

Prescribing Progress: French Veterinary Medicine in the Service of Empire

Diana K. Davis

The complex relationships between tropical medicine, colonialism, and imperialism have been explored increasingly in recent decades by scholars interested in the history of medicine, the history of science, and the history of colonialism. Much of this research has focused on the British empire and its experiences overseas, especially in India.¹ A smaller body of work exists for French colonial medicine and the medical adventures of other European countries in their overseas territories. Very little, if any, similar research has been conducted on the connections between veterinary medicine and imperialism. This article, based on archival research, explores these relationships by outlining the multiple and vital roles played by veterinarians, especially military veterinarians, *les vétérinaires militaires*, in nineteenth- and early twentieth-century French imperialist activity in Africa. Far from functioning solely as veterinarians for the treatment of sick or wounded animals, these men also treated humans when necessary, conducted research on tropical diseases, and promoted commerce. In addition, they strongly influenced agricultural and environmental policies during the colonial period in ways not yet widely recognized. An examination of their complex duties shows that colonial veterinarians played a crucial role in French imperial expansion and subsequent administration in Africa.

France had lost all of its overseas colonies by the early years of the nineteenth century, largely as a result of the Napoleonic wars. With its occupation of Algeria in 1830, though, France embarked on a vigorous and lengthy campaign of colonial expansion in Africa.² Military veterinarians were integral to the success of their colonial endeavors. These men were present on the front lines of the battles of occupation in most, if not all, French campaigns in Africa and they remained essential

to French mechanisms of control throughout the colonial period. These veterinarians were so esteemed that one French general, Général Mordacq wrote of them in 1912:

The veterinarians have proved, charging with saber in hand each time the occasion presented itself, that they are horsemen and fighters. We demand that they treat men or animals indiscriminately, to carry orders under fire, to assure the provisioning of the assault troops, to command the porters or the evacuation convoy for the injured, to be an officer of topography or a professor of agriculture. It is not my place to judge their work but I must point out that not even the unfavorable conditions in which their practitioners found themselves could prevent these men from penetrating and shining light on the mysterious ensemble of tropical diseases which they did with the power of their patient labor and intelligent research.³

Just over 100 years after the French began their colonial venture in Algeria, they finally succeeded in pacifying the last of the dissident nomads in the Maghreb, in 1934, in southern Morocco.⁴ The general who led this difficult campaign said after it was all over that “without the happy initiatives and the devotion of the military veterinarians in Morocco, the operations executed by my columns would not have succeeded.”⁵ Military veterinarians, in fact, were pivotal to the success of the French in Africa for over 100 years.

Fully trained and practicing veterinarians, these men, in addition to their veterinary duties, fulfilled a staggering variety of roles and functions for the French colonial regimes. They cared for those injured in battle, both human and animal; they conducted primary research on tropical and subtropical veterinary diseases; they performed agricultural and other duties where

needed; and they promoted business ventures.⁶ There are several documented cases of military veterinarians saving the lives of injured soldiers on the battlefield, often with surgery.⁷ These men also provided information for the intelligence services of the French government and actively aided in the pacification of the indigenous populations. Furthermore, they founded and organized veterinary and range management services in the colonial territories. The impact these military veterinarians made is still felt today in many contemporary international development programs implemented in former French colonial African countries.



Figure 1. Veterinary surgery in the countryside, Morocco.

Source: *L'Inspection du Service Vétérinaire de l'Armée. Le Service Vétérinaire et Le Service de la Remonte aux Colonies, Les Armées Françaises d'Outre-Mer: Collection Éditée à l'Occasion de l'Exposition Coloniale Internationale de Paris* (Paris: Imprimerie Nationale, 1931).

The French experience in Africa was confined to Algeria until the late nineteenth century when they expanded their colonial territory to include Tunisia (1881) and several countries in sub-Saharan Africa, primarily in West Africa, and Madagascar (1896). Their early experiences in Algeria were formative for dealing with much of what came later in newer colonies in many different sectors, from veterinary and human medicine, to forestry and agriculture, to urban development. The Maghreb in general, and Algeria in particular, were showcased as “models of colonial installation” to be emulated in other French colonial territories.⁸

Recent research has detailed the status and roles of military physicians in Algeria.⁹ One

of these military physicians who practiced in Algeria, M. Laveran, won the Nobel prize in 1907 for the discovery of the parasite that causes malaria, *Plasmodium falciparum*, as well as other pathogenic protozoa.¹⁰ Of course, he discovered it many years earlier, in 1880, in the blood of a soldier in Algeria. What Laveran saw in his blood smear usually takes place inside the anopholes mosquito vector, but it is thought that the blood or the slide must have sat for at least 15 minutes before Laveran looked at it for him to witness this form of the parasite. Nobody had witnessed this before, and no one took his findings seriously for several years because, in the words of Robert Desowitz, Laveran “...was a nobody from Bone (Algeria).”¹¹

This example of Laveran partially illustrates the low status in which army physicians were held in the French colonial military forces and the modest role they played until late in the nineteenth century. Especially in the early years of the occupation they “...followed the army with the baggage train ... they had poor equipment and received little attention from the administration.”¹² This is not to imply that physicians did not play important roles in Algeria and other colonies, for they did. Doctor Auguste Warnier, for example, may well be one of the most famous and influential of these military physicians.¹³ These doctors also provided essential treatment and care to French soldiers and, sometimes, to local Africans.

Military veterinarians accompanied the first armed forces that attacked Algeria in 1830 and they remained crucial to French control and administration of Algeria while the wars of pacification continued during the first three decades of occupation.¹⁴ In every other colonial territory conquered by the French in Africa, military veterinarians accompanied the occupation forces and played pivotal roles in the success of the French war machine.¹⁵ It is important to note that until after World War I, the vast majority of power for all militaries came from animals, usually horses and mules. Not only did these animals carry men and supplies on their backs and tow wagons and other vehicles, they also carried the weapons. As the French conquered different areas of Africa they adapted to the local conditions and to the local animals.

In Madagascar, for example, the “*Zébu de mitrailleuse*,” the machine gun *Zébu*, as shown

in figure 2, was useful to the French. Military veterinarians were of paramount importance in keeping these animals fit and able to work. If the horses and other beasts of burden couldn't advance, neither could the French army. Humans were more expendable, in many ways, than the animals because the French were drawing on local Algerian conscripts as well as on their own prisons to man the French African Army, *L'Armée d'Afrique*.¹⁶ These French prisoners were hardened criminals who were difficult to control. They were sardonically called *les joyeux*, the cheerful or merry ones.

In North Africa, in particular, camels became an important force in the French war apparatus since much of the terrain they set out to conquer was difficult if not impossible to cover without them. In fact, the French developed an entirely new form of military unit, the Mehari Company, *le compagnie méhariste*, based almost entirely on camels and they utilized substantial local Algerian labor to man these units.¹⁷ The name is derived from the type of camel preferred for these units, the *Méhari*, a very light colored camel. As a result of dealing with this new beast of burden, the French were forced to learn a great deal about camel husbandry and treating camel diseases. This research formed a substantial part of their scientific contributions as veterinarians in Africa and culminated in major works like that of the veterinarian Curasson, *The Camel and its Diseases*, still cited today.¹⁸

French veterinarians in Africa made many important scientific contributions to medical knowledge in general, and veterinary knowledge in particular. One example comes from the work of veterinarian Camille Guérin and his colleague the physician Dr. Calmette.

At the Pasteur Institute, named "Pastoria," in the Guinean town of Kindia, the "first trials of the vaccination against tuberculosis with BCG were made."¹⁹ BCG stands for Bacille Calmette-Guérin and this vaccine developed by Guérin and Calmette is still used in many countries to protect against tuberculosis. Pastoria was created and directed by the military veterinarian Wilbert. Another veterinarian, Dr. Nocard, supervised some of the first trials of the vaccine for anthrax in Algeria in 1898.²⁰ Prior to this, Dr. Nocard had researched cholera in Egypt, and was considered by Dr. Louis Pasteur to be very talented. In 1911, the veterinarians Bouquet and Bridré discovered and tested the first vaccine against sheep pox in Algeria.²¹ Other important research by military veterinarians included work done in Morocco on trypanosomiasis, a significant killer of camels in North Africa. These are a few of the many examples of important veterinary

and medical research conducted by French veterinarians in Africa.

Military veterinarians, though, did not limit their activities to healing animals or the research of exotic diseases. These men played an active role from

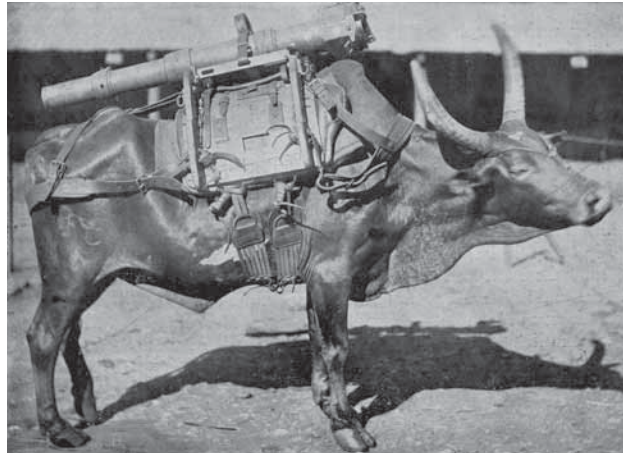


Figure 2. Machine Gun Zebu, Madagascar. Source: *L'Inspection du Service Vétérinaire de l'Armée. Le Service Vétérinaire et Le Service de la Remonte aux Colonies, Les Armées Françaises d'Outre-Mer: Collection Éditée à l'Occasion de l'Exposition Coloniale Internationale de Paris* (Paris: Imprimerie Nationale, 1931).



Figure 3. The Pasteur Institute "Kindia," Pastoria, Guinea. Source: *L'Inspection du Service Vétérinaire de l'Armée. Le Service Vétérinaire et Le Service de la Remonte aux Colonies, Les Armées Françaises d'Outre-Mer: Collection Éditée à l'Occasion de l'Exposition Coloniale Internationale de Paris* (Paris: Imprimerie Nationale, 1931).

the early period in each French colonial territory in strengthening the local economy, orienting it towards the economy of the French metropole, and variously promoting business ventures. Thus they helped to organize sheep ranching and wool cooperatives and they promoted the development of refrigeration and frozen transport to facilitate the export of meat not on the hoof. One military veterinarian famous for his economic contribution was Dr. Philippe Thomas who worked in Tunisia. He was sent there in 1885 by the French prime minister, Jules Ferry, on a geologic mission to study the protectorate's resources. Dr. Thomas discovered large reserves of phosphates and also sources of other important minerals such as zinc and copper. These mineral resources brought significant wealth to Tunisia for nearly a hundred years, well into the independence period.²²

The French learned from their colonial experiences in many different parts of the world that the provision of free medical services was a highly effective way to convince the local population of the good and benign intentions of the occupying French army.²³ This became an integral part of their civilizing mission, to "improve" the lives of the indigenous peoples in their colonial empire. It was equally important for the administration to gain their confidence. The French also learned quickly that in regions with high densities of livestock that the provision of free and effective veterinary services for pacification worked as well as, and perhaps even better than, the provision of free medical services for humans. As with the provision of human medical services, the provision of veterinary services was used frequently therefore as a tool to gain the confidence of, and to control, the indigenous populations. General Gallieni, who led the occupation offensive in Madagascar, fully recognized the importance and effectiveness of military veterinarians in performing these vital roles. He



Figure 4. Mobile Veterinary Group near Marrakech, Morocco.

Source: L'Inspection du Service Vétérinaire de l'Armée. *Le Service Vétérinaire et Le Service de la Remonte aux Colonies, Les Armées Françaises d'Outre-Mer: Collection Éditée à l'Occasion de l'Exposition Coloniale Internationale de Paris* (Paris: Imprimerie Nationale, 1931).

reported to the Minister of the Colonies in 1905 that "the veterinarians put in charge of diverse districts fulfilled their jobs with a zeal for which it pleases me to give them tribute."²⁴

The way such veterinary services were provided in many territories, especially those far out in the countryside, was via mobile veterinary groups, *les groupes vétérinaires mobiles*. These units were also used to facilitate the infiltration of dissident and enemy territories. The mobile veterinary groups were organized and run by the branch of the

military more or less equivalent to the American secret service or FBI, and were always staffed with at least one military veterinarian, an armed guard and usually several local assistants.²⁵ One of the most famous cases of this type of infiltration comes from Morocco where veterinarians were able to penetrate enemy territory in the High Atlas mountains in the territory of the *Glaoui*, a powerful tribal leader. Thus, a relationship was established between the veterinarians and the enemy, which facilitated the latter's eventual pacification, before the military could enter the region.²⁶ One French general bragged that "well before any other French officer could be risked in the region, following this veterinary penetration, a military column was able, without combat, to install a post."²⁷ Even after pacification of the country was achieved, veterinarians provided information required by the military on a regular basis in the form of reports on the activities of the local population. They were considered especially effective at this form of information gathering since they were usually welcomed by the people and often allowed into their homes, which afforded a privileged and intimate view of the family.

In Morocco, one military veterinarian, who arrived with the occupying forces of the army, organized the infiltration and pacification

campaigns involving veterinarians, supervised their intelligence gathering, and organized the veterinary and range management services. This man was Veterinary Colonel Théophile Monod (1864-1942), director of the veterinary service of the Troops of Morocco. Born and educated in France, he was serving in Algeria before he was twenty.²⁸ Besides many years of service as a military veterinarian in Algeria he also served in French West Africa, Indochina and in Martinique. This man epitomizes, in numerous ways, the multifaceted roles played by military veterinarians for nearly 150 years in French Africa.

In addition to organizing the veterinary service with its research laboratories and various permanent and mobile treatment facilities, he also founded and organized what is known today as livestock and range management, *le Service de l'Élevage*. This was first briefly known as the zootechnical service, and it included creating water sources for livestock, building shelters for them, improving pastures, placing certain pastures off limits for regeneration, creating artificial pastures, and conducting research experiments on acclimatizing foreign forage species.²⁹ It also dealt with grazing in forests and some other aspects of forestry in conjunction with the forestry service. This pattern had been followed previously in Algeria and Tunisia and also in several of the sub-Saharan African colonies.

Although it may seem strange today to think of veterinarians being responsible for range management and the reconstitution of pastures, in the eighteenth and nineteenth centuries this was perfectly normal in France. When the first veterinary school in the world was established at Lyon, France in 1762, there was no organized agronomy education being taught in France.³⁰ Thus, for more than half a century, into the 1800's, agronomy and what we know as range management was taught in the veterinary schools in France.³¹ This was usually known as the rural economy and it included treating animals, feeding and housing them, and improving their environment (pastures and other grazing land, including forested pastures). Pastures and crops are, of course, dependent on soil, and the better the soil, the better the vegetation. French veterinarians, therefore, were also trained in some other subjects, such as soils and botany, when they had a bearing on the rural economy. This at least

partly explains how the veterinarian Philippe Thomas could have been sent out to perform a geological reconnaissance mission in Tunisia as outlined above.

This kind of comprehensive training continued until at least 1830 when the Algerian colonial project was set into motion, and many military and civilian veterinarians were trained in this manner. Habits and patterns set during these early years were transferred, in various forms, to nearly all other French colonial ventures. From the early period of colonization in Algeria, military veterinarians developed programs that reached far beyond the scope of treating animal diseases. Dr. Jean Bernis (1811-1868), principal veterinarian in the French African Army, for example, not only rendered veterinary services to military stock, he also made important contributions to livestock and range management.³² In 1852 he outlined an elaborate plan for improving sheep raising in Algeria that laid the foundations for most of the subsequent 100 years of pastoral range management in French North Africa.³³ In the 1890s, military veterinarian Edouard Ducloux headed the veterinary service of Tunisia, which he directed for 40 years. He introduced many programs similar to those of Bernis in Algeria. After the conquest of French West Africa, early in the twentieth century, military veterinarian Camille Pierre was named director of veterinary and range management services for all of French West Africa. He, too, instituted similarly widely ranging programs that included range management.³⁴

Thus, in all of the French colonies, military veterinarians played important roles in the organization of livestock and range management services. As Colonel Monod explained in the courses he taught to new recruits in Morocco in 1927, veterinarians were charged with the amelioration of the whole environment in which animals were raised and thus "...also with obtaining the reconstitution of pastures."³⁵ This remained true in French West Africa as well. Dr. Curasson was appointed inspector general of all of the West African French colonial territories in 1932 and he regularized their range and livestock management programs following many of the ideas first outlined by Bernis.³⁶ An important component of the range management policies that were constructed by military veterinarians



Figure 5. Nomads grazing their livestock on the High Plains of Algeria. The caption reads: “As far as the eye can see, the steppe, flat, bare. Some rare tufts of grass nourish the flocks of the nomad tribes. A landscape of desolation that announces, already, the Sahara.”

Source: Jean Blottière. *Les Productions Algériennes*. (Orléans: Imprimerie A. Pigelet & Cie., 1931).

in most French colonial territories is that they were designed specifically to eventually eliminate nomadism and the movement of livestock and people which were seen as a threat to national security and economic progress. Therefore, many programs were designed to obtain “a reduction in the amplitude of seasonal migrations, the progressive sedentarization of errant populations, and the creation of...foci of prosperity in the sectors experiencing desertification.”³⁷ This approach still forms the basis of most contemporary anti-desertification programs in the pastoral areas of North and West Africa. Such efforts have been highly effective and successful in the Maghreb and as a result the vast majority of nomads in North Africa were sedentarized by the end of the colonial period and their numbers continue to dwindle.

It is clear, then, that French military veterinarians performed crucial services during colonial battles of occupation in Africa by treating the wounded and that they continued to hold key positions in the administration for the rest of the colonial period. They played more diversified, numerous, and important roles in French colonial expansion in Africa than those in most of the other “professions,” such as human medicine or forestry, for example. They conducted primary research on infectious diseases, facilitated commerce, gathered critical information for the government, penetrated enemy territories, and facilitated the pacification of dissident populations. Range

management and several other environmental policies were also largely constructed, or strongly influenced, by military veterinarians. It is in this sector that their legacy appears to have survived the longest. Many of the programs that the French developed for range and livestock management in Africa are currently being implemented by local governments, although often in modified form. The multifaceted work of these colonial veterinarians thus still influences large numbers of people and their livestock today.³⁸ Their legacy persists especially in range management policies and related anti-desertification programs which continue to grow in scope.

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NOTES

1. See, for example, Arnold, D., ed. *Warm Climates and Western Medicine: The Emergence of Tropical Medicine* (Amsterdam: Rodopi, 1996), Curtin, P. D. *Death By Migration: Europe’s Encounter with the Tropical World in the Nineteenth Century* (Cambridge: Cambridge University Press, 1989), and Harrison, M. *Public Health in British India* (Cambridge: Cambridge University Press, 1994). The books by Arnold and Curtin also contain sections on the French colonial experience.
2. Aldrich, R. *Greater France: A History of French Overseas Expansion* (London: MacMillan Press Ltd., 1996), provides details of this period.
3. Mordacq, *Les Spahis Soudanais*, quoted in Vivien, V. G. “Les Vétérinaires Militaires Français, Leur Histoire, Leur Oeuvre,” *Bulletin de l’Académie Vétérinaire de France* 9 (1936): 494-522, p. 517 cited.
4. The Maghreb is a term used to designate the countries of Algeria, Morocco and Tunisia, sometimes also called French North Africa during the colonial period. Morocco was occupied by the French in 1912.
5. Vivien, p. 517.

6. Veterinarians were frequently involved in commercial ventures involving wool, leather, and meat products.
7. See for example, Mordacq, L.-C. *Les Spahis Soudanais* (Paris: Henri Charles-Lavauzelle, 1912), pp. 417-430.
8. Chevalier, A. *L'Agronomie Coloniale et le Muséum National d'Histoire Naturelle: Premières Conférences du Cours sur les Productions Coloniales Végétales & l'Agronomie Tropicale* (Paris: Laboratoire d'Agronomie Coloniale, 1930), p. 2.
9. See, for example, Lorcin, P. "Imperialism, Colonial Identity, and Race in Algeria, 1830-1870: The Role of the French Medical Corps," *Isis* 90 (1999): 653-679.
10. Desowitz, R. S. *The Malaria Capers: Tales of Parasites and People* (New York: W. W. Norton & Company, 1991), p. 170.
11. Desowitz, p. 168.
12. Moulin, A. M. "Tropical without the Tropics: The Turning-Point of Pastorian Medicine in North Africa," In *Warm Climates and Western Medicine: The Emergence of Tropical Medicine, 1500-1900*, edited by David Arnold, 160-180. (Amsterdam: Rodopi, 1996), p. 162.
13. Lorcin, p. 664. In addition to performing his medical duties, Warnier, an Algerian colonist, was elected to the French parliament and strongly influenced an important law governing land and property in Algeria. For more details on Algerian history, see Ageron, C. R. *Modern Algeria: A History from 1830 to the Present*. Translated by M. Brett (originally published 1964) (London: Hearst & Company, 1991).
14. See "Expédition d'Alger." 26 February 1830, by the director of the Cavalry Office, Ministry of War, Service Historique de l'Armée de la Terre (SHAT), Paris, France. This order provided three veterinarians to accompany the expedition forces.
15. In French West Africa military veterinarians arrived with some of the first occupation forces in 1878 as part of the Senegalese Spahi squadron (*l'escadron de spahis sénégalais*). L'Inspection du Service Vétérinaire de l'Armée. *Le Service Vétérinaire et Le Service de la Remonte aux Colonies, Les Armées Françaises d'Outre-Mer: Collection Éditée à l'Occasion de l'Exposition Coloniale Internationale de Paris* (Paris: Imprimerie Nationale, 1931), p. 57. In Madagascar, 17 military veterinarians accompanied the occupation troops in 1895-96. *Ibid.*, pp. 42-43.
16. Porch, D. *The Conquest of the Sahara* (New York: Fromm International Publishing Corporation, 1986).
17. The Mehari companies continued to be used until near the end of the colonial period. See Trancart, C. *De l'Emploi des Unités Méharistes dans l'Administration des Nomades: d'Une Unité Militaire Perimée à un Outil de Commandement Territorial* (Marseille: unpublished, 1946), consulted at the Centre des Hautes Études sur l'Afrique et l'Asie Modernes (CHEAM), Paris, France.
18. Curasson, G. *Le Chameau et ses Maladies* (Paris: Vigot Frères, Éditeurs, 1947).
19. L'Inspection du Service Vétérinaire de l'Armée, p. 71.
20. Tridon, J.-G., ed. *Vétérinaires de France* (Paris: Service de Propagande, Édition, Information, 1965), p. 492.
21. *Ibid.*, p. 492.
22. L'Inspection du Service Vétérinaire de l'Armée, pp. 9-10. Thomas had also studied paleontology.
23. For a discussion of the use of health care provision to pacify and "peacefully conquer" indigenous populations in the Maghreb, see Perkins, K. *Qaids, Captains, and Colons: French Military Administration in the Colonial Maghrib, 1844-1934* (New York: Africana Publishing Company, 1981), pp. 132-135, Hoisington, W. *Lyautey and the French Conquest of Morocco* (New York: St. Martin's Press, 1995), pp. 258-261, and Gallagher, N. E. *Medicine and Power in Tunisia, 1780-1900* (Cambridge: Cambridge University Press, 1983).
24. Tridon, p. 513.
25. L'Inspection du Service Vétérinaire de l'Armée, p. 22.
26. *Ibid.*, p. 23.
27. Vivien, p. 517.
28. "Feuillet du Personnel," Dossier 8.752, SHAT.
29. Martin, L.-A. "L'Élevage au Maroc," *Maroc Médical* 292 (1949): 468-482, p. 472 cited.
30. The French not only led the world in the development of veterinary education, they also established the first overseas veterinary schools. The first veterinary school established outside of Europe (by Europeans) was in Mauritius, then called the Isle-de-France, in the late eighteenth century. Although veterinary schools were not built in Algeria, Morocco or Tunisia until these countries achieved independence, the French built veterinary schools in Egypt in the 1820s and 1830s as well as a military veterinary school in Constantinople in 1842. For more details, see Tridon, pp. 479-510.
31. Tridon, p. 343.
32. Bernis arrived in Algeria in the early 1830s with the French African Army and quickly rose in rank. In 1851 he was attached to the military columns of General Margueritte that conquered parts of southern Algeria. He was responsible for convincing Marechal Randon, Minister of War, to accord the rank of officer to all military veterinarians. See Neumann, L.-G. *Biographies Vétérinaires* (Paris: Asselin et Houzeau, 1896), pp. 20-21.
33. Bernis' article was published in 1852 and was reprinted in Turlin, A., F. Accardo, G. B. M. Flammand, and M. E. Du Champ. *Le Pays du Mouton: Des Conditions d'Existence des Troupeaux sur les Hauts-Plateaux et dans le Sud de l'Algérie, Ouvrage Publié par Ordre de M. Jules Cambon, Gouverneur Général de l'Algérie* (Alger: Typographe Giral, Imprimeur du Gouvernement Général de l'Algérie, 1893), pp. 5-11.
34. Pierre, C. *L'Élevage dans l'Afrique Occidentale Française* (Paris: A. Challamel, 1906).
35. Monod, V. C. T. *L'Élevage au Maroc: Cours Préparatoire* (Rabat: Résidence Générale de France au Maroc, Direction Générale des Affaires Indigènes, 1927), p. 10.
36. See Tridon, pp. 499-501.
36. Tridon, p. 483. The concept of desertification was, in fact, largely constructed during the French colonial period in North Africa, and it is fundamentally flawed. See Davis, D. K. "Desert "Wastes" of the Maghreb: Desertification Narratives in French Colonial Environmental History of North Africa," *Cultural Geographies* 11 (2004): 359-387.
38. Unfortunately, this all too often entails coercive sedentarization programs, justified by inaccurate and outdated ecological science, which result in the continued disenfranchisement and impoverishment of pastoral nomads. As was true during the colonial period, these programs frequently result in poor use, and even misuse, of regional arid and semi-arid environments. For a case study, see Davis, D. K. "Indigenous Knowledge and the Desertification Debate: Problematising Expert Knowledge in North Africa," *Geoforum* 36 (2005): 509-524.

ABOUT THE AUTHOR

Diana K. Davis, DVM, PhD, is Assistant Professor, Department of Geography, 1 University Station A3100, University of Texas at Austin, Austin, TX 78712.