The Vulnerability of Nations: Food Security in the Aftermath of World War II

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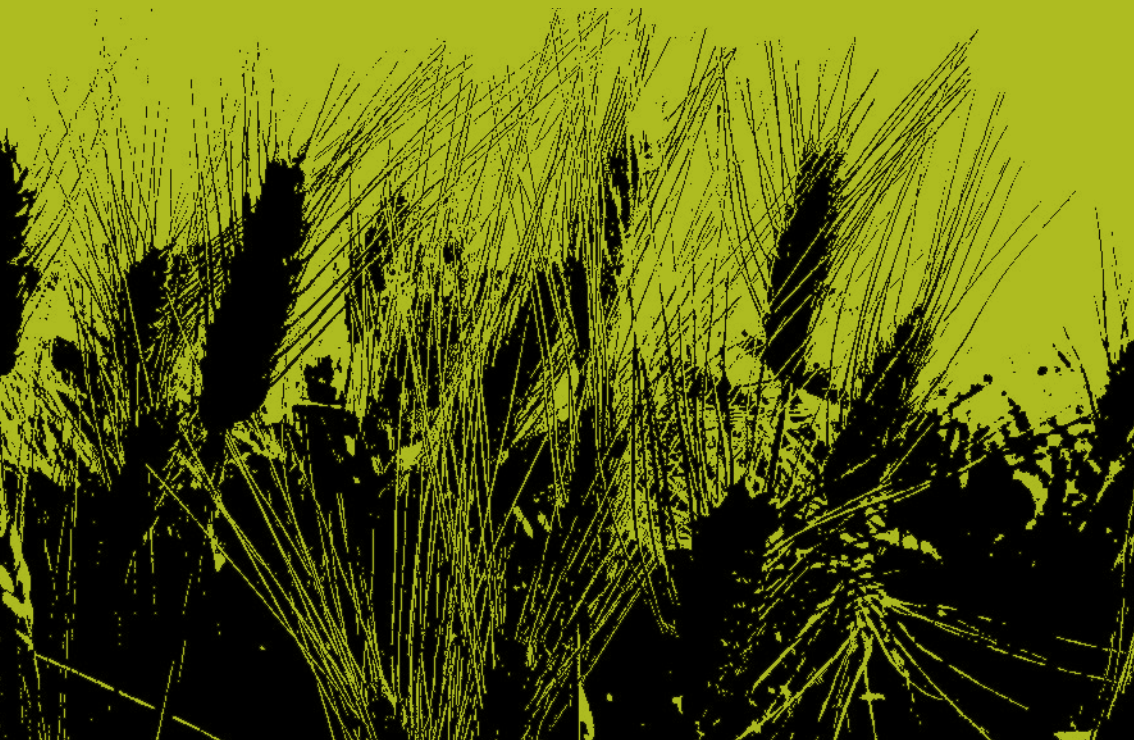
In World War II, hunger stood out as one of the most devastating lasting outcomes, with Europeans facing food shortages, austere rationing, and bleak winters. The creation of the Food and Agriculture Organization (FAO) in 1946 marked an attempt to stem the tide of hunger and to map out a future of food security as the world attempted to heal the scars of war.[1] In Europe, civilians and former soldiers alike stood on the brink of starvation during the harsh winter of 1946, and they would again



in the even harsher winter of 1947.[2] Emergency measures added pressure to already strained economies and drew upon scientific expertise to understand just how vulnerable humans were in the early moments of peace. It remained to be seen whether, in that time of destruction and reconstruction, Europe would reclaim old practices or become something quite different, based on scientific knowledge. As experts gathered in international organizations, they began to ask if there were ideas about protecting crops and nourishing people that might be implemented in that historical moment of both crisis and opportunity.

The reconstruction of Europe did occur, not only through postwar FAO coordination but also through wartime and postwar actions by the United Nations Relief and Rehabilitation Administration (UNRRA), and eventually by the United States European Recovery Plan. The American plan, more widely known as the Marshall Plan, not only aided the recovery of Western Europe but also solidified the economic and political divisions between East and West.[3] We know less of the ecological dimensions of the Marshall Plan that might reveal how American ideas influenced land use, the distribution of plant and animal species, and even health and nutrition. The same is

[1] Scholars during World War II and today continue to state that food access was a major cause of the war itself and that the primary goal of the FAO was to address the food-based sources of conflict. On food as a major cause of the war, see L. Collingham, *The Taste of War: World War II and the Battle for Food*, Penguin, New York 2012. Similar claims were made in the 1940s; a notable example is F. Osborn, *Our Plundered Planet*, Little, Brown, Boston 1948. The influential postwar notion that the world's resources were a continuing source of conflict is emphasized in T. Robertson, *The Malthusian Moment: Global Population Growth and the Birth of American Environmentalism*, Rutgers University Press, New Brunswick 2012. On the FAO's creation and early years, see A.L.A. Staples, *The Birth of Development: How the World Bank, Food and Agriculture Organization, and World Health Organization Changed the World, 1945-1965*, Kent State University Press, Kent, Ohio 2006.

[2] On the economic and hunger crisis in its larger context, including the Marshall Plan, see T. Judt, *Postwar: A History of Europe since 1945*, Penguin, New York 2006, pp. 86-99.

[3] Such divisions were in part economic, but also were reinforced by attitudes about consumption that differed between East and West. See G. Castillo, "Domesticating the Cold War: Household Consumption as Propaganda in Marshall Plan Germany", in *Journal of Contemporary History*, 40, 2, 2005, pp. 261-288.

true of international organizations such as FAO, which attempted to introduce "modern" scientific practices among member nations all over the world.[4] We do not yet have a complete sense of how older practices of pest control, fertilization, crop choice, and nutritional standards, to name just a few examples, were influenced by the wholesale reconstruction of the global economy after the war. We also are only beginning to understand the influence of the war on what we might call environmental security, from biological weapons programs to neo-Malthusian concerns about population collapse.[5]

The present essay focuses on the scientific approaches emerging from the war that attempted to identify key risks to food security. It shows how a number of scientists in the United States and Britain addressed the problem of human vulnerability in the immediate postwar years, prior to the implementation of the Marshall Plan. The goal of the essay is to highlight how wartime experiences informed notions of food security within international organizations for many decades to come. It is tempting to see such international efforts primarily in their Cold War context – one that pitted American abundance and market availability against the supply limitations of Soviet-backed regimes. That is an important story that justifiably characterizes much of the literature about the Marshall Plan.[6] However, focusing on the

[4] The role of FAO in distilling crucial aspects of contemporary thought about economic development is emphasized in Staples, *The Birth of Development* cit. Other scholarship points out that much of the postwar ideas about development, whether global or country-specific, have their roots in scientific and economic thought during and prior to World War II. See M. Connelly, *Fatal Misconception: The Struggle to Control World Population*, Harvard University Press, Cambridge 2008. D. Ekbladh, *The Great American Mission: Modernization and the Construction of an American World Order*, Princeton University Press, Princeton 2010.

[5] On population concerns, see Robertson, *The Malthusian Moment* cit. Connelly, *Fatal Misconception* cit. On biological weapons and environmental security, see J.D. Hamblin, *Arming Mother Nature: The Birth of Catastrophic Environmentalism*, Oxford University Press, New York 2013.

[6] For an analysis of the Marshall Plan that places the assistance programs in the context of the United States' broad domestic and foreign economic goals, see M.J. Hogan, *The Marshall Plan: America, Britain, and the Reconstruction of Western Europe, 1947-1952*, Cambridge University Press, New York 1989.

East-West clash can obscure the ways in which American attitudes stood in conflict with European (particularly British) ones in the immediate postwar years, despite all experts wearing the mantle of modern Western science. Attitudes in the long-lived organization, FAO, were deeply influenced by European attitudes, which in turn were fundamentally shaped by wartime experience, in ways that often stood in stark contrast with American views. We can see these differences in sharp relief when experts debated diet, crops, and the overall approach to managing global food insecurity in the long term. Because of the later significance of the Marshall Plan, many of these approaches to food security have become invisible in our scholarship, even though they continued to exercise a powerful influence in United Nations circles for much of the postwar period.

The Coming Winter

When the Soviet Red Army captured Vienna in April 1945, most Viennese lost their connections to the countryside, to markets, and to food. In the chaos, no rationing program existed, and the people had to subsist on what they had managed to hoard.[7] Even when the Soviets started a rationing program in June 1945, they only allotted about 800 calories per day for the average person, with only limited vitamin content and no fresh vegetables. When the Allied Council for Austria (ACA) was established that September, it attempted to raise this average to some 1,550 calories per day, and to assess nutritional content. Even then, the Allies knew this was too low, especially with winter coming.[8]

What happened in the next year was quite remarkable. There was universal agreement that the people stood on the brink of starvation, and government authorities constantly clamored for aid. Yet in 1946,

[7] On the fears of a "hunger catastrophe" in occupied Austria, see J. Lewis, "Dancing on a Tight Rope: The Beginning of the Marshall Plan and the Cold War in Austria", in *The Marshall Plan in Austria*, G. Bischof, A. Pelinka, D. Stiefel (eds), Transaction Publishers, New Brunswick 2000, pp. 138-155.

[8] M. Pyke, "Nutrition in Vienna in September, 1945", reprint from *British Medical Journal*, 2, 839, 1945, MAF 98/196, UK National Archives.

when the Allied Council for Austria tried to assess the devastating effects of food shortages, scientific surveys of the population were not so definitive. British nutrition scientist Magnus Pyke flew in, visited hospitals and other institutions, and then made a stunning pronouncement: there was no evidence of starvation, and therefore adequate food must be available. Pyke realized his findings were "strongly unpalatable" to most of the experts already working there, including those of the United Nations Relief and Rehabilitation Administration (UNRRA). And yet there was a troubling inconsistency between the scientific surveys and the basic reality of daily life. He noted that the Austrians "are living completely from hand to mouth and without any stocks whatever". He also acknowledged that should rationing fail at any point, famine would immediately follow. Already there was widespread anemia and dangerously high incidence of tuberculosis. But on the whole, the Austrians were improving.[9]

The Americans were perplexed by Pyke's attitude, and they implored him not to circulate his report to British authorities. They and others working for the Allies in Vienna were frightened that any hint of well-being in Austria would be used as an excuse to diminish food aid. What the Austrians needed was an abundance of food, not barely enough to survive. Pyke did in the end show the report, but only after his superiors insisted upon seeing it. Falling death rates, rising weights of schoolchildren all indicated positive change. Hospital reports were good: almost no edema (dropsy), and few convincing cases of vitamin deficiency. Weights were fine, though Pyke qualified that: "although, of course, compared with American anthropometric standards the people are under weight".[10] And yet Austria – as well as many other countries in Europe – was supposedly on the brink of starvation.

The incident illustrated well a difference in attitude between the Americans and their Allied counterparts, most of whom had undergone austerity measures of their own. Although they all shared the

[9] M. Pyke to Mr. Anderson, 15 July 1946, MAF 98/196, UK National Archives.

[10] M. Pyke to Dr. Hugh Sinclair, 19 July 1946, MAF 98/196, UK National Archives.

notion of calorie consumption as a marker of nutritional stability, they differed on the key indicators: the Americans saw it as market availability of food, whereas the British saw it as adequate rationing. In Austria in the summer of 1946, there was almost no legal market availability of food, but there was a rationing program in place to keep Austrians from starving. And the robust black market, based mostly on corruption by officials or outright theft of stocks meant for rationing, accounted for the rising nutritional health of the people.[11]

One reason these results were so controversial was the fact that most experts in international organizations agreed that postwar reconstruction should attempt to round out the diets of all Europeans in a way consistent with the science of nutrition. And even though the surveys suggested otherwise, they believed that most people in war-torn countries remained extremely vulnerable to malnutrition and undernourishment. This was especially so of children. From data collected at the close of the war, public health officials knew that children suffered in a multitude of ways, from being physically harmed, to the psychological costs of displacement from their homes and the deaths of family members, to malnourishment and lingering ailments. Even those who avoided atrocities were vulnerable. For example, data from central Europe and China pointed out that amenorrhea, the absence of menstruation, was common in young women, likely because of extremely poor nutrition, and the prevalence of tuberculosis in children was high. These problems often were compounded by homelessness, lack of parents, and physical disabilities. Premature births and infant mortality rates were high, and average weights of children were low. Skins diseases were prevalent, too, likely because of vitamin deficiencies.[12]

Documenting health deficiencies was nearly impossible. Surveys had to correlate incomplete or partially destroyed wartime data, and the state of the science was itself in flux. While the tragedy

[11] M. Pyke, *Report on the General Level of Nutrition in Vienna, July 1946*, MAF 98/196, UK National Archives.

[12] *Report of FAO-WHO IC Committee on Child Nutrition* (to advise ICEF), 23-26 July 1947, Washington D.C., box 10DIR346, folder WHO, FAO Archives.

of wartime children had many manifestations, health officials often reduced them to the problem of access to calories. What wartime children received was barely enough to keep alive, and they usually lacked access to milk. They certainly did not routinely have access to the "Oslo Breakfast", touted in the 1930s and 1940s as the perfectly balanced meal to serve to schoolchildren.[13] While organizations like UNRRA were deeply concerned about nutrition, they often reduced the problem to that of calorie intake. Historian Nick Cullather has shown how the calorie became politically legible as a unit of energy, even though few know precisely what calories were. Measuring food energy universalized it, apparently stripping it of environmental, biological, and social context. As Cullather argues, "the calorie represented food as uniform, composed of interchangeable parts, and comparable across time and between nations and races".[14]

In contrast to the strictly delineated and carefully measured "Oslo Breakfast", providing the apparently ideal configuration of nutrients, the American approach was to emphasize quantity and diversity. Different wartime experiences between North America and Europe served to reinforce the stark contrast. When British authorities from the Ministry of Food visited Canada and the United States in 1946, they were appalled at the thoughtless gluttony they found. Many Americans seemed unaware that the British were still on rations, and they found North Americans generally uninformed of the fact that Europe stood on the brink of starvation. When D.F. Hollingsworth visited restaurants, she was shocked to see the huge portions of food, the large

[13] One study of the benefits of Oslo Breakfast described it as made up of 210 to 225 ml. raw milk together with brown bread, butter, cheese or ham, fruit, sugar and jam. See E.J. Bigwood, G. Jacquemins, P.M.G. Levy, *Une expérience alimentaire en Belgique: influence de la distribution de "petits déjeuners d'Oslo" ou de rations de lait sur l'état de nutrition d'enfants âgés de 5 à 16 ans*, Brussels 1940.

[14] The idea that government bodies make populations "legible" through constructed units of analysis is offered most persuasively in J.C. Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed*, Yale University Press, New Haven 1999. On the calorie, see N. Cullather, "The Foreign Policy of the Calorie", in *American Historical Review*, 112, 2, 2007, pp. 337-364. Quote on p. 345.

amount of bread served, and was taken aback when she learned that public health regulations "require that all food – even that which has not been touched – must be discarded if it is returned from the table to the kitchens… I was continually amazed at the amount of food wasted, even by people such as home economists and dietitions who – one would have thought – should have set a better example".[15]

These British visitors returned flabbergasted by the "complete lack of appreciation in the United States of conditions elsewhere", and the "unreasoning outlook existing in America". They also were surprised to learn that, in contrast to most European countries, the US federal government did not attempt to control or direct the food supply at all. Again Magnus Pyke, who attended the 1946 meeting of the American Dietetic Association in Cincinnati, observed some of the extraordinary differences. In the UK, food distribution was rigidly controlled by the government so that nutrients were directed exactly where they were needed, with a view to achieving adequate levels of nutrition for all and minimizing waste. Palatability was hardly considered at all. "The situation in the United States is entirely different", he reported. "The food supply is lavish. Although a measure of general understanding about dietetics exists there is anarchy in food distribution". Although some items were hard to come by, such as sugar, there was so much variety in the available food that it was nearly impossible to avoid a nutritionally adequate diet. Pyke lamented that the average American seemed to have no concept of how different the situation was for Europeans:

> It is appreciated that food may be scarce in the UK and big shops in the large American towns supply hampers and food parcels for dispatch as presents to British families, but there is no appreciation that the dietary commonplaces of American life, such as, for example, that there is always a glass of milk, a candy bar or a bag of nuts to be had from a peddler in a railway coach or a fried egg sandwich from a drug store, do not hold in this country.[16]

[15] D.F. Hollingsworth to Dr. M. Pyke, n.d., MAF 98/197, UK National Archives.

[16] M. Pyke, *Report of My Visit to the United States and Canada during October, 1946*, 14 November 1946, MAF 98/197, UK National Archives.

The British visitors were struck by how much abundance and diversity – so commonplace in North America – affected American attitudes.

This lavish food supply had some unexpected effects on how Americans developed nutrition policies. It seemed that federal scientific advice about daily allowances was based on overabundance, and federal programs for school nutrition were highly influenced by the economics of surplus. Pyke scoffed at the US Department of Agriculture's (USDA) notion of seven food groups, which he took as an essentially arbitrary number that only meagerly took into account the National Research Council's recommended nutrient allowances. He and other British observers concluded that Americans were encouraged to eat a mixed diet, not committing to any particular configuration, with unreasonably high allowances of some products, especially milk. "In a country such as the United States where food supplies are ample, lavish advice is probably justifiable though not necessarily scientific". Although Pyke lauded American efforts to provide federally-sponsored school meals, he noted that they were far more successful from a commercial point of view than a nutritional one. Foods were rarely presented in a way that led to children choosing items of nutritional value, and like many others then and since, he gained the impression that school meal schemes were designed principally to dispose of surplus agricultural products.[17]

With such strong impressions of economic considerations outweighing scientific ones, Pyke concluded from his visit that there was not much chance of persuading the American government to provide more food aid to Britain on scientific grounds. As he and his colleagues already knew, it was extremely hard to demonstrate malnutrition. Case in point: in 1944, just months after their government's capitulation, the Italians were surveyed for malnutrition by

[17] For an example of scholarship that identifies the negative consequences of using agricultural surpluses as food aid, see H. Friedman, "The Political Economy of Food: The Rise and Fall of the Postwar International Food Order", in *American Journal of Sociology*, 88, S1, 1982, pp. S248-S286. Pyke's views are in Pyke, *Report of My Visit* cit.

the Italian Central Institute for Statistics. The surveyers were unable to show that the people were at risk, despite the obvious food shortage problem there. And yet the Italian people were vocal in their outcries, and received considerable food assistance from the Americans. Pyke argued that corporate farms and livestock producers were too strong in the United States for logical appeals based on science to have any effect. However, "the Italian example suggests that strong, emotional propaganda addressed to a wide American public, as a well as to Cabinet officials, could be expected to produce results".[18]

A Biological Arms Race

Although Pyke and other British observers reacted strongly against American ignorance of all things beyond the water's edge, American scientists themselves were not always as ignorant as they appeared. The wartime diversity of crops was perceived widely as the key to American strength. With the frailty of Europe in mind, scientists began to assess the vulnerability of North America. Reflecting on the wartime "part played by the abundant – often record-breaking – crops produced on this continent in supplying food to our fighting forces and to allied civilian populations", American plant pathologists Neil Stevens and Russell Stevens tried in 1947 to draw attention to the postwar vulnerabilities of those crops. They noted that root rots could cut crop yields by as much as sixty percent. They recalled the epidemic of stem rust of wheat in 1916, which severely upset America's ability to feed itself and its allies during the First World War.

To these American scientists, the exuberance of victory masked a disturbing trend, namely the arms race between resistant varieties and ever-evolving pathogens. In 1940, 1941, and 1942, wheat rust caused only minor damage in Canada. But in 1943, stem rusts afflicted both wheat and oats in eastern Canada. Field experiments demonstrated that there would have been a major epidemic had there not been varietal resistance to the rust. And in 1944 and 1945, resistance appeared to be steadily in decline, as leaf rust arose in varieties where previously

[18] Ibid.

it had not appeared. "Here, too, formerly resistant varieties were affected, probably indicative of attack by new races of the rust".[19]

Citing the cereal rusts and potato blights, American plant pathologist Elvin C. Stakman wrote in 1947 that "it is not too much to say that epidemics of plant diseases sometimes amount virtually to a national calamity". Like a wartime enemy, these diseases were dangerous and, worse, hard to pin down from place to place or year to year. They were "shifty enemies", as he put it. One could look around at the worst offenders – chestnut blight, citrus canker, white pine blister rust, pasmo disease in flax, Dutch elm disease, and the grape mildews afflicting the wine industry in Europe – and one could argue that it was "virtually certain that they never would have invaded those countries had man not brought them in". Stakman blamed humans for most of these diseases, as they transported plant pathogens from one region or continent to another. He did not say they did so on purpose, but "either through ignorance, apathy, or ineptitude".[20] And yet he also pointed out that nature was the world's greatest plant breeder, producing mutation and hybridization on a colossal scale, harnessed by winds that could carry rust spores far and wide, and aided by rains that could bring them to ruin man's food crops. At length, Stakman pointed out how it was necessary to conduct extensive hybridization experiments to anticipate the most damaging pathogens and find resistant varieties. The key to food security was not abundance per se, but biological diversity. Scientists should try to predict what may happen in the future "and be prepared to meet future emergencies before the future has already become the past".[21]

Stakman believed that the hard-won lesson of World War II would continue to be relevant during the Cold War. He was a strong advocate of research on new varieties as a defense against biological invasions, including purposeful ones. "With a cold war going

[19] N.E. Stevens, R.B. Stevens, "Plant Diseases during the Years 1941-1945 in the United States and Canada", in *Botanical Review*, 13, 2, 1947, pp. 92-115. Quote p. 93.

[20] E.C. Stakman, "Plant Diseases are Shifty Enemies", in *American Scientist*, 35, 3, 1947, pp. 320-350. Quotes on pp. 322-323.

[21] Ibid., p. 349.

on, our enemies may resort to biological warfare by producing extra virulent strains of plant diseases", he told an audience of Wisconsin farmers in 1949. He told them that potato blight had been a major factor in the collapse of Germany in the First World War. At the time he was talking about the ways of increasing variety, including the use of atomic radiation to produce more genetic mutations, to add to the hybridizer's toolkit.[22]

Most of the published writing about controlling plant diseases emphasized the struggle of species, and in that struggle apparently *Homo sapiens* had the great advantages of reason and forethought. As USDA scientist W.A. McCubbin put it:

> On the one hand are ranged a host of parasitic forms of life, numerous, successful, often advantageously specialized, always blindly surging toward new territory by virtue of a tremendous dispersal pressure, but unable to overcome certain obstacles and limitations. Matched against these is a human society, endowed with intelligence, capable of effective organization, furnished with vast means of accomplishment, but not yet fully aware of its threatened interests, and only partially awake to the character of its enemies.[23]

McCubbin used explicitly wartime language: calculating "tribute exacted", "drains on the national treasure chest", or the "national damage bill".[24] The eventual outcome in the struggle between the two antagonists, McCubbin wrote, lay far in the future.

The Americans were torn about how best to handle American vulnerability, because powerful economic arguments tended to weaken science-based protectionist policies. For example, plant pathologists believed that the irregular flows of goods and people during the war had played a major role in the introduction of plant diseases, which damaged the food supply. One of the leaders in developing foreign plant quarantine policies before, during and after the war was Ernest Sasscer. In his 1940 presidential address to the American Association of

[22] "Tells of Atom in Plant Study", in *Milwaukee Journal*, 19 Mar 1949, L9.

[23] W.A. McCubbin, "Preventing Plant Disease Introduction", in *Botanical Review*, 12, 2, 1946, pp. 101-139. Quote on p. 101.

[24] Ibid., p. 105.

Economic Entomologists, "Undesirable Insect Aliens", Sasscer warned of risks to the United States even prior to American involvement in the war. He called to mind the dangerous precedent of the First World War, when he believed the U.S. government allowed its quarantine policies to slacken. The challenges of acquiring commodities in a global conflict went hand-in-hand with the problem of unwelcome insects and fungi in the holds of ships who had visited unusual ports of call.[25]

Despite this knowledge, the economic pressures of World War II motivated Sasscer's office to slacken controls. Under existing quarantine laws, for example, the USDA had previously limited the importation of foreign nursery plants intended for propagation in the United States, but in the three successive moves, his office allowed for a 25% increase in the number of plants, then changed that to 60% increase, and by 1943 it eliminated the restriction altogether. When the war ended, restrictions were not reinstated. In the postwar Congressional hearings about reinstating quarantine, these scientists had to stand up against tulip bulb merchants who argued that the Dutch people needed American help to rebuild a key economic sector (tulip bulb exports), and that quarantine laws went against the values of free trade.[26]

In the postwar period, some Americans had advocated what McCubbin called the pathogenic equivalent of the "Open Door" policy, which meant abandoning quarantine measures in the hope that free entry to all foreign pathogens would lead eventually to biological stability on a global scale. This philosophy, he argued, ignored the extraordinary scale of variability and evolutionary change: "If pathogenic species both at home and abroad are constantly, or at least frequently, developing new biologic forms, a hitherto confident reliance on our ability to breed permanently resistant varieties is materially weakened". The adjustment period envisaged by "open door" advocates would not be brief, but would instead be permanent.

[25] A.S. Hoyt, "Pioneer in International Plant Quarantine Work", in *Science*, 122, 3171, 1955, p. 632. "War Brings Renewed Danger of Invasions by Insect Foes", in *The Science News-Letter*, 37, 1, 1940, p. 15.

[26] *Amend Plant Quarantine Act*, U.S. GPO, Washington 1947.

Despite these concerns, ecological arguments tended to make Americans look more robust than ever against any enemies. Kenneth Starr Chester argued in *The Scientific Monthly* that although plant diseases could cripple a national wartime economy, the United States was in a favored position because it was not dependent on one, or even a few, crops for its basic nutritional needs. Many varieties of wheat, corn, and potatoes could supply carbohydrates, and essential oils could come from flax, cotton, corn, soybeans, or sunflowers. "We are fortunate that corn, our greatest crop and the one with the most varied uses, is least subject, among the cereals, to sudden destructive disease epidemics". But there were other protections, too. Because the "war-vital American crops" were grown on millions of acres, Chester and other pointed out that the main threats would be those diseases that could be spread by air. And even these would take years to make serious inroads into the crop. Referring to Stakman's and others' research, Chester wrote that several years are required for cereal rusts to build up in significant concentrations. Even the worst diseases, such as Dutch elm disease and pine blister rust all required long periods of time. Were these likely to be effective instruments of war? In a short war, no. But if one includes years of prewar sabotage, they might be. However, as an offensive weapon - especially against countries far less diversified than the United States - they could be far more important.[27]

But what if that prewar sabotage already was underway? Experts advising the UN's Food and Agriculture Organization agreed that invasions already were occurring. With reconfigurations of trade routes, migrations of peoples, and movement of troops during the war, these were years of frenzied ecological invasion and displacement, with widespread dissemination of a variety of species previously living in relative isolation. Of the nearly two hundred species of pests routinely discovered in imports to the United Kingdom, for example, many were relatively unknown prior to the twentieth century. *Ephestia kuehniella* – also known as the mill moth, flour moth, or pantry moth – was discovered in German mills in the 1870s, but

[27] K. Starr Chester, "Will Biological Warfare Include Plant Disease?", in *The Scientific Monthly*, 63, 6, 1946, pp. 477-480.

was a global phenomenon just thirty years later. The common spider beetle (of the Ptinus family) was completely unknown in England before its appearance in 1892, but quickly spread to all the British Isles and continental Europe. Scientists' best guess was that it originated in Tasmania, having traveled along the trade routes of the British Commonwealth, infesting stored yeast and fish meal.[28] How long would it be before the World War II invaders took over completely?

British officials mapped out the wartime migrations of these stowaways as best they could, concluding that the ships themselves were as much to blame as the foodstuffs. Vessels carrying copra (the dried meat of coconut) from the Philippines to Vancouver, Canada, for example, also carried ample populations of the pest species associated with copra; when the copra was sold, many of those pests would remain aboard and infest the wheat from Canada to the next destination. The same process repeated itself in every port of call, with insects and vermin often ending up infesting products with which the species had no prior history – copra insects from the Philippines, living in Canadian wheat, or barley insects from Argentina ending up in boxes of European manufactured goods. One British scientist estimated that between 1942 and 1947, about 150 species of beetles were introduced for the first time to the British Isles through these stored products. Ten percent of these were previously unknown to science. Not all of them were equally menacing to food, and not all were able to survive the new environment; but others were very threatening, such as the wood boring weevils (*Euophyrum rufum* and *Euophyrum confine*) that attacked not just food but larger structures as well.[29]

To any given European country, the effects of any one invasion could be dramatic; but for North America, even intense impacts typically were localized. An illustration of the difference was the potato. The well-known historical nightmare of potato famine was due to the fungus-like *Phytophthora infestans*, causing blight (typically called

[28] FAO, *Summary of Proceedings: International Meeting on Infestation of Foodstuffs*, London 5-12 August 1947, box 10AGP154, Folder Infestation Meetings, FAO Archives, p. 10.

[29] Ibid., pp. 10-12.

either "potato blight" or "late blight"). Though typically associated with the mid-nineteenth century Irish potato famine, it was dreaded wherever the crop was grown, which included most of the combatants participating in the European war. American vulnerability to blight could swing wildly. In 1941, losses seemed negligible, with only the state of Wisconsin reporting a significant loss to blight, on the scale of about 4% of its total crop. But reports of serious damage surged in 1942, with some parts of Maryland reporting half of their potatoes lost to blight. The American crop was saved that year due to increased yields on the other side of the continent, in the far west. But all potato-growing states saw blight at some point in the war, and often in areas where it never had been seen before. In 1944 and 1945, pockets of the country reported the worst blight losses in their history.[30] Despite this, what was disastrous for an individual farmer – and an indicator of extreme vulnerability – was not necessarily visible from a national perspective. If a boom year in Oregon could offset a fifty percent wholesale crop failure in Alabama, the United States potato crop's vulnerability to blight might seem negligible.

The opposite attitude prevailed in Europe, where diversity was neither easily accomplished nor vigorously pursued. In the war years, potato acreage in England and Wales surged to over a million (this would drop down to some 650,000 a decade after the war). Increased dependence upon potatoes translated into widespread anxiety about keeping the crops free of disease or infestation. The British Mycological Society devised a method of tracking the course of blight throughout various parts of the country in different seasons. The method involved an assessment "key" which assigned numerical values to conditions, roughly reflecting the percentage of leaf area affected by blight in a given field. The Society members hoped that it would help in imagining ways of controlling the blight through spraying, usually of the rain-resistant "Bordeaux mixture" (copper sulfate and calcium hydroxide), often deposited with horse-drawn sprayers. Experiments in heavily blighted regions during the war years had convinced scientists that spraying could

[30] N.E. Stevens, R.B. Stevens, *Plant Diseases* cit., p. 100.

prolong growth and yield 1-3 more tons per acre, saving some two-thirds of what might have been lost by blight. After the war, by tracking the flow of blight through sprayed and unsprayed areas, they calculated fairly precisely what losses would have been to the whole potato crop each year, had they not sprayed. In some areas (such as Devon and Cornwall, where each year was "blight year") these losses could be as much as twenty percent. And yet even so, spraying and dusting was not universal, only amounting to about thirty percent of total crops.[31]

Despite this extreme vulnerability to blight, most Europeans relied on the potato to achieve their target calorie levels. The potato also had a crawling enemy: the Colorado beetle, which had eaten its way across America and had invaded Europe by the turn of the century. Increasingly Europeans relied on chemicals, especially DDT from American firms that had ramped up production during the war. Spraying DDT against the Colorado beetle, often mixed with anti-blight chemicals, became common in France in the late 1940s.[32] These potatoes were perceived as so vulnerable that in 1948 both Czechoslovakia and East Germany accused the United States of dropping crate-loads of Colorado beetles on their potato fields, just to sabotage the economies of the communist countries.[33]

A Scientific Diet for All

In the late 1940s, there was a clear tension between the European view – a scientifically determined diet, and stern efforts to prevent waste – and the American one – unenforced scientific guidelines, with robust efforts to create abundance, diversity, and markets for any surpluses. So whose values were reflected in the first international standards for achieving food security?

At FAO, the European view seemed to hold sway. The same

[31] A.E. Cox, E.C. Large, *Potato Blight Epidemics Throughout the World*, United States Department of Agriculture, Washington D.C. 1960.

[32] Ibid.

[33] On the Colorado beetle episode, see Hamblin, *Arming Mother Nature* cit.

shock expressed by austerity-worn British officials upon visiting the United States, for example, also pertained to Europeans participating in FAO meetings when confronted with actual figures on the sheer amount of food waste around the world. Foods imported from tropical countries were particularly susceptible. Rough figures available to FAO, for example, showed that food originating in the United States carried a 14 % loss by the time it reached its destination, whereas foods from Europe typically lost less then five percent. Honduras, Haiti, and Ecuador, by stark contrast, lost about fifty percent. During the war, the British typically welcomed the lightly infested or clear goods from Canada, but routinely saw heavy infestation in goods from South America, Africa, and India.[34]

FAO convened a meeting dedicated to such infestation losses, in London in August 1947. Representatives from twenty-six countries came to share strategies for keeping stored food away from pests. Based on various national estimates and FAO's calculations, the conferees determined that roughly ten percent of the world's grain and cereal products were lost each year due to infestation. Despite some disagreement about the reliability of calculation methods, all agreed that "the data indicate a loss of enormous dimensions". Particularly in tropical and subtropical regions, national efforts to control such infestation appeared to be lax, to say the least, a fact compounded by the favorable conditions in those areas for the thriving of pests. Because of the increasing degree of contact – escalating over the previous half-century – among the markets of the world, pests appeared in areas where they previously had been unknown, with unprecedented challenges posed to local farmers.

What is remarkable about these meetings was that they cast this problem not as one of creating standards, or even as an economic issue, but as an essential problem in securing the world food supply. What the Hondurans did at the docks, in other words, was the whole world's problem. Infestation control became a central platform from which FAO officials would preach the importance of modern, scientific methods - often involving chemical pesticides. But even

[34] FAO, *Summary of Proceedings* cit., pp. 8-10.

more than that, standards included the establishment of organizations to oversee storage, processing, and transportation; training for food handlers; and keeping in contact with FAO to ensure adequate international coordination, including the sharing of international experts to facilitate training.[35] These control measures fit into the ideals of the postwar system of international organizations. At FAO they rallied behind the phrase "full diet for all". In the absence of promising methods of enhancing food production, they targeted ways to improve efficiency and to reduce waste.

Scientists in European countries believed that they could have saved untold amounts of food by taking measures to block the entry of undesired immigrant organisms. In remarks issued to delegates at the meeting, British Ministry of Food official John Strachey drew attention to the "enemy within our walls" who invaded insidiously during the war years, taking a nearly invisible, incremental toll on food supplies - over time it amounted to a vast amount of waste lost to fungi, beetles, weevils, rodents, and other pests. FAO's director-general, Sir John Boyd Orr, emphasized that in light of the inadequacy of worldwide grain supplies in the immediate postwar years, their first task ought to be to try to save what already was produced and to reduce these enormous losses. He called on the international community of scientists to pool its efforts, observing that science was inherently international and that they ought to bring the power of unanimous assessment to bear on their common problems.[36] His colleague at FAO, L.E. Kirk, echoed the sentiment and pointed to the future:

> We know something of the magnitude of the losses. We know also that we are dealing with something which is insidious and unspectacular. But on the other hand, before us we have tangible evidence of what can be accomplished when it is tackled in the right way. Science has placed in our hands new and effective methods of destroying the insects, fungi and rodents which have carried on this work of sabotage in such a stealthy manner.[37]

[35] FAO, *Report of London Meeting on Infestation of Foodstuffs*, London 5-12 August 1947, box 10AGP154, folder Infestation Meetings, FAO Archives.

[36] Id., *Summary of Proceedings* cit., p. 6

[37] Ibid., p. 7.

He pointed to the power of combined effort and the universal recommendation of the world's top scientists to eliminate the intolerable amount of waste.

The most delicate point was the obvious fact that most of the highly infested goods came from those countries classed as "underdeveloped" or "developing". While some explained this as a result of climate, crop, and pest species difference, others looked at the vast economic disparity. Respected British entomologist J.W. Munro put it bluntly: "In my view our real problem… is that there are underdeveloped countries, and I do think we want to give some consideration to those countries which cannot have the facilities we have, who may not have them for many years to come, and who will continue to ship dirty goods elsewhere". Given the present food shortages, neither Britain nor any country was in a position to refuse goods; that meant it was impossible to enforce good practices. He hoped his colleagues would "bear in mind the fact that we have to deal, amongst others, with small peasant farmers in Africa who cannot compete with large countries like America and Canada". That, Munro hoped, would be FAO's most important role, to encourage – and perhaps provide facilities for – standardized international practices that were already routine in Europe, Canada, the United States, and most of the British Commonwealth.[38]

What was needed, Munro and others thought, was a change in perspective by farmers in Latin America, Africa, and Asia. If local peasants were tied to global markets, they would have to change their practices - particularly by speeding up the time between harvest and export. But also they needed to start benefiting from the latest publications in European and North American scientific journals, knowledge sorely lacking in developing countries. This could be accomplished by providing local organizations with the Imperial Institute of Entomology's publication, *Review of Applied Entomology.* Because it abstracted articles from a wide range of sources, a subscription to the *Review* was an indispensable resource connecting subscribers to the latest knowledge on pest control. As Munro stated,

[38] Ibid., p. 28

"The merchants, the millers and the farmers, large and small, must be educated by administration. Where there is an advisory service it is through that service that they look for education. We must get the administrative officers, who are not scientists at all, to understand that it is their job to persuade the peasant farmer not to hoard his grain but to hand it over for distribution". [39]

FAO's approach amounted to imposing order on the global food supply, with a managerial perspective aimed at reducing waste. It was not only ambitious; it was presumptuous. Chakratong Tongyai, an American-trained entomologist from Siam, pointed out that persuading people to change their time-honored traditions was easier said than done. Siam was "not only backward but deep in the jungle", but also its people were not typically in touch with any literature at all. Abstracts in the *Review* were no substitute for the full papers; moreover, the full spectrum of people, from the peasants to the political leaders, resisted changes based on scientists' recommendations. "There is also still great superstition in the country," he said, "and in explaining these simple problems, like dealing with insects, we have met with much opposition." British delegates reassured him that such backwardness was to be expected among those not conversant in the science. For example, entomologist J.A. Freeman pointed out that English warehouse workers were just as ignorant, and it was difficult to persuade them that their practices were to blame for infestation, and to dispel the belief in spontaneous generation of pests.[40]

FAO officials suggested showing films in lieu of stocking libraries. But one British official warned:

> Our first publicity film on rat control in this country, produced by professionals in collaboration with scientists, was quite a good film but it led to a minor riot - many women in the cinema fainted on seeing a crowd of rats devouring the pomades, creams and powders on a dressing table. The horror aspect must therefore be avoided in putting over a film.[41]

[39] Ibid., p. 30
[40] Ibid., pp. 33-35.
[41] Ibid., p. 38

The solution, to these entomologists, was to focus not on the organisms themselves but on material loss and the extraordinary waste allowed by the prevalence of pests. Knowledge about species should be subordinated to training about how eliminate them.

Conclusion

When British nutritionist Sir John Boyd Orr took the helm of the Food and Agriculture Organization in 1946, he brought with him the mentality of global management. He recruited specialists from all over the world and outlined a plan for a world order based on improving agricultural production and fine attention to distribution. When he won the 1949 Nobel Prize for Peace for his efforts promoting the cause of food security, he stated that he would like to see "a world government able to keep the peace and get nations to cooperate in harnessing the great powers of science to serve mankind". The machinery to achieve it, he believed, lay with the United Nations. Plans for development had the advantage, he said, of sidestepping political ideology and speaking in terms of "tons of wheat and standards of timber".[42] Boyd Orr was not the only advocate of world government in the late 1940s, but his vision has been perceived by some scholars as an example of a kind of scientific internationalism that had great appeal for a short time, before being swamped by the geopolitics of the Cold War and by American economic strategies through the Marshall Plan.[43]

Though it is true that Boyd Orr's attitudes were anathema to American diplomats who saw them running counter to liberal trade policies, a close examination of some of the scientists during and after the war yields a more complex situation. It was marked by fundamental differences in approach to nutrition and agricultural practices, differences based not only on divergent economic assump-

[42] Lord Boyd Orr, Nobel Lecture, 12 Dec 1949, http://www.nobelprize.org/nobel_prizes/peace/laureates/1949/orr-lecture.html (accessed on February 14, 2013).

[43] Staples, *The Birth of Development* cit., pp. 84-96.

tions but also on different environmental conditions between North American and Europe and more importantly, different lessons drawn about diet and agricultural vulnerability, based on wartime experience. These contrasting views did not simply pit scientific ideas against economic preferences. There were scientists on both sides of the Atlantic who saw the indicators of food security in dramatically distinct ways, one focusing on diversity and market availability and the other upon rational food distribution and elimination of waste. When Boyd Orr and others came to FAO, the latter approach held sway. One could interpret FAO's approach not simply as scientific internationalism, but rather as a managerial ethos that shared many characteristics of top-down wartime rationing. The difference was that, to FAO, the food supply was that of the whole world, and it had to be treated communally.

By the end of the 1940s, the competing visions of food security seemed to change, putting the Americans at the helm. Scholars have long indicated how much the Marshall Plan imposed American attitudes upon Europe, particularly the emphasis on market abundance as an indicator of the strength of the capitalistic economic system vis-à-vis the communist one farther east. And yet FAO's values tended to be more European than American, an important distinction that would continue to inform the international agency's actions long after the Marshall Plan ended.

The goal of FAO advisors was not to find ways to return Europe to its prewar state, but rather to transform European practices fundamentally to what they perceived as more scientific and modern methods. At the time, that meant emphasizing food processing and the introduction of food preservatives, to avoid waste and spoilage. It also meant turning away from rural and small-scale farms and industries. They did not focus on abundance and diversity, but instead on micromanaging the land currently under cultivation and using science to make it as productive and reliable as possible. They discussed livestock adaptability, and the importance of breeding future animals that could live in various climates around the world. They hoped for increased attention to inland waterway control, to make land less dependent upon rainfall. They advised an increase in milk

processing plants throughout Europe, in the belief that milk should provide far more protein and calcium than it currently did in the average person's diet. They argued for fundamental transformations of land use, using chemical fertilizers and pesticides when possible: "If modern knowledge of the proper use and management of soils were applied everywhere, similar results could be achieved on practically all the world's soils".[44] But by 1949 they still lamented that "the adoption of improved equipment, improved technology, and larger units of production utilizing simple machines is taking place at a painfully slow pace".[45] To these advisors, there seemed little doubt that such changes were crucial to achieving food security.

It is clear that FAO advisers from dozens of countries focused on precisely the kinds of approaches they would have pursued back at home working on wartime austerity measures. And yet their task was not one of temporary austerity. Rather, it was to set global standards for years to come, with the goal of achieving a full diet for all. What I emphasize here is not that these motivations were either wise or mistaken, but that they were closely linked to wartime experience, an experience that differed from the experience of Americans. For many scientists in Britain, imagining a postwar world was not dissimilar from planning a rationing program, in which the global food supply could be identified, protected, made efficient, and doled out according to need. These standards would retain enormous influence in the years to come, as FAO's scientific expertise would shape practices not only in Europe and North America, but also in the developing world.

[44] FAO, *FAO European Activities in Agriculture in 1948-49*, n.d., box 10DIR349, folder European Committee on Agriculture, 1st Meeting, FAO Archives.

[45] Ibid.