technology, and American Poultry Production" *Technology and Culture* 42, no. 4 (October 2001), 632-633. For more on the development of modern production techniques, see: Kendra Smith-Howard, "Antibiotics and Agricultural Change: Purifying

Milk and Protecting Health in the Postwar Era." *Agricultural History*, Vol. 84, Iss. 3 (Summer 2010), pp. 327-351.

[12] They define "biological innovation" very broadly as, "new plant varieties, fertilizers, pesticides, irrigation or drainage systems, improved cultural practices and the like." Alan L. Olmstead and Paul W. Rhode, *Creating Abundance: Biological Innovation and American Agricultural Development* (New York: Cambridge University Press, 2008), 10.

[13] This essay is not necessarily about the actual changes wrought in pig bodies over the studied period. For a brief discussion of the physical changes made to pigs between 1900 and 1940s, see: Olmstead and Rhode, *Creating Abundance*, 312.

[14] For a discussion of the interrelation between animals and their feed, see Chapter 9, "More Crops, More Animals: Livestock and Feeds in the Farm Economy" in Olmstead and Rhode, *Creating Abundance*, 262-283.

[15] Or, as historian Mark Finlay made the case, "by altering the feeding, housing, and management issues associated with the hog, farmers essentially embraced the role of industrial managers who focused less on animal husbandry and more on controlling labor and energy inputs." Mark R. Finlay, "Hogs, Antibiotics, and the Industrial Environments of Postwar Agriculture." In *Industrializing Organisms: Introducing Evolutionary History*, edited by Susan R. Schrepfer and Philip Scranton (New York: Routledge, 2004), 238.

[16] Bennett, "Aspects of the Pig," 230-233.

[17] For example, Alfred Crosby described pigs as part of the biological imperialism of European settlers in the Americas. Alfred W. Crosby, *Ecological Imperialism: The Biological Expansion of Europe, 900-1900* (New York: Cambridge University Press, 1986, 2004), 174-176. On their decline, see: Bennett, "Aspects of the Pig," 234.

[18] William Cronon detailed the importance and problems that came from pigs during eighteenth-century Anglo-Indian relations. Cronon even wrote, "Pigs thus became both the agents and the emblems for a European colonialism that was systematically reorganizing Indian ecological relationships." William Cronon, *Changes In The Land:*

Indians, Colonists, and the Ecology of New England (New York: Hill and Wang. 1983, 2000), 137. Pigs would not cease to be sources of conflict after the eighteenth century, and for an example of the issues that caused in the nineteenth century see: David J. Grettler, "Environmental Change and Conflict over Hogs in Early Nineteenth-Century Delaware." *Journal of the Early Republic*. Volume 19, Number 2 (Summer 1999) pp. 197-220. By the nineteenth century, it was not uncommon for pigs to roam city streets in the United States, though during that century overall consumption of them declined. Their ubiquitous presence is mentioned here: Charles E. Rosenberg, *The Cholera Years: The United States in 1832, 1849 and 1866* (Chicago: The University of Chicago Press, 1962), 17, 113.

[19] This is because before refrigeration salted hams and bacon could be stored and shipped much easier than other meats (such as chicken or beef) that had to be taken to market and slaughtered locally. John C. Hudson, *Making the Corn Belt: A Geographical History of Middle-Western Agriculture* (Bloomington: Indiana University Press, 1994), 80.

[20] For example, see: Earl B. Shaw, "Geography of Mast Feeding." *Economic Geography*. Volume 16, Number 3 (July 1940), 233-249.

[21] On the development of breeds and breeding associations more generally during this time period (including, among others, pigs), see: Olmstead and Rhode, *Creating Abundance*, 289-291. Also see Sam White, "From Globalized Pig Breeds to Capitalist Pigs: A Study in Animal cultures and Evolutionary History," *Environmental History*, 16 (January 2011), 94-120.

[22] Rudolf Alexander Clemen, *The American Livestock and Meat Industry* (New York: The Ronald Press Company, 1923), 48-52. The domestication process especially can be seen in Ohio's Miami Valley, where pig breeders worked to develop profitable breeds because, as geographer John Hudson argued, though they "might have turned to other agricultural specialties they also knew, […] none that were apparently at hand brought the return that hog production offered." Hudson, *Making the Corn Belt*, 80-87, quotation 81.

[23] Coburn, *Swine in America*, 13-14.

[24] "Appendix," *Yearbook of the United States Department of Agriculture*, 1900 (Washington: Government Printing Office, 1901), 678.

[25] Deborah Fitzgerald, *The Business of Breeding: Hybrid Corn in Illinois, 1890-1940*(Ithaca: Cornell University Press, 1990), 8. The book is generally concerned with the creation of hybrid corn in Illinois and the relationship between industry scientists, academic scientists, and farmers.

[26] Poland Chinas are a breed of pigs. James Wilson, "Report of the Secretary," in *Yearbook of the United States Department of Agriculture*, 1905 (Washington: Government Printing Office, 1906), 31. After serving six years as the Iowa fifth congressional representative to the U.S. House, Wilson served as the Secretary of Agriculture from 1897-1913.

[27] Willet M. Hays, "Progress in Plant and Animal Breeding," in *Yearbook of the United States Department of Agriculture*, 1901 (Washington: Government Printing Office, 1902), 221, 231-232. Hays was an agriculturist from the Minnesota Agricultural Experiment Station.

[28] Hays, "Progress in Plant and Animal Breeding," 219.

[29]Darwin actually became interested in pigeons *after* the main points of his ideas about natural selection were already sketched out, but nonetheless pigeons and pigeon breeding helped further inform and expand Darwin's ideas about evolution. For more information, see: James A. Secord, "Nature's Fancy: Charles Darwin and the Breeding of Pigeons." *Isis*, Vol. 72, No. 2 (Jun., 1981), pp. 162-186.

[30] For example, see: James Wilson, "Report of the Secretary," in *Yearbook of the United States Department of Agriculture*, 1907 (Washington: Government Printing Office, 1908), 34-35. This focus also frequently was mirrored in other livestock breeding literature at the time. For example, see: Victor Arthur Rice, *Breeding and Improvement of Farm Animals* (New York: McGraw-Hill Company, Inc., 1926) Rice graduated from North Carolina State College (later renamed North Carolina State University) and even played quarterback for their team that upset Navy in 1915. He then worked at both the University of Massachusetts and North Carolina State College teaching animal husbandry. Frederick N Andrew, "Victor Arthur Rice, 1890-1964: A Brief Biography." *Journal of Animal Science*. Vol. 77, Iss. 6 (Jun 1999), 1319-1321.

[31] Authors at the time did devote copious pages to various breeds and describing the differences between them. For examples, see: F. D. Coburn, *Swine Industry: A Practical Manual for the Breeding, Rearing and Management of Swine with Suggestions as to the Prevention and Treatment of Their Diseases* (New York: Orange Judd Company, 1898); Thomas Shaw, *The Study of Breeds in America: Cattle, Sheep and Swine* (New York: Orange Judd, 1900); and George E Day, *Productive Swine Husbandry* (Philadelphia: J. B. Lippincott Company, 1913, 1915), 41-128. Shaw occupied the chair of the Animal Husbandry Department at the University of Minnesota while Day was Professor of Animal Husbandry at Ontario Agricultural College.

[32] For example, see: William Dietrich, *Swine: Breeding, Feeding and Management*(Chicago: Sanders Publishing Company, 1910), especially Chapter 1, "Selection of a Breed." Dietrich was both Professor of Swine Husbandry at the University of Illinois and Assistant Chief in Swine Husbandry at the Illinois Agricultural Experiment Station, Urbana, Illinois.

[33] Day, *Productive Swine Husbandry*, 26-27. Specifically, utility meant an animal superior in the eyes of two persons, "(1) The butcher requires an animal that will give him the largest proportion of valuable meat, and (2) the farmer requires an animal that will reproduce its kind in profitable numbers and make rapid and economical gains."

[34] John Foley, "A Working Plan for Southern Hardwoods, and Its Results," *Yearbook of the United States Department of Agriculture, 1901* (Washington: Government Printing Office, 1902), 474-475.

[35] W. J. Spillman, "Systems of Farm Management in the United States," *Yearbook of the United States Department of Agriculture*, 1902 (Washington: Government Printing Office, 1903), 358.

[36] W. J. Spillman, "General Farming," *Yearbook of the United States Department of Agriculture*, 1904 (Washington: Government Printing Office, 1905), 189.

[37] James Wilson, "Report of the Secretary," *Yearbook of the United States Department of Agriculture*, 1911 (Washington: Government Printing Office, 1912), 98-99.

[38] A leading expert on pigs during the second half of the nineteenth century, Coburn spent his adulthood in Kansas where he occupied prominent positions on the Kansas State Board of Agriculture, including the office of secretary for almost twenty-one years. William Elsey Connelly, *A Standard History of Kansas and Kansans, Vol. III* (Chicago and New York: Lewis Publishing Company, 1918), 1216-1217.

[39] W. A. Henry, "*Swine in America* and Its Author," in Coburn, *Swine in America*, ix.

[40] Coburn, *Swine in America*, 21.

[41] Henry Clay Dawson, *The Hog Book: Embodying the Experience of Fifty Years in the Practical Handling of Swine in the American Cornbelt* (Chicago: The Breeder's Gazette, 1911), 8, 160, 187. As the title might suggest, this advice stemmed from his half century of experience in the pig industry. The second point was more directed at the actual process of copulation than breeding for improvement, but can stand as his advice in general as Dawson seemed to advise taking few chances and playing everything safe.

[42] In fact by 1920, pork production was worth almost as beef. Oliver E. Baker, "Agricultural Regions of North America. Part II—The South." *Economic Geography*. Volume 3, Number 1 (January 1927), 56.

[43] Robert Seth Curtis, "Hog Raising in North Carolina," (West Raleigh: Edwards and Broughton Printing Co, 1910), Bulletin 207 (April, 1910), North Carolina Agricultural Experiment Station of the College of Agriculture and Mechanic Arts, 132, 136-140.

[44] W. F. Ward, "The Boys' Pig Club Work," in *Yearbook of the United States Department of Agriculture*, 1915 (Washington: Government Printing Office, 1916), 180. Ward occupied the post of Senior Animal Husbandman of the Animal Husbandry Division in the Bureau of Animal Industry.

[45] Carl Vrooman, "Meeting the Farmer Halfway," in *Yearbook of the United States Department of Agriculture*, 1916 (Washington: Government Printing Office, 1917), 188. Vrooman served as the Assistant Secretary of Agriculture.

[46] J. D. McVean, "Pig Clubs and the Swine Industry," in *Yearbook of the United States Department of Agriculture*, 1916 (Washington: Government Printing Office, 1917), 374-376. McVean worked in the Animal Husbandry Division in the Bureau of Animal Husbandry.

[47] T. P. White, "Practical Points in Hog Cholera Control," in *Yearbook of the United States Department of Agriculture*, 1919 (Washington: Government Printing Office, 1920), 197. White's work in the Division of Hog-Cholera Control in the Bureau of Animal Industry made his thoughts particularly worthwhile.

[48] D. S. Burch, "Harnessing Heredity to Improve the Nation's Live Stock," in *Yearbook of the United States Department of Agriculture*, 1919 (Washington: Government Printing Office, 1920), 347, 352. Burch served as an Editor in the Bureau of Animal Industry.

[49] For more information on the Smith-Lever Act, which established the state extension services in connection with land-grant universities, see Emmett Fiske, "From Rolling Stones to Cornerstones: Anchoring Land-Grant Education in the Counties through the Smith-Lever Act of 1914." *The Rural Sociologist*, Vol. 9, Iss. 4 (Fall 1989). The article focuses on how the USDA and Land-Grant universities formed a coalition to help push the bill through Congress. Fiske argued that the most important part of the Smith-Lever Act was that it selected "the county agent as integrator, demonstrator, and disseminator of research-based knowledge generated by the USDA and the Land-Grant colleges. The country agent became the cornerstone of this federal-state-local collaborative effort—linking and closely binding the ties between community and college. Fiske, "From Rolling Stones to Cornerstones," 13. On Shay, see Michael D. Thompson, "This Little Piggy Went to Market: The Commercialization of Hog Production in Eastern North Carolina from William Shay to Wendell Murphy." *Agricultural History*, Vol. 74, no. 2 (Spring 2000), 572.

[50] Carleton R. Ball, *Federal, State, and Local Administrative Relationships in Agriculture, Volume I* (Berkeley: University of California Press, 1938), 444.

[51] Shay made it clear who the boss was, especially when he signed every annual report, "W. W. Shay. In Charge Swine Extension Office." For example: Swine Extension—Annual Report, 1920 in UA # 102.002, Box

36, Folder 6, University Archives, North Carolina State University Libraries, Raleigh, North Carolina. Hereafter referred to as NCSUL.

[52] On corn as pig food at the time see: Earl Shaw, "Swine Production in the Corn Belt of the United States." *Economic Geography*. Volume 12, Number 4 (October 1936), 367. Of course many in the South at the time believed in mast feeding their pigs. However, mast feeding often was criticized, as "Hogs fattened only on woodland mast produced soft pork which was also oily and hard to preserve, whereas corn feeding made the flesh solid, the lard white and firm." Hudson, *Making the Corn Belt*, 83. Thus Shay's insistence on corn feeding likely stemmed in part from regionalism but also from a desire to encourage a higher quality pork that could more easily be sold at market.

[53] "An Appropriate Combination—Hogs and 'Licker'" *The News and Observer* (Raleigh, NC) Thursday, December 06, 1894; Issue 116; col B.

[54] Thompson, "This Little Piggy Went to Market," 573-574.

[55] Swine Extension—Annual Report, 1921, in UA # 102.002, Box 36 Folder 7, NCSUL.

[56] For example, here Shay said, "the feeding demonstration has been pushed as our major project." Swine Extension—Annual Report, 1924 in UA # 102.002, Box 36, Folder 9, NCSUL.

[57] W. W. Shay, "Save the Brood Sow," Swine Extension—Annual Report, 1925, in UA # 102.002, Box 36, Folder 10, NCSUL.

[58] E. T. Meredith, "The Year in Agriculture: The Secretary's Report to the President," in *Yearbook of the United States Department of Agriculture*, 1920 (Washington: Government Printing Office, 1921), 48. Edwin Thomas Meredith, an Iowan, served as the Secretary of Agriculture from 1920-1921.

[59] D. S. Burch, "From Scrubs to Quality Stock," in *Yearbook of the United States Department of Agriculture*, 1920 (Washington: Government Printing Office, 1921), 331-333.

[60] "Appendix," in *Yearbook of the United States Department of Agriculture*, 1921 (Washington: Government Printing Office, 1922), 845.

[61] Though the comment is generic, the Secretary wrote much more about cattle than pigs within this specific context. W. M. Jardine, "The Year in Agriculture: The Secretary's Report to the President," in *Yearbook of the United States Department of Agriculture*, 1926 (Washington: Government Printing Office, 1927), 81. Before serving as the U.S. Ambassador to Egypt, Jardine held the post of Secretary of Agriculture from 1925-1929.

[62] Ulysses Grant Houck, *The Bureau of Animal Husbandry of the United States Department of Agriculture: Its Establishment, Achievements and Current Activities*(Washington, D.C.: Hayworth Printing Company, 1924), 245. The title page of the book claims Houck wrote it "with the collaboration of other members of the Bureau Staff."

[63] D. S. Burch, "Breeding Improved Livestock," in *Yearbook of the United States Department of Agriculture*, 1926 (Washington: Government Printing Office, 1927), 183, 186-187.

[64] J. H. Zeller, "Hog Profits Increased by Proper Selection of Foundation Animals," in *Yearbook of the United States Department of Agriculture*, 1928 (Washington: Government Printing Office, 1929), 365. Zeller was a longtime employee in the Animal Husbandry Division of the Bureau of Animal Industry, evidenced by works of his cited here stretching from 1918 to 1935.

[65] Those raising pigs are called "artisans" here. Hugh C. McPhee, "Livestock Improvement Can Be Accomplished by Selective Breeding," in *Yearbook of the United States Department of Agriculture*, 1928 (Washington: Government Printing Office, 1929), 428. McPhee worked in the Bureau of Animal Industry at the USDA, at one point as the assistant chief.

[66] Donald R. G. Cowan, "The Commercial Application of Forecasting Methods," *Journal of Farm Economics* 12, no. 1, (January 1930), 141. At the time of publishing, Cowan worked in the public sector for the Commercial Research Department of Swift and Company.

[67] H. C. Thompson, "Present Status of the Peanut Industry," *Yearbook of the United States Department of Agriculture*, 1917 (Washington: Government Printing Office, 1918); C. F. Doane and A. J. Reed, "Cheesemaking Brings Prosperity to Farmers of Southern

Mountains," *Yearbook of the United States Department of Agriculture*, 1917 (Washington: Government Printing Office, 1918)

[68] J. D. McVean, "Pig Clubs and the Swine Industry," *Yearbook of the United States Department of Agriculture, 1917* (Washington: Government Printing Office, 1918), 373-374.

[69] Rudolf Alexander Clemen, *The American Livestock and Meat Industry* (New York: The Ronald Press Company, 1923), 53-54. Also focused on quality of pork in relation to feed was: J. H. Zeller and O. G. Hankins, "Pork of Good Quality Grown Efficiently on Corn-Soybean Ration," *Yearbook of the United States Department of Agriculture, 1934* (Washington: Government Printing Office, 1934)

[70] E. Z. Russell, "Hog Profits Rest Largely on Care Brood Sows Get," *Yearbook of the United States Department of Agriculture*, 1927 (Washington: Government Printing Office, 1928), 374.

[71] S. S. Buckley and O. G. Hankins, "Trend in Hog Production is Toward Efficiency and Quality of Product," in *Yearbook of the United States Department of Agriculture*, 1933 (Washington: Government Printing Office, 1933), 253. Both were from the Bureau of Animal Industry.

[72] O. G. Hankins and J. H. Zeller, "Hogs of Danish Origin Imported for Breeding Studies in This Country," in *Yearbook of the United States Department of Agriculture*, 1935 (Washington: Government Printing Office, 1935), 231. They championed science as a way to help "the producer of agricultural commodities to conduct his business more efficiently and meet the needs of a changing economy."

[73] The slaughtered pigs were used for three things: 1) fertilizer 2) a grisly practice of being fed back to other hogs and 3) meat for the poor, which ended up totaling around 100 million pounds of pork products. Bill Winders, *The Politics of Food Supply: U.S. Agricultural Policy in the World Economy* (New Haven: Yale University Press, 2009), 51-52.

[74] S. S. Buckley and O. G. Hankins, "Trend in Hog Production is Toward Efficiency and Quality of Product," 253-257.

[75] W. A. Craft, "Swine Breeding Research at the Regional Swine Breeding Laboratory." United States Department of Agriculture, Miscellaneous Publication No. 523, July 1943, 1-2. Craft wrote this from

his position as Director of the Regional Swine Breeding Laboratory of the Bureau of Animal Industry, Agricultural Research Administration.

[76] For example in 1933 prices became so low that Shay did his own research. Swine Extension—Annual Report, 1933, in UA # 102.002, Box 37, Folder 3, NCSUL.

[77] Swine Extension—Annual Report, 1936, in UA # 102.002, Box 37, Folder 6, NCSUL.

[78] "Fast-Growing Pigs Are Best Breeders," Swine Extension—Annual Report, 1937, in UA # 102.002, Box 37, Folder 7, NCSUL.

[79] Found both in the annual report, page 9, and in an included, unidentified article, "Purebred Swine Sales Are Aiding N.C. Hog Industry," Swine Extension—Annual Report, 1938, in UA # 102.002, Box 37, Folder 8, NCSUL.

[80] H. W. Taylor and J. E. Foster, "Raising Hogs in North Carolina." Extension Circular No. 238 (November 1939), North Carolina State College of Agriculture and Engineering and U. S. Department of Agriculture, Co-Operating, N. C. Agricultural Extension Service, 3.

[81] Hog Marketing Letter No. 75, 30 January 1940, H. W. Taylor to All County Agents, Swine Extension—Annual Report, 1940, in UA # 102.002, Box 37, Folder 10, NCSUL.

[82] This can especially be seen in the yearly plans of work during the War. Swine Extension—Plan of Work, 1942, in UA # 102.002, Box 37, Folder 9, NCSUL, 2; and Swine Extension—Plan of Work, 1944, in UA # 102.002, Box 37, Folder 11, NCSUL, 1.

[83] H. C. McPhee and O. G. Hankins, "Swine—Some Current Breeding Problems," in *Yearbook of the United States Department of Agriculture*, 1936, "Better Plants and Animals, Vol. 1" (Washington: Government Printing Office, 1936), 897.

[84] Ralph W. Phillips, "Breeding Better Livestock," in *Yearbook of the United States Department of Agriculture*, 1943-1947, "Science in Farming" (Washington: Government Printing Office, 1947), 38. At various times Phillips worked in charge of genetics investigations in the Bureau of Animal Industry and worked in China and India to help their

governments with "livestock problems." He also served as Editor for the *Journal of Animal Science*.

[85] While James Watson and Francis Crick (and the less well known, but just as important Rosalind Franklin) would not uncover the double helix structure of DNA until 1953, H. R. Davidson wrote in 1948, "The relation of genetics to practical pig breeding is a tricky subject. Here I have endeavoured to indicate what cannot reasonably be expected from genetics, while suggesting how the pig producer can make the most of the situation by manipulating those environmental factors that are under his control in such a way as to get the best result from inherited characters." H. R. Davidson, *The Production and Marketing of Pigs* (New York: Longmans, Green and Co., 1948), viii. Davidson was a British pig farmer and also ran experiments at Cambridge and Aberdeen Universities.

[86] Enos Johnson Perry, ed. *The Artificial Insemination of Farm Animals* (New Brunswick: Rutgers University Press, 1945), 203. Perry was an Extension Professor of Dairy Husbandry at Rutgers University, and all of the contributors either worked at Universities or experiment stations.

[87] For example, see: Davidson, *The Production and Marketing of Pigs*, 271 and R. B. Kelley, *Principles and Methods of Animal Breeding* (New York: John Wiley & Sons, 1946), 216-218. Kelley worked as an animal geneticist for the Council for Scientific and Industrial Research, and also served as the Officer-in-charge for the F. D. McMaster Field Station.

[88] This does not mean that technology was new to breeding. As an example of a technique previously proposed, years before a USDA Farmers' Bulletin recommended farmers use a special breeding crate. J. H. Zeller, "A Simple Hog-Breeding Crate," Farmers' Bulletin 966, United States Department of Agriculture, 22 April 1918.

[89] Everett E. Edwards, "American Agriculture—The First 300 Years," *Yearbook of the United States Department of Agriculture*, 1940, *"Farmers in a Changing World"* (Washington: Government Printing Office, 1940)

[90] At this point, Zeller was "in charge of swine investigations in the Bureau of Animal Industry." John H. Zeller, "The Use of Forage in

Feeding Hogs," *Yearbook of the United States Department of Agriculture*, 1948, "Grass" (Washington: Government Printing Office, 1948), 99.

[91] H. R. Davidson, *The Production and Marketing of Pigs* (New York: Longmans, Green and Co., 1948), 290.

[92] Arthur Laurence Anderson, *Swine Management, Including Feeding and Breeding*(Philadelphia: Lippincott, 1950), 336.

[93] This transition continued to occur after World War II. For more information on the development of the meat-type hog, "in terms of both morphology (shape) and the living tissue itself," see: J. L. Anderson, "Lard to Lean: Making the Meat-Type Hog in Post-World War II America." In *Food Chains: From Farmyard to Shopping Cart*, ed. Warren Belasco and Roger Horowitz (Philadelphia: University of Pennsylvania Press, 2009), 29-46.

[94] Donald E. Hirsch and J. K. Samuels, "Payment for Quality," in *Yearbook of the United States Department of Agriculture*, 1954, "Marketing" (Washington: Government Printing Office, 1954), 221.

[95] For an understanding of changing consumer practices and power, see: Lizabeth Cohen, *A Consumers' Republic: The Politics of Mass Consumption in Postwar America*. (New York: Alfred A. Knopf, 2003)

[96] R. E. Hodgson, "Livestock Production in Transition," in *Yearbook of the United States Department of Agriculture*, 1959, "Food" (Washington: Government Printing Office, 1959), 331. Hodgson worked in Latin America during World War II and later worked as Director of the Animal Husbandry Research Division at the Agricultural Research Service in Beltsville, MD.

[97] U.S. Environmental Protection Agency's website, "What is a CAFO?" http://www.epa.gov/region07/water/cafo/index.htm, accessed 16 November 2009.

[98] T. E. Bond and C. F. Kelly, "Environment of Animals," in *Yearbook of the United States Department of Agriculture*, 1960, "Power To Produce" (Washington: Government Printing Office, 1960), 234.

[99] H. B. Puckett, "Machines to Help With Chores," in *Yearbook of the United States Department of Agriculture*, 1960, "Power To Produce"

(Washington: Government Printing Office, 1960), 242-244.

[100] For an example of the industrial ideal and the idea that a farm can be engineered to be more efficient, see: J. W. Rockey and S. S. DeForest, "Engineering the Farmstead," in *Yearbook of the United States Department of Agriculture*, 1960, "Power To Produce" (Washington: Government Printing Office, 1960), 250-267.

[101] Richard White, "'Are You an Environmentalist or Do You Work for a Living?': Work and Nature," In *Uncommon Ground: Rethinking the Human Place in Nature*, ed. William Cronon (New York: W. W. Norton & Company, 1995), 178.

[102] For an entirely hagiographic look at Wendell H. Murphy, whose Murphy Farms by 1988 was the nation's largest pig producer, and also a case study of the rise of CAFO farms, see: Hiram M. Drache, *Creating Abundance: Visionary Entrepreneurs of Agriculture*(Danville: Interstate Publishers, Inc., 2001), 187-210.

[103] Marc Nerlove, *The Dynamics of Supply: Estimation of Farmers' Response to Price* (Baltimore, 1958), cited in Winifred B. Rothenberg, "The Market and Massachusetts Farmers, 1750-1855." *The Journal of Economic History*, Vol. 41, No. 2 (Jun., 1981), 305. More broadly, Rothenberg's article shows how, in the markets of eighteenth and nineteenth-century Massachusetts, "at least to a first approximation, […] feed (corn) and meat (pork) prices played a statistically significant role in farmers' decisions respecting the weight at which to slaughter hogs." Rothenberg, 306.

[104] On the commoditization of pigs, and meat in general, as they became fully integrated into nineteenth-century markets see: Sigfried Giedion, *Mechanization Takes Command*, "Mechanization and Death: Meat," 209-246.

[105] Deborah Fitzgerald, *Every Farm a Factory: The Industrial Ideal in American Agriculture* (New Haven: Yale University Press, 2003), 4.

[106] Even if made from synthetic products, machines are created from products made by the earth (even if modified by humans). Russell questions, as many have before him and will after him, where humans should draw the line between what is "natural" and what is not.

Moreover, Russell emphasizes that just as scholars have recognized "The Machine in the Garden," historians need also to recognize how often the garden finds itself in our machines. Russell, "The Garden in the Machine," 1.

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