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Defense by Defoliation: The Necessity for Agent Orange in Vietnam

by Heather M. Brown

In the mid-to-late 1960s, Americans became increasingly concerned with the strategic decision-making of U.S. leaders regarding the military's presence in Vietnam. One of the most controversial decisions of the era was ratified on 7 January 1962, when the U.S. Air Force and the U.S. Army were given authorization under Operation RANCH HAND, to deploy the herbicides 2,4,5-trichlorophenoxyacetate (2,4,5-T) and 2,4-dicholorophenoxyacetate (2,4-D), commonly known by its code name, Agent Orange, on South Vietnam. Operation RANCH HAND directed the herbicide spraying project from U.S. Air Force C-123 twin-engine aircraft, U.S. Army helicopters and infantry hand sprayers.[1]

The RANCH HAND herbicide missions were held to a specific standard: typically multiple, brief, two-minute sprays requiring three to five C-123 aircraft flying in staggered lateral formation. Targets were chosen by U.S. military officers who were granted special approval from the U.S. Military Assistance Command and the American Ambassador. Thus, the U.S. Air Force was responsible for defoliating southern Vietnamese jungles, forests and foliage in order to improve visibility of enemy territory by exposing Việt cộng and North Vietnamese Army infiltration routes, base camps, weapon placements, and storage sites.[2] U.S. Air Force records indicate, between 1962 and 1971, U.S. Army and Air Force units conducted 6,542 spray missions and deployed approximately 12 million gallons of Agent Orange on South Vietnam. They specifically targeted foliage used for cover, food crops and U.S. base perimeters.[3]

The U.S. military's use of Agent Orange severely impacted the region of southern Vietnam and the environmental damage serves as a reminder of the U.S.'s actions against those aggressors who jeopardize international peace. Similarly, the use of any military biotechnology, regardless of the country initiating disbursement, can inflict long-lasting collateral damage. However, Agent Orange can be viewed as an innovative and effective biotechnology whose unfortunate negative ecological impact proves the effectiveness of its original purpose. This

1 The term Agent Orange originated from the orange band that surrounded the 55-gallon steel drums in which the herbicidal agent was stored and transported. Agent Orange was used primarily by the U.S. Air Force and U.S. Army for defoliation in Vietnam because it was "favored over all herbicides because of its general utility and low cost." J. B. Neilands, "Vietnam: Progress of the Chemical War," *Asian Survey* 10 (March 1970): 220-1.

2 Paul Frederick Cecil, *Herbicidal Warfare: the Ranch Hand Project in Vietnam* (New York: Praeger, 1986), 1; Alvin L Young, *The History, Use, Disposition and Environmental Fate of Agent Orange* (New York: Springer, 2008), 2; Jeanne Stellman et al., "A Geographic Information System for Characterizing Exposure to Agent Orange and Other Herbicides in Vietnam," *Environmental Health Perspectives* 11 (March 2003): 321; Michael G Palmer, "The Case of Agent Orange," *Contemporary Southeast Asia* 29 (April 2007): 172.

3 Hisao Furukawa, Ecological Destruction, Health, and Development: Advancing Asian Paradigms (Nagoya: Kyoto University Press, 2004), 143; David Naguib Pellow, Resisting Global Toxics: Transnational Movements for Environmental Justice (Cambridge: Massachusetts Institute of Technology Press, 2007), 159; Spencer C. Tucker, Encyclopedia of the Vietnam War: Political, Social and Military History, trans. David Coffey et al. (1998; repr., New York: Oxford University Press, 2000), 7.

paper will explore the U.S.'s commercial development and aggressive use of Agent Orange, examining its negative ecological impact as relates to foliage regrowth in southern Vietnam. Additionally, this paper will refute the assumption that the successful testing of Agent Orange preceding the Vietnam conflict deterred the U.S. military from utilizing other defoliation options.

Agent Orange Development

As early as 1943, the development of herbicides began in the U.S. for domestic and commercial distribution. In that same year, the U.S. Department of the Army contracted with the University of Chicago to study the effects of the two herbicides, 2,4-D and 2,4,5-T, on cereal grain crops and foliage. The Department of the Army suggested that three chemical processes were required for a successful defoliation mission against enemy forces which included "the rapid reduction in foliage by desiccation; the systematic herbicidal activity to kill the plants and residual herbicidal action in the soil to prohibit or retard growth." The University of Chicago concluded that no single herbicide could bring about all three processes concurrently and it was, therefore, necessary to utilize mixed and formulated herbicides. The extensive use of Agent

Orange in Vietnam "was based upon proven performance in both military and commercial situations, availability in large quantity, costs, and known or accepted safety in regard to their toxicity to humans and animals."[4]

With this initial success, the U.S. Army moved quickly to test various 2,4-D and 2,4,5-T mixtures at Bushnell Army Airfield in Bushnell, Florida.[5] Positive results from these studies prompted the Department of the Army to implement the use of herbicides from military aircraft to destroy enemy crops and disrupt their food supply.[6] The U.S. military extended their herbicidal development to an expansive spray-system that included aircraft, infantry hand-sprayers, helicopters, and boats in order to destroy North Vietnamese Army and Việt cộng aerial cover and food supplies.[7] From the studies conducted at Bushnell Airfield, Army scientists determined that an initial spray of Agent Orange was immediately "absorbed into the wax layer of the plant cuticle" and "could not be physically dislodged." Thus, a single application of Agent Orange had the potential to completely destroy wooded forests without the possibility of reforestation. As applied in the dense mangrove forests of southern Vietnam, one application destroyed a moderate amount of trees whereas two applications killed 50% of all mangroves within the spray radius.[8]

In January 1970, 2,4,5-T was restricted in domestic production and sale because of its teratogenic effect after it was reported that laboratory animals given the herbicide showed significant birth defects. As domestic production came to a halt, the U.S. Department of the Army requisitioned the entire U.S. production of 2,4,5,-T for use in combat.[9] At the time the Army commandeered the production of 2,4,5-T, it was not known that the herbicide was

4 Young, 24, 27.
5 Palmer, 172.
6 Young, 24.
7 Ibid, 24; Palmer, 172.
8 Young, 24, 14; Palmer, 172; Neilands, 223.
9 Nielands, 221, 210.

"contaminated with the extraordinarily toxic compound TCDD (2,3,7,8-terachlorodibenzo-para-dioxin)."[10]

From its inception in January 1962, Operation RANCH HAND was widely accepted by U.S. Air Force regiments, not only because compliance is a necessary component of military service, but because Agent Orange embodied the latest biological defense technology. In fact, so many field commanders enthusiastically requested to conduct herbicide missions that the requests "exceeded the capacity of the organization, despite repeated project expansion."[11]

The U.S. Anti-War Influence

Heightened military fervor did not outweigh fierce domestic criticism, and by 1965, the anti-war movement gained national attention and prominence in the U.S. The actions of the Vietnam anti-war movement protestors parallel those described by author Erich Hoffer in his influential book, *The True Believer*, where he suggests the strength of a mass movement stems from the inclination of its followers for united action. Hoffer notes the collective "hatred is a convenient instrument for mobilizing a community." The Vietnam anti-war movement was pioneered by men who relied on powerful emotion that metastasized into fanaticism. Hoffer identifies hatred as the most accessible and comprehensive unifying agent, and common hatred unites even the most diverse people. As the alienation and malevolence of the anti-war movement followers deepened, group unification intensified.[12]

The Vietnam anti-war movement attempted to illustrate the presence of the U.S. military in Vietnam as offensive. Those claiming allegiance to the anti-war movement demanded the military's swift return in the hopes of providing a peaceful future for Americans and Vietnamese alike. As the Vietnam conflict continued, the collective American sentiment began to shift toward the coercive propaganda, often misinformation, of anti-war movement protesters.

The widespread circulation of unverified data led many Americans to believe the U.S. military lost its ability to inspire and lead. Anti-war movement protestors were particularly critical of the use of Agent Orange and insisted the U.S. was guilty of violating the Geneva Protocol by using chemical and biological weapons against the Vietnamese. The Geneva Protocol, as ratified in 1925, specifically prohibits complying nations to use both chemical and biological weapons in times of war. However, this anti-war claim is invalid as the U.S. did not agree to the Geneva Protocol until April 1975, thirteen years following the implementation of Operation RANCH HAND.[13] Thus, the Vietnam anti-war movement was successful in creating waves of tension by conducting protests under the assumption that other, more diplomatic, options were required by the Geneva Protocol.

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10 National Academy of Sciences, Committee on the Effects of Herbicides in Vietnam, Division of Biological Sciences, Assembly of Life Sciences, *The Effects of Herbicides in South Vietnam: Part A - Summary and Conclusions* (Washington, D.C.: Government Printing Office, 1974), S-2.

11 Cecil, 1.

12 Eric Hoffer, *The True Believer: Thoughts on the Nature of Mass Movements* (1951; repr., New York: Harper Perennial Modern Classics, 1989), 97, 64, 69, 70, 91, 99.

13 "The 1925 Geneva Protocol (Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare)," The United Nations, accessed September 18, 2010, http://www.un.org/disarmament/WMD/Bio/1925GenevaProtocol.shtml; P.S. Ruckman Jr., "Geneva Protocol," International Relations, Rock Valley College, accessed December 7, 2010, http://ednet.rvc.cc.il.us/~PeterR/IR/docs/Geneva.htm.

In response, the U.S. military attempted to regain public confidence by disclosing their achievements in Vietnam. Unfortunately, the U.S. anti-war movement was unwavering and refused to recant their opinions or make concessions. To this end, the movement was successful in depreciating and negating all associations with the Vietnam conflict, including the use of Agent Orange, even though "most Americans welcomed [any] technology that brought "total victory" over national...enemies."[14]

In April 1969, seven years after Operation RANCH HAND began, Congressman Richard D. McCarthy (New York-D) publicly disputed claims that the herbicides used in Vietnam were either permanently damaging to the environment or were hazardous to human beings. He claimed that there were "no herbicidal chemicals used in Vietnam to destroy vegetation which have not been widely used in the United States" to clear large agricultural and industrial areas.[15] In fact, the field manuals distributed to Army soldiers serving in Vietnam described the missions they were required to complete, missions that included the dispersal of Agent Orange. These manuals confirmed that the actions of U.S. soldiers were "not party to any treaty now in force that prohibits or restricts the use in warfare of toxic or nontoxic gases, or smoke, or incendiary materials, or of bacteriological warfare."[16]

Quelling American Anti-War Resistance through Scientific Study

As tensions heightened between anti-war movement protestors and U.S. diplomats, the National Academy of Sciences approved the Committee on the Effects of Herbicides in Vietnam to conduct aerial studies of the herbicidal effects on southern Vietnam. This committee was created to reduce public anxieties over the potentially permanent and irreparable damage to forests and crops.[17] The Committee attempted to determine the validity of the anti-war protestor's claim that the U.S. Army and U.S. Air Force's use of Agent Orange could "denude the land, alter the ecology, change the climate and possibly latterize the soil."[18]

The Committee determined the mangrove forests to be especially susceptible to severe and pervasive defoliation as caused by direct exposure to Agent Orange. The mangrove's initial exposure to Agent Orange "resulted in the death of virtually all exposed trees" which equated to 257,728 acres of South Vietnam. The Committee proposed that it could take close to a century for the mangroves to return to their previous numbers and that a program of reforestation could drastically reduce the required time for recovery by as much as two or three decades.[19] At present, technologies are under development to aid in soil and sediment decontamination. However, this is a slow and labor intensive process that relies heavily on thermal destruction.

14 Edward P Russel II, "Speaking of Annihilation: Mobilizing for War Against Human and Insect Enemies," *Journal of American History* 82 (March 1996): 1506.
15 Richard D. McCarthy, "Statement of Richard D. McCarthy on Chemical and Biological Warfare Policies and Practices" (official statement), Federation of American Scientists, accessed September 12, 2010, http://www.fas.org/cw/cwc_archive/CW_history/1969_StatementofRichardDMcCarthy.pdf.
16 Nielands, 211.
17 National Academy of Sciences, Committee on the Effects of Herbicides in Vietnam, Division of Biological Sciences, Assembly of Life Sciences, S-1.
18 Nielands, 221.
19 National Academy of Sciences, Committee on the Effects of Herbicides in Vietnam, Division of Biological Sciences, Assembly of Life Sciences, xii.

Additional physical, chemical, and biological processes are under trial and are promising for future applications.[20]

Forty-eight years following the implementation of Operation RANCH HAND, the ecological damage caused by Agent Orange is still widely visible in southern Vietnam as countless missions left a barren landscape and eroded coastline. The Committee's aerial photographers and scientists noted "the extensive inland tidal flats at the headwaters of many streams have...evidence of accelerated erosion caused by the spraying."[21] The most severe damage occurred in the lush mangrove forests which serve an important ecological role as unparalleled breeding grounds for an array of aquatic species. Reforestation will require a multifaceted cooperative between diverse governments with cutting edge technology.[22] Southern Vietnam lost an astonishing "8.5 million cubed meters of merchantable timber in the [effected] area." The loss to non-merchantable timber is estimated between 5,500,000 and 11,150,000 cubed meters or about ten percent of all the trees of the inland forest canopy.[23]

The Committee on the Effects of Herbicides in Vietnam conducted an additional aerial photographic study to determine if bamboos replaced broad-leaved mangrove trees in the forests of South Vietnam as a result of military defoliation.[24] As early as 1974, three years following the conclusion of Operation RANCH HAND, the areas most affected by Agent Orange were refoliated by an aggressive growth of bamboo. Photographers noted "the beginnings of natural recovery" even though it would "be many years before the forests will approach their former productivity."

Military Significance

It has been nearly fifty years since the initial RANCH HAND missions commenced. Since that time, the international wartime focus has shifted from the use of napalm and Agent Orange to the contemporary realities of extraordinarily precise unmanned aerial vehicles and cruise missiles. Upon examining the biotechnological weapons choices, strategy, and results, the Vietnam conflict is often omitted from American history textbooks and even historical discussion.[25] It is because of this essential need for a more complete understanding of American military history that this paper endeavors to serve as a unique retrospective by exploring the necessity for Agent Orange, regardless of its impact on foreign environments.

In order to gain a full understanding of the motives behind the use of Agent Orange, it is necessary to examine the military perspective that influenced one of the most dramatic decisions

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20 United States Environmental Protection Agency, "Contaminants: Dioxins," Clu-In, accessed November 2, 2010, http://www.clu-in.org/contaminantfocus/default.focus/sec/Dioxins/cat/Overview/.

21 Charles P Weatherspoon and Alan Krusinger, *The Effects of Herbicides in South Vietnam Part B: Working Papers - Air-Photo Studies of the Rung-Sat* (Washington, D.C.: Government Printing Office, 1974), 24.

22 "Agent Orange," Science Clarified, accessed November 9, 2010, http://www.scienceclarified.com/A-Al/Agent-Orange.html; National Academy of Sciences, Committee on the Effects of Herbicides in Vietnam, Division of Biological Sciences, Assembly of Life Sciences, S-9, S-15.

23 National Academy of Sciences, Committee on the Effects of Herbicides in Vietnam, Division of Biological Sciences, Assembly of Life Sciences, S-8.

24 William B David, *The Effects of Herbicides in South Vietnam Part B: Working Papers - The Ecological Role of Bamboos in Relation to the Military Use of Herbicides on Forests of South Vietnam* (Washington, D.C.: Government Printing Office, 1974), 1.

25 In military textbooks used at Texas State University-San Marcos, like *War in European History*, typically no more than one page, and in sometime cases a meager paragraph, is all authors contribute to the U.S. presence in Vietnam. Their brief synopses include tactics and the associated weapons which exclude the use of Agent Orange.

in American military history. It should be noted, however, that little information is available regarding the political and military decisions that directed Operation RANCH HAND because that material remains classified.[26]

The Bluejacket's Manual identifies officers as "responsible for leading...subordinates in a manner that will not only get the job done but will preserve...dignity and minimize any negative effects that may be part of a difficult task."[27] In fact, the military hierarchical structure relies upon military leaders to make sound judgments, execute proper authority, and implement standard procedure. Upon examining the Vietnam conflict, many presume U.S. soldiers aggressively questioned orders regardless of their allegiance to their superiors. To that end, subordinate infantrymen of the U.S. Air Force and U.S. Army relied upon the judicious and sensible choices of their superiors and would never have questioned or challenged the use of Agent Orange.

According to Professor James Pohl, military historian and professor at Texas State University-San Marcos, there is currently no universal military text that encompasses American military tradition or a conclusive military dynamic.[28] Thus, the American military tradition relies upon the simultaneous combination of servicemen and women actively engaged in the analysis and execution of a unique blend of ideas in order to ensure victory. Accordingly, the numerous successes of Agent Orange testing in the U.S. caused American military officers to view Agent Orange as the most efficient abatement of environmental obstacles in southern Vietnam. Biotechnological advances like Agent Orange were often selected by military commanders to be utilized strategically because of its ease of application, speed of delivery and consistent results. To selectively burn or manually defoliate the jungles would have exposed U.S. troops, ground equipment, aircraft, and boats to the open for prolonged periods whereas herbicides took little training to deliver and minimized the exposure of the troops to enemy fire.

Military theorists and historians have concluded that tactical herbicides "have certain characteristics which set them apart from conventional high explosive and flame munitions." Accordingly, chemical biotechnologies and tactical herbicides like Agent Orange "are viewed primarily as "area" weapons that can be used to inflict casualties [to] a prescribed region without the intelligence requirement for precise targeting that constrains the effective employment of conventional weapons."[29] Therefore, the core assumption of American anti-war protestors - that there were equal yet less drastic defoliating options - is invalid. While other, more diplomatic options were available, political relations could not match the ease, speed and accuracy of Agent Orange.

Another erroneous and wide-spread assumption remained: that the U.S. Army and U.S. Air Force could have used traditional carpet bombing techniques causing substantial and irrepressible fires that would simultaneously flush out North Vietnamese Army and Việt cộng infantry while defoliating the forests used for cover. This misguided assumption gained prominence in the U.S. because many Americans were unaware that massive carpet bombings conducted by the U.S. Air Force would only be effective against an industrialized Western army. It is assumed that Vietnam could be fought like previous conflicts. But the military situation

26 Cecil, x.
27 Thomas J. Cutler, *The Bluejacket's Manual of the United States Navy* (Annapolis: Naval Institute Press, 2002), 88.
28 James W. Pohl, "War and Society Introduction" (lecture, Texas State University-San Marcos, August 26, 2010).
29 Ivan L. Bennett Jr., "The Significance of Chemical and Biological Warfare for the People," *Proceedings of the National Academy of Sciences of the United States of America* 65 (January 1970): 272.

changed so dramatically from earlier wars that American soldiers could not fight like they had done previously with conventional weaponry. The carpet bombings conducted in Vietnam "had little effect against [North Vietnamese Army] troops subsisting on handfuls of rice whoselogistics depended on human porterage."[30] North Vietnamese Army and Việt cộng supply lines could not be effectively interrupted therefore forcing military leaders to determine what strategies and tactics would be most conducive to victory in Vietnam through trial and error. U.S. Army and U.S. Air Force regulars had never fought in a guerilla-style war and had little or no training to handle these offensive tactics. It is for that reason that the traditional use of linear tactics, the deployment and formation of infantrymen into battle lines, would be ineffective and could compromise the lives of American soldiers in Vietnam. Thus, Vietnam was the first conflict fought in radically different terms as opposed to the major European wars of the twentieth century.

Allan R. Millet and Peter Maslowski, co-authors of *For the Common Defense*, maintain that the Vietnam conflict was "a conflict of hide and seek operations" that was fought away from highly populated areas. In this way, Vietnam initially shared characteristics with the world wars of the 20th century in which "regulars fought regulars in the hills, along mountain rivers, amid plains of high grass, and beneath the triple-canopy rainforest." But, in the "mountain jungles or the heavy forests that ran from the delta and Saigon to the border, [American] [soldiers] searched for Communist regulars, attempting to find...and destroy enemy units with air and artillery and close infantry combat."[31]

The strategies with which North Vietnamese Army troops fought were modeled after the teachings of the ancient Chinese military strategist, Sun Tzu, who viewed wars of attrition as a military strategy to be avoided. In attrition warfare, opponents attempt to defeat one another with an overall superior, yet individually expendable, infantry. Attrition warfare was conducted successfully by the European powers during the World Wars of the twentieth century - but the strength of the North Vietnamese Army resided in stealthy maneuvering under the cover of the dense jungle foliage of southern Vietnam.[32] It was U.S. chemical biotechnologies, napalm and Agent Orange, that were among the few successful tactical weapons in combating North Vietnamese Army and Việt cộng guerrilla tactics. The use of these chemical agents allowed for U.S. victories, winning individual battles at a great cost to the environment. The conflict ultimately resulted in U.S. Army and U.S. Air Force withdrawal without declaration of victory or admission of defeat.

In the decades following the U.S. presence in Vietnam, negative attitudes toward the decimation of millions of acres of Vietnamese mangrove forests and foliated landscapes by the use of tactical herbicides have made the conflict one of the most devastating environmental tragedies in history. However, when one considers the violent circumstances and unprecedented tactics to which American soldiers were subjected in Vietnam, the use of Agent Orange can be recognized as the best option of defense by defoliation.

U.S. military policies and practices continuously come into question, and those deployed in Vietnam are no exception. As soldiers returned from combat, Americans implored U.S. military officials for the rationale of military operations during the conflict. This search

30 Michael Howard, *War in European History*, 2nd ed. (New York: Oxford University Press, 2009), 141.
31 Allan R Millet and Peter Maslowski, *For the Common Defense - A Military History of the United States of America (Revised and Expanded)*, 2nd ed. (New York: Simon and Schuster, 1994), 581-2.
32 James W Pohl, "Sun Tzu" (lecture, Texas State University-San Marcos, November 2, 2010).

prompted a sudden resurgence in the study of military history which, in turn, lead Americans to question why Vietnam was conducted the way it was. Every war is different. Situations and circumstances change dramatically from previous conflicts and the military simply cannot fight in the same manner as previous wars. It was only through trial and error that U.S. military leaders determined that Agent Orange was the most appropriate tactical method that would save the lives of American soldiers in Vietnam.

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This essay is dedicated in loving memory to my grandfather, Wayne Forrest Tysver, January 25, 1932 – October 18, 2010 who was honorably discharged from the U.S. Army with the rank of E-6 in 1962after 10 years of devoted service to his country.