Agricultural Involution in the Postwar Soviet Union

Jenny Leigh Smith
Georgia Institute of Technology

Abstract

This article describes a form of agricultural labor intensification common in the postwar Soviet Union that shares some important similarities to Clifford Geertz's notion of agricultural involution, first devised to describe Javanese wet rice agriculture. Using the examples of hog farming and cotton production, this paper describes the phenomenon of postwar agricultural involution, and explores its limits and possibilities. The most important divergence from Geertz's original model is that in the Soviet cases, agricultural involution did not attain any form of environmental equilibrium; in fact, because of agricultural involution, the Soviet Union was forced to confront the environmental limits of agricultural intensification. The concept of agricultural involution provides a way of thinking about the relative flexibility or rigidity of agroecological health in the face of labor intensification. This quality—how much additional labor and how many extra humans an agricultural ecosystem is able to support—is critical in evaluating how robust or fragile a landscape is.

This essay explores the relationship between farm labor and the environment in the context of Soviet agricultural industrialization in the years between 1945 and 1970. In this period, agricultural production increased dramatically across the Soviet Union. By most measures, these were the critical decades during which Soviet agriculture industrialized. Yet agricultural industrialization in the Soviet Union was uneven and sometimes unusual. I argue that while many farms industrialized, machines did not always displace workers and that farm tasks were not always deskilled. These two processes, deskilling and mechanization, have been almost universal indicators of agricultural industrialization.[1] In the Soviet case, this was not necessarily true.

It is instructive to consider this unusual form of industrialization as a kind of agricultural involution, in which humans doubled down on manual labor rather than rely on machines to help them accomplish ambitious state goals.[2] The term is Clifford Geertz's, and in his original description, agricultural involution was a process through which labor intensified in Javanese wet rice agriculture in order to feed the rapidly growing population of the island. While some agricultural ecosystems would have collapsed under such labor intensification, the rice fields of Java were able to absorb this extra labor and convert it into greater agricultural productivity. Soviet agricultural involution as I describe it here differs in two important ways from Geertz's original Javanese case study. First, involution was not ecologically sustainable in the Soviet Union in the long term. Agricultural involution was necessarily short-lived because the agricultural ecosystems that hosted these intensifications could not indefinitely

International Labor and Working-Class History
No. 85, Spring 2014, pp. 59–74
© International Labor and Working-Class History, Inc., 2014
doi:10.1017/S0147547913000458

https://doi.org/10.1017/S0147547913000458 Published online by Cambridge University Press

absorb extra labor with positive results. Secondly, agricultural involution in Java was necessary because Java was crowded; a large and growing population lived on a small island from which it was difficult to emigrate. The Soviet Union had a relatively small population scattered across a vast territory. It was not crowded in the traditional sense.

However, as I have argued elsewhere, the Soviet Ministry of Agriculture created relatively isolated archipelagoes of order in the patchwork of state farms across the rural Soviet Union. At the same time citizens were often forbidden or obstructed from moving away from rural areas; an internal passport system controlled their movements.[3] While not bounded by the same physical geographical limits as the Indonesian archipelago, the Soviet Union faced its own population pressures during this period. In some agricultural ecosystems, survival and agricultural success depended on increasing both the number of farm workers and the intensity with which they approached their work tasks.[4]

To illustrate my argument, I use historical data from Soviet cotton plantations in Uzbekistan and pig farms in Ukraine and Eastern Siberia to show how socialist priorities and marginal environments sometimes combined in the postwar Soviet Union to create agricultural policies and practices that prioritized humans over machines. Historians and economists usually interpret the Soviet Union's deviations from central plans as signs of failed or deferred industrialization. Here, I take them as proof of a flexible form of modernization, an agrarian manifestation of the "muddling through" Blair Ruble has argued was crucial to other sectors of Soviet industrial development.[5]

Increasing, rather than decreasing the farm workforce across the Soviet Union was not the original choice of agricultural planners. The first three Five Year Plans all called for mechanization on a wide scale. To quote Stalin in 1930, evaluating the first Five Year Plan, "it was necessary … to pass from small, individual peasant farming to large-scale collective agriculture equipped with tractors and modern agricultural machinery, as the only firm basis for the Soviet regime in the countryside."[6] But agricultural mechanization was easier to plan than it was to carry out for a variety of reasons. Machines did not always work, and factories did not always produce machines at the tempo the state ordered. If machines did arrive on farms as scheduled, they often broke down, and spare parts and petrol were not always available.

In pig farming, the Soviets initially planned to mechanize and scale up the industry as quickly as possible. The second Five Year Plan (1932–1937) originally called for "massive buildings housing 5,000 or more swine each." An American swine specialist who attended a presentation about farms planned for 1932 explained that "(t)he one proposed was 1/2 mile long, two stories high and the pigs were to be fed from conveyor belts. …"[7] Clearly, not all of these plans proved practical. As Soviet planners moved pigs indoors, cholera and other communicable diseases posed serious health threats. After the Second World War, pig farming, like most agricultural industries, needed to be rebuilt from the ground up because of wartime destruction. As pig farming

https://doi.org/10.1017/S0147547913000458 Published online by Cambridge University Press

scaled up and expanded a second time in the postwar period, disease, crowding, and malnutrition were still problems.

The cotton crop also posed significant challenges for the Soviet state. Soviet cotton was intended to showcase the Soviet Union's impressive system of irrigation and mechanization in Central Asia. Soviet investments in cotton farming were linked to the expansion of expensive irrigation networks that carried water from the major rivers of the region deep into the arid highlands of Uzbekistan. Initially, irrigation and mechanization were tightly coupled concepts in cotton production plans, but this changed over the course of the 1960s. Irrigation remained a focal motif of modernization and progress in Central Asia, but mechanized agriculture quietly slipped into the background.

I do not argue that Soviet collective farms were benign or empowering places simply because their leaders made strategic, locally appropriate adaptations in order to industrialize. While there are numerous examples of ingenuity and resourcefulness on Soviet farms, idiosyncratic industrial models still marginalized vulnerable populations and stranded unwilling workers in low-paying jobs in rural locations. The Soviet Union's adaptive policies allowed the state to extend and solidify its grasp in rural areas, creating new jobs and new categories of rural workers, but these flexible policies also ignored many of the social and economic ills that plagued the postwar Soviet countryside and perpetuated rural poverty. The purpose of this essay is not to excuse or diminish the state sponsored injustice and brutality that occurred during this period of history, but to note that states can be both brutal and clever. Indeed, in marginal and remote rural environments in the Soviet Union, it helped to possess both attributes.

The unusual form of industrial agriculture described here was not the only game in town. In the grain sector, the Soviets initially pursued agricultural policies that reflected the vision of "legible" high modernism that the political scientist James Scott has famously described. Yet simplifying, enlarging, and centralizing rural power nodes—quintessential activities of the high modernist state, in Scott's view—were far from the only viable methods the state employed in order to extract resources from the countryside. Grain (specifically, wheat) collection was the primary state goal in 1930 when collectivization was first violently enforced, but in the postwar period discussed in this paper, increased grain production was just one of myriad goals the Soviet state held for its countryside.[8] New goals required new tactics of statecraft, and the labor-intensive strategies described here were more effective at creating well-ordered, legible rural spaces in the postwar period than the original techniques of mechanizing and consolidating farms that were widespread in the 1930s. These earlier techniques, when practiced away from the grain producing heartland of the country, proved largely ineffective at creating the rural obeisance the Soviet state desired, and as a result many Soviet farms, collectivized in name only, remained poorly monitored by the state until agricultural policies changed in the postwar period.

https://doi.org/10.1017/S0147547913000458 Published online by Cambridge University Press

Soviet agricultural involution was one part of a hybrid industrial system, and it evolved as an ad hoc backup plan, not as a stand-alone policy. In the twenty-five years after the Second World War, the Soviet Union relied simultaneously on the stoop labor of children in its cotton fields, state-of-the-art satellite monitoring for its maize crops, nomadic pastoralist reindeer herding brigades, teenage calf-tending assistants, and some of the largest and most sophisticated combine harvesters ever constructed. This multifaceted agricultural system supported the Soviet state and significantly expanded Soviet food production during the Cold War. Such diversity of labor, technique, and technology was essential for the efficacy of an industrial system in an empire as environmentally wide-ranging as that of the Soviet Union.

In the immediate postwar period Soviet agriculture faced several serious, simultaneous challenges. The first and most pressing issue was a widespread scarcity of food, especially in the formerly occupied territories of Ukraine and western Russia. Food shortages culminated in 1946–1947 when Ukraine and southern Russia experienced a devastating famine. The famine was the combined result of a drought and low postwar agricultural production levels, but state disorganization and an overzealous campaign of grain requisitioning made the famine worse.[9] Rebuilding the food supply was the first pressing challenge for the Soviet state after the war.

Typical of late Stalinism, the fourth Five Year Plan, released in 1946, included an ambitious goal to completely rebuild and surpass the prewar agricultural output of the country. While it might have made more sense for a country facing food shortages to focus on staples like wheat and other grains, Soviet planning in this era called for significant increases in meat and milk as well as items like cotton and sugar.[10] Postwar agricultural reconstruction was intended not just to feed the country, but also to demonstrate to the rest of the world that the Soviet Union was wealthy and well fed. The Plan called for increasing milk by an astounding (and ultimately unattainable) 67 percent and cotton by 25 percent.[11]

The initial enthusiasm for mechanizing agriculture, a holdover from the 1930s, was rapidly tempered by the rural labor situation in many parts of the Soviet Union. In spite of war losses, the Soviet state had plenty of human capital. How to effectively use that capital was a second significant postwar challenge. Like other industrializing countries, over the course of the twentieth century, the Soviet Union's population shifted away from farms toward cities as its economy created new jobs in urban-based manufacturing and service sectors. There were push factors as well, since life on Soviet collective farms was difficult, and rural citizens had limited access to material goods compared to their urban counterparts, a disparity the historian Elena Osokina has aptly termed a "hierarchy of poverty."[12] Unlike most industrializing countries, this demographic shift from villages into cities occurred as a series of hiccups rather than in a gradual, incremental transfer. The Soviet population left the countryside at a rapid pace between 1926 and 1940, and again after 1970, but between 1950 and 1972, outmigration from farms slowed.[13] Well into the

https://doi.org/10.1017/S0147547913000458 Published online by Cambridge University Press

1960s, more than half of Soviet citizens lived in rural areas, and more than half of all Soviet workers were classified as agricultural workers.[14] This period, between 1950 and 1972, was one of significant industrial expansion and is generally recognized as a robust period of growth for the Soviet Union.[15]

In this context, the slackened pace of urbanization in the postwar years is initially surprising but was, in fact, due to the expansion of labor-intensive farming operations that sought to keep the rural population on farms. New, labor-intensive categories of work that the state created in the postwar period triggered a labor demand in rural areas. While rural citizens were not often clamoring to remain on farms in the postwar period, the surplus of jobs available on farms served to keep people on farms, or at the very least delay rural egress. These labor-intensive strategies were sometimes place-holding measures, as in the case of cotton, and sometimes, as in the case of swine production, they were more sophisticated efforts to refine and improve the work that was available on collective farms during the postwar period.

Pigs and Progress

In order to describe the context of agricultural involution in hog farming in the Soviet Union, it is important to understand a little about the scientific theories that undergirded postwar agricultural policy decisions. While some of these were colored by the autocratic dicta of Stalin and the reformist ideas of Nikita Khrushchev, the biologist Trofim Lysenko was the public figure who had the most influence on Soviet agricultural policy during the postwar era. Lysenko became the director of the All-Union Academy of Agricultural Science in 1947, in part because of the popularity of his theories of inheritance that blended socialist ideology with a weak understanding of biology. Lysenko's ideas about plant and animal breeding, while nominally based in Darwinian evolution, also accepted Lamarck's theory—discarded by most scientists since the late nineteenth century—that acquired characteristics could be inherited and that plants and animals could adapt to their environment over time if they encountered appropriately structured environmental challenges. This notion was appealing in a country where climate, rainfall, and soil quality played such a fundamental role in determining the scale and success of agricultural enterprise. It also echoed socialist notions that humans ultimately controlled their own social and economic destiny.

Lysenko's popularity was rooted in the proletarian nature of his scientific research. Unlike genetics, which had become a laboratory-based science in Western countries by midcentury, the more dubious science of Lysenkoism never lost its interest in farms and fields. In the words of Lysenko, "close contact between science and the practice of collective farms and state farms (enables) us to learn ever more and more about the nature of living bodies and the soil."[16]

Most critiques of Lysenko have focused on the disastrous effects his theories had for grain production across the Soviet Union, especially for dry-land

https://doi.org/10.1017/S0147547913000458 Published online by Cambridge University Press

wheat farming. This crop experienced major setbacks because of Lysenko's advice. The losses the Soviet Union encountered in grain production during these years were devastating both to the economy and the environment.[17] In general, however, scholars have tended to overstate the failure of both postwar agriculture and its most famous theorist. In some cases, the use of Lysenkoism as a management ideology and the incremental improvements in the scale and productivity of livestock and crops were linked. Just because Lysenko's theories were based on bad science did not mean they always resulted in disastrous policies. As we will see in the example of the Soviet hog industry, occasionally bad science yielded good results.

The Soviet hog industry of the 1950s and 1960s is significant for two reasons. First, production of all kinds of meat and milk expanded in the postwar period, but especially with the production of pork Soviet economic leaders were successful in what they set out to accomplish. The Soviet Union had been trying to produce more pigs since 1930 without much success, but in the postwar period, new hog farming techniques dramatically increased pig populations. By 1963 the Soviet Union had so many pigs that the state actually ordered farms to slaughter significant portions of their stock, fearing they would not be able to provide adequate feed for pigs during that year.[18] Secondly, Soviet pigs and their housing stock did not change much before and after the Second World War. Hogs had access to roughly the same feed regimes and were stymied by the same genetic and health issues and inhabited similar living areas. The most dramatic change in the Soviet approach to hog farming between the two periods was a new labor-intensive strategy of care.[19]

The key to the success of postwar hog farms resided with the women pig tenders, or *svinarki,* who helped safeguard the health and well being of pigs in farms across the Soviet Union. The extra care *svinarki* provided was instrumental in increasing survival rates of hogs after the war. The rise of such a position came about because of the skewed demography of the Soviet countryside in the wake of the Second World War. In many parts of the postwar Soviet countryside, women outnumbered men by a ratio of two to one, due to the high mortality rate during the war, at which time women had taken over men's positions on the farm, such as plowing, harvesting, and running the grain collection facilities. After the war, men returned to these better-paid positions, and women workers were in surplus. Animal care became a new sector of rural work into which collective farms could siphon this surplus.[20] On state farms that specialized in animal breeding, women almost exclusively came into direct contact with animals, and women made up between one-third and one-half of the workforce as late as 1955.[21] Increasing the number of skilled laborers who worked with animals on state and collective farms solved several problems at once for Soviet authorities. First, it was easier than trying to recruit, place, and appease outsiders who often found the isolation and inconvenience of rural life intolerable. Secondly, skilled positions were an advertising boon for the Soviet state. It is no coincidence that *svinarki* were featured so prominently in the local and national press, for they were aspirational rural figures. As the Soviet state

https://doi.org/10.1017/S0147547913000458 Published online by Cambridge University Press

mechanized some sectors of agriculture, like grain production, it created new positions that were less based in drudgery. New jobs, centered around caregiving, administrative skills, and working with animals were perceived as appropriate for women.

To be sure, these kinds of skilled jobs were better than what had been available before to women in rural areas who had finished high school and had one or two years of additional technical training, but they were often terminal positions. While many teenagers became *svinarki* or *doiarki* (their bovine counterparts), jobs as agronomists and zoo technicians tended to be the top rung that women in rural areas reached in the postwar period; they could go just so far and no farther as technical professionals on farms.

The three-year plan for agriculture issued in 1947 and the fourth and fifth statewide Five Year Plans called for massive increases in the realm of animal agriculture, specifically in intensifying and improving the level of care and feed of collectively held farm animals. Trofim Lysenko addressed this new policy focus directly in an often-repeated statement that "the basis for increasing the productivity of domestic animals, for improving existing breeds and producing new ones, is their food and the conditions in which they are kept."[22] Overseeing the food and conditions of animals was a labor-intensive occupation. In 1962 on mixed-use kolkhozes in one Siberian oblast, workers spent more than half their time tending to animals, and just under one-third of their time working with field crops. Pigs, cows, and other livestock were, by definition, labor-intense subjects, and it is no wonder that Khrushchev spent much of his time in power trying to phase out mixed-use kolkhozes because of their inefficiency.[23]

The theory that single-generation breed stabilization was possible and that a rapid increase in fecundity and survival would result derived from Lysenkoism, but the success of this theory was based in the work performed by the women who took care of the animals. The striking contributions *svinarki* made to the improvement of pig breeding comes first from the nationally proscribed rituals of daily care, which were intended to improve survival rates by nursing sick animals and cleaning animal sheds and barns. The second contribution *svinarki* made was to chronicle the progress of their pigs by making daily or weekly accounts of individual attributes such as weight, personality, and feed consumption.[24]

By quantifying the experiences of their charges and by itemizing the animals themselves, *svinarki* provided a window into an otherwise opaque world for outside office-level authorities, such as the authors of one breeding farm's annual report, who were able to browse through such records and translate the lives of pigs in twenty-two separate farms into unified narratives of general progress and modernization for the benefit of their superiors in Moscow.[25] This same project of quantification allowed bureaucrats to decide which local pigs could be considered foundational stock.

The rituals of daily care *svinarki* met were national standards set by the central animal agriculture committee in Moscow. These included hygiene basics such as cleaning stalls and removing uneaten food, as well as more

https://doi.org/10.1017/S0147547913000458 Published online by Cambridge University Press

modern specifics, such as adding fish oil to the feed of the weakest animals and heating the rooms where malnourished litters slept.[26] Pigs were assigned to *svinarki* based on weight, so one *svinarka* could be in charge of nearly a hundred half-grown barrows and gilts, or just two dozen pregnant sows.[27] Central authorities also ruled on the amount of time pigs should spend out of doors (four to six hours in summer and two outings of twenty minutes each in winter) and recommended constructing straw-filled dens rather than spacious stalls in order to allow pregnant sows to bed down more comfortably.[28] These standards of practice were part of the training *svinarki* received (mainly in short-term night education courses), but the most detailed form of instruction came from articles in Ministry of Agriculture press releases and in local, party-run newspapers. These newspapers and mini-biographies included endless and endlessly repetitive stories of the daily lives of successful *svinarki*, focusing on the dedication, sobriety, and civic mindedness of workers. These stories always highlighted the maternal care these women gave to their charges and their pride in their job in spite of the challenges it brought.[29] From these various media, the message of work expectations was clear and constant: pig caretakers were personally responsible for the fecundity of their sows and the survival rate of litters. Contrived socialist competitions between *svinarki* in weight gain or litter survival rate were given more column space, but the real proof of the job's expectations were found in the "shaming" sections of the papers, where drunken, slothful, or otherwise inept animal caretakers were chastised publicly, especially when their poor job performance resulted in the death of an animal. The continued seasonality of pig management into the 1950s is also obvious from newspaper articles: The *svinarka* biography appears most frequently in the late winter and early spring when pig mortality was highest due to flagging feed reserves and widespread illness. The stories disappear in the late spring and summer months, replaced by more seasonally appropriate articles on productivity in field labor and the arrival of new farm machines.

An American delegation visited a number of Soviet farms during the summer of 1955, and when they returned to the United States they published many of their observations and also sent reports to the Foreign Agricultural Service of the USDA Delegates were universally surprised at the large number of workers on Soviet farms. One visitor (J. Marion Steddom) noted that "[i]t did not appear to be a highly efficient organization. The mechanized or automated operations, such as the preparation of hog feed, were eclipsed by the amount of hand labor which both preceded and followed the mechanized portion."[30] Another American wrote that "all of the members of our delegation were surprised at the large amount of labor that was being used in conjunction with every farm operation. … only … where there is relatively little livestock did the ratio of labor to land reach approximately the average of the US."[31] Both of these observations conveyed an overall impression that the Soviet system of raising livestock was inferior to the American system, but the hand labor the Americans were so unimpressed by was what ensured progress, and development actually happened on Soviet

https://doi.org/10.1017/S0147547913000458 Published online by Cambridge University Press

hog operations; after all, the country did not have the use of American-style technological advances like prophylactic antibiotics or surplus whey and meat byproducts with which to bulk up their hogs.[32]

Svinarki made a difference both socially and materially. The work of nursing runty piglets, warding off winter bronchial infections, force-feeding young stragglers, and hosing down pens made a significant difference in reversing previously abysmal survival rates, thus increasing the established success of postwar pig operations. Official figures on postwar hog populations are impressive, but likely inflated. However, even skeptical agricultural analysts such as the Soviet dissident Zhores Medvedev admits there was steady growth in the pig population between 1945 and 1963 and again between 1965 and 1980.[33] Likewise, the seemingly banal work of taking stock of pigs by name, genealogy, growth, temperament, and appearance had important ramifications above and beyond the imaginary world of Lysenkoist breed standards and regional annual reports. An itemized pig was, at least potentially, a healthier and more productive pig. Written records created medical and family histories that helped keep track of increasingly complicated feeding regimes, growth patterns, and breeding cycles. Marking out pigs through name and number allowed their caretakers to care for their individual life situation, even if such a caretaker had no personal experience with the animal in question.

Over the course of 1958, Soviet workers spent approximately seventy hours of labor on each pig on their farms. This was far less than the annual labor required for a milk cow (360 hours, on average) but far more than labor averages in any Western, capitalist country.[34] American analysts interpreted this as a sign of the backwardness of the Soviet system that had failed to mechanize its agricultural system. What Cold War era American analysts interpreted as failure on the part of the Soviets can be seen in retrospect as an effective stopgap measure that solved a labor surplus problem at the same time it solved a pig scarcity problem.

Unlike wet rice farming in Java, Soviet hog operations had environmental limits that the state confronted several different times while implementing this modified program of agricultural involution. Droughts in 1963 and 1972 exposed the major environmental weakness that increased production of both pigs and cattle created: the risk that animals would need to compete with humans for food. In both years, anticipation of crop failures resulted in preemptive livestock slaughtering. In 1963, this anticipatory slaughter was especially severe for pigs; the number of swine in the Soviet Union dropped from Seventy million head to forty million in a few months in 1964.[35] Fear of grain shortfalls also inspired the state to import grain from the United States, which in 1972 caused world food prices to rise dramatically during this decade.[36]

Cotton in Uzbekistan

My second example, cotton, examines a very different kind of agricultural commodity whose industrialization also succeeded in the postwar era by increasing,

https://doi.org/10.1017/S0147547913000458 Published online by Cambridge University Press

rather than decreasing, the number of workers involved in production. Cotton's extensive labor force diverged in significant ways from the army of *svinarki* who looked after Soviet pigs. Cotton had very different environmental needs when compared to pigs, and Central Asian cotton plantations had a very different demographic profile from the hog farms of the Soviet heartland.

Cotton remains the major cash crop of Uzbekistan today, but it was not a traditional product of the region. Historically, the near-desert environment of most of the Uzbek Republic had made most forms of agriculture impossible. Ancient irrigation networks had created a few fertile river valleys where small clusters of farmers settled permanently. Recognizing that irrigation was the key to economic expansion, Russian capitalists from Moscow and St. Petersburg tried to build large-scale irrigation systems for the region, then known as Turkestan, in the first decade of the twentieth century. These projects failed, but Lenin picked up these ideas and planned massive irrigation systems that would bring water to the Fergana Valley.[37] Lenin's plans were expanded and completed under Stalin in the postwar era, and new, larger canals were constructed during Khrushchev's rule, all with an eye toward surmounting the aridity of the region and creating a new base for cotton production. By 1959, the Soviet Union was processing more than 4.6 million tons of raw cotton annually, an increase of 400 percent from 1920.[38] By the 1960s, dozens of larger, consolidated state farms centered in Uzbekistan—but scattered across Turkmenistan—as well specialized in growing and milling raw cotton, which was then shipped to Moscow and abroad to be woven into textiles.

The rise of cotton plantations in the Uzbek Republic, supported for forty years by irrigation from the Aral Sea, was part of a short-lived industrial boom in Central Asia that ended with the shrinking and salinization of the inland Aral Sea after the two main rivers that drained into the Aral Sea, the Amu Darya and the Syr Darya, were diverted for cotton irrigation. Creating a cotton empire in Uzbekistan was part of a threefold scheme by the Soviets to increase the number of European settlers in Central Asia, to stabilize the economies of rural areas, and to market-orient consumer industries—in this case, the textile industry.[39] Parts of the cotton scheme were successful; certainly the population of the Uzbek SSR, specifically the Fergana Valley, increased, and the Soviet Union became an important producer of cotton during this time. However, socially and environmentally the cotton plantations were devastating for the region.

The death of the Aral Sea was one such environmental disaster. Its demise and the salinization of the lands surrounding the Aral Sea have been documented as one of the largest ecological disasters of the twentieth century.[40] It is not that Soviet scientists did not anticipate the draining of the Aral Sea basin, which is now less than one-tenth the size it was in 1960. At the time, experts saw this as a necessary tradeoff and downplayed the environmental harm this process could cause. In their estimation, river water was worth far more diverted onto cotton fields than it was simply draining into the Aral Sea.[41] The benefits of allowing the Sea to remain with its present volume were worth less than the short-term

https://doi.org/10.1017/S0147547913000458 Published online by Cambridge University Press

benefits of building a cotton empire across the Uzbek SSR, and so agricultural planners chose this option.

Originally, the state cotton farms of the postwar period were supposed to be completely mechanized by 1958, but in reality, after a period of attempted mechanization, the state abandoned this effort and returned to relying on human labor until well into the 1970s.[42] As with the surplus numbers of women on farms in Ukraine and southern Russia, where pigs prospered in the postwar period, Central Asia was a region of dramatic, but very different, demographic change. The population of Central Asia was increasing. In the face of a declining nationwide fertility rate, the five Central Asian Republics maintained a high and increasing birthrate throughout the 1960s and 1970s. Compared to a national reproduction rate of 1.1, the five Central Asian republics had an average reproduction rate of 2.5 in 1970.[43] This high reproduction rate also meant that the average age of the population in these republics was especially young, with many children and few older people. Although Soviet policies actively encouraged workers and families from the European Soviet Union to migrate into Siberia and Central Asia, this project met with only limited success in the case of the Uzbek SSR. Large, ethnically Uzbek and Turkmen families comprised the bulk of population growth for the republic.

A cotton boom and a baby boom, occurring as they did in perfect synchronicity in the postwar Uzbek SSR, deferred agricultural mechanization but not the industrialization of cotton. Industrialization simply occurred without the machines that Soviet planners had first judged to be essential. Because cotton was a seasonal crop that only needed a high labor input for two or three months out of every year, raising cotton in the Uzbek SSR was, from a capitalist point of view, tremendously inefficient. However, while demographers noted that the high birth rate in Central Asia was a problem, the Soviet state was still committed to full employment for residents of all republics. While the Soviet Union constantly extolled the virtues of industrial efficiency and mechanization, their labor policies actually prioritized full employment over efficiency and humans over machines.[44]

The Soviet Union was eager to mechanize the cotton industry, and in the postwar period, it worked hard to acquire the technological ability to do so. The Tashkent Agricultural Machinery Plant (TashSelMash) began production in 1949 and had produced 25,000 cotton-harvesting machines (the small SKh-M48) by 1954. By 1955, the plant was producing more than one hundred different agricultural machines, many of them targeted specifically at the local cotton industry.[45] However, the presence of machines did not eliminate human workers in the cotton industry, and TashSelMash's impressive initial output hid chronic problems with quality control and the long-term durability of its machines. In general, the early Soviet machines were not as efficient at picking cotton as humans. Even on state farms where machines were used, a large group of workers trudged after the machines to gather what had been left in their wake. Furthermore, the early cotton harvesting and ginning machines (those produced before 1964 or so) were not durable: Most of them

https://doi.org/10.1017/S0147547913000458 Published online by Cambridge University Press

lasted only a few years in the field. State reports list 25,000 machines in use in cotton production in 1957, but only 10,000 in use in 1959.[46]

Agricultural involution in the cotton industry happened about a decade later than it had occurred on hog farms. In 1957 and 1958, the same years the government decommissioned the majority of first-generation cotton harvesting and ginning machines, the state made a conscious decision to exploit human labor instead of machines. Unlike the pig caretakers in the first scenario, cotton harvesting was not a skilled occupation; children, unemployed adults, and government office workers were all ordered by the state to help with the cotton harvest in the fall. Cotton became a site of obligate agricultural involution. In the words of the Soviet demographer Aleksandr Kvasha, "the mechanization of agriculture also facilitates the liberation of a part of the labor force. … In the Republics of Central Asia these processes also go on but their intensity is slowed down by (rapid growth of population)."[47] Much of this labor came from women and children. In 1970, these two groups made up 90 percent of the workforce during harvest season.[48] Schools closed during harvest months and children over the age of ten were expected to work in the fields picking cotton. Although state farms generally paid workers cash salaries, cotton pickers in the Uzbek SSR had steep farm-wide quotas to fulfill before they received wages for their labors. Children and adults worked together in the fields dragging heavy bags of cotton bolls through the rows during all daylight hours. It was tedious, uncomfortable stoop labor that was universally detested.

In spite of the difficult labor situation the cotton industry engendered, the Uzbek Republic had one of the lowest rates of rural egress in the country. Although the Soviet state actively encouraged outmigration from Uzbek state farms, residents were reluctant to leave their communities, preferring to remain in traditional, extended-family groups, working seasonally on state farms for low wages. This preference mystified contemporary Soviet planners. In retrospect, it speaks to the potential prejudice Muslims felt they might face if they left Central Asia as well as to the strong community ties that persisted in rural Central Asia in spite of decades of chaos and violence brought about first by agricultural collectivization and then by war.[49]

Once harvested, the crop itself, like many in the Soviet Union, was vertically integrated and highly mechanized. Bags of handpicked raw cotton were transferred first to Soviet-owned gin stands, located along railroad lines where the cotton was ginned and baled. Bales of cleaned cotton were then shipped by rail to Moscow factories where they were spun into thread, and woven into textiles. Except for the harvest, every other step in the cotton production process was highly mechanized and used a more traditional industrial pattern of skilled labor. In terms of efficiency, it is difficult to accurately evaluate how efficient was hand labor in the Soviet cotton industry. Much of the harvesting work was done by women and children, and since the Soviet labor statistics did not differentiate in its labor norms between men, women, and children, Soviet cotton plantations looked very inefficient from an economic standpoint. In 1958, just as the Soviet Union switched from machines to humans, Soviet farm

https://doi.org/10.1017/S0147547913000458 Published online by Cambridge University Press

workers devoted 1,270 hours per hectare to the production of cotton.[50] This is an astounding amount of labor (for contrast, sugar beets, the next most labor-intensive crop, absorbed 726 labor hours per hectare in the same year).[51] This situation was only possible because so many of the workers in cotton fields at this time were women and children. The seventh Five Year Plan ambitiously aimed to reduce this labor input to 171 hours per hectare, but a drive to re-mechanize Soviet cotton plantations with larger, more reliable harvesters and gins did not get underway until 1968. Thus, it seems safe to assume the ambitious goals of the seventh Five Year Plan were not realized by the plan's end in 1965.

The major environmental legacy of Soviet cotton farms was the death of the Aral Sea, but this ecological disaster unfolded over a series of decades, and it was not until after the Soviet Union had dissolved that the new nations of Uzbekistan and Kazakhstan began to recognize the environmental limits of cotton farming and large-scale irrigation within their territories. More obvious to Soviet agricultural planners in the short-term was the detrimental impact cotton farming had to the lands on which the crop grew. While Uzbek cotton farms initially benefitted from the relatively rich soils of the territory that had never supported large-scale agriculture, the positive boost in productivity this provided for cotton was short-lived. Furthermore, cotton was an extreme monoculture, which meant that the crop was especially vulnerable to numerous insect and disease invasions. Cotton became one of the first Soviet crops to depend on the regular application of pesticides, herbicides, and fertilizers. By 1970, the Fergana Valley was using more pesticides than any other agricultural industry in the Soviet Union and was applying up to 400 kilograms of fertilizer per hectare of cotton.[52] These chemical inputs contributed to environmental pollution and the contamination of water supplies, which were already serious problems in 1970 and endure today as difficult and seemingly intractable problems that Uzbekistan and the rest of the Soviet Union's former cotton empire must continue to confront.

Final Observations

In many sectors of Soviet agriculture, farms industrialized in a way that might look familiar to any resident of the American Midwest; fields expanded, villages disappeared, tractors and combines appeared, and their work quickly replaced that of skilled humans. Occasionally, however, industrialization in the Soviet Union unfolded quite differently. Skilled workers sometimes held key positions in the postwar Soviet agricultural workforce, and occasionally farms tabled the grandiose plans to mechanize and fully automate that were set forth in Five Year Plans in favor of expanding systems of human labor in areas of population surplus. These exceptions to the standard, business-as-usual model of industrialization are important to acknowledge and study because they have something to teach us about the flexibility and diversity of industrialization—a system that is not always understood to be either flexible or diverse.

https://doi.org/10.1017/S0147547913000458 Published online by Cambridge University Press

Soviet agricultural involution diverges from the classic pattern Clifford Geertz described in 1963. On neither Soviet pig farms nor Soviet cotton plantations was agricultural labor intensification sustainable in the long term. In both cases the pattern of involution described above became rapidly ecologically unsustainable. Soviet agricultural planners realized the risk of growing food for livestock instead of humans in an agriculturally marginal country in 1963, only a little more than a decade after the Soviet Union's *svinarki* had been charged with improving the survival rate and well-being of Soviet pigs. The environmental fallout from large-scale cotton plantations happened equally rapidly: Soviet scientists recognized the environmental and health risks of increased fertilizer and pesticide usage by the late 1960s. Although geographers who noticed the dropping levels of the Aral Sea initially expected these to self-correct, by 1978 it was obvious that the Aral Sea had entered a state of irreversible decline.

In spite of the fact that these Soviet case studies did not result in the same kind of remarkable environmental equilibrium that characterized Clifford Geertz's Javanese case study, agricultural involution remains a productive concept in these examples. It links population pressures with environmental pressures by showing how, in addition to the work of machines, the work of human labor also alters landscapes and environments. Agricultural involution also provides a way of thinking about the relative flexibility or rigidity of agroecological health in the face of labor intensification. This quality—how much additional labor and how many extra humans an agricultural ecosystem is able to support—is critical in evaluating how robust or fragile a landscape is.

Soviet landscapes that supported pigs and cotton proved to be relatively fragile—as more pigs and more cotton crowded into these landscapes, environmental health declined. In the case of pigs, the Soviet pig industry revealed its fragility when an overabundance of pigs and a scarcity of corn resulted in pigs competing with human food supplies. In the case of cotton, irrigation networks and heavy pesticide use allowed a labor-intensive crop to flourish but at the cost of destroying the health of the landscape that hosted the crop: The cotton growing regions of Central Asia are so environmentally damaged by decades of intensive agriculture that these regions are rapidly becoming unlivable.

NOTES

1. The literature on this process is voluminous and largely focused on the United States. The best works on this topic include Pete R. Daniel, *Breaking the Land: The Transformation of Cotton, Tobacco, and Rice Cultures since 1880* (Champaign, IL, 1986); Deborah Fitzgerald, *Every Farm a Factory: The Industrial Ideal in American Agriculture* (New Haven, CT, 2003); David Danbom, *The Resisted Revolution: Urban America and the Industrialization of Agriculture, 1900–1930* (lowa City, IA., 1979). The most comprehensive book on Russian and Soviet agriculture, A. A. Nikonov, *Spiral Mnogovekovoi dramy: Agrarnaia nauka i politika Rossii, XVIII–XX vv.* (Moscow, 1995), discusses mechanization but not deskilling.

2. Clifford Geertz, *Agricultural Involution: The Processes of Ecological Change in Indonesia* (Berkeley, CA, 1963).

https://doi.org/10.1017/S0147547913000458 Published online by Cambridge University Press

3. Jenny Leigh Smith, *Works in Progress* (New Haven, CT, 2014), Ch. 1–2. On the internal passport system, see Gijs Kessler, "The Passport System and State Control over Population Flows in the Soviet Union, 1932–1940," *Cahiers du Monde Russe*, vol. 42 no. 2–4, 477–504, David R. Shearer, *Policing Stalin's Socialism: Repression and Social Order in the Soviet Union* (New Haven, CT, 2009), 243–85.

4. Geertz, *Agricultural Involution*, 32–37.

5. On failed industrialization, see Noam Jasny, *Soviet Industrialization* (Chicago, 1961); Eugene Zaleski, *Stalinist Planning for Economic Growth* (New York, 1971). On failed agricultural industrialization, see Zhores A. Medvedev, *Soviet Agriculture* (New York, 1987). On muddling through, see Blair Ruble, "Muddling Through," *Wilson Quarterly* (winter, 1981): 126–38.

6. Jospeph V. Stalin, *Works*, vol. 13, 1930–1934 (Moscow, 1954).

7. Guy L. Bush to Louise G. Bush, letter, August 9, 1931. Private collection of Guy L. Bush, Jr.

8. James Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition have Failed* (New Haven, CT, 1998), 193–222; Kate Brown, "Gridded Lives: Why Kazakhstan and Montana are Nearly the Same Place," *The American Historical Review* 106 (2001): 17–48.

9. Michael Ellman, "The 1947 Soviet Famine and the Entitlement Approach to Famines," *Cambridge Journal of Economics* (2000): 618–19. On the famine more generally, see Nicholas Ganson, *The Soviet Famine of 1946–1947 in Global and Historical Perspective* (New York, 2009).

10. Nikolai Voznesenskii, trans., *Five-Year Plan for the Rehabilitation and Development of the National Economy of the USSR, 1946–1950* (London, 1946).

11. Ibid.

12. Elena A. Osokina, *Our Daily Bread: Socialist Distribution and the Art of Survival in Stalin's Russia, 1927–1941* (New York, 2001), 82–90.

13. Of course, between 1926 and 1940 the Soviet countryside experienced a series of extraordinary events including collectivization and famine. These may have pushed some people out of rural areas, but the slower rate of urbanization between 1950 and 1972 still stands.

14. The rural population decreased five percent between 1926 and 1939, and three percent between 1959 and 1970. Chauncy Harris, "Urbanization and Population Growth in the Soviet Union 1959–1970," *Geographical Review*, vol. LXI no. 1, (1971): 102; Frank Lorimer, *The Population of the Soviet Union: History and Prospects* (Geneva, 1946), 168.

15. David Kotz and Fred Weir, *Revolution from Above, the Demise of the Soviet System* (London, 2007), 35.

16. *The Situation in Biological Science: Proceedings of the Lenin Academy of Agricultural Sciences of the USSR, Session July 31st–August 7th, 1948, Verbatim Report* (Moscow, 1949).

17. For example, see Dominique Le Court, *Proletarian Science: The Case of Lysenko* (London, 1977); Zhores A. Medvedev, *The Rise and Fall of T.D. Lysenko* (New York, 1969); Valerii Soyfer, *Lysenko and the Tragedy of Soviet Science* (New Brunswick, NJ, 1994); Conrad Zirkle, *Death of a Science in Russia* (Philadelphia, 1949).

18. Roy D. Laird and Edward L. Crowley, eds. *Soviet Agriculture: The Permanent Crisis* (Lawrence, KS, 1965), 121, 159.

19. I base these assertions on the observations of two groups of Americans: swine experts who lived and worked in the countryside on hog farms from 1930 to 1931, and a group of visiting agricultural specialists, including swine experts, who visited the country in 1955.

20. On gender distribution after the war and gender imbalance in the rural Soviet Union, see Elena Zubkova, *Russia after the War: Hopes, Illusions, and Disappointments, 1945–1957* (New York, 1998), 20–21, 38–39.

21. Of the two hundred workers on seven breeding farms for which I have data, there were no women in positions of leadership on these farms. RGAE, f. 7486, op. 25, d. 44, l. 1–4.

22. Lysenko, "New Developments in the Science of Biological Species," (Moscow: Foreign Languages Publishing House, 1951).

23. GARF, f. 616, op. 1, d. 5638, l. 49 (verso). Khrushchev reduced but did not eliminate mixed-use kolkhozes in the Soviet Union. The numbers for this oblast (Irkutsk) are likely higher because it was in Siberia, but the general pattern of animals being labor-intensive is true throughout the Soviet Union.

24. RGAE, f. 7486, op., 25, d. 71. This document, which chronicles the progress of the Urzhumskaia breed of pig between 1954 and 1956, is based entirely on the daily records of

https://doi.org/10.1017/S0147547913000458 Published online by Cambridge University Press

weight gain, feed intake, and health for the pigs in Urzhumskaia raion. Such records were almost certainly kept for every purebred hog breeding facility, of which there were hundreds.

25. RGAE, f. 8390, op. 12, d. 1558.
26. GAKhO, f. 4672, op. 7, d. 4004.
27. RGAE, f. 7468, op. 25, d. 44, l. 165.
28. RGAE, f. 7803, op. 4, d. 1349, l. 56.
29. For Ministry of Agriculture press releases, see RGAE, f. 7486, op. 25, d. 46, ll. 10–35. In magazines, see *Kolkhoznoe Proizvodstvo, Kolkhoznoe Selo and and Pishchevaia Promyshlennost' (Miasnaia)*. For example, "From Each Sow: 27 Piglets," *Kolzhoznoe Proizvodstvo*, June 1949, 36–37.
30. "Visits to Soviet Agricultural Installations: November 15, 1961," report, Folder: Agriculture, Record Group 166, NARA Records of the Foreign Agricultural Service Narrative Reports 1955–1961.
31. D. Gale Johnson, "Eye Witness Appraisal of Soviet Farming: 1955," *Journal of Farm Economics* 38 (1956): 291.
32. On postwar hog industry, see Joseph Anderson, *Industrializing the Cornbelt: Agriculture, Technology and Environment* (Chicago, 2009), 94–102.
33. Medvedev, *The Rise and Fall of T.D. Lysenko,* 180–82. See also Alec Nove, "Soviet Agriculture under Brezhnev," *Slavic Review* Vol. 29, No. 3, (1970): 186–87.
34. Folke Dovring, "Soviet Farm Mechanization in Perspective," *Slavic Review* Vol. XXV, No. 2, June 1966, 292.
35. Nove, "Soviet Agriculture under Brezhnev," 187.
36. Dan Morgan, *Merchants of Grain* (New York, 1979), 161–79.
37. On imperial plans, see Muriel Joffe, "Autocracy, Capitalism and Empire: The Politics of Irrigation," *Russian Review* 54 (1995): 365–88. On Soviet plans, see Igor Zonn, "The Impact of Political Ideology on Creeping Environmental Changes in the Aral Sea Basin," in *Creeping Environmental Problems and Sustainable Development in the Aral Sea Basin*, ed. Michael Glantz (Cambridge, 1999), 157–190.
38. Robert N. Taaffe, "Transportation and Regional Specialization: The Example of Soviet Central Asia," *Annals of the Association of American Geographers* 52 (1962): 80–98.
39. Philip R. Pryde, "The Areal Deconcentration of the Soviet Cotton-Textile Industry," *Geographical Review* 58 (1968): 577.
40. See Michael Glantz, *Creeping Environmental Problems*; Siegmar Breckle, Walter Wucherer, Liliya A. Dimeyeva, Nathalia P. Ogar, eds., *Aralkum—A Man-Made Desert: The Desiccated Floor of the Aral Sea* (Springer, 2011).
41. Institut Geografii, *Problema Aral'skogo Morya*, ed. S. Yu Geller (Moscow, 1969), 5–16.
42. Richard Pomfret, "State-Directed Diffusion of Technology: The Mechanization of Cotton Harvesting in Soviet Central Asia," *The Journal of Economic History* 62 (2002): 170–88.
43. *Naseleniye SSSR, 1973* (Moscow, 1975), 138.
44. Ajay Patnaik, "Agriculture and Rural Out-Migration in Central Asia, 1960–1991," *Europe-Asia Studies* 47 (1995): 147–69.
45. The Great Soviet Encyclopedia, 1979, "TashSelMash," online at http://slovari.yandex.ru/ / ~ книги/БСЭ/Ташкентский%20завод%20сельскохозяйственных%20машин/
46. Quoted from the 1960 "Sel'skoe Khoziastvoe" annual report, in Naum Jasny, "A Note on Rationality and Efficiency in the Soviet Economy. II," *Soviet Studies* (1961): 66.
47. A. Ia. Kvasha, translated by and cited in David Heer, "Three Issues in Soviet Population Policy," *Population and Development Review* 3 (1977): 241.
48. *Towards the Contemporary Period: From the Mid-Nineteenth to the End of the Twentieth Century History of Civilizations of Central Asia*, ed. Chahryar Adle, Madhavan Palat, and Anara Tabysalieva (Paris, 2005), 536.
49. Patnaik, "Agriculture and Rural Out-Migration in Central Asia," 148–49.
50. Dovring, "Soviet Farm Mechanization in Perspective," 292.
51. Ibid.
52. Nancy Lubin, "Uzbekistan: the Challenges Ahead," *Middle East Journal*, vol. 43, Number 4, Autumn 1989, 629.

https://doi.org/10.1017/S0147547913000458 Published online by Cambridge University Press