UNRULY NATURE AND TECHNOLOGICAL AUTHORITY: GOVERNING LOCUST SWARMS IN THE SAHEL

by

Claude Péloquin

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A Dissertation Submitted to the Faculty of the

SCHOOL OF GEOGRAPHY AND DEVELOPMENT

In Partial Fulfillment of the Requirements

For the Degree of

DOCTOR OF PHILOSOPHY

In the Graduate College

THE UNIVERSITY OF ARIZONA

2014

THE UNIVERSITY OF ARIZONA
GRADUATE COLLEGE

As members of the Dissertation Committee, we certify that we have read the dissertation prepared by Claude Péloquin, titled Unruly Nature and Technological Authority: Governing Locust Swarms in the Sahel and recommend that it be accepted as fulfilling the dissertation requirement for the Degree of Doctor of Philosophy.

_____Date: 16 December 2013
Paul Robbins

_____ Date: 16 December 2013
Sallie Marston

_____Date: 16 December 2013
Elizabeth Oglesby

_____Date: 16 December 2013
Diane Austin

_____Date: 16 December 2013
Tor Benjaminsen

Final approval and acceptance of this dissertation is contingent upon the candidate's submission of the final copies of the dissertation to the Graduate College.

I hereby certify that I have read this dissertation prepared under my direction and recommend that it be accepted as fulfilling the dissertation requirement.

_____ _____ Date: 16 December 2013
Dissertation Director: Paul Robbins

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ACKNOWLEDGEMENTS

This dissertation owes much to the intellectual environment provided by the University of Arizona's School of Geography and Development. I want to thank my advisor Paul Robbins and committee members, Sallie Marston, Elizabeth Oglesby, Diane Austin, and Tor Benjaminsen at Noragic University Life Science of Norway. My work at SGD has greatly benefited from exchange with and the influence of Diana Liverman, John Paul Jones, and Marv Waterstone, and fellow graduate students, especially, Majed Akther, David Tecklin, Audra El Vilaly, Abd Salam el Vilaly, Jamie McEvoy, Jacob Miller, Kate Sammler, Manuel Prieto, Kerry Jean Ormerod, and Jennifer McCormack. This research followed from and was made possible by the brilliant initiative of the SETER (Socio-Ecological Theories and Empirical Research) project based at Cirad, Montpellier, France. In Montpellier, the first crucial few steps of this doctoral research on the political ecology of state-locust relations was greatly facilitated by comments and contributions from François Bousquet, Martine Antona, Denis Gautier, Gabrielle Bouleau, Nancy Peluso, and Tor Benjaminsen. In the "Locust World"; I thank Michel Lecoq and Jean-Michel Vassal, of the Cirad-Acridologie Unit (Locust Ecology and Control Unit), also in Montpellier, for making this research possible in several ways. Their support include multiple 'crash courses' in locust biology, and ensuring that I receive the financial, logistic, and moral support to access structures of locust governance, especially within the Western Region and at the Desert Locust Control Committee of the FAO in Rome. At Cirad-Acridologie, I also thank Antoine Foucard, Benjamin Pélissé, and Tahar Rachadi. At Clcppro, I thank Thami Ben Halima, Mohamed Lemine Ould Ahmedou and Dominique Menon. At Cnlcp, Fakaba Diakité, Sory Cissé, Oumar Traoré, Hadya Sow, and Bouraima Koné. At CNLA, Mohamed Abdallahi Ould Babah, Amar Ould Amar, Ahmed Salem Ould Benahi, Diallo Amadou and Koutaro Maeno. At Cnlaa, I thank Saïd Ghaout, Saïd Lagnaoui, Ahmed Mouhim, Abdelghani Bouaïchi, and Hafid Rachid. This research was funded by the National Science Foundation Doctoral Dissertation Research Improvement Grant #1201876, 'Institutions, development, and the politics of locust control in West Africa', the Social Sciences and Humanities Research Council of Canada, Arizona Science Foundation, the Social and Behavioral Research Institute of the University of Arizona, the Seter Project and the Pests and Diseases: Risk Analysis and Control Research Unit of Cirad. Finally, I thank Vanessa, Léo, and Félix for making this life a good one.

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ABSTRACT

This dissertation examines how states and international organizations respond to complex ecological problems that are mismatched to their management capacity. The study concentrates on effort by scientific advisors, technicians, and bureaucrats to manage the population dynamics of the desert locust, *Schistocerca gegaria* in Western and Northern Africa. Desert locusts periodically invade crops and pastures, where they cause massive depredations that undermine agricultural productivity and food security, often in extremely impoverished regions. The immensely complex and bio-geographically stochastic breeding and gregarization dynamics of the desert locust put the insect at odds with the conventional spatiality of the state. This make it difficult for managers to precisely predict and effectively control locust outbreaks and invasions. To better understand the factors shaping institutional responses to this insect, I address three interrelated questions primarily informed by political ecology, political geography, and critical development studies: (1) What historical trajectory yielded the contemporary configuration of locust control? (2) Why do some approaches to locust management become selected over others amongst experts and organizations? (3) What is the relationship between the spatial dynamics of locust outbreaks and invasions, on the one hand, and the spatial logic and imperatives of the state? Analysis of interviews, field observations, and archival records indicates that the ability of the desert locust to evade and exceed the conventional spatiality of the state has made this pest problem an appealing field to innovate and enact new regimes of governance that operate transnationally. This has embedded locust control in the historical arc spanning from formal colonialism to the current configuration of independent states supported by international programs of foreign aid and technical assistance. In this context, concerns

for the professional viability of locust expertise within state agencies and international organizations favor the selection of strategies that best fit the modalities of access to development aid and resources. This motivates state-mandated locust managers to favor the adoption of locust control strategies that are best aligned with capacity building goals of these programs, and that incorporate locust management in broader interventions of social and environmental improvement.

CHAPTER I

INTRODUCTION

On February 28th, 2009, in the VIP Lounge of the Tunis-Carthage airport, the French State Secretary of Defense Jean-Marie Brockel gave a press conference at the close of a diplomatic visit to Tunisia. His speech situated his visit in "the long shared history that the two nations have had", from the colonial era to the present (Bockel, 2009, p. 260). The Secretary spoke of the future of that relationship and its implications for regional dynamics, especially within the Dialogue 5+5, an association of five European and five African countries on each side of the Mediterranean Sea.[1]

When asked by a journalist whether joint military operations by the two countries were planned in the coming period, Brockel responded that the next collaboration will be a joint exercise of desert locust control in the Northern Sahara, scheduled as part of the Dialogue 5+5 initiative. The Secretary quickly added the following precision:

> The desert locust is an issue that is not, strictly speaking, military. Yet, it is exactly the kind of civil-military issues that armies are called on to intervene alongside civil authorities, civil society and other protection. (Bockel, 2009)

This mention of locust control by the French State Secretary of Defense in the address above is emblematic of the main thrust of this dissertation in three main ways.

First, the discursive use of locust control by a French state official during a visit to a former colony (Tunisia) is illustrative of the type of transnational configuration

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[1] "Dialogue 5+5" or "Partenariat 5+5" is an association of ten countries of the Western Mediterranean: Morocco, Mauritania, Algeria, Tunisia and Libya in the South, and in the North, Portugal, Spain, France, Italy, and Malta. This is a forum on political, economic, and cultural issues common to all countries.

wherein acridology (the study of locusts and grasshoppers) is practiced. Because the agricultural pest hazard presented by the desert locust exceeds the conventional geo-political boundaries of the state, it is a problem that simultaneously calls for and enables modes of intervention that also are themselves transboundary. In this sense, the institutional factors shaping the management of desert locusts have very much to do with the factors shaping the apparatuses and practices of 'governing at a distance' that have been a cornerstone of both colonial rule and post-independence developmental government on the African continent and elsewhere (Duffield, 2007; Mbembé, 2001; Rose, 1999).

Second, part of what makes locust control *work* as an example of, as Brockel puts it, "exactly the kind of civil-military issues that armies are called on to intervene alongside civil authorities" has to do with the ability of the insect to exceed or evade not only territorial borders but also professional spheres and epistemological frameworks of social and environmental intervention (Brand & Karvonen, 2007). In this sense, the swarming of the desert locust calls for and enables reconfiguration and recombination of multiple forms of power-knowledge. Of particular relevance here is the mutually constitutive relation between expertise, environmental management, and institutions of political rule. Put differently, this is the co-production of technological and political authority in nature-society relations.[2] What kinds of new forms of government of people and things are produced by the encounters and collaboration between entomologists, military officers, development experts, pest control agencies, and locusts? And how do

[2] Technology is used here in the sense defined by the Oxford English Dictionary: "the application of scientific knowledge for practical purposes".

these shape the sets of constraints and incentives within which locust management is produced?

The third and final theme of relevance from the statement above has to do with how the management problem caused by the desert locust is compounded by the tendency of swarms to often emerge from areas where the territorial sovereignty of the state is severely constrained and challenged. Some of the reasons why efforts to monitor and control desert locust swarms can be used by a state official as an example of "civil-military issues" follow from this fraught relationship between the spatiality of the swarming of the locust and the territorial imperative of state power.[3] My examination of that theme interrogates whether locust control contributes to the extension of 'state-space' and 'state-vision' in areas where governmental authority is otherwise challenged. To do so I explore the role and place of locust management at the intersection of territorial sovereignty and 'outward' or 'upward' state practices, especially in the light of scholarship on the state in sub-Saharan Africa that stress the impact of relations between the state and international structures of governance. These include what Bayart (2009) calls strategies of extraversion and Cooper (2002) calls gatekeeping.

In sum, this dissertation examines how management agencies negotiate the material and discursive forces that alternatively enable or hinder their ability to know and control unruly elements of nature. I concentrate on effort by scientific advisors, technicians, and bureaucrats to manage an extreme case of such unruly nature: the desert locust. In this context, the three themes mentioned above highlight particularly

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[3] According to a note appended to the press release about the conference, it so happens that the joint-military exercises of locust control announced by the French State Secretary of Defense in his Tunis press conference were eventually cancelled due to "security concerns".

significant political geographical implications of the ways in which locust control is *also* productive of and produced by social phenomena that e*xceed* the purely technical purposes commonly attributed to applied entomology or similar fields. These implications are the main topic of this dissertation.

The three substantive chapters of this dissertation (chapters 3, 4, and 5) emphasize in turn each of these three themes. The first theme is the historical relation of the interface between state spatiality and transnational *encompassment*, from the colonial era to the present (Ferguson & Gupta, 2002; Venn, 2009). The second, is the simultaneously complementary and competing logics and modes of techno-political intervention at this national-transnational interface in so far as they are constitutive of developmental and environmental forms of governmentality (Ferguson, 1990; Michael Goldman, 2005; Li, 2007; McGregor, Challies, Overton, & Sentes, 2013; Watts, 2003). The third theme is the relation between territory as the spatial extent of state sovereignty (Elden, 2009) and competing and complementary sources of articulation of stateness and topographies of power in the post-colonial/developing world, especially as they pertain to the African state (Allen & Cochrane, 2010; Bayart, 2009; Cooper, 2005; Hagmann & Péclard, 2010; D. S. Moore, 2005). I return to these themes below after a brief description of the desert locust as a social-ecological actor and a discussion of the methods and site of the study.

The Desert Locust

The desert locust is a grasshopper that spends most of its existence as isolated, solitary, individuals in remote desert settings in parts of the Africa continent, the Arabian Peninsula, and South Asia. Under favorable ecological conditions, populations of the insect change behavior and appearance as they make a transition from their

solitarious phase to a gregarious phase. As they do so, individuals start to seek one another, eventually forming massive groups that travel out of their desert environments to areas of greater vegetal productivity, where they consume crops and pastures at massive rates, causing crop depredations of catastrophic magnitude (Baron, 1972; Van Huis, Cressman, & Magor, 2007).

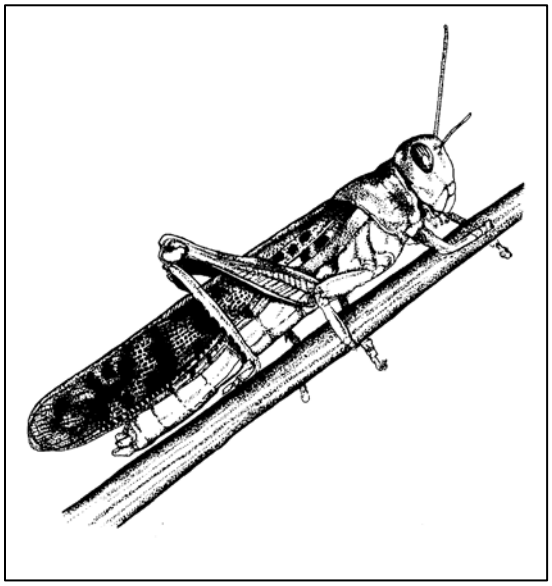

Figure 1.1 Adult desert locust (from Bijlmakers, 1989)

The 20th century has seen several protracted plagues, or runaway invasions, of desert locusts across the northern part of the African continent, the Arabian Peninsula and South Asia. Periods of locust invasions include 1888-1910, 1912-1919, 1926-35, 1940-47, 1949-62, 1987-1989, and 2003-2005 (Waloff 1966, Lecoq 2003, Magor et al. 2008). The frequency and magnitude of these protracted plagues have diminished since the 1960s, plausibly due to some measure of success in control activities (Magor et al. 2008), although swarms continue to challenges to management capacity to this day (Van Huis et al. 2007).

The distribution and behavior of desert locust is determined by complex and stochastic biogeographical dynamics occurring over immense areas. Factors shaping these dynamics include wind patterns, temperature, and precipitation. In these tropical and sub-tropical regions these are largely conditioned by oscillations of the inter-tropical convergence zone. Precipitation patterns influence vegetation, which in turn influence locust crowding. As individual locusts are brought in proximity to one another, they start to gradually change their behavior toward a new phase wherein they seek *even more* crowding. This is transition from their solitarious phase, first to the intermediate *transiens gregariens*, and if conditions remain viable, to a fully gregarious phase. Ecological conditions determine whether gregarious populations keep on forming larger groups or instead revert back to their solitary phase, or die off. The unpredictability of the timing and location of phase change and migration patterns is central to the challenges faced by locust managers.

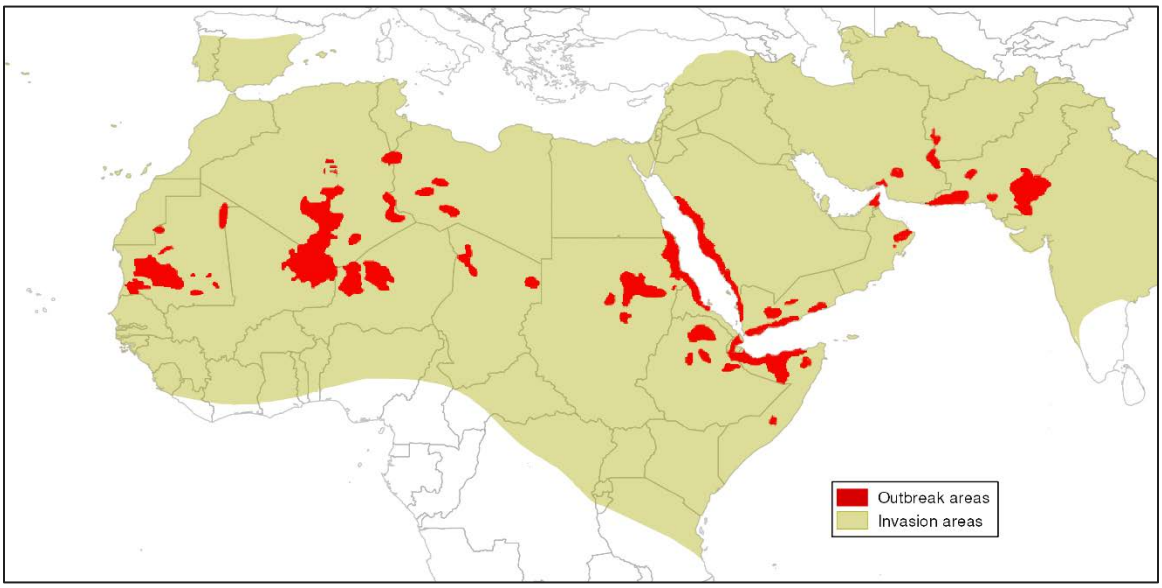

Figure 1.2 Areas of desert locust outbreak and invasion. Map by Author, data from FAO and Cirad.

Because the insect tends to be found in many of the world's poorest countries, and due to the genealogy of locust control as a branch of tropical agronomy in the colonial sciences of the late 19th and early 20th centuries (as has been the case with much applied entomology, cf Vayssière 1980; Clark 2009), locust management on the African continent is closely intertwined with the development networks that emerged in the wake of formal independence of the colonies. Moreover, the ability of the insect to travel across political boundaries has called for and enabled transnational configurations.

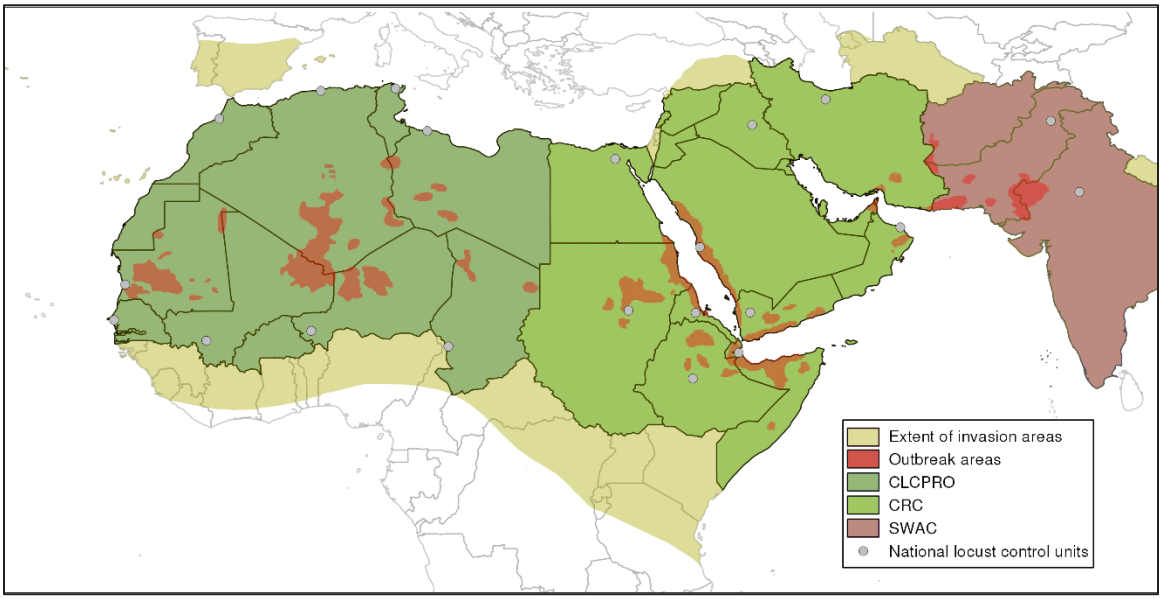

Figure 1.3 Regional commissions and national units of desert locust control. Map by author, data from FAO and Cirad.

Desert locust survey and control operations in West Africa are primarily organized and carried out by locust prospectors, applied entomologists and agronomists employed by state crop protection agencies. These efforts are coordinated in, and receive logistic, technical and scientific support from, aid agreements with foreign government and international organizations. Prominent among these are the Food and Agriculture

Organization (FAO), the World Food Programme (WFP) and the Development Programme of the United Nations (UNDP), the World Bank, the African Development Bank, and national development agencies such as France's Agence Française de Developpement (AFD) and the United States Agency of International Development (USAID). Scientific researcher affiliated with University or public research centers also contribute to locust management efforts. These are most often entomologist researchers, commonly called *acridologists*, from acridology, the study of locust and grasshoppers, who serve as consultants or advisors to these locust-related aid programs.

The Desert Locust as a Problem of Fit between Ecosystems and Institutions

Locusts can be understood as prone to undergo what has been described as "sustained eruptions" and "eruptive, spreading outbreaks" (Berryman, 1987, cited in Magor et al. 2008, p.1530). What is meant by that is that locust population dynamics

> have a stable equilibrium at both low and high densities. Locusts at low densities remain that way until rare but exceptionally favorable weather provides conditions suitable for very successful breeding and populations erupt to reach very high (plague) levels (Magor et al. 2008, p. 1531).

The particularity of its ecology and multiplicity of phases make the agricultural pest hazard produced by the desert locust especially difficult to manage. More specifically, this bifurcation of distinct spatial and temporal states poses serious challenge to the technological capacity of organizations that are ill-equipped to deal with entities characterized by such indeterminacy and emergence.

Many environmental problems are at odds with the logic and spatiality of the institutional arrangements responsible for their management. Some of these problems, such as atmospheric and water pollution as well as wildlife migration are so large or mobile that they transcend and exceed the territory of the nation-state. Others, such as

disease outbreaks and agricultural pest infestations, because they are immanent and emerging, occur at spatial-temporal scales that are often conversely too small or too fast for large states or international organizations to control.

In this sense, the desert locust is both too small *and* too large. The solitary locust is small, diffuse, and yet the immanence of the problem it constitutes is overwhelmingly rapid, which makes the location and timing of outbreaks unpredictable beyond a very coarse resolution, complicating monitoring and prevention efforts. The gregarious swarms, however, are too large and too mobile for the nation-state, exceeding or crossing its boundaries.

Precisely because it presents such a challenge to organizational capacity, the condition brought by this polyphenism—the multiplicity of phenotypic phases—of the locust makes the management of this insect an ideal field to critically examine what scholars of nature-society relation call the problem of fit between institutions and ecosystems (Folke, Pritchard, Berkes, Colding, & Svedin, 2007). Especially, the assertion that certain types of institutions are mismatched to certain types of ecological problems invites questions about why and how certain institutional and technological orientations are selected over others to manage (contain, prevent, foster) some sets of biophysical interactions as natural resources or hazards. In other words, how do experts and agencies go about 'carving out' parts of complex ecological systems as they seek to foster one type of social-ecological relation over another?

The desert locust provides a great laboratory to explore these questions, in part because the complex spatial and temporal multiplicities produced by the insect's polyphenism are especially effective at uncovering or highlighting how the diverse logics and mandates pursued by different experts and organizations yield different

conceptualizations of ecological problems and solutions. In this context, I ask how do locust management specialists conceptualize, negotiate, and enact efforts to prevent, contain, and terminate the swarming of this insect? What kind of socio-political apparatus is enabled by these techno-scientific efforts? How do these institutional-political processes shape the selection and stabilization of ways of knowing and managing the locust?

Research Design

I address the broad interrogation above, on locust management as simultaneously a problem of fit between ecosystem and institutions and as an ecological problem of development, by concentrating on three research questions:

1. How has the political ecological and institutional framing of the locust hazard changed from its time as a "colonial peril" (Jeannel, 1944) to its current role as problem of international development?

2. Do perceptions of the locust problem and locust control preferences vary between professional specializations, agencies, or nations? And to the degree that they do, why do some approaches to locust management become selected over others amongst experts and organizations?

3. What is the relationship between the spatial dynamics of locust outbreak and invasions, on the one hand, and the dynamics at the basis of socio-political territorialization on the other?

Below I describe the research orientation, methods, and sites that I combined to answer these questions. This is followed by a discussion of the geographical, methodological and theoretical limitations on the study. Finally, I conclude this chapter with a brief summary outlining the key findings of this study and how they will be presented in the remainder of this dissertation.

Research Orientation and Methods

My approach is primarily qualitative, largely because this methodological orientation is best suited to exploratory inquiries on the relation between meaning, practices and interpretations that are at the core of the study (Creswell, 2003; Denzin & Lincoln, 2008). This is especially the case in studies, like this one, that examine such relations as they span multiple institutional settings with more or less different cultural understandings of broadly overlapping but not exactly matching themes. In such contexts, quantitative modes of inquiry rarely add analytic precision. In the worst cases, they may actually undermine the accuracy of the research by providing seemingly strong statistical evidence that are in fact based on erroneous premises.

Qualitative inquiries do not usually yield precisely calibrated findings of the kind produced by, for example, multivariate statistical tests. That said, many research problems are difficult, if not impossible, to approach quantitatively because such methods are only good at evaluating already established hypotheses about relations (causal or not) between variables. In that sense, quantitative inquiries are strongly constrained by a priori assumption about the research topic, which is especially problematic in studies focused on meaning, interpretation, discourses and other similar processes defined by categories that are dynamic and that the researcher may not have

adequate a priori understanding before the study. The questions pursued by this dissertation match that description.

Although qualitative research may be limited in precision, there are numerous approaches to and methods of qualitative data collection and analysis that help ensure the validity, fit, and accuracy of interpretation of qualitative materials. In this study I adopt some of these methods and criteria provided by literature in grounded theory, ethnography, and discourse analysis in documentary research.

Grounded theory (Glaser, 1992) favors heuristic uses of models of explanation that are continuously reformulated following iterative back-and-forth between inductive and deductive combinations and evaluation of hypothesis and observation. This approach to qualitative research calls for the interpretation of data materials by the researcher via the formulation of codes, concepts, and categories that guide the construction of working hypotheses *grounded* in data materials, and for the subsequent confirmation or reformulation of these hypotheses based on the fit, relevance, and workability of the explanation produced by the formulation and verification of these concepts to the question at hand.

Ethnography has a long history as a qualitative research method, especially in cultural anthropology and sociology. Canonical anthropological studies from the early 20th century have tended to be rather holistic in scope and intent. These were usually written as monographs attempting to describe the totality of a given culture as seen from the point of view of an immersed outsider. The ethnographer would seek to account for semiotic and material dimensions as varied as belief systems, rituals, and production and organization defining societies that were usually assumed to be more or less self-contained and static units of analysis. Debates about epistemology and representation,

especially since the late 1970s and early 1980s have problematized these approaches on several grounds that include the false pretense of objectivity, essentialist representations of exotic 'others', and assumptions about what constitutes a proper unit of analysis and the relation of that unit to broader claims about cultural traits. Despite these problems ethnography as a methodological approach was also shown to allow especially flexible, reflexive, and holistic engagement with and interpretation of social dynamics. In the light of these concurrent developments, scholars in critical social science methodologies have made the case for ethnography as an approach to observing, writing, and interpreting social phenomena that is open and attentive to the fluidity of social-cultural meanings, practices and representation, pending adequate reflection on the scope of the investigation and the limits of the claims derived from these inquiries (Aunger, 1995; Katz, 1994; Marcus & Fischer, 1986; D. E. Smith, 2005).

An ethnographic approach combining unstructured and semi-structured interviews with participant observation is most sensitive to the micro-patterns of daily practice, interpersonal dynamics, and is attentive to what participants consider most important and to how they choose to talk about it. It is also attentive to information that may be omitted from written record or interviews because it is deemed relevant, because it is considered 'second-nature' tacit knowledge that is not easily abstracted, or because it is simply censored. Finally, it allows the researcher to pay close attention to the relations between discourses or self-image and practices, and in turn to the incidence of the material context on these relationships.

This study pursues a rather selective, multi-sited, institutional ethnography that differs markedly in scope, depth, and 'thickness' from the conventional ethnographic tradition (Comaroff & Comaroff, 2003; Ferguson & Gupta, 2002; D. E. Smith, 2005;

Trouillot, 2001). I am not attempting a description of the totality of a given culture, not even of a rather limited organizational culture. Rather, in my ethnographic inquiry I sought to identify and contrast the understanding on specific issues of locust control held by diverse actors involved in this management apparatus. The reason why I adopted an ethnographic approach is because it is most attentive to the relation between how actors conceptualize and describe their social practices and what they actually do. Again, ethnographic research is also especially attentive to dynamics that may be taken for granted by actors within a cultural setting, who would not mention them, or who might not even know about these dynamics as a thing that ought to be conceptualized even though these dynamics make a great difference in the interpretation of the analyst. This includes many more or less subtle differences that may be flattened in verbal and written accounts of interpretation and meanings. This focus on specific *meaning* and/or *conceptual models* as object of study is much narrower in this sense. At the same time, the ethnographic inquiries were quite broad in that they looked at a these meanings as they travel across multiple sites in different countries and continents.

My approach is especially informed by institutional ethnography, a method of inquiry pioneered in feminist sociology and focused on understanding how everyday lives are productive of practices that are constituted by and constitutive of social structures (D. E. Smith, 2005). I apply insights from this approach of institutional ethnography to bear on the question of, as anthropologist Mary Douglas (1986) puts it, how do institutions think, and how do these 'institutional ways of thinking' relate to broader ideological currents (Denzau & North, 1994)? To this end, I draw on ethnographic studies of state practices (Chalfin, 2010; D. S. Moore, 2005; Mountz, 2010), development projects (Ferguson, 1990; Li, 2007; Mosse, 2004), scientific work

(Latour & Woolgar, 1979), and interactions among heterogeneous sets of human and non-human actors (Comaroff & Comaroff, 2003; Kosek, 2006; Ogden, 2011). My ethnographic approach relied on two of the most common methods to generate materials: participant observation and interviews.

Participant observation (Laurier, 2003) entails the immersion of the researcher in the cultural or institutional context under study. It is a continuum of levels of engagement from rather detached/passive observation to rather active participation where the researcher learns from a cultural context as she or he actively participates in shaping said context. In the case of this study, my degree of participation was quite minimal: I spent time in the workplaces of locust experts and managers, lobbies, office spaces, break rooms, and conference rooms during staff meetings as well as regional and international meetings, but did not actively contribute to the activities carried in out these places. In each of these study sites, I made notes of observations of the physical configuration of these environments, and the occurrences, daily routines, behaviors, and interactions among study participants (Laurier 2003). My notes on these observation turned out to be much more valuable to my interpretation of the institutional cultures than the text below would suggest. Although I only rarely make direct use of these materials in my writing, my time getting acquainted with the physical environment and the institutional dynamics of the organizational settings under study directly informed the orientation of my interviews and document surveys. For example, attending staff meetings in research units provided me with key insights on how these actors conceptualize and negotiate trade-offs between different models of collaboration, and what type of preoccupation are shared or not by different sets of actors within a given agency.

Interviews with actors of locust governance ranged from open, unstructured conversations to more formal, semi-structured interviews (Bernard, 1994; Creswell, 2003). In these exchanges I sought explanation, confirmation, or additional precisions on patterns and events noted during my observations of meetings and review of documents. Interviewees were recruited on the basis of their occupation and/or professional affiliations and post titles, and included locust survey and control agents, staff, scientists, development experts, government officials, and farmers and herders. Interviews concentrated on (1) locust ecology and relation to human livelihood and development, and (2) on the nature and functioning of the transnational and national components of the apparatus of desert locust management, including its logistical, technical, financial, cultural, material and political dimensions. Given the scope of the study in France and West and North Africa, where French is commonly spoken among professionals and public officers, and the focus on experts and managers in these countries that are quite comfortable speaking in French, the interviews were carried out in that language.

In the unstructured interviews, I principally sought to find what study participants considered most relevant, letting them describe and explain phenomena, problems and practices in their own terms. These informal conversations revealed elements of significance to understand the problem that had not been foreseen prior to beginning the study (Bernard 1994). During these conversations I kept the precise formulation of my research questions in mind but also remained open and attentive to other themes that became important and that appeared necessary to incorporate in the study (Glaser 1992).

Semi-structured interviews were more formal, carried out according to a common protocol, and guided by a question schedule. The writing of these questions was informed by preliminary findings from documentary survey, participant observation, and unstructured interviews. This multiple-step approach to 'zooming-in' on increasingly precisely formulated interview prompts was aided by the fact that the study spanned conversations with actors in the field over three years and during multiple visits to diverse sites (see below). Questions were re-worded during interviews to ensure that they were intelligible to the interviewee and that they referred to specific situations (as opposed to abstract generalities). These semi-structured interviews range from 30 to 90 minutes, and whenever appropriate and possible they were one-on-one, recorded, and I also took notes highlighting salient points, thoughts, observations, and new questions as they came up (Bernard 1994). When appropriate, I invited interview participants to draw on blank paper sheets how they conceptualize locust management: what actors (including themselves) play what role, when, where, in relation to what goals, constraints, which in turn are based on what information. This cognitive mapping method (Hukkinen, 1999) was used to encourage research participants to think about how the relations between specific practices and things on the one hand, and more abstract notions (e.g. power dynamics) shape decision-making and management interventions but do not fit usual narrative account or formal representations of organizations.

Following Hootkoop-Setenstra (2000), I made sure to account, to the extent possible, on how the situation, contingency, and dynamic of the interview encounter shaped the content, direction, and outcome of the conversation. In that sense, I do not claim that the interviews carried out in this study revealed unaltered, independent or

essential statements. The statements in the interviews were remarks made to me by participants in a conversation that only happened in the context, and was shaped to a large degree by the objectives, of this study. Moreover, participants were likely encouraged to stress a specific issue or another by my prompt, responses, or their knowledge or assumptions about my own perspective on the topic at hand. That said, my interactions with many participants in applied acridology over a relatively long period of time and in many different settings in multiple countries allowed me to be able to contextualize statements received during interviews, and to cross-reference these statements with materials obtained during analysis of documents and during participant observation. Based on this, I do not claim that the quotations provided in the text are exhaustively or objectively representative of how actors in the field think or approach a given problem, but I maintain that these statements are representative of positions that do exist in the field and are thus worthy of examination.

My investigation of behavior and perception within locust management circles were guided by and supplemented with survey of information and analysis of discourses in published and non-published documents about these agencies, as obtained on organizations websites, in public libraries, and in the documentation centers and libraries of study sites. Agency reports, press releases, campaign notes, and other documents were analyzed for contextual information against which informal accounts and observation can be compared and completed (Atkinson & Delamont, 2008).

An inquiry on relation among diverse groups of actors in diverse organizations calls for attention to the genealogy, the tensions between the continuities and discontinuities of representation and meanings as they link more or less specific moments in the past to the present (Davis, 2009; Foucault, 2003; Scheurich &

McKenzie, 2008; Venn, 2009). To this end, my documentary analysis looks backward at specific historical junctures from the mid-20th Century to the present in so far as they inform a geographical and historical understanding of how locust science co-evolved with various phases of government, state-building, and development in West Africa, from the colonial era to the present (Chalfin, 2010; Cooper, 2002; Venn, 2009).

The body of materials for the study consisted primarily of extensive field notes that were taken during, before and after each step of the study. Notes were handwritten in note books and typed via a note-taking software to record observations, notes, additional questions, insights, impressions and doubts (diary format), as well as to describe settings and interactions and to record interviews and interactions. These notes were loosely and intuitively coded by theme, location, organization and categories of informants. I listened to all interview recordings to note salient points and transcribe verbatim select portions of the recordings. Analysis of secondary materials (locust science literature, conference proceedings and crop protection agency reports) helped situate site-specific ethnographic observations and interview materials in their broader geo-historical context, and vice-versa.

These materials together were analyzed to determine how perceptions of locusts and their control vary between groups, experts and authorities, which factors direct and control the flow of locust control resources, and how and whether each of these vary over time and across agencies. The validity of my analysis was ensured in three main ways. Whenever possible I verified claims contained in materials and my interpretation of these materials with actors in the field. I also remain attentive to concordance between multiple and heterogeneous sources, seeking ‘triangulation’ between ethnographic and documentary materials whenever possible. Lastly, I have made sure to provide sufficient

information about the context of origin of the materials and to limit my interpretation to this context.

Scope, Sites, and Access

Because of the immense habitat range of the insect, efforts to manage the desert locust involve close to forty states along with numerous international and regional organizations. The regional scope of this study is concentrated on organizations whose work pertains to locust populations in the western portions of the Sahara and the Sahel, in northwestern and western Africa (See figures 1.1 and 1.2, above). This corresponds to the area currently under mandate of the Commission for controlling the Desert Locust in the Western Region ("Commission de Lutte Contre le Criquet Pèlerin dans la Région Occidentale": Clcpro)[4], and the Locust Emergency Prevention System program in the Western Region (Empres-Locust, Western Region)[5]. The activities of this commission (Clcpro) and the program supporting it (Empres-Locust Western Region) operate under the Desert Locust Control Committee of the United Nations Food and Agriculture Organization (UN-FAO). They help support and coordinate locust control activities in Burkina Faso, Chad, The Gambia, Mauritania, Mali, Niger and Senegal (to the south), Morocco, Algeria, Tunisia, and Libya (to the north). Together these countries constitute the Western Region of locust control.

Except for The Gambia and Libya, all these countries have been colonies or semi-colonies of France for some portion of the 20th Century, and they remain to this day

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[4] Data collection relied primarily on interviews and documents in French. For consistency and coherence I use the abbreviations that are most commonly used by actors in the field of locust control, regardless of whether these abbreviations correspond to the French appellation (e.g. Clcpro) or the English one (e.g. DLCC—Desert Locust Control Committee or Empres—Emergency Prevention System).

[5] Henceforth referred to as Empres-RO (Région Occidentale).

within the French zone of influence in political, economic, cultural affairs. As this zone of French influence in the region extends to applied acridology, a political ecological investigation of locust management in this Western Region calls for attention to French contribution to the field as well. It is for this reason that I also examines the work of Cirad-Prifas and related interventions and programs from France in the region.

Finally, understanding the transnational linkages that connects these various countries within the Western Region and abroad also called for attention to the nature and logic of the multilateral organizations responsible for these connections. I concentrate primarily on the contribution of the UN-FAO's Desert Locust Control Committee and Empres program, and donor agencies, especially the World Bank, in shaping institutional orientations.

I visited headquarters of national agencies of crop protection (or specifically locust control) in West and North Africa, and centers of policy and scientific research in Africa and in Europe. Duration of visits to these sites ranged from one to four weeks in seven trips that took place from summer 2010 to summer 2013. During these visits I met and exchanged with prospectors, pest control agents, entomologists, professors, scientific researchers, administrators, and development experts. These interactions included semi-structured interviews with these actors, which provide the bulk of the quotations used in this text. I observed the configuration of and activities in office spaces conference rooms, equipment warehouse, pesticide depots and on locust surveillance missions. At the offices I consulted agency reports, press releases, and meeting campaign notes, and attended official meetings pertaining to locust management in the Western Region and beyond. Security concerns and timing prevented me from attending actual locust treatment in the field, but that did not turn out to be a significant limitation.

Interest in and active support of my research by senior entomologists at Cirad involved in locust control was critical for the success of this research project. It allowed access to key researchers and to the documents at the Locust Ecology and Control Research Center of Cirad in Montpellier. This support also provided avenues to visit the national locust control centers in several countries, especially Mali and Mauritania, and to meet key actors in the international locust control community.

Approval through the UA Institutional Review Board's (IRB) Human Subjects Protection and Research was obtained for all phases of the research (project No. 10-0252-02). Even though several participants agreed to be quoted by name, I have chosen to mask the identity of all interviewees, except in the few occasions when the interviewees explicitly indicated a preference to be named. Similarly, I only provide details about the locations of my visits and observations when such details are clearly both useful and appropriate, and I chose to not provide an exhaustive list of the sites visited. In an effort to balance verifiability and ethical commitment to research participants, I only provide location information when this disclosure adds to the strength of the data while also posing no risk of professional harm to research participants. The reason behind this is that even though the professional field of the 'locust world' spans an immense geographic area, it actually involves a relatively small number of people clustered in a dozen of centers that are hierarchically linked. The implication is that providing the name of those that agree to being named would diminish the degree of anonymity of those who did not.

Additional Notes on the Scope and Purpose of the Dissertation

This dissertation is not a comprehensively descriptive account of locust management in a given place and time. Rather, it is an interrogation of the role of the

spatial logic of institutions in shaping the co-production of expert knowledge and political authority, focusing especially on these dynamics at the intersection of global environmental governance and international development. Readers looking for a historical account of locust management that is less selective than the one here provided could refer to the books by Baron (1972), Roy (2001), and Sistach and Pujol (2007).

This research focuses on 'looking up' the vertical hierarchy of power that links state subjects, state officials, and international authorities. I am especially interested in the political geographical implications of the production and use of expert knowledge. For this reason, I do not explicitly address the 'downstream' effects of this co-production on livelihoods and ecosystems affected by intervention (or lack thereof) in locust management. Put differently, this study does not evaluate or measure the outcome that certain ways of knowing and managing the locust may have on populations of farmers, herders in these countries, or the environmental impacts of these interventions.

To study how experts on and managers of desert locusts conceptualize, negotiate, and carry out their work vis-à-vis the demands of the state and supranational organizations, I adopt a position working with, and within, the parameters of applied acridology. To this end, I adopt what can be described as a form of methodological agnosticism vis-à-vis key debates within that field. For example, I am more interested in studying the statements made by locust control experts on how to prevent swarm outbreaks than independently evaluating whether such efforts are desirable socially and environmentally, and whether one approach is more suitable to that end over another. Lastly, I want to state my respect and appreciation for the work of the locust scientists, whose passion for this strange insect is not only contagious but also tends to make them an especially interesting bunch.

In the interest of simplicity, I use the terms locust management and locust control to refer to the constellation of practices enacted to attempt control of locust population dynamics. I use the terms locust managers, locust control officers, and locust control technicians to refer to actors primarily involved with national agencies of pest control, or more specifically, national locust control units where those exist. I use the terms locust experts and scientists to designate actors primarily involved with science or policy in multilateral organizations. Although practical as a shorthand, the validity of this distinction between these designations is only partial, and should not be exaggerated, as there is significant overlap in these two categories of roles.

Plan of the Dissertation

The dissertation engages with three themes pertaining to the political geography of environment and development. The first theme pertains to questions on how to best apprehend the contingent, sometimes even accidental or opportunist nature of environmental science and management's incorporation in the making of rationalities of rule. Of particular interest is the relation between ecological techno-power and the mechanisms of governing at a distance that have been shaping the world order from the colonial era to the present (Venn, 2009). The historicity and contingencies of mechanisms of rule is key to understand how these relations operate, and with what effect (Bayart, 2005, 2009; Ferguson, 1990; Foucault, 1979). As with many similar hazards that are emergent (Robbins, Farnsworth, & Jones, 2008) and that transcend political boundaries, the desert locust is, in either of its phases, precisely at odds with the spatial reach of conventional management institutions (Lecoq, 2001; Skaf, Popov, Roffey, Scorer, & Hewitt, 1990). This tension presents a case where the same behavioral and bio-geographical particularities that make the desert locust so problematic in

"normal times" made it an ideal field of intervention to help resolve unconventional challenges to, or shortcomings of, social order. In other words, the ability of the desert locust to evade and exceed the conventional spatiality of the state has made this pest problem an appealing field to innovate and enact new regimes of governance that operate transnationally. This has embedded locust control in the historical arc spanning from formal colonialism to the current configuration of independent states supported by international programs of foreign aid and technical assistance.

The second theme refers to the question of how the relation between expertise and mechanisms of rule (Mitchell, 2002; Rose, 1993) influences how researchers and managers, as actors of environmental governance, apprehend and respond to the complexity and unruliness of nature? In other words, what is made of the unpredictable, emergent, and biogeographically stochastic breeding and gregarization dynamics of the desert locust as they are made as an object of techno-power? In what ways do complex sets of social-ecological processes get 'carved off' as hazards and resources by social organizations, and what is the nature of the relationship between these selection and available technologies and configuration of management? My observations suggest that concerns for the professional viability of locust expertise within state agencies and international organizations favor the selection of strategies that best fit the modalities of access to development aid and resources. This motivates locust managers to favor the adoption of locust control strategies that are best aligned with capacity building goals of these programs, and that incorporate locust management in broader interventions of social and environmental improvement.

The third theme points attention to the relation between (1) state power as a particular concentration and representation of managerial authority and (2) other levels

'higher up' in the vertical institutional hierarchy that posits the global as above the state, society, and localities (Allen & Cochrane, 2010; Ferguson & Gupta, 2002). It explores the constraints and incentives that operate on locust managers in Sahelian states. My findings suggest that locust control specialists working in these state agencies are primarily motivated by the opportunities and demands of participation in transnational programs and structures of governance, and that it this participation primarily shapes the contribution of locust control to development statecraft.

These three themes unevenly span the three substantive chapters of the dissertation (chapters 3, 4, and 5), each coming to the forefront of analysis in one chapter and receding in the background in the others. Together, they highlight the nature and effect of the socio-spatial dynamics produced by and productive the role of ecological expertise in relation to technological power in global environmental governance and international development.

CHAPTER 2

LOCUSTS AND THE POLITICAL GEOGRAPHY OF ENVIRONMENT AND DEVELOPMENT

Success or failure in environmental management is often attributed to the degree of fit between the ecological processes under management and the spatial logic and capacity of mandated institutions (Cash et al., 2006; Dietz, Ostrom, & Stern, 2003; Folke et al., 2007; Liu et al., 2007).

Rather than taking the mismatch between institutions and ecosystems as pre-given, however, work in social studies of science, political ecology and related fields has critically investigated why and how given socio-ecological dynamics become "seen", adopted as management mandates by agencies, how they are represented, and what technological or institutional arrangements are favored by these configurations (Alatout, 2008; Biehler, 2009; Mara Goldman, 2009; Robertson, 2006). That body of work highlights how the practices of environmental managers are shaped by interrelations between (1) the material demands of the object of management concern, (2) the scientific knowledge about the object, and (3) the strategic imperatives of authoritative legitimacy (Peet, Robbins, & Watts, 2011).

An explicitly political geographical consideration of these questions (Robbins, 2008) suggests that the spatial extent and resolution of a given socio-technical apparatus is not a pre-existing condition, but rather the outcome of contingent negotiation between ideas, representations, and objects. One key implication from these views is that the "fit" between institutions—such as state agencies—on the one hand, and ecological processes under their management, on the other hand, is not pre-given. Rather, "fit" —or "mismatch" —are produced by the particular relations that link on-going social–

ecological processes with the various goals and agendas of managers and agencies at a given time and place. This implication calls for inquiries into why specific institutional arrangements come to be selected, and what political work is done by this selection.

This dissertation develops and adopts a political geographical perspective on the relation between institutions and ecosystems by considering the incidence of the dynamic relationships between (1) the selection and stabilization of ecological problems and solutions (Bassett & Bi Zuéli, 2000; Davis, 2007; Mara Goldman, 2009), (2) their adoption within the logic and imperative of institutions (Alatout, 2008; Biehler, 2009; Robertson, 2006), and (3) the emergence of a specific apparatus of rule (Baldwin, 2003; Foucault, 1980, 2003; Legg, 2011; Whitehead, 2009).

My principal theoretical objective is to deepen our understanding of how the authority of the state is produced by the scientific and technical work of experts and managers as they try to govern non-human actants. This study of locust control specifically emphasizes how the state is made, from the colonial to the present, in its engagement with problems that evade or exceed its spatial reach and extent. In turn this sheds light on the techno-political nature and outcome of interactions between transnational networks of expertise and the technological authority of the state.

In this brief chapter, I define key concepts used to develop my argument, and discuss some implications of these concepts. I first address aspects of the conceptualization of social-technical power that guides this study. Second, I discuss how this conceptualization informs an open understanding of the state, especially state spatiality. Third, I discuss implications of this approach for theoretical considerations of scientific and technological authority. Finally, I discuss some implications of these three elements combined for our understanding of modes of government that are enacted via

transnational programs designed to enhance social development and environmental sustainability—what some authors have respectively called developmental and ecological governmentality (Birkenholtz, 2009; Dressler, 2013; Ilcan & Phillips, 2010; Li, 2007; McGregor et al., 2013; Rojas, 2002; Watts, 2003).

Mechanisms of Power

My approach to the politics of nature and technical interventions is primarily informed by a theoretical concern for the multiplicity of ways in which mechanisms, techniques, and practices come together to shape the field of actions of both the self and of others (Foucault, 1980, 2003, 2004; Rose, 1999). These devices, rationalities, and practices through which governable subjects and governable spaces are produced, and through which the "conduct of conduct" is governed, together amount to what Foucault called governmentality (2007). By government, Foucault refers to the tendency of modern societies toward the dominance of positive forms of power in which care and attention to populations shape what types of existence and choice are possible. In this theoretical formulation, the concept of governmentality groups the sets of techniques and rationalities whereby greater emphasis on "pastoral" or security modes of power comes to dominate the relatively more coercive practices of sovereignty and discipline.

The work of Foucault on the relations between techniques, practices and discourses, and social forms led to a view of political power as capillary, diffused, malleable, and whose distribution is always contingent and temporary. This formulation constitutes a radical break with the conventional zero-sum view of power as a singular, pre-existing entity that determines why a subject (assumed to be pre-existing) is dominated by a pre-defined Sovereign ruler (Granjon, 2005). Instead, modern governmentality, the conduct of conduct, entails dynamic combinations of judiciary,

disciplinary, and biopolitical forms of power, positive and coercive, articulated in multiple and colliding symbolical, theatrical, and material manifestations that reinforcing one another.

Geographers have explored the implications of these Foucauldian conceptualizations of power for our understanding of socio-spatial dialectics, further contributing to the identification of the myriad ways in which social power is produced as outcome and effect of various practices and technologies in which knowledge, bodies, behaviors are ordered, subjectifying individuals to a given regime of conduct (Crampton & Elden, 2007).

In line with this geographical take on Foucault's work, my engagement with the concept of governmentality is explicitly spatial. To this end I follow elements of the works of Henri Lefebvre and Claude Raffestin on the relationship between state, territory, and the "global" (Elden, 2008; Lefebvre, 1976; Raffestin, 1980, 2012). These approaches invite and enable remarkably open and reflexive conceptualizations of how these structures emerge from the triads of spatial practices, representations of space, and spaces of representation (Lefebvre, 1991). Such a reflexive understanding of society and space allows an understanding of the spatiality of social order that is not reduced to *a priori* assumptions about transcendent structures of power. Rather, this approach is sensitive to the ways in which these structures, including the state, are made through ordering of practices and representations of these practices (Gupta, 1995; Mitchell, 1999, 2002; Painter, 2010).

I briefly discuss, below, how these theoretical insights pertain to our understanding of the spatialities of political power within and beyond the state, in

interventions of international development, and in the application of science in engineering and social practices, or technology.

The State and Stateness

The view of power as immanent, multi-directional, and diffuse, although not excluding the state *per se*, certainly decenters it, and invites for its problematization. Abrams's article on the 'state-idea' (1988) was one of the first direct engagement with state theory taking on the problematization mentioned above. Abrams called for a conception of the state as "nothing above" the relation between (1) the state-system, "the palpable nexus of practice and structure of government" and (2) the state-idea: the notion of an orderly and unified orientation of practices that make the state appear as real.

Mitchell (1999) built upon that assertion to argue that the state-idea and the state-system are in fact two dimensions of the same process: the state (as we think we know it) *is* the outcome (effect) of government practices (daily routines of spatialization, bureaucratic rituals etc.). Mitchell contends that as persons are made subject of the state, they learn and accept their supposed place within it, contributing to the reification of particular regimes of rule. The illusion of the state then shapes politics, as subjects are made in relation to what can and cannot be thought as possible. This outcome calls for attention to how this illusion of the state-idea simultaneously permeates and emerges from the contingencies of daily life, the various mundane practices of ordering reality, and to how people are made subjects of what they come to perceive as a state above society (Gupta, 1995; Painter, 2006).

Rejecting the conventional conceptualization of the state as an a priori thing or actor then, these critical theorizations of the state have called for investigation of the

ways in which the "idea" of the state as a unitary entity is produced through socio-technical practices and representations that are often mundane and diffuse, and for the identification of the political effects of these practices (Abrams 1988, Mitchell 1999, Painter 2006). This calls for inquiries on the ways social life is made 'state-like', how the statisation ("étatisation") of the social relations occurs. Painter describes these inquiries as a theorizing of "the intensification of the symbolic presence of the state across all kinds of social practices and relations" (2006, p. 758). Stateness, in this sense, is the outcome of this intensification, which, again according to Painter, is "actualized in countless mundane social and material practices within and outside the institutions conventionally referred to as the state apparatus" (Painter, 2006, p. 771).

These developments have accompanied a view of the state as not a given fact, but rather a constant negotiation (Hagmann & Péclard, 2010), a contingent and unstable process of governance (Passoth & Rowland, 2010), as a matrix of ideas and representations, government and bureaucratic agencies, and land and people (Carroll, 2000, 2006). To understand how the state is made and what it does, then, it is necessary to investigate the practices of ordering the social and the ecological that underpin these specific social formations, and in turn the political effects of these practices (Jasanoff 2004b; Painter 2007; Whitehead 2008).

It follows that the logic whereby state power operates is shaped through the sedimentation of historically specific goals and ways of doing. Brenda Chalfin's (2010) ethnographic study of Ghana border control at its main port has shown how that particular state apparatus has become constituted over time of the remnants of different phases of the "never achieved goal of sovereignty". Remnants of its colonial, socialist, military, democratic and neoliberal 'phases' all co-exist, complementing and

contradicting each other over time and space. Allison Mountz (2010) has shown how employees of the Canadian state had to struggle with the physical challenges of deploying a manifestation of a particular state apparatus—its border—to do what it does (processing bodies)—in temporary shelters in a remote British Columbia island to achieve the spectacular display of state-power it wanted in response to the unexpected arrival of a boat carrying hundreds refugee-status claimants at that location.

Sensitivity to how these semi-stable rationalities of state rule interact with the materiality of the world in time and space is necessary to understand both how political actors present the state as (1) a rational power above society and over a territory (power "inside" the state), and (2) a sovereign entity in the international world order (power "outside" the state).

This reasoning in turn applies to not only the state but also to other assumptions of a vertically hierarchical topography of power wherein the 'global', 'international' and 'empire' are *above* 'national' and 'local' units of social organization (Ferguson & Gupta, 2002; Gupta, 1995; Marston, Jones, & Woodward, 2005). Claims that certain processes or entities operate at a "superior spatial reach and vertical height" (Ferguson and Gupta 2002, p.595) lead to a scalar conception of the social as nested concentric circles embedded in one another, e.g. state *above* society. These conceptions in turn reinforce certain forms of political order and make others impossible. In the context of development in Africa, Ferguson (2006) argues that this vertical topography wherein the "national" is subsumed to, yet sovereign within, the "global", masks important aspects of transnational governmentality, which in turn depoliticize underdevelopment. Just as with the 'state-idea' then, the question becomes how and why these notions of verticality and encompassment are produced? How do technical and political actors understand,

enact, and ultimately reify or challenge this vertical hierarchical conceptualization of the political topography and topology of global governance?

These theoretical foundations converge with the analytical framework of "negotiated statehood" that Hagmann and Péclard proposed to study the dynamics of power and domination in sub-Saharan Africa (2010). This framework seeks "to better understand how local, national and transnational actors forge and remake the state through processes of negotiation, contestation and bricolage" (Hagmann & Péclard, 2010, p. 544). It is through this lens that I approach the question of how governmentality operate through their making of state, space, territory, and transnational dynamics. This allows a conceptualization of both the material and discursive dimensions of the processes through which human and non-human actants relate to one another, and in turn how these socio-ecological relations are implicated as both the source and outcome of power dynamics within societies and across societies.

Demeritt (1998) groups as "artefactual constructivism" the approaches concerned with understanding how "the reality of the objects of scientific knowledge is the contingent outcome of social negotiation among heterogeneous human and non-human actors" (p. 176). A particular advantage of such approaches is that they allow, and call for, considerations of the ways discursive and material processes combine, and of how the logic and imperative of technologies and social formations are produced by, and productive of, these combinations. Engagements with the relationship between science and authority have been particularly helpful in this regard.

Science and Technological Authority

Partly because of its important incidence on these practices of ordering, techno-science has become a key site of modern state-making (Alatout, 2009; Carroll, 2006;

Mitchell, 2002; Whitehead, 2009). The interdisciplinary field of science and technology Studies (STS) provides important insights on the co-production of knowledge and social dynamics. Research on co-production is concerned with understanding how "knowledge-making is incorporated into practices of state-making and governance, and in turn how these political effects of knowledge shape how it is made and used (Jasanoff, 2004a). Investigations of the practices, techniques, texts, and quotidian activities by which scientific facts are produced and stabilized, as well as of the ways in which techno-scientific practices are adopted and modified as they travel across different settings, and their incidence on social configuration—all key concerns of STS—(Bijker, 1997; M. J. Goldman, Nadasdy, & Turner, 2011; Jasanoff, 2004c; Lave, 2012) also have serious implications for geographic understandings of state-making. For example, Patrick Carroll (Carroll, 2006) presented a compelling description of how the nation-state of Ireland constitutes a mangle of state-ideas, state-systems and state-country. This simultaneously semiotic and material project, Carroll shows, was a direct outcome of technical and scientific techniques of measurement and ordering of populations, which in turn helped channel them. It follows that the important role of the state and science in shaping social-ecological relations ought to make this co-production of state power and scientific knowledge an important concern for political ecologists (Robbins, 2008; Whitehead, 2008, 2009).

Similarly, Timothy Mitchell's Rule of Experts (2002) outlines the emergence of a new form of politics based on technical expertise in mid-20th Century. His argument is centered on his reading of political events in late colonial and early independent Egypt, the narrating of these events, and how all of it is greatly intermeshed with various technical innovations, which tend to come as solution to previous technical problems. A

particularly useful concept for this discussion is provided by Mitchell's notion of techno-politics, which he describes as "the kinds of social and political practices that produce simultaneously the powers of science and the power of modern states" (Mitchell, 2002, p. 312, note 77). Techno-politics, for Mitchell, is

> always a technical body, an alloy that must emerge from a process of manufacture whose ingredients are both human and nonhuman, both intentional and not, and in which the intentional or the human is always somewhat overrun by the unintended. But it is a particular form of manufacturing, a certain way of organizing the amalgam of human and nonhuman, things and ideas, so that the human, the intellectual, the real of intentions and ideas seems to come first and to control and organize the nonhuman. [6] (Mitchell, 2002, pp. 42-43)

The concept of techno-politics shares much with Jasanoff's idiom of co-production, which allows an appreciation of the two-way relationship that links the making of social order with scientific knowledge. This approach, as Jasanoff puts it, "calls attention to the social dimensions of cognitive commitments and understanding, while at the same time underscoring the epistemic and material correlates of social formations" (2004b, p. 4).

This approach to production, broadly speaking, has informed insightful treatment of how scientific practices and knowledge in numerous fields have been constituted as an outcome of negotiation between bio-physical and social-cultural processes and demands. Much work on co-production and cognate concepts has concentrated on how the demands of statecraft (Carter, 2008; Harris & Alatout, 2010) and of the creation of markets (Robertson 2006) have influenced the stabilization and

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[6] Mitchell's definition of techno-politics differs slightly from Gabrielle Hecht's notion of technopolitics (un-hyphenated), which she describes as "the strategic practice of designing or using technology to embody, or enact political goals". That said, Hecht's concept of technopolitical regimes (1998, p. 56), as "linked sets of individuals, engineering and industrial practices, technological artifacts, political programs and institutional technologies acting together to govern technological development and pursue technopolitics" is of direct relevance, and thus also informs, my consideration of human-locust relation in late colonial West Africa.

selection of scientific objects of knowledge and management practices. Elsewhere, notably in social studies of atmospheric governance, co-production was used to discuss how the expertise on atmospheric contaminants, weather, and climate have co-evolved with the making of a technocratic body of government with global reach (Bulkeley, 2012; Miller & Edwards, 2001; Whitehead, 2009).

Interrogations of state-science relations have benefited from, and contributed to, examinations of the specific role of science and technology in colonial and post-colonial forms of statecraft. As Christophe Bonneuil points out, this includes a consideration of "colonial science" as not just science practiced in the colonies but also knowledge that contributes to a discourse conceptualizing European domination while also shaping the subjectivities of colonized peoples (Bonneuil, 2000).

This sub-field, which Anderson (2002) calls "postcolonial technoscience", has demonstrated different ways in which science, especially in fields such as health, sanitation, planning, and agriculture, have co-evolved with colonial rule (Bonneuil, 2000; McClellan & Regourd, 2000; Raj, 2000; Tilley, 2011; Waterton, 2002; Worboys, 2000). These different ways include (1) the use of technoscientific projects to experiment, perform, and represent forms of social order and subjectivities in colonial settings, (2) the effect of using colonies as laboratories to experiment with modes of government that would later be incorporated in metropolitan governance, and (3) the role of local material, cultural contingencies, and popular agency in shaping the actual outcomes of these projects. Of particular relevance for this study is Anderson's suggestion that, considered together, these topics help trace the "co-production of identities, technologies, and cultural formations characteristic of an emerging global order" (Anderson, 2002, p. 643)

Studies of human-insect relations have been very productive in these regards, notably in political ecologists recent inquiries on the role of insects in state-making.

Biehler (2009) discussed bedbugs' and cockroaches' responses to different chemical insecticides, revealing how the properties of these insecticides contributed to changing the perception and the management of public housing in Baltimore, Maryland.

Investigating colony collapse disorder among honeybees, Kosek (2011) has shown how bees were remade both symbolically and materially during the 'War on Terror': US government officials' responded to what they described as the swarming, beastly nature of 'terrorists' by calling for bio-technological innovation wherein bees are turned in bio-robot soldiers. Drawing on Russell's (1996) account of the discursive connections between insect and human annihilation in the Second World War, Kosek situate the remaking of the honeybee within the broader context of the politics of nature (human/non-human divide) as it in turn relates to human warfare.

Writing about the colonization of northwestern Argentina in the late 19th and early 20th Century, Eric Carter showed how mosquito eradication efforts at the basis of malarial control campaigns enabled and enhanced the state's ability to 'see' and 'order' people and things hitherto recalcitrant to such domination. The presence of mosquito-borne malaria in the area called for and allowed the creation of a "malarious zone" which enabled political authorities' extension of state-vision and state-space. The special sanitary geographical delimitation thus produced provided an effective mechanism for the "standardization, transformation, and bureaucratization of space, territory, and landscape" which contributed to render the region, and its population, legible, and thus, space, governable (Carter, 2008, p. 278). These and other similar observations invite

inquiries on how the spatial practices of locust control relate to the spatial practices of state control, which I address below, especially in chapters 3 and 5.

Developmental and Environmental Governmentalities

The elements discussed above suggest that the intersection of environmental governance and international development, as both are produced by and enacted via significant measures of techno-scientific expertise, are intertwined with the making of what Whitehead, drawing on Foucault, calls "government with science" (2009, p.14). Whitehead's *State, Science and the Skies* (2009) explores how atmospheric pollution in England was put to use in the production of such scientific governmentality. His analysis stresses the "knowledge effects that have been formed between the methodologies of science and reasons for government" (p.15), in so far as these processes related to the popularization of the scientific method vis-à-vis the understanding of the atmosphere.

International Development, what Hart (2010) calls "Development with capital D", is a dominant feature of the contemporary relationships between many of the former metropolis of the global north and former colonies or semi-colonies of the global south. Development is best understood as intrinsic to the constellation of processes and techniques whereby the current ordering of the global world-system is produced and reproduced. This makes development constitutive of a mode government of spaces and of societies, in the Foucauldian sense (Ferguson 1990, Goldman 2005, Li 2007, Venn 2009)—that operates remotely, simultaneously incorporating and transcending the nation-state in ways that amount to what Ferguson and Gupta (2002) call a *transnational governmentality*. Of particular usefulness for inquiries on developmental governmentality are the insights by authors that sought to respond and correct Foucault's underplaying of the role colonial expansion and subjectification among the

factors that made possible the genealogy of power, political economy and race in liberal capitalism (Mbembé, 2001; Venn, 2009; Watts, 2001).

Development programs are often technical in nature. Enacted as provision of medical support, or in overseeing the management of ecological resources and hazards, in civil engineering, and so on, these programs share much with and extend the late and post-colonial practices of governing by improving, which have given techno-science a key role in the ordering and making of colonial states and empires (Bonneuil, 2000; Carroll, 2006; McClellan & Regourd, 2000; Tilley, 2011; Worboys, 2000). A number of scientific fields have been shaped by their roles in the colonial and formerly colonial peripheries. Water engineering (Akhter, 2013; Alatout, 2008, 2009), tropical agronomy (Bonneuil, 2000; McClellan & Regourd, 2000) , and applied entomology (Clark, 2009; Vayssière, 1980) are often cited as examples of this dynamic.

The legacy of colonial science in the techno-scientific expertise underpinning contemporary development practices and discourse has implications for the political geography of the developmental state. In the broadest sense, the *developmental* state refers the state apparatus of developing countries. This is more open than considerations of the *developmentalist* state, which usually refers strictly to the heavily interventionist and *dirigiste* tendencies of the colonial and early post-colonial state, especially in sub-Saharan Africa (Bonneuil, 2000).[7]

Looking at mechanisms, discourses and practices by which development occurs in Lesotho, Ferguson demonstrated a pattern wherein development projects “produce

[7] For Bonneuil, the developmentalist state refers to a “specific state in the history of African societies, situated between the early colonial state and the post-1980 crisis of the state in Africa” (Bonneuil, 2000, p. 259).

unintended outcomes that end up, all the same, incorporated into anonymous constellations of control" (1990, p 20). Subsequent work in different regions (and across them) documented how such projects contribute to the production and reproduction of transnational governance regimes (Ferguson and Gupta 2002).

In sum, the conceptual language of "government" as the (productive) conduct of conduct has been usefully applied by political ecologists and scholars of critical development studies to explain the logic and effect of the 'the governing at a distance' in environmental programs (Bulkeley, 2012; Bulkeley & Castán Broto, 2013; Dressler, 2013; Duffy, 2006; Oels, 2013) and development (Cox & Negi, 2010; Ferguson, 1990; Michael Goldman, 2005; Ilcan & Phillips, 2010; Li, 2007; McGregor et al., 2013; Mercer, Mohan, & Power, 2003; Venn, 2009; Watts, 2003). The various institutional practices that make environment and development as a field of government rely a great deal on the production of knowledge in the form of techno-scientific expertise. That reliance of governmental rationalities on techno-power contributes to the stabilization and selection of certain ways of apprehending, representing, and approaching the management of complex and dynamic ecologies.

The remainder of this dissertation combines these strands of literature to develop three interrelated arguments about the spatial logic of locust governance and its relation to the political geography of environment and development.

CHAPTER 3

LOCUST SWARMS AND THE TECHNOLOGIES OF TRANSCOLONIAL FEDERALISM

In the introductory chapter I mentioned that the desert locust's ability to emerge out of *nowhere* and travel seemingly *everywhere* makes it an extreme case of the problem of fit between institutions and ecosystems. As a first step in my effort to understand how experts and agencies respond to the locust problem, I first sought to document the conditions under which agencies become responsible for locust management. To this end I surveyed historical materials on locust management organizations throughout the 20th century. I concentrated on the relation between the institutionalization of locust management and the broader geo-historical movements in which this pest control was embedded. These materials suggest that precisely because the locust problem is so mismatched to the spatial and temporal preferences of conventional political organizations, locust management was institutionalized as a field to innovate, perform, negotiate, and represent new modes of governance.

This pioneering role of locust management as a site of institutional innovation is a point of pride among policy-makers and locust experts. On several occasions, officers of the FAO and specialists of locust management in other organizations stressed how dominant approaches in programs to reduce transboundary threats to agricultural and livestock productivity were first developed in locust control programs and, only after that, expanded to other domain of intervention.

For example, when the new Director General took office at the UN-FAO in 1994[8], he selected two areas for special emphasis by FAO: (1) world food security, and (2) transboundary animal diseases and plant pests, and he made a request for the establishment of special programs specifically designed to address these issues (FAO, 2001). One of the two programs that were created toward this special emphasis of the FAO was the System for Transboundary Animal and Plant Pests and Diseases (Emergency Prevention System: Empres). The initial area of focus of this Empres plant pest program was the management of desert locusts (Empres-locust).

Another example of locust-based or locust-driven institutional innovation that came up on some occasion is as follows. A key components of the Commission for controlling the desert locust in Southwest Asia (SWAC) is the joint-border meetings the Commission holds at the Pakistan-India border. Despite decades of tensions and conflict between the two countries, locust control officers from India and Pakistan meet monthly during the summer to exchange information and collaborate on trans-boundary locust movement.[9] During a presentation on the locust management dynamics in the region, an expert on the topic claimed that these border meetings of Indian and Pakistan locust control officer have provided the template for similar summits between other agencies of both governments.[10]

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[8] Jacques Diouf, Director-General of the UN-FAO from 1994 to 2011.

[9] Reports of these "Indo-Pak Joint-Border Meetings" from 2005 to 2013 are available on the FAO Locust Watch webpage: http://www.fao.org/ag/locusts/en/publicat/meeting/topic/2021/2022/index.html (Accessed Oct 2013)

[10] Joint or "flag meetings" between Pakistan rangers and Indian border security forces are relatively common. A border security forces official was quoted in The India Times describing these meetings "as routine" ("Border meet between BSF and Pak Rangers next month", 2013), ("BSF, Pakistan Rangers hold flag meeting on international border in Jammu", 2013). At these meetings officers on both side of this border exchange on common problems such as flash floods, cattle, and attacks on civilians. I have not verified the extent to which the claim that these

In this chapter I concentrate on the type of institutional experimentation and innovation called for and enabled by the desert locust. I examine how authorities responding to the locust problem have made locust management a field to innovate, experiment, represent, and perform new forms governance that held and hold the promise of much broader applicability beyond crop protection and pest management per se, i.e. allowed experimentation of new approaches to governing both things and people.

Especially, I examine how the ability of the desert locust to evade and overwhelm the conventional spatiality of social organizations calls for experimentation of modes of intervention that simultaneously recombine and operate between different levels of vertical topography of power produced by the encounter between state sovereignty and transnational governance.

I explore socio-spatial elements of the institutional history of two locust control organizations in West and North Africa during the period that spans from the last years of formal colonial rule to the early years of post-colonial France-Africa relations, i.e. 1940s to 1970s. As historian Frederick Cooper (2002) argues, the dynamics of the transformations of political order in African societies during that period have received much less attention than either the colonial regimes that preceded them or the post-colonial condition that followed them. The tensions between competing visions of governance at that historical turning point, are key, I argue, to understand the contemporary techno-politics of development in the region. Of particularly significant relevance for political considerations of nature-society relations in these contexts is a

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summits were indeed spearheaded by the joint locust-survey is precisely valid. The point is that this is an example of how actors of locust governance perceive their work as embedded in institutional and socio-political innovation.

historical take on the politics of colonial and post-colonial science (Anderson, 2002; Bigon, 2013; Bonneuil, 2000; Moon, 2010; Tilley, 2011).

This detour in time helps better situate the institutional dimensions of locust control in the broader history of 20th Century North-South relations. It also provides an additional way of looking at the logics of power-knowledge that are produced by (and productive of) the work of technical and scientific actors in programs of environment and development broadly speaking.

The chapter is divided as follows. First I survey the diverse regimes of social rule in which locust management has been incorporated through the ages. This review highlights how political and religious authorities in ancient and modern times have responded to the 'spectacular' effects of locust swarming by incorporating them in discursive practices of social subjectification and coercion. The point is that, although pre-modern authorities were most often unable to do much to effectively control the swarms, they responded to the insect in ways that would enhance, or at least, maintain, their control over human populations, 'enlisting' the locust problem in efforts to increase and sustain social order. This discussion allows the identification of a central theme of this dissertation: the political effects sought in these attempts—or performance of attempts—to govern the locusts, regardless of their actual effectiveness in controlling locust populations.

The second part of the chapter turns to the peculiar case of the creation of the first transnational organization devoted to the control of the desert locust: the National Anti-Locust Board ("Office National Anti-Acridien": ONAA). As we will see below, the creation of this organization took place in the context of strategic efforts by the leaders of

the French Resistance in exile in Morocco during Nazi occupation of mainland France in the Second World War.

Analysis of the record of the anti-locust conference held in Rabat in December 1943 shows how French authorities in exile sought to advertise their new commitment to locust management within the French colonial Empire (via the newly creation of the ONAA in the weeks preceding the conference, which they themselves organized), precisely at the time when their claim of legitimacy within 'mainland France' was most compromised. Allocutions and debates at the meeting suggest that French political authorities' sudden interest in and commitment to locust swarms had much to do with pressing concerns about their own political legitimacy vis-à-vis both their colonial subjects and Allied countries, especially the British. I argue that institutional and discursive responses to locust invasions were used to imagine, re-create, and represent the type of transnational techno-power that would maintain the role of French authority as the intermediary between the territories of its colonial Empire and the new configurations of transnational rule emerging during the Second World War. In that section I also pay attention to how the material and idiosyncratic particularities of late-colonial locust governance also shape the nature and outcome of that 1943 anti-locust meeting. In this sense, the political outcome of the ONAA and late-colonial French acridology should not be simply, or functionally, 'read off' the objectives of political authorities. One must be careful to not reduce the work of scientific and technical actors to the geopolitical end-goals sought by political authorities putting these actors to work. Nor should these geo-political intentions and goals be ignored, however.

The third and final section of the chapter concentrates on the Anti-locust and Anti-avian Organization ("Organisation commune de lutte antiacridienne et de lutte

antiaviaire": Oclalav). This regional organization was responsible for the joint efforts of locust control in ten countries of the West African Sahel from the 1960s to the 1980s. I explore the socio-spatial nature of this organization to consider the differences and similarities between this Oclalav organization and both the ONAA that preceded it and the current configuration of semi-autonomous national units coordinated by the UN-FAO that followed it (Clclpro). I suggest that Oclalav was shaped by the experimentation of new spatialities of techno-political order to which the locust problem was put to use during and after the end of the formal French colonial Empire in West Africa. This particular orientation, although innovative at the time of its implementation, eventually turned out to be insufficiently well aligned with the socio-spatial logic preferred in international programs and organizations of development that came to dominate this type of transnational governance. This led to the organization's demise in the mid-1980s.

Governing the Locust: A Partial Historical Survey

As locust–human relations span long historical periods and diverse regions, they have interacted with and wrought several institutional configurations, either semiotically, materially, or both.

Earlier accounts often emphasize the helplessness of farmers as they watch the locust swarms descend and pillage their crops. These occurrences have most often been interpreted by historical actors as divine interventions (e.g. Old Testament). Such fatalist views discouraged direct managerial responses and instead encouraged propitiatory practices. Arbel (1989) described how social responses to locust invasions in 14th century Venetian Cyprus first and foremost favored a range of propitiatory practices. Authorities summoned their subjects to pray, use holy water, and to display crosses and similar icons to contain or overpower the locust curse. For example, imperial subjects

were sent on treacherous eight-month journeys to distant Persia, where they would seek to obtain some reputedly magic water held to attract locust-eating birds.

Similar propitiatory response to locust invasions have been described in Hsu's 1969 article on what she calls the "Locust Cult rituals" in China between 1500 and 1900. The article reports that over 800 temples were built for the specific purpose of inviting plague reduction, through various rituals that included sacrifices (Hsu, 1969). Hsu understood these rituals as coping mechanisms to diminish social anxiety against the environmental stress caused by the invasions.

The early 20th century classic *The Criminal Prosecution and Capital Punishment of Animals* (Evans, 1906) describes other instances where locust populations were made object of similarly symbolic rituals. Evans distinguishes between two categories of animal prosecution: those of domesticated animals and those "which were not subject to human control and could not be seized and imprisoned by the civil authorities" (Evans, 1906, p. 3). Locusts were in the latter category. This made the insect object of "judicial proceedings instituted by ecclesiastical courts (...) to prevent them from devouring the crops, and to expel them from orchards, vineyards, and cultivated fields by means of exorcism and excommunication" (Evans, 1906, p. 2). Vermin that escaped human control required recourse to what the author describes as "metaphysical aid". For example, in Rome in the year 880 C.E., as reward for extermination of invading locusts had not yielded satisfactory results, "recourse was had to exorcisms and besprinkling with holy water" (Evans, 1906, p. 65). These were reportedly effective. Similarly, a 1541 C.E locust plague in northern Italy is said to have been successfully dispersed following its excommunication (Evans, 1906, p. 93). Evans points out that there was confusion as to whether these 'beasts' were sent by Satan or by God, and what exactly was the

meaning of religious authorities' responses to the swarms. The point here is that the spectacular nature of the swarms, the fear they instilled, and the hunger that followed their path, all called for and enabled manifestations and representations of political power through symbolic and material response to the swarms.

In addition to these "magical-religious" responses, numerous active management practices were taken on, sometimes on a voluntary basis, but most often as mandatory *corvée*. This included physical collection of insects, especially at younger stages (eggs, nymphs) and attempts to scare them with noise. Other measures included flooding of ditches around crops, burying and burning the pest itself (mentioned as far back as the Iliad) as well as the burning of hopper-infested areas (Arbel, 1989; Baron, 1972; Herculais, 1893).

A point worth mentioning here is Berembaum's suggestions that highly bifurcated population dynamics of insects, such as locusts, usually make them a relatively 'safe' target of management intervention, in the sense that these interventions are likely to appear 'successful' no matter what:

> One safe thing about a promise to drive away locusts (or indeed any insect that suddenly undergoes a population explosion) is that in most cases it is easy to keep; eventually, density-dependent population regulation factors kick in and bring down the numbers in a given locality. So, no matter what people did to drive away locusts, it eventually appeared to be successful. (Berenbaum, 1995, p. 114)

This characteristic of insect management helps understand the diversity, and co-existence of distinct institutional responses to locust threats and invasions. Basically, this condition makes it very difficult to precisely measure the degree of success of one locust management strategy over another. In turn, this increases the likelihood that individuals and organizations select one strategy over another based on preferences about other effect than merely its impact on locust population dynamics.

Locusts and Empire

Like much of applied entomology, the history and genealogy of locust science is closely intertwined with the history of imperial rule (Clark 2009). Indeed, acridology itself—the study of locusts and grasshoppers—emerged as a sub-field of entomology following the work of Russian entomologists involved in the colonization of the Transcaucasus in the early 1900s. It was in that context that the leading acridologist Boris Uvarov observed that what was until then thought to be distinct species of grasshoppers were in fact different phases of the same species. This discovery and subsequent work led him, years later (when he had left Russia to work at the no less imperial "British Imperial Bureau") to formulate the phase theory of locust (Uvarov, 1921)—the basis of modern acridological science.

Across the African continent, locust invasions ranked high among the many "colonial perils" of concern to officials and scientists. French involvement in locust control dates back to its conquest of Algeria in 1860s-1890, at a time when the concern was to ensure the viability of the nascent settler colony. Officers worried that the insect endangered their project of making Algeria sufficiently 'civilized' to be part of Greater France (Herculais, 1893). In response, they mobilized tens of thousands of indigenous (and unremunerated) laborers to participate in massive campaigns of collection and destruction of locust egg and larvae (see Figure 3.1). Workers also piled up immature (flightless) locust 'hoppers' into pits and stomped on them to crush the insects to death. Herculais describes how the bare feet and legs of the laborers doing the stomping would become covered in cuts from the sharp and rigid legs of the locusts, cuts that would be filled with "the juice of crushed insects", eventually causing severe infections. The

combination of these infections with the heat, dust, and severe exhaustion often lead to violent illness, at times fatal.

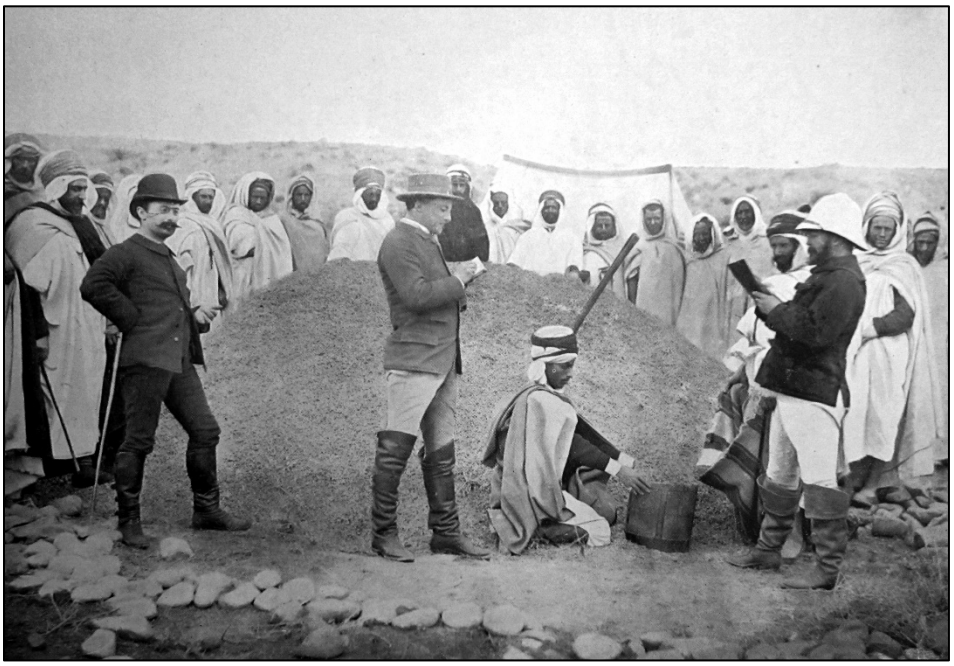

Figure 3.1 Collection of locust eggs, Algeria, 1889, from Herculais, 1893

Starting in the 20th century, technological innovations provided tools to replace these campaigns of mechanical and manual collection. Flamethrowers, poisoned baits, and finally, sprays of chemical insecticides became increasingly favored (Baron, 1972; Roy, 2001; Vayssière, 1980).

It is also in the first half of the 20th Century that public authorities began to recognize the insect's ability to exceed political boundaries required trans-regional organizations that spanned colonial Empires and zones of imperial influence. A Conference held by Rome's International Institute of Agriculture (precursor to the FAO) in 1920, on the topic of "La lutte contre les sauterelles dans les divers pays" appears to be the first attempt at such an internationalization of locust control. This gathering was followed by five international meetings on the management of grasshoppers and locusts

between 1930 and 1938 in Rome, Paris, London, Cairo, and Brussels. At each of these five international meetings on the locust problem, resolutions were passed for the creation of a permanent international locust control organization, but none of these resolutions had sufficient political momentum to be followed with action (Buj Buj, 1995; Roy, 2001). The Second World War, however, eventually created the conditions that made such an organization not only possible, but a very urgent matter of strategic importance– at least for the authorities of the French colonial Empire.[11]

Locust Allies, Locust Axis: Late Colonial Entomology and WWII Techno-Politics

Protracted locust plagues, or runaway invasions, were widespread and dramatically massive during the Second World War. Waloff (1966) reports that by 1941 swarm infestations had spread across the entire habitat range of the insect, with swarms forming and traveling "in the area extending from Arabia to Pakistan": Egypt, Ethiopia, Eritrea, Somalia, the Sudan, and on the other side of the African continent, in Mali, Niger, Mauritania, and Morocco. This "major plague", Waloff adds, persisted until "its first marked decline" in 1946.

Scientists and colonial government officials were active in developing and implementing locust management techniques in their colonies and protectorates across these regions (Baron, 1972; Jeannel, 1944; Roy, 2001). It is in this context that the first conference devoted specifically to the desert locust (as opposed to the preceding ones that were concerned more broadly with all pest grasshoppers worldwide) was held in Rabat, Morocco, in December 1943. It was organized by French authorities. That initiative is in itself not surprising, as the locust swarms presented a threat to

[11] A significant portion of this section was previously published in Peloquin, 2013.

agricultural production across such vast territories, including French possessions in Northern and Western Africa.

What is remarkable, however, is the geopolitical context within which these institutional developments occurred. In December 1943, at the very height of the Second World War, the question of French Authority, and in fact, the very statehood of France, was in a crisis of epic proportion. The Government of France had capitulated, following military defeat to the German army in July 1940. The French nation-state had become "Vichy France", named after the town where the capitulated government established itself under the leadership of the Axis collaborator French Marshal Philippe Pétain.

The 'French authorities' that organized the Rabat Conference on the Desert Locust were not, however, representatives of the Axis-collaborating French Government of Vichy. They were members of the French Resistance, the French Committee of National Liberation ("Comité français de libération nationale: CFLN"). After the capitulation of mainland France, authorities in exile sought to organize resistance from abroad, working with the Allies to vanquish and reclaim territory lost to the Axis. In 1943, the two authorities of the French Resistance, the London based France Libre (Free France) and the North Africa-based Commandement civil et militaire d'Alger, unified to create the CFLN. That committee was co-presided by the leaders of both these organizations (Free France's General Charles De Gaulle and the Commandement's General Henri Giraud). On the 9th of November of that year the Committee came under the sole presidency of Charles De Gaulle following Giraud's resignation. A month later, on December 7, 1943, the CFLN adopted a resolution creating the first permanent, trans-boundary organization devoted to the control of the Desert Locust: the National Anti-Locust Board ("Office National Anti-Acridien": ONAA).

The resolution specified that the first mandate of this newly formed anti-locust organization was to organize a meeting of "international scope" (read: Allied countries and their colonial possessions) on the desert locust as soon as possible. It took merely three weeks for the organization to fulfill that mandate. The meeting was held from the 28th to the 30th of December, in the meeting room of the Secretariat-General of the French Protectorate, in Rabat, Morocco.

Locust Control and New Spatialities of Governance

The primary source for this analysis is the Proceedings of the conference published in winter 1944 (*Congrès antiacridien de Rabat: procès-verbaux des scéances des 28-30 Décembre 1943*, 1944). The-44 page document consists of a list of the attendees, summaries of the different sessions of the meeting, and transcripts of presentations and deliberations. Speeches may plausibly have been edited in this official published version. As such the text may not reliably represent the exact wording of the meetings' presentations, debates or events. Other sources corroborate, at a coarser level, the conditions of the emergence of the ONAA and the importance that French authorities accorded to locust invasions as a field of colonial rule, and how entomologists contributed to that sense of importance (Bredo, 1944, 1945; Jeannel, 1944; Pasquier, 1942; Roy, 2001). That said, none of these other sources report on the specifics of the meeting at the same level of detail as the Proceedings, which leaves most of the meeting transcripts on which this analysis relies unconfirmed by external sources. The limitations above notwithstanding, the content of the document in question, even if plausibly inaccurate in its representation of the meeting, remains not only compatible with, but also supportive of the claim made in this chapter. I understand both the meeting and the Proceedings that followed it as discursive performances. In this sense the written text

stands in itself as part of the phalanx of discursive formations by which the techno-political effect under analysis here was pursued.

The record of the 1943 Rabat conference, and the creation of the ONAA that it accompanied, suggests that the locust problem was an urgent field of intervention for Free France because requirements for, and the effects of, successful locust control organizations and campaigns were expected to help overcome multiple challenges to the Resistance's claims as legitimate authorities of the French Empire. The locust problem was mobilized as a common threat requiring the unity of the French colonies and the Allies. Such techno-political unification of the empire held the promise of allowing French authorities allied to Free France to continue to perform as legitimate governments in colonies despite being exiled from the occupied mainland France.[12] In 1943, these colonies were almost all that was left of the Republic of France as a state apparatus, and

[12] Borot (2006) drawing on Roy (2001), made a very similar argument based on plausible assumptions about the geo-historical conditions of the meeting. I build on, and expand that argument by engaging with the actual content of the conference proceedings and texts from the historical actors themselves, rather than solely on contemporary hindsight about the course of events.

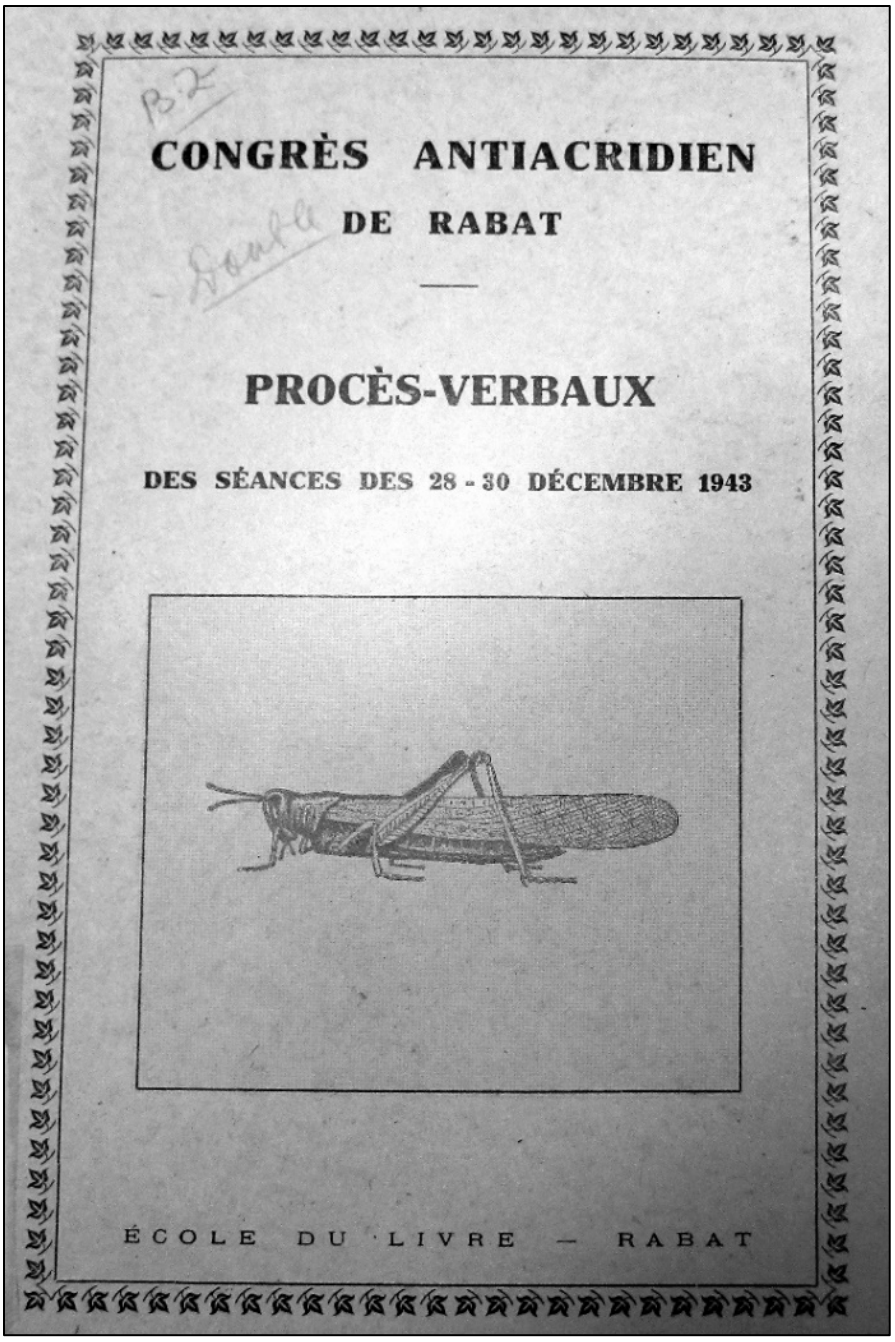

Figure 3.2 Cover page of the Proceedings of the 1943 Rabat Anti-Locust Conference

their unity was paramount to the Republic's survival. At that point it was unclear whether mainland France would be recovered from the Axis, or, in the event of an Allied victory, whether it would be considered among the vanquished (the Vichy government being an Axis collaborator). In this context the exiled French authorities could not afford to lose legitimacy in the non-mainland areas that may end up being the only remnants of the French empire. A colonial policy of improvement and intervention, as enacted by timely response to locust swarms, would help not only demonstrate that its colonial rule was legitimate but also that it was Free France, rather than Vichy France, that would ensure the welfare of the colonies.

The Rabat 1943 Conference Proceeding lists over twenty participants from nine governments representing Allied colonial Empires, French colonies and protectorates, and two other allied nations. The Republic of France (CLFN) had five delegates; Great Britain and the British Empire, four; the French Protectorate of Morocco, six; the General Government of Algeria, two; the USA, two; and the French Protectorate of Tunisia, the French Mandate for Syria and the Lebanon, the Federation of French West Africa (AOF), and Spain all had one each. Table 3.1 below provides additional details, listing the organizations represented and the names of the attendees as they are provided in the 1944 conference proceedings and translated to English.

Table 3.1 *List of Participants at the 1943 Rabat Meeting*

Administrative entity	**Name and Title/Occupation**
French Committee for National Liberation (CFLN) (Republic of France)	Mr. Dulin, Director, Agriculture and Supply Department Mr. Diethlem, Commissary, Supply and Production, Mr. Misse, head of the Agricultural Production Service Mr. Zolotarevsky, Entomologist, Director of Office National Anti-Acridien (ONAA)
Protectorate of Morocco	Mr. Dupré, Director, Agriculture, Commerce and Supply Mr. Jean, Deputy-Director, Agriculture, Commerce and Supply Mr. Combette, Deputy Director, Agriculture Mr. Defrance, Head of the Crop Protection Service Mr. Rungs, Entomologist, Inspector of Crop-Protection Service, technical advisor to ONAA Mr. Mimeur, entomologist, delegate of the Moroccan Scientific Institute
General Government of Algeria	Mr. Delassus Head, Crop Protection Service Mr. Pasquier, Professor of Zoology at the Algerian Agronomic Institute, Entomologist, Director of the National Anti-Locust Institute, technical advisor to ONAA
Federation of French West Africa (AOF)	Mr. Risbec, Director, Agronomy Center of the French Soudan
Protectorate of Tunisia	Mr. Payre, Comptroller, Civil Administration
States of the Levant (Mandate for Syria and the Lebanon)	Mr. Delbes, Agricultural adviser to the Republic of Syria
Great Britain and the British Empire	Mr. Uvarov, Entomologist and Director of the Anti-Locust Research Centre, Mr. Kenneth-Guichard, Entomologist, London Colonial Office Mr. Lea, Entomologist, South African Union, Agricultural Office, British Department of Agriculture delegate to Tripoli Mr. Grosschalk, delegate of the British Ministry of Supply, Member of the North Africa Economic Board (NAEB)
United States of America	Mr. Schasseur, President of the Food Committee of the NAEB in Alger Mr. Little, Director of the NAEB in Casablanca
Spain	Mr. Morales Agacino, Entomologist, Madrid Agronomic Institute, representative of the High Commissary of Spain to Morocco.

The meeting first began on the morning of Tuesday 28 December, with a preliminary information session among members from French organizations (CFLN, Morocco, Algeria, and Tunisia—the representatives of AOF and Syria had not yet arrived). The preliminary session concentrated on the nature, composition and mandate of the recently created ONAA. Mr. Dulin, director of CFLN's Agriculture and Supply

Department opened that preliminary session by congratulating the director of that new organization, Boris Zolotarevksy, as well as his two technical advisers, Mr. Rungs (Morocco) and Mr. Pasquier (Algeria) for their nomination.

Reminding attendees that the resolution creating the ONAA specified that the organization be operational as early as possible, the CFLN's Mr. Dulin requested that the date for the next meeting be decided on that day. The director of newly created ONAA, Mr. Zolotarevksy, requested more time, stating that the organization had yet to prepare a budget. Zolotarevsky also inquired about the composition of the Management Board of the ONAA. This dialogue suggests that the ONAA was created hastily. The tone and content of the conversation suggest that the entomologists suddenly summoned by the French Resistance welcomed the new and intense interest in their scientific work, but were not clear about the nature of the organization's mandate, or about how they were expected to carry it out.

Following that preliminary session, the actual meeting opened with remarks from Gabriel Puaux, the Commissary Resident-General of the French Republic to Morocco. During the French Protectorate (1912–1956), Resident-General was the highest ranking title in that country's political hierarchy, along with the Moroccan Sultan.

The presence of such a high profile politician is indicative of the importance given to the meeting by French colonial leadership in Morocco. That said, Mr. Puaux was introduced in the meeting as the "Ambassador of France", rather than as "Resident-General". The Ambassador designation, as opposed to Resident-General, has a number of implications. First, the designation of Ambassador highlights the political importance attributed to the meeting by colonial authorities. Second, this designation underplays the imperial nature of French involvement in Morocco. Finally, by stating that it has the

"Ambassador of France" among its ranks, the French Resistance could also bolster its claim that it represented the legitimate authority of France. In the participant list that opens the Proceedings, however, Mr. Puaux is listed as Commissary Resident-General of the French Republic to Morocco. The wording of the "French Republic" further situates these actors as part of the Resistance: Vichy France referred itself to as the French State ("État Français"), whereas the French Republic was the designation used prior to (and after) Vichy, and by those that contested that collaborator regime, as were Mr. Puaux and the CFLN. It is unclear as to which of these official designations was specifically used in the meeting, or whether they were modified or added in by the editors of its record. Notwithstanding the ambiguity of the historical source, however, the fact that both colonial and diplomatic designations for the same political title co-exist in the document suggests that the CFLN was drawn to, or at least cognizant, of the potential effects that the meeting is likely to have on the delicate configuration of political power within the empire and the importance of careful balancing between national aspirations and the legitimacy of the imperial order.

Mr. Puaux's opening remarks are also suggestive of the political positionality of these French authorities in exile vis-à-vis the colonial Empire and the Allied war efforts, on how these relate to the locusts. After stating how he insisted on being part of the meeting, the Ambassador/Resident welcomed

> in the name of the Government of the Protectorate, to this Moroccan land, this oeuvre on which the French have worked for thirty years, which they hold dearly, and to which is attached the name of this great creator

Marshall Lyautey.[13], [14]

Mr. Puaux expressed some uneasiness about addressing such prominent entomologists, given how "as most Parisians, he only knows the insect from the Bible" and is among those who confuse the swarming, "true" locusts ("locustiens"), and other grasshoppers from the same family ("acridiens"), prone to lumping them all as grasshoppers ("sauterelles"). Mr. Puaux went on to describe how, at the beginning of his 'African career', in Tunisia in 1907, he first saw locust swarms in action, the extent of the damage they make, and realized how little could be done against them. The Ambassador, "hopefully assuming that much progress has been made in that regard since then", expressed how pleased he was "to see gathered men from diverse nations, given that the fight undertaken is one that interests all colonizing nations".

The speaker specified being particularly pleased to greet (the British) Professor Boris Uvarov, "whose scientific fame has gone beyond Great-Britain", stating that "thanks to his science, thanks to his methods, he will help (us) fight this plague". Turning to the specific socio-political context at hand, the Ambassador pointed out that "circumstances have made it that the nations allied in the war find themselves today allied against the grasshopper". Humorously referring to the anecdote as "a secret that could be of interest to the controllers of the Axis", Puaux reported that his daughter spoke of the German occupiers she encountered in Romania as "the grasshoppers", having previously encountered locusts as a young child in Tunisia. For Mr. Puaux, this

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[13] All quotations from the conference were taken from The Proceedings of the 1943 Rabat Meeting (*Congrès antiacridien de Rabat: procès-verbaux des scéances des 28-30 Décembre 1943*, 1944), and translated from French.

[14] Hubert Lyautey, 1854–1934, was the first Resident-General in Morocco and is credited as a great contributor to French colonial rule in that country.

analogy is justifiable given "how these insects have the same greenish uniforms, the same absorption capacity than these bands that roam all over Europe". Building on that comparison, he adds:

> just as the Allied nations are successfully fighting the 'Axis Grasshoppers', I do not doubt that, thanks to you, we will be able to fight the plague of (real) grasshoppers that constitutes currently for Morocco a rather agonizing reality. And I dare hope that our English and American allies will want to help us effectively in this fight.

The speech concludes by making a last parallel between the war and locust control:

> I do not know if there are secret weapons against the grasshoppers that we can use immediately, but if you want to experiment, it is with the greatest fervor and recognition that we will accept these weapons.

Comparison and metaphorical conflation of animal pests—insect or otherwise—and military enemies are not uncommon (Russell, 1996). Pests have also been physically mobilized as tools in war (Lockwood, 2008). In some cases, the metaphorical mobilization was accompanied by attempts to transform the very materiality of insects to make them more compatible with warfare (Kosek, 2011). The foregoing adds to this list by presenting a case where the symbolic mobilization of the insect in relation to warfare contributed to the institutionalization of expertise and management capacity related to the insect.

The allusions made by the French Ambassador to Morocco, Mr. Puaux, highlight commonalities between the locust and Axis threats: both roam across and invade territories, and both, if left unfettered, will destroy the 'wealth and order' built by the French. To some extent, the territorial sovereignty that was lost to and that continued to be threatened by the Axis was also threatened by the locusts. Political legitimacy of the French and British Empires was especially crucial during the War. This is because the Liberation effort relied very heavily on not only the Allies for supplies but also on actual

military enrollment of colonial subjects in the fight against the Axis. Crop protection, and pest control generally, was also a critical part of the actual war effort, as insect depredations had a direct incidence on the supply of the allied countries. This made locust control closely intertwined with, and reliant on, the alliances, technologies, and resources of the Allied war effort, while depredations by the swarms could actually undermine the production and supplies of food necessary for that effort. In other words, the fight against the locust *is*, or at least *strongly overlaps with*, the fight against the Axis, and vice-versa.

The second speech of the Conference was made by Mr. Dulin, Director of Agriculture and General Supply. This address further illustrates how the leadership of the French Resistance valued their commitment to an anti-locust organization. After briefly thanking Mr. Puaux for opening the meeting, Mr. Dulin stated how

> (by) attributing a national reach to the Office national antiacridien, created by order on 7 December 1943, by placing it under the authority of the Commissary to Supply and Production, which represents central power, and by allowing the participation of the State to the budget of the Office, the French Committee of National Liberation has signified the importance it attaches to the fight against locusts.

The speaker then specified how that concern is not specific to the CFLN, as:

> the extent of the locust plague, its repercussions on economic and even political life of the different countries affected by these locust invasions have long been a concern of public powers.

This concern, according to Mr. Dulin, has led to much progress being achieved in that field: “currently, all (the affected) countries have their own locust control organizations” and “much has also been done to coordinate this fight at national and international levels”. Dulin then highlights how France has been an “active and important participant” in these efforts, and how its “international reputation”, its “extensive track record”, and

the “lessons learned from experience” made France (meaning Free France) best positioned to carry out its mandate. Mr. Dulin continued:

> The mandate of the Office is vast. Its attributions, as defined by the order, are limited to the coordination of activities related to the study of locusts for their destruction. But the study of locusts and the organizing of the fight itself are so closely intertwined that the activities of the Office will always be closely linked to the activities of the (national-level) locust control organizations.

At the same time, the attributions of the Office are limited in a way that “preserves the autonomy of local anti-locust services in the organization and operation of anti-locust campaigns on their territories”. This specification has not only practical but also political implications, both of which are highlighted by the speaker:

> all these services belong to administrations that are distinct and independent from one another; they operate and rely on dissimilar frames and labor, have different local resources and work in diverse climates. Unification of their organization and (excessive) influence on their function by an extra-territorial organization could only hamper and interfere with the initiative of local leaders, who know the local working conditions in their countries, and would impede the most judicious use of local resources.

In turn, continues Dulin, limiting the breadth of ONAA’s mandate “allows it to devote a large part of its activity to studies and on the information and documentation service, which are so crucial to the applied work of the local services”.

While these limitations on the Office’s capacity were seen as justified in normal times, Dulin stresses how the “exceptional circumstances” of the time “impose on the Office an activity that will escape it in normal times”. Namely, the ONAA was situating itself, during wartime, as the direct link between the local anti-locust services and the supply organizations of the Allied. The speaker made it clear that the role of the Office is to immerse itself as central node linking the diverse other parts to ensure “the centralization of locust-related documentation and signalization” produced and reported

“across all French countries”, and the dissemination of that information to all interested countries”.

As Borot points out (2006, p. 136), it is likely that the authorities that called for the creators of ONAA had to walk a fine line in carrying out this geopolitically discursive manoeuver. One the one hand, they sought to send the message that the French empire was taking seriously its commitment to support the colonies, putting forward a colonial policy that was lacking in Vichy's projects. Yet, they had to take care not to upset the local powers whose allegiance to either claimant of French representation (Vichy or CFLN) remained uneven and unstable, and whose aspiration of political autonomy circumscribed the extent of claims of techno-scientific benevolence by the French.

What the foregoing suggests is the likelihood that locust control was useful politically and militarily in part because its role as crop protection made it a suitable field of techno-scientific benevolence, justifying colonial rule (Borot, 2006). Crop protection, especially applied entomology, figured prominently among the fields of techno-scientific benevolence that were used to justify colonialism as a legitimate form of rule (Clark, 2009). This was especially critical in Africa from the 1920s to the 1960s, as colonial Empires were facing growing criticisms from not only the colonized populations themselves but also other governments such as the United States and other members of the League of Nations (Cooper, 2002).

The geopolitically experimental purpose of this institutionalization of locust expertise as governmental science partly explains the ambiguous oscillation by these historical actors between national and international designations. For example, the nominally “National” ONAA is meant as an international organization, “National” being used to refer to the French Empire, reflecting ambiguity about the relationship between

the spatialities of Empire and of the state-form. These designations are themselves, to some degree, tied to the lack of clarity about the emerging hybrid spatiality at the intersection of national and international configurations of power that is being negotiated during late colonial and post-colonial regimes of rule (Cooper, 2002; Tilley, 2011). More than other sub-fields of applied entomology, however, a number of spatial characteristics specific to locust control made it especially relevant as a field of intervention for Free France during that crisis of sovereignty. These characteristics were (1) the insect's ability to form swarms almost anywhere across immense regions, pending appropriate ecological conditions[15], and (2) the large and mobile swarms' ability to transcend state boundaries. It is because of these, I contend, that of all the problems to which the French Resistance could concentrate in these times of crises, it prioritized the locust.

The solution to the locust problem, i.e. the creation of the ONAA, fostered the creation of a techno-scientific field linking the colonies with other colonial governments and organizations. This field was useful for the leadership of Free France to imagine, narrate, and perform its role as a federal authority overseeing a network of semi-autonomous colonial entities, in ways that addressed mounting criticisms in the last days of colonialism. As historian Helen Tilley states, "science and Empire" were particularly inter-meshed in the "layers of institutions established to meet the needs of the Empire" that "occupied an interstitial space that is neither national nor international" (2011, p.9). Across the African continent, the 1940s were the beginning of the end for European

[15] The fact that the desert locust does not have established outbreak location is not yet scientifically established in the 1940s. Nonetheless, the outcome and conditions caused by this ecological particularity of the insect, as they hinder managers' ability to precisely predict outbreaks are clearly known.

colonial Empires. As Cooper points out, colonial governments had to start thinking about what kind of politics would be "allowed in the ambiguous space between colonial domination and territorial autonomy" (2002, p.66). Science and technology played a key role in these exercises of political renewal, and locust control, via the creation of the ONAA, provided an especially suitable field to enact a response to the challenges faced by French authorities at this particular geo-historical conjecture.

By responding to locust invasion, the exiled authorities of Free France enacted a form of techno-politics that would, they hoped, bolster the case for a united French colonial Empire. This response shares much with similar instances of "enlisting" of applied entomology for the justification and continuation of imperial rule (Vayssière, 1980, Clark, 2009). More than other insects, however, the spatiality of the "locust problem" that makes it so intractable and overwhelming to the nation-state in conventional times made locust control a field of intervention through which multiple challenges to colonial statecraft could be overcome. As it transgresses states' territorial boundaries, the insect is a poor fit with institutions operating on the conventional Westphalian model of state sovereignty. But the solution to this entomological challenge to state spatiality—the creation of an international apparatus of locust control—called for and allowed the kind of techno-political intervention through which the French colonial Empire could be re-invented, re-negotiated, and re-presented in the face of a crisis.

More specifically, the war-time institutionalization of locust control via the creation of the ONAA called for precisely the type of transnational, federal, and techno-political apparatus that was necessary to legitimize the role of Free France at the head of the remaining French empire, and as the node linking the colonies with the other Allied countries. These features made responses to locust invasions an ideal field for Free

France to imagine, experiment, and enact its role at the head of the French colonial Empire in spite of and against the occupation of its mainland territory by Axis Troops during the Second World War.

That said, it is important to not exaggerate the actual operational and geopolitical significance of the ONAA as either an actor of locust management and as a site of colonial techno-power *in practice*. The Board appears to have been little more than a paper organization, at least in its first years, especially during the war. The ONAA was little more than an extension of the French Committee for the Study of Locust Biology based at l'Institut Agricole d'Algérie.

The Techno-Political Negotiation of Locust Governance

The adoption of the locust control as a privileged field for the performance and representation of colonial statecraft during the war was not the appropriation of an *a priori existing* applied entomology by a stable and transcendent state power. To understand this nuance, it is helpful to consider the co-evolution of science and state by returning to Mitchell's notion of techno-politics as an "alloy" emerging from contingent and often unpredictable encounters between the human and the nonhuman (Mitchell, 2002, p.42). Debates between participants of the 1943 Rabat meeting, as documented in the Proceedings, highlight several dimensions of such negotiations between sought-out political effects, representations, and the material conditions of the techno-scientific practices at hand.

A significant portion of the 1943 meeting dealt with questions on the types and quantities of materials (e.g. tires, fuel, bags, bran, and chemicals) needed to enable effective locust control. The discussion about which kind of poison should be used for locust baits is especially telling of the balancing act between scarce availability of

resources, toxicity, and concerns that risks of livestock poisoning could lead to popular resistance. Mr. Defrance, head of the Crop Protection for the French Protectorate of Morocco made the following statement:

> For toxic substances, we planned the use of sodium silicate, because it is less toxic to animals. In 1930, we used sodium arsenite and found a number of poisoning of cattle. In 1942 we used the sodium fluosilicate with no accident. Last year, the supply of fluosilicate being exhausted during the campaign, we had to finish with arsenite. There was a number of poisoning of animals, although they were not of economic importance for Morocco as a whole. For us then, the use of sodium fluosilicate is mainly a psychological issue [with regards to perception by local populations]. It is why Morocco would prefer to receive, if possible, 650 tons of sodium fluosilicate. However, even though we would prefer to use the fluosilicate, if delivery were to prove difficult, we can replace it by 325 tons of sodium arsenite.

Mr. Defrance's British counterpart, Boris Uvarov responded that, given the scarcity of supplies and the high cost of transportation, requests for the more toxic sodium arsenite are better advised than sodium fluosilicate. Because the latter necessitate a double dosage it requires twice as much tonnage than arsenite, doubling transport costs. Defrance repeats that Morocco would prefer the less potent fluosilicate but that the country bows in the face of the imperial need to reduce the tonnage: “It would obviously be possible to use sodium arsenic, but we will have to overcome much local resistance”.

Scarcity of documentary evidence makes it impossible to know the extent and severity of local resistance to locust control operations in the region at the time. Jamal Mohamed (2002) documented, on the other side of the continent and years later, occurrences of anti-colonial resistance in British Somaliland in 1945 and 1950, that had been aggravated by instances of cattle being poisoned from eating cereals used as insecticidal baits placed to control an incoming locust invasion. Colonial policies in Somaliland, especially their impacts on transhumance combined with additional restrictions on grazing, had already led to overgrazing and soil erosion, with negative

consequences on sheep and camel raising, activities central to the local economy. When, in May 1945, the British Locust Control Department responded to the arrival of locust swarms "with an energetic campaign of locust control in which it attempted to distribute and set poisoned baits for young hoppers throughout the country" (Mohammed 2002, p. 190), reports of livestock poisoning were interpreted in the light of suspicions of colonial conspiracies by the British to destroy pastoral livelihoods. This lead to violent protests against the poison baits on the "grounds that it is poisoning stock and infecting pastures and water supplies" (G.T. Fischer, Anti-Locust Campaign officer, 5 June 1945, cited in Mohamed, 2002, p. 190). In various parts of the country, protesters burned locust control camps and equipment, and attacked locust control officers; all of which, according to J. Mohamed, was encouraged and channeled by anti-colonial resistance movements.

It is impossible to establish whether the local resistance to locust control that the Moroccan authorities sought to avoid or contain was of a similar magnitude than the one that later occurred in Somaliland. What is evident from the available text, however, is that the consequences of an elevated risk of livestock poisoning was seen as, at best, undermining locust control's usefulness as a demonstration of the techno-scientific benevolence of colonial rule. This suggests that such concerns made the Moroccan delegate express preference for the less potent—but bulkier and costlier—pesticide.

A recurring theme during the discussions at the meeting was questions on the nature and style of the strategic orientation that should be pursued in locust control, given the especially challenging circumstances imposed by the war. These debates also hinted at criticisms made by British locust experts to the effect that the governments of French Africa had not made sufficient efforts to curtail locust swarms. At one point,

Boris Uvarov, representing Great Britain, asked Mr. Risbec of West French Africa's anti-locust service: "Will the effort in 1944 be the same as it was in 1943 in AOF? Can we make a greater effort?"

> Risbec: Yes, effort can be greater. The credits proposed are the same as for 1943, but that does not mean we will be limited to that. We are ready to face a given situation.
>
> Uvarov: Last year's effort was certainly very important, but insufficient; we must do much more...

Uvarov then asked Mr. Zolotarevsky (France) whether control can be carried out effectively in Mauritania, to which Zolotarevsky responded: "Yes, in most cases, northern Mauritania is accessible to vehicles, if it is not possible to send trucks, we must not think about it, it's impossible." In these regions:

> we must mount expeditions that are completely different from those that are organized in populated areas; we should organize vehicle columns that would bring the personnel, support for toxic substances, water, and supplies.
>
> These difficulties are not specific to Western AOF and Mauritania, but are also the case in the north of the French Soudan [Mali], the north of Niger, Chad, in these regions, the army cannot help, local resources are extremely limited, and labor should be brought in from very far.

Uvarov dismissed these excuses, not believing "that these regions are much more difficult than Saudi Arabia, where Great Britain has successfully carried out control operations. After rhetorically asking whether "this question only relates to AOF, or is it a general question for all French territories", he volunteered that "for (his) part (he does) not believe that it is only a question for AOF", suggesting that the problem lies, rather, with French capacity, broadly speaking.

The debate then turned to questions on the usefulness and desirability of military involvement in locust control. For the French delegate Zolotarevsky, control operations

in remote desert areas could only be achieved “with the help of the army”, which he deems not useful:

> My conclusions about the assistance provided by the military in the fight against locusts are that this help is generally mediocre because of the lack of experience of the military.

These views are not shared by his British counterpart Uvarov: “We have already made the experience in the British colonies. It has shown that we succeed better than with a civilian workforce”.

Disagreements between the French and the British representatives also pertain to the location, timing, and intensity of the control operations. For the British, a total effort and a generalized fight (“lutte généralisée”) everywhere locusts are found, with heavy military involvement, was imperative. For the French, the consensus was that such total efforts would likely be vain if the swarms were already too large, and that instead the imperative was to find and destroy the source of this swarming through reliance on a specialized civilian workforce. Responding to Uvarov’s claim that massive campaigns of swarm suppression by military columns had worked, Zolotarevsky asked: “Have we succeeded in destroying the grasshoppers in the desert? If not, it would better to not try again in Africa.” Uvarov:

> For my part, I believe it is possible, by consenting to a very important effort. This may not be very economical, but it does not matter. Do not forget that we are at war! This will probably cost a lot, but if the crops are saved, cost is of no importance. My conviction is that a generalized fight is totally possible, and that no difficulty is insurmountable.

Zolotarevsky’s position was echoed by the other senior French acridology experts. Roger Pasquier, who also remained skeptical as to whether massive operations can control invasions, and Mr. Defrance, who argued that an “offensive fight can only give results when it is executed at the beginning of the invasion”.

Responding to the argument that a generalized fight cannot be successful, Uvarov asked "If you had the necessary means and personnel, would it be possible? Risbec (French West Africa) contended that:

> If I told you that we need 50,000 trucks, could you find them? (...) Results depend on the distance from population centers. Never, with the populations as they are presently distributed, could we destroy grasshoppers on a large scale, across the entire Sahara, of which the extent is impossible to monitor.
>
> (...)
>
> I repeat that it is impossible to destroy (locusts) and to destroy (them) everywhere. We should find other means than poisoned baits, but in the current circumstances, I do not believe that it is possible.

Despite these disagreements, the French representatives eventually moderated their view, recognizing that even though the type of "total" swarm suppression efforts called for by the British are unlikely to be successful on their own, they would "help more than harm" their stated objectives. Zolotarevsky eventually agreed with Uvarov's position that "an offensive fight (lutte offensive) must be led in AOF"; adding that this approach "may not give absolute and definite results, but in any case, the relative results obtained may be very helpful for the defensive fight". Risbec also agreed that even though one cannot expect definitive results, it would help in the reduction of the locust masses.

Francophone and Anglophone traditions of locust science tend to respectively prefer distinct technological and organizational approaches to swarm management (see chapter 4). The translations and implications of these technological and organizational preferences in actual practices and representation of locust control have changed over time. During the era at which the Rabat conference was taking place, the 'British school' of acridology translated into something that historical actors call offensive control (lutte

offensive), or total effort or even total war, whereas the 'French school' favors what was then called defensive control (lutte defensive).[16]

In the context of the Rabat Conference, however, the debate was temporarily suspended. French entomologists making the case for approaches more akin to preventive strategies came to amend their strategic and conceptual disagreements with, or at least reservations about, British prescriptions for total and offensive efforts of swarm suppression. What the French needed most out of this meeting was support by the British government and Allied committee for their new commitment to locust control across northern and western Africa. As this support hinged on the approval of their initial plans by British entomologist Uvarov, this provided significant incentives to agree on technical and strategic issues whenever possible.

Moreover, the scaled up, massive and total efforts of swarm suppression, as argued by Uvarov, were very compatible with the performance of techno-scientific benevolence pursued by the French Resistance in its haste to enact some response to locust invasions. This last point is well illustrated by the closing statement made by Mr. Misse—the representative of the agriculture and supply direction of the (French) CFLN, in which he stressed that:

> It is important that the principle proposed by Mr. Uvarov, of extreme extension of the fight, be added to the proceedings of our meeting, *because it will open a very large program in the future, regardless of borders, frontiers, and particular administrative authorities*. Moreover, the ONAA will be able to play an important role in these operations (emphasis added).

The French authorities in charge of the meeting, I suggest, were responding to two sets

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[16] These organizational and technological preferences eventually came respectively to translate as preventive and curative orientations (see chapter 4).

of geo-political concerns as they pushed for the creation of the ONAA and the organizing of the Rabat Conference. First was the issue of recognition and legitimation of the French colonial Empire in the region, which implied good relations with and acceptance by colonial subjects. Techno-scientific benevolence, such as providing expertise and transboundary coordination in locust control was clearly in line with this objective. Francophone locust experts, however, were cautious and preferred strategies and technologies of locust control that carried less risk of upsetting local power dynamics. This meant (1) calls for civilian-based and contained efforts as opposed to the military "total war effort" preferred by the British representative, and (2) requests for insecticide chemicals of lower toxicity, to avoid local resistance in resulting from cattle poisoning.

The second set of geo-political concerns pertained to recognition by, and support of the CFLN and the colonial French Empire by Allied governments. The contribution of locust control to this objective was plausibly seen as best achieved by stated support from the entomologist representing Great-Britain at this instance, Boris Uvarov. What the text of the Proceedings suggests is that, to receive British approval and support, the French parties agreed to suspend their opposition to military action and the use of the more toxic insecticides. Despite their concerns and reservations about key strategic goals and techniques of locust control on which the British insisted, French spokespeople rapidly rallied themselves to the British perspective, I argue, in part because the scientific prestige and institutional and logistic support of these Allies was paramount, and trumped other professional and technical concerns.

The enlisting of the locust problem for at particular moment of colonial statecraft had to be negotiated with various material and discursive processes, both structural and contingent. The objects of these negotiations not only included the logic and imperative

of colonial rule but also an entire array of discourses (development, Allied unity, anti-colonial resistance, etc.), as well as people, insects, chemicals insecticides and vehicles. The co-production of techno-scientific expertise and state-making underlying this particular moment in the genealogy of locust control illustrates the constellation of concerns that shaped managers' decisions about which strategies should be selected to govern the desert locust.

The debates between French and British locust control experts during the Rabat meeting highlight how the stabilization and selection of strategic preferences for locust control were an outcome of the negotiation between (1) the preferred effects and availabilities of select technologies, and (2) ideas and practices underlying given rationalities of rule, as well as their representation.

Despite voicing their disagreement with British experts about which strategies and tools ought to be used to control the locust invasion, the French scientific experts and government officials eventually surrendered their position, subsuming it to the more pressing matter of receiving scientific and logistic support from the British. In other words, the political end to which the locust was put to work was not a given, determined neither by its materiality alone, or by available technologies, or by pre-existing transcendent state power. Rather, the particular alignment of all these processes in relation to a given rationality of rule shaped the political work done by locust control at this specific geo-historical juncture. And what this juncture called for was a specific enactment and representation of vertical hierarchy of political power (Allen & Cochrane, 2010; Ferguson & Gupta, 2002), placing the French metropole at the interface between emerging nation state and the emergent post-colonial world order.

Competing Strategies of Locust Management Debated

Notwithstanding the eventual surrender by the French in the negotiation of terms the initial disagreements between the French and British representatives at the meeting are interesting in the broader historical arc of applied acridology during the 20th Century. The points of contention at the basis of these debates between British and French acridologists at the 1943 conference have much in common with elements of the opposition across applied acridology as a whole between preventive and curative approaches to locust management. According to contemporary actors in the field, 'Francophone' acridologists tends to favor orientations that are more preventive, whereas 'Anglophone' acridologists tend to favor orientations that are less preventive, and effectively more curative in nature (see chapter 4). The debate between French and British locust experts at the 1943 Rabat Conference provides, however, an especially informative context to discuss the genealogical relation linking these historical debates to the present ones.

As I mentioned above, Uvarov, the entomologist speaking on behalf of the British Empire, insisted at the meeting that locust invasions can only be effectively dealt with via a massive response characterized by "total effort" and "generalized fight", preferably involving the mobilization of military personnel. It turns out that Uvarov was able to do just that in massive overland campaigns "on a paramilitary basis" across vast parts of the Middle East and East Africa, in his capacity of Locust Control Advisor of the British War Cabinet (N. Waloff & Popov, 1990, p.5). The work and stature of Uvarov gained much by the paramilitary application of his entomological expertise. He pointed that out himself when in an interview saying that "War is a wonderful factor for progress, at least technically" (Quoted in Baron, 1972, p.18). One of his paramilitary and motorized anti-

locust expeditions across the Great Nefud Desert in Saudi Arabia during WWII was described by Baron as “one of the strangest of the war”:

> In two vast convoys, 24 officers and 803 other ranks, all unarmed at the insistence of the Saudi Arabian government, and with attendant wireless and medical sections, set off from Cairo in some 360 vehicles weighted down with loads of sodium arsenate for the locusts and bags of specially minted golden sovereign and silver Maria Theresa dollars with which to pay for recruited labor (Baron, 1972, p.20).

Elsewhere, Baron reports that:

> In East Africa the plague was at its worst in Sudan and Kenya, where at one time 4,000 troops and 30,000 civilians were in action, hacking roads through the bush so that they could get to the infested districts (Baron, 1972, p.21)

In contrast, the entomological experts speaking for France at the meeting, especially Zolotarevsky and Pasquier, were skeptical about the desirability of such military deployment in massive campaigns, preferring more diffuse civilian-based responses. In the year before the Algeria-based French locust expert Roger Pasquier (1942) had written about the different methods against grasshopper. He contrasted what he called symptom-focused approach, a curative orientation, versus what he call a “Lutte rationelle préventive”—rational preventive control, arguing that the latter is more desirable to minimize impacts of locust invasions (Pasquier, 1942, p. 10).

Since the 1960s, preventive control has officially become the dominant orientation in locust control, the point of almost being an object of consensus among contemporary locust management organizations. That said, there is a great deal of disagreements or misunderstandings about what each agency means about what is to be prevented exactly. As we will see in greater details in chapter 4, during my fieldwork in agencies and centers of locust control active in predominantly Francophone countries of West and North Africa, my interlocutors often mentioned that they perceive a tendency

among Anglophone acridology experts and organizations to be less preventive than their Francophone counterparts.

The positions held by the representatives of France at the 1943 Rabat meeting share much in logic and spirit with preventive control, and those argued by the representatives of Britain with curative control. It so happens that the work of the Anti-Locust Research Center and other primarily Anglophone actors in the Central Region (East Africa and the Middle East), have tended to privilege what can be qualified as a comparatively more curative orientation[17]. For example, experts associated with the British school of acridology have argued that premature interventions on too small locust groups is wasteful; only a small proportion of outbreaks pose a risk of developing into a plague, and instead, most of these outbreaks recede following local populations much before becoming problematic, making early interventions wasteful (Bennett, 1976; Symmons, 1992).

This idea that Anglophone acridology is comparatively more curative in orientation, although difficult to evaluate, can be traced and perhaps even explained, by collision of several technological, cultural, and physiographical elements. These elements have to do with different biogeographical conditions in the respective sets of former colonial territories, differentials in availability of certain technologies, and models of colonial governance. I briefly address these and speculate on the nature of their interrelations.

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[17] It is true that Boris Uvarov, after formulating the phase theory of locust change, initially claimed that prevention of outbreaks would resolve the problems (see chapter 4). The problem is that although such preventive measures were possible for other locust species, the desert locust's lack of reliable outbreak locations undermine the efficacy of such efforts. Debates, then, pertain to how to respond to the challenge thus posed.

First is the question of technological selection. Actors that argue for the relative advantage of concentrating on massive campaigns to terminate already well-established populations of desert locusts—a core element of the curative orientation—stress that this approach is best achieved with aerial means. This invites the question of whether preferences along the prevention-suppression axis of locust management were selected in relation to differentials in availability of aircrafts over time. The overabundance of airplanes and pilots in British East Africa after the Second World—a key moment in the institutionalization of locust control—versus the absence of either in French West Africa may have contributed to stabilizing already existing tendencies to prefer one or the other approach: the African segments of the British Empire in East Africa received many of the surplus airplanes and pilots that England had acquired during the Second World War, many of which were retrofitted as insecticidal dusters assigned to various crop protection mandates.

Consider for example one of the main success stories of Anglophone acridology: the Desert Locust Control Organization of Eastern Africa (DLCO-EA), based in Addis Ababa, Ethiopia. This organization, which recently celebrated its 50th anniversary, has been in charge of many if not most of the locust control operations in the East African region where the British school of acridology spearheaded by the Anti-Locust Research Centre, has been the most influential. It turns out that the DLCO-EA is pretty much a service of aerial-based locust swarm suppression. It is composed of only a handful of pilots and aircraft engineers that maintain a fleet of airplanes, based in Ethiopia and that travel to wage campaigns against locust outbreaks across the ten countries members of the organization. As I discuss in greater details in chapter 4, the DLCO-EA can be said to operate on a model that is largely compatible with this curative orientation.

The respective preferences for preventive and curative orientation between Francophone and Anglophone acridologists are also compatible with competing discourses and models of colonial governance, what is often summarized as the distinction between the French "civilizing mission" versus the British "indirect rule" (Conklin, 1997; Crowder, 1964). Many assumptions of British experts on how to organize locust control echoed the culturally predominant assumptions about how to govern colonies, i.e. a detached, discreet, indirect rule supported by a core of field officers that would only intervene when necessary. This was different than the French model of civilizing mission through which French colonial officers immersed themselves deeply in some of the local intricacies of management in their colonies. This difference played out in offering differing compatibilities with more capacity-building, training and field research type of the work of Pasquier in AOF, and the relatively more 'hands-off' managerial position in Eastern Africa.

Lastly, it is quite possible that the preference by French and British acridologists for more preventive versus more curative orientations respectively was further reinforced by difference in the biogeographical conditions of swarm outbreaks between (predominantly French) West Africa and (predominantly British) East Africa. It is possible that the greater proximity of invasion zones to outbreak areas around the Red Sea in East Africa, compared to the enormous distance separating outbreak and invasion areas in the Western Sahel may have made early prevention much more important in predominantly Francophone West Africa versus the predominantly 'Anglophone' Central Region in East Africa (CL, entomologist researcher, personal communication,

Montpellier, June 2010; RM, locust control officer, personal communication, Bamako, October 2011)[18].

The point here is that if indeed the claim that Francophone acridologists are *more preventive* than their Anglophone counterparts turns out to be empirically verifiable beyond the circumstantial conjunctures listed here, the origins of these preferences can only be understood as the overdetermined outcome of multiple diverse, unstable, and contradictory sets of processes occurring at overlapping temporal and spatial scales. In other words, the articulation of French acridology as *more preventive* cannot just be 'read off' any geopolitical, technological, biogeographical conjecture alone. This tendency, or at least the claim by some of its actors that there is such a tendency, must be understood as the outcome of a contingent, uneven, and quite 'plastic' assemblage of various discursive and material forces that aligned as historical actors adapted to new, often contradictory demands. The different outcomes of these geo-historically specific collisions, such as the one that led to the creation of ONAA in 1943, have also created the template after which subsequent organizational structures have been designed.

Geopolitical Strategies Personified and the Idiosyncrasies of Institutional Orientations

One last parenthesis is in order before we move on to the next section of this chapter. The issue is that the debates between French and British representatives at the 1943 Rabat Meeting also speaks to important questions about the relations between

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[18] Initials are pseudonyms. Full name is provided when the interviewee requested to be identified. When provided, the location indicates the locality where the interviewee took place, not necessarily where the interviewee is based.

individual practices and subjectivities vis-à-vis and the broader institutional and political processes and movements in which these are embedded. The particular encounter at the meeting between the French and British visions or 'schools of thought' of locust control took the form of a brief debate between the directors of the national anti-locust organizations of the respective Empires: Boris Uvarov on the British side, and Boris Zolotarevsky on the French side. It is worth to pay closer attention to these individuals.

As the names Boris Uvarov and Boris Zolotarevsky suggest, both scientists were of Russian origin. The engagement with each other's acridological persuasions go much beyond that one meeting. In fact Uvarov was the professor and mentor of Zolotarevsky in the Russian Transcaucasus in the early 1900s, where they both began their scientific career in entomology. Both were employed by the Entomological Bureau of Stavropol until the tumultuous period of the First World War, the Russian Civil War, and the rise of Georgian nationalism made their careers much more difficult. Uvarov, unable to continue entomological research scraped a living by making and selling pies in the town square before giving "barely remunerated" lectures at the University (N. Waloff & Popov, 1990, p. 4). After meeting with British troops stationed in Russia, he was eventually invited to join the Imperial Bureau of London, in 1920, where he eventually created the Anti-Locust Research Center some three decades later. As it was mentioned earlier, during the Second World War, Uvarov became the locust control adviser to the British War Cabinet, a position that had him order and oversee the organization of "anti-locust campaigns on a paramilitary basis from Morocco to India" (N. Waloff & Popov, 1990, p. 6).

Zolotarevsky was not as fortunate. As reported by Vayssière (1980), he was conscripted in the Russian army during the war, until he eventually became too ill and

was discharged. Unemployed, he would often play cards with army reservists, where he eventually came across a newspaper containing a classified ad in which Uvarov had published his new address in England, inviting his old Russian colleagues and friends to contact him there. Zolotarevsky ripped the classified and kept it. Shortly after, his search for employment led him to embark on a ship to Brazil, where he would, according to his plan, go to raise cattle. Due to what he would later refer to as bad travel conditions, he clandestinely left the ship during an unscheduled night stop in Italy, running for the forest. In Italy, he first found farming work until he managed to contact Uvarov (via the address he had kept with him all this time), who found him employment in French colonial entomology.

I can only speculate on how these two entomologists came to express different visions of how locusts ought to be controlled. These may have to do with competition, profound convictions, exposure to distinct bodies of scientific work, or that they just expressed the visions sought by their respective employers. What is fascinating, however, is that both entomologists came to adopt and argue for strategic preferences of locust control that line up with respective strategies of the colonial empires for whom they worked. This raises questions on the ways in which the practices and discourses of individuals, align, despite contradictions, into social currents to which they cannot be reduced (Lester, 2012; S. B. Smith, 1984).

In this specific instance, as is often the case, the paucity of available materials does not allow claims about the specifics of how these processes occurred in shaping the positions debated at the meeting. That said, the idiosyncratic nature of these two individual trajectories suggests that one should not be too quick to reduce their work to the visions of their respective empires. I flag this issue here because the concern it raises

is indicative of how I interpret the contemporary ethnographic materials in the next two chapters. The point again is that the goals and trajectories of individual actors should not be reduced to the broader techno-political matrix in which their work is situated, yet the latter ought not be ignored in examinations of the former.

The highly specific historical detour and focus on the 1943 Rabat meeting allowed me to define and describe key elements of the geo-historical context and dynamics that are also at play in shaping contemporary applied acridology. Again, the 'take-home message' of the section is that the institutionalization of locust control that occurred in Francophone northern and western Africa during the mid-20th Century was embedded in—tributary to and following from—the socio-spatial logic resulting from the complex uneven, and contingently negotiated encounter between colonial Empire, post-independence state-building, and international development. This discussion sets the stage for the remainder of the dissertation, which concentrates precisely on understanding what demands this socio-spatial logic imposes on actors of locust governance.

Post-Independence French West Africa and Federal Unity: Oclalav

Before we move on to the contemporary institutional and political dynamics of desert locust control in West Africa, one last consideration remains in order to properly situate the contemporary ethnographic work within its longer historical arc.

Although the discursive role sought in the war-time creation of ONAA provides very important insights on the dynamics at play in the making of late-colonial acridology in the region, it is important to not overestimate the significance of the particulars of the 1943 Rabat meeting discussed above. Specifically, the negotiations at said meeting do not reveal much about the actual structure and operational capacity of regional

(transnational) locust management organizations in the late and former French colonial Empire.

As I mentioned before, the ONAA, whose creation preceded the 1943 meeting by a few weeks only, never became much more than a paper organization that represented metropolitan France's commitment to being involved in locust control in the colonies and semi-colonies. Materially, the ONAA never became much more than an office space in the Algerian Agronomic Institute, where Roger Pasquier was professor of Zoology; it was, according to Roy (2001, p.34), an extension of the Algerian Agricultural Service, nominally under the authority of the French Minister of Agriculture in Paris. Some of the studies and works carried out by Pasquier and colleagues were published in the handful of bulletins and memoirs published by the organization in the early 1960s, but there is no indication that it was anything more. It is also unclear how the organization ended exactly.

That said, even though the ONAA turned out to not be a major player in regional acridology, at least operationally speaking, the federal/transnational techno-political logic sought by the organization did materialize elsewhere. I turn to one of these manifestations: the organization that would eventually become Oclalav.

Again, during and after the war, actual locust management activities were not carried out by the ONAA but by local or territorial entities. Authorities of the French colonial Empire had to be careful to not overshadow or upset local authorities in one way or another. In the Maghreb sub-region of North Africa (Morocco, Libya, Tunisia, Algeria), autonomous national units adopted or kept the mandate of locust control in

their countries[19]—these were exactly the type of units that ONAA was supposed to help and support, but it always remained unclear how that would be, and with what resources.

The closest to the federal/transnational structure with a configuration similar to ONAA and actual operational capacity that materialized was the federal anti-locust service of the French West Africa. Unlike the colonies and protectorates of the Maghreb, which remained more or less individually autonomous, the French colonial Empire in West Africa was consolidated as a Federation of French West Africa ("Afrique Occidentale Française": AOF), whose structure and extent constantly evolved during its existence which lasted from 1895 to1958. This AOF government already had an Anti-Locust Service ("Service anti-acridien") during the Second World War. That Service was represented at the 1943 Meeting by Mr. Risbec, but the initial creation date of that service, and its composition and extent in these early years are unclear. Roy (2001, p. 35) writes that a resurgence of locust activity in the region after the war led to the creation of the federal apparatus of locust control in the AOF in 1952, but that "creation" seems more likely to have been in fact the restructuring and expansion of the previously existing federal service at the level of AOF government, when territorial crop protection capacity became supplemented with a transnational Anti-Locust Organization ("Organisme de Lutte Anti-Aviaire": OLA), based in Dakar, Senegal (Roblot, 1967).

The point is that this Locust Control Service was a Federal organization concerned with the management of a transboundary pest problem that was active in the

[19] These national units eventually became coordinated by the Clcpano (Commission de Lutte au Criquet Pèlerin en Afrique du Nord-Ouest, 1973), a regional commission, itself overseen by the Desert Locust Control Committee of the FAO (FAO, 2011).

last decade of formal colonial rule in West Africa, and, it so turns out, continued, albeit in a modified form, following the independence of West African states.

The French Empire ended in 1946 (a consequence of the constitution of the newly established Fifth Republic of France) and was then replaced by the French Union, which itself lasted until 1958. After that year, the federal structures linking colonies, such as the French West Africa became subsets of the French Community, which was composed of member states. The colonial federal structure responsible for the AOF's anti-locust service ended as well.

The authors of texts justifying the new organization state how the 1952 Federal Service of Locust Control was "very effective", and that the governments of the newly formed West African states and metropolitan France agreed that an organization similar to the Desert Locust Control Service of French West Africa would be in order to face this agricultural pest hazard that exceeds the newly established national borders (Roy, 2001, p. 36).

The argument was that "birds and locusts obviously ignore national borders". As no country "left to its own device was likely to succeed in establishing protection capacity", these pests required a combination of "territorial-level organizations" (read: under the authority of the colonies' local government) and federal services (under the General Governor of the Federation). It follows that the suppression of these structures following independence threatened to "leave a gap", which encouraged the "young states to unite" against these pest problems (Roblot, 1967, p.2).

The Ministers of Agriculture of former AOF member states met in 1958 in Bobo-Dioulasso to create the post-independence version of this Service (Roy 2001, p.36). At that meeting, the Dakar-based, AOF-mandated Anti-Locust Organization, the OLA, was

more or less revived as a post-independence West African structure via the creation of the Joint Organization for the Control of Locusts ("Organisation Commune de Lutte Antiacridienne": OCLA). At its onset in 1959, the membership of OCLA consisted of seven countries affected by desert locust invasions and France; two other countries joined later. A similar organization, Joint Organization for the Control of Birds ("Organisation de Lutte Antiaviaire": Oclav) was created at the same time to protect crops and pastures from bird invasions, especially the Red-billed Quelea. The Oclav initially had four members and rapidly expanded to six. In 1960, one year after the establishment of this regional organization these countries became formally independent from France, although their economies and political configurations remained closely interlinked with metropolitan France

After about five years of operating in a widely overlapping area, and with a similar structure and equipment, the member counties of OCLA and Oclav (five of which belonged to both organizations) agreed to merge the two to create the Joint Organization for the Control of Locusts and Birds ("Organisation commune pour la lutte anti-acridienne et anti-aviaire: Oclalav"). Borot (2006, p. 153) reports that the France's Minister of International Cooperation had made the continuation of its financial contribution to the organization conditional to such a fusion.

On 29 May, 1965, delegates from the nine members countries[20] met in Fort Lamy (N'Djamena, Chad) to sign and ratify the joint-declaration whereby Ocla and Oclav were to be merged, creating the *Oclalav* as an inter-state organization with moral and financial autonomy (Roblot 1967). It was also decided that the headquarters of the

[20] France withdrew from Ocla/Oclalav membership at that point, but remain involved in capacity of support.

organization would be in Dakar, Senegal, the capital of the AOF and where the OLA (1952) and OCLA (1959) had previously been based well. As of 1967, Oclalav was composed of Cameroon, Chad, Cote d'Ivoire, Dahomey (Benin). Mali, Mauritania, Niger, and Senegal.

Figure 3.3 Logo of Oclalav, from Roblot, 1967.

The Oclalav consisted of a Board of Directors responsible for the nomination of an executive director, appointed on a rotating basis, and four technical groups responsible for on-the-ground operations (Mauritania-Senegal, Mali, Niger, Chad, and Cameroon). The organization became quite large. A 1967 booklet authored by the then Executive Director of the Oclalav (Roblot, 1967) reported that it employed 182 agents, including 5 engineers, 20 technicians (mechanics and aircraft pilots), 12 technical agents, and 145 execution personnel. Upper managers were largely from French technical agencies or official organizations (including the director and author of brochures and articles on the organization, Mr. Roblot), whereas the execution personnel was largely "local". The organization's capital was reported at 425 million CFA

(equivalent to 850,000 French Francs or 1.7 million USD at 1967 value). The contribution of member countries was supposed to add up to 325 million CFA/year (Roblot, 1967, pp. 9-10), but the author of the booklet considered this amount to be insufficient for essential operations, which led him to call for "organizations against hunger" to help with the development of organizations such as Oclalav". That being said, the author also stresses the importance of striking what he calls "a just measure of financing" as greater budgets can allow more teams, leading to better capacity of locust control, yet, he argues, increases in staff and materials make the apparatus difficult to sustain during recession periods.

It turns out that Oclalav did continue to expand. In 1968, it started acquiring aircraft and recruiting pilots and mechanical support, more costly equipment and staff, to the point of having its operation costs much higher than the results would warrant.

I return to the implications of this management organization below. For the time being, I want to focus attention on the spatiality of this Oclalav organization, at the interface between territorial colonial entities and the transnational configuration of Empire and the lasting legacy of this configuration after the independence of the colonies. I argue that the particular organizational structure was favored in part because it corresponded best with the type of institutional arrangement sought by French political authorities to foster a sort of post-colonial French West Africa as a united federation tributary to France. In other words, Oclalav was the material manifestation of the techno-political space that was sought with the institutionalization of the ONAA: a federalizing site of techno-scientific benevolence that simultaneously spans state sovereignty and reproduces imperial spatiality, including the production of vertical hierarchy and encompassment, placing the French 'above' the territories. This spatiality

is emphasized, for example, by the emblem of the organization (figure 3.3, above), which demarcates the contour of French West Africa, overshadowed by a locust and bird. In sum, the foregoing suggests this socio-spatial logic enabled by post-colonial locust management co-evolved with the making of development as a mode of government in a way that contributed to what is best described as transcolonial federalism: a federalizing, encompassing structure meant to group and 'overlay' territorial entities, and that remained well after the dismantling of the formal structures of the colonial Empire.

The Demise of the Oclalav

Despite being hailed as successful in the literature and in interviews with historical and contemporary actors of locust governance, the structure of the Oclalav fell out of favor in the 1980s. In 1982-1983, France stopped funding the aerial component, and withdrew its managers and pilots from the organization. The exact timing of the defunding and demise of Oclalav is not clear. Roy (2001) and Borot (2006) report that it was in 1985 that France decided that the organization was no longer in charge, others report that the organization lost its legitimacy in 1986 or 1987. 1987-1989 saw a very important invasion of desert locusts in the region, which many attribute to inadequate management response in part because of the demise of Oclalav and the recent ban on Dieldrin for locust control—the structure and technology around which all locust control capacity had centered since the 1970s. By 1990, all locust control capacity in the West African region had been transferred to national crop protection agencies—most often under the authority of the countries' Ministers of Agriculture—and all that remained of

Oclalav was its head office, whose continued role of "coordination" (within this restructured acridology landscape) was not clearly defined.[21]

Roy (2001) and Borot (2006) attribute the decline of Oclalav to its limited efficiency, which they blame on the competing institutional and political demands made on this organization. The merger of OCLA and Oclav, they argue overwhelmed the material and managerial capacity, as invasions by birds and locusts tend to occur simultaneously, thus 'spreading thin' response capacity. This was worsened, according to Borot, by the practice of distributing resources equitably across the region rather than according to skills or needs. For example, the appointment of Executive Director followed a rotation of nationalities, rather than expertise (Borot, 2006, p. 151), and the repartition of material resources on the territory without consideration for bio-ecological dynamics in the territory, e.g. each countries receiving aircraft and similar resources despite uneven distribution of needs.

The causes identified by Roy and Borot are quite likely part of the explanation of why the Oclalav became defunded, but I question that these factors are sufficient to explain why France chose to stop supporting Oclalav in the 1980s. Rather I suggest that these factors were made to 'matter' after the fact. Oclalav was not terminated because of inefficiency, but because it became out of step with the type of institutional arrangement in which post-colonial transnational rule eventually morphed. The type of top-heavy, "big machine", and Empire-derived form of governance and management that this organizational structure favored proved to be insufficiently productive and flexible compared to other similar modes of transnational government that replaced colonial

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[21] The fate of Oclalav, and its peculiar existence as sort of a ghost organization as of 2012 is discussed again in chapter 5.

power with a combination of state-building overseen by international structures of expertise.

The transformation that locust control underwent in the sub-region in the 1980s was to remedy that problem in one way, by committing to a better alignment of West African locust control with the apparatuses of international development whose configuration and logic differ with the ones of the heavily interventionist and dirigist, developmentalist state (Bonneuil 2000).

On the other side of the continent, the Desert Locust Control Organization of East Africa (DLCO-EA) has remained active for over 50 years, since 1962. This is surprising in the light of the foregoing discussion, for two reasons. First, the DLCO-EA, created under leadership of the London Anti-Locust Research Center, adopted the structure and orientation of the West African OCLA that preceded it by a few years (The DLCO-EA's establishment was three years after the 1959 OCLA). Second, writings on the DLCO-EA attribute the success of the organization, at least in part, to the two same factors that commenters blame to the demise of Oclalav: (1) reliance on aircrafts, and (2) broadening of mandates to include not only bird control but also other similar transboundary pests.

The main difference between Oclalav and DLCO-EA, however, is that DLCO-EA did so by remaining rather centralized and structurally lightweight: only a small group of technicians and pilots based in Addis-Ababa, no ground teams, no prospection, no research, and no networks of field stations. This configuration happens to be congruent with the relatively less preventive orientation that is often attributed to Anglophone acridology and its institutionalization in East Africa.

On the west side of the continent, Oclalav, then, may have become too big—at least according to the donors funding the bulk of its operational budget—not simply because it combined multiple pest management mandates or because it started to use aircrafts, but because it *added* these elements to too many other dimensions of expertise, growing in all directions at once.

What I suggest is that Oclalav was indeed the "right technology" to enact the kind of post-colonial federal configuration through which the French colonial rule could be reinvented via techno-political benevolence. First, in the late 1950s and early 1960s, the political configuration of "Françafrique" was much more centrally federalized than the relatively fragmented former British colonial Empire in Africa. This unity simultaneously called for and allowed direct involvement of French technical assistance in the creation of a federal structure of techno-power. Second, the transition from colonial rule to international development did not follow a smooth, pre-defined trajectory, neither in France-Africa relations (Dufour, 2010) or elsewhere in the continent (Cooke, 2003; Cooper, 2002; Cooper & Stoler, 1989), the question of continuities and ruptures between these episodes of north-south relations remains object of debate. What emerged over time, however, is the dominance of development centered on the nation-state supported via bi-lateral nation-to-nation foreign aid and by multi-lateral organizations such as the various agencies of the United Nations. These two overlapping modes of transnational governance through which development became increasingly enacted after the 1960s started to make the top-heavy federal structure of Oclalav increasingly awkward and out of step with the emerging channels of foreign aid and technical assistance.

Having shown the types of experimental political ends in which the unruliness of the locusts was incorporated, I turn in the following two chapters to the question what

that function of locust management in transnational governance means for professional acridologists. The experimental purpose to which the locust problem was 'put to work' so to speak, has also shaped the institutional settings in which technical and scientific actors of locust management also operate, thus influencing the work of these experts. The next two chapters further concentrate on the implications of these efforts to 'developmentalize' West African/Francophone applied acridology.

CHAPTER 4

GOVERNING LOCUSTS, DEVELOPING GOVERNMENT: EXPERTISE, COMPLEXITY, AND THE WILL TO IMPROVE

In this chapter I turn to the second set of questions approached by this study. Do perceptions of the locust problem and locust control preferences vary between professional specializations, agencies, or nations? And to the degree that they do, why do some approaches to locust management become selected over others amongst experts and organizations?

Despite general agreement among experts on the basic nature and consequences of locust upsurges and plagues, actors in the field of locust management tend to favor different strategic orientations to respond to these phenomena. I divide these different orientations in three categories.[22] The first approach is best defined as the preventive orientation. It prioritizes active involvement and *early and rapid* efforts to monitor, locate, and terminate gregarizations and/or upsurges of gregarious locust populations *before* they reach certain thresholds of size, density, coherence, and mobility (Lecoq, 2001, p. 9; J Magor, Lecoq, & Hunter, 2008). The preventive orientation is the dominant and official position in organizations and programs of locust control. This dominance is incomplete and unstable, however, owing to (1) ambiguous use of technical terms across agencies and nations, and (2) competing conceptualizations of the problem that question the value of committing resources to early stages of upsurges.

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[22] This typology is consistent, albeit in a highly simplified manner, with the one described by other observers of locust management. For less schematized discussion of the cycles of recession-invasions and the diverse strategic orientations to manage these cycles see Showler (2002), Magor, Ceccato, Dobson, Pender, and Ritchie (2007), and Van Huis, Cressman, and Magor (2007).

The second approach is best described as a curative orientation. It tend to prioritize the ability to suppress, terminate, or eliminate upsurges and plagues. This calls for methods and resource allocations that enhance organizations' ability to respond and contain upsurges *after* they have reached a given threshold of size, density, coherence, and mobility (Symmons, 2009).

The third orientation refers to a constellation of measures that favor acting *not* on the locusts directly, but rather intervening on people, either via insurance, damage compensation, and so on. This orientation emphasizes social adaptation to locust population dynamics rather than attempts to prevent or control them. In its modern incarnation, the adaptive orientation tends to be primarily motivated by concerns on the impact of toxic insecticides on people and their environments (El Bashir, 1997; Pesticide Action Network UK, 1998; Peveling, 2005) and by economic analyses that question whether attempts to control invasions are worth the effort (Hardeweg, 2001; Joffe, 1995; Krall, 1995; Krall & Herok, 1997).

These strategies are best understood as forming a continuum of responses to the risk of locust invasions; these are complementary rather than mutually exclusive. The degree of appropriateness of either approach is largely conditioned by locust population dynamics at a given time. During recession periods, when gregarious populations are scarce and at low density but still present a risk of upsurge, most would agree that some efforts to monitor and prevent these upsurges (i.e. preventive action) are justified. When an outbreak does occur, most would agree that some efforts suppress and eliminate these upsurges (i.e. curative action) is justified. Similarly, most would agree that some efforts to compensate for the impacts of locust depredation on human livelihoods (i.e. adaptive action) are justified.

Nonetheless, in the face of scarcity of financial and institutional resources available for locust management, experts, managers, policy makers and program officers face trade-offs when they adopt or push for specific measures. This leads to debates and disagreement among locust management actors about the respective value of these competing orientations. In this chapter I examine these debates by focusing on how experts in the field conceptualize these competing orientations and how they are related to one another, and on why some experts deem one approach better than the others. These debates are of interest for this study because each of these orientations calls for different sets of practices and representations, which in turn rely on and reinforce competing understandings of the problem and of its solution. Exploring why some approaches to locust management become selected over others amongst experts and organizations provides a useful entry point to our examination of the institutional dimensions of this technical and scientific field. Why are some institutional responses to the stochastic nature of locust swarm outbreaks selected over alternative strategies? What do the genealogies of these preferences, and their respective organizational requirements and effects, tell us about the social and institutional dimensions of locust management? What are the social and ecological outcomes of adopting one approach over another?

To answer these questions I draw on scientific literature, institutional historical documents, and interviews with practitioners in the field of locust management. I focus especially on the points of view and explanations provided by the researchers affiliated with the Locust Ecology and Control Research Unit of Cirad, in France, representatives of countries members of the Clcpro, the Western Commission for Locust Control, and

program managers at the UN-FAO. These materials are supplemented with analyses of documents published by or about similar organizations in Europe and Africa.

Analysis of these diverse sources inform a nuanced understanding of the relations amongst the three main orientations of locust control. It also highlights how these relations have co-evolved with the social and institutional dynamics of locust management. In the light of this analysis I describe the dominance of preventive control and I propose a political ecological explanation for this dominance. This explanation highlights how the spatial logic and discursive orientation of institutions contribute to shaping (1) the construction of ecological dynamics—natural resources and/or hazards—are constructed, and (2) the stabilization and selection of technological approaches to manage these dynamics.

First, my attempt to unpack this notion of prevention in locust management reveals that part of what makes this orientation dominant is that the notion of prevention itself is highly flexibly conceptually. The term 'prevention' is so ambiguous as to qualify as a boundary object: a construct that is sufficiently malleable to work for multiple groups (Bijker, 1997; Mara Goldman, 2009). Even though an important majority of actors in locust management agree on the importance of prevention, they do not necessarily agree with one another on what ought to be prevented or on when and how this prevention ought to take place. In other words, prevention means different things to different people. Even most of the locust experts that are seen by others as relatively more aligned with 'curative' strategies describe their work as preventive. The difference between what some consider to be a curative and a preventive orientation is found in conceptual differences on what ought to be prevented: outbreaks, upsurges, or

plagues. I explore these conceptual differences and how they are blurred in locust management programs and organizations.

Second, this exploration of why and how the notion of prevention is so widely adopted among acridologists despite profound differences concerning its meaning takes me to the main argument of this chapter. The ambiguity of the notion of prevention—the ability of the concept to serve as a boundary object—is insufficient to explain its dominance in international locust management. After all, 'curative' and 'adaptive' can be equally ambiguous, yet both are relatively marginal in locust management literature and in how actors of this field of insect control talk about their work. Based on interviews with locust experts and analysis of documents revealing institutional histories, I argue that prevention is the dominant approach because both the discourse and the institutional practices enabled by this orientation best ensure the relevance of locust expertise within development networks. This relevance is a key requisite for the professional viability of acridology because these programs and organizations of humanitarian relief, technical assistance, capacity building—i.e. development—are crucial clients and brokers of locust expertise. By cultivating the fit between their work and the mandates of these developmental entities, actors of locust governance maintain or increase access to development aid and resources from these programs, and by extension, maintain or increase the relevancy of their expertise within and for the apparatuses of the developmental states.

The preventive orientation in locust management is most aligned with developmentalist imperatives in part because the two are spatially and discursively compatible. Drawing on Foucaldian theorizations of the mechanisms of rule in modern government, I argue that the technologies of power that are enabled by this construction

of and response to the locust problem yield relatively complex institutional arrangements that expand outward in other spheres of societies as they seek to 'improve', 'build capacity', and foster 'better governance'. This makes this approach to locust management productive of power-knowledge that operates centripetally—that expands, proliferates outwards. In this sense, preventive control makes acridology a field in which techno-political interventions are 'pushed away' from what Foucault calls disciplinary modes of power, and toward what he calls security. The relatively sophisticated institutional requirements of effective preventive control makes this orientation a good fit for developmental projects, i.e. interventions designed to enhance landscapes, livelihoods, governance, and technical capacity broadly speaking. This best aligns the preventive orientation with the demands of what Tania Li (2007) calls the "will to improve", a key feature of development practice. Drawing on Foucault (1991), Li's discussion of this will to improve refers to the deployment of a governmental rationality via attempts "to manage processes and relations, balance diverse objectives, and conduct the conduct of individuals and groups, all in the name of improvement" (2007, p. 270). This alignment has the effect of favoring attention to the immanent aspects of locust swarming, which in turn favors a celebration of, rather than an aversion to the complex and stochastic nature of the insect's population dynamics. The improvement imperative enabled by this orientation favors attention to environmental concerns of pesticide use and capacity building in technical services.

The chapter is organized as follow. First, I describe in greater detail the three competing orientations in locust management, the reasoning underlying them, and their respective technological implications. Second, I describe the relations between these competing orientations, focusing on key debates in the field of locust management and

among commentators and policy makers. This brings us to a consideration of the social and institutional factors that lead agencies to favor one approach over the others. Specifically, I discuss how the respective instrument-effects of these competing strategies of locust control differently contribute to the professional viability of locust expertise. Finally, I draw on theorizations of modern governmentality to show how these locust management orientations have co-evolved with different modes of governmental logics at the intersection of international development and global environmental governance.

Competing Approaches to Locust Management

For the most part, locust managers are concerned with the hazard presented by populations of desert locusts that are in the gregarious phase: invasions of immature hopper bands or swarms of flying adults. Management efforts are concerned with preventing, responding, or adapting to significant increases in these gregarious populations. The most common technical term for these increases is upsurge. Upsurges follow from outbreaks, which are commonly understood as successful phase transitions from solitarious to gregarious phase. Upsurges are often described as invasions or swarms. Under certain conditions, upsurges increase in size and mobility, groups join one another and multiply leading to widespread infestations that can last one or several years. These infestations are called plagues. These plagues eventually lose cohesion as gregarious populations either die off or return to low densities and eventually re-transform to their solitarious phases. This last (or first) stage of the cycle is called recession: this is the pre-outbreak conditions when locust populations are for the most part in their solitary phase and only found in low densities.

What distinguishes locust management strategies from one another is the stage of this recession-plague cycle on which they concentrate. Categorizations of these

strategies are difficult. This difficulty has much to do with disagreements about what the stages of the cycle are. Nonetheless, in general terms the preventive orientation favors earlier interventions. In the broadest sense, this means 'plague prevention', which includes everything short of plague suppression. This broader conception of prevention thus even includes suppression and elimination of upsurges. But as we will see below, several acridologists with whom I have spoken insist that the preventive orientation is concerned only with the earlier stages or this cycle: either preventing upsurges or outbreaks. These acridologists consider that management strategies concerned with later stages, such as upsurge suppression and elimination, are not preventive but rather curative. This is even though proponents of upsurge suppression and elimination often consider their approach to be preventive as well (albeit preventing plagues rather than upsurges or outbreaks).

Because this study concentrates especially on the perspective of members of the Clcpro that tend to agree that prevention means prevention of outbreaks and upsurges, I use this distinction as well. The diagram below illustrates this categorization. The first row of the diagram from the top shows the different stages of locust population dynamics. The second row shows the different types of locust management strategies that correspond to these stages. The third row illustrates how these strategic moments are grouped as preventive and curative in the light of my analysis of explanations of locust management in the literature and in interviews with experts in the field. As with all classifications, the boundaries are arbitrary and not the object of consensus among actors in the field. Nonetheless, this typology is helpful to guide the discussion concerning this study.

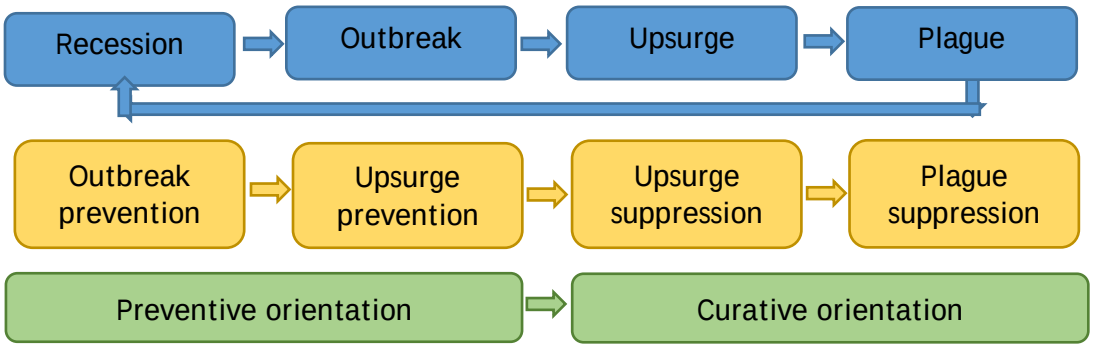

Figure 4.1. Locust population dynamics and management strategies. Adapted from Van Huis et al. (2007).

Preventive and curative orientations are enacted sequentially. That sequence follows the evolution of outbreaks, upsurges, and plagues. Management strategies that focus on earlier stages in this cycle are *more preventive* than management strategies that focus on later stages in the cycle, as these are *more curative*. The adaptive orientation is not represented in the diagram above. The main reason for this omission is that, as it is commonly conceptualized, this approach to the locust problem is not constrained to one phase of the locust population cycle. Even though it has not been adopted formally in locust management schemes, elements of this adaptive orientation have had a strong influence on the design of contemporary institutional arrangements and programs shaping the work of locust managers. The sub-section below describes each of these orientations in greater details. These descriptions are followed by a description of the debates and disagreements on the nature and relations between these orientations.

Preventive Orientation

Proponents of preventive control argue that the most effective approach to locust management is to prevent upsurge by forecasting and monitoring outbreaks, and chemically terminating gregarizing populations *in situ* and as early as possible to avoid

groups of gregarious locusts forming groups that could become too large and mobile to contain. This orientation thus seeks to prevent locust gregarization from crossing a certain threshold. This requires managers to initiate control intervention during, or shortly after groups have started to form (Lecoq, 2001).

Initial formulations of this preventive approach followed the scientific discovery leading to the elaboration of the theory of locust phase change. Again, it was only starting in the 1920s that the solitary and gregarious forms of the locust began to be recognized as distinct phases of the same species, as opposed to distinct species (Uvarov, 1921, 1966). Prior to that, management efforts only concentrated on already well-established upsurges of gregarious locusts when and where they pose an immediate threats to crops. In other words, locust control attempts that pre-date the formulation of phase theory were de-facto curative, focused on defending crops from invasions. Following the discovery that these solitary and gregarious grasshoppers are different forms of the same species some entomologists began to call for a control strategy focused on the pre-upsurge stage, i.e. when insects are only starting to form groups that are small and manageable. Consider for example this statement reportedly made by Boris Uvarov, a key figure in the formulation of locust phase theory:

> As the wonderful phenomenon of the transformation of a swarming locust into a solitary grasshopper explained the periodicity of locust invasions—and recessions—then evidently the best way to check invasions was to stop the enemy in its non-swarming stage, that is, in its outbreak area. This, however, first had to be found. (Boris Uvarov, cited in Baron, 1972, p.46)

The quote above highlights how the key to managing desert locust populations was the identification of the outbreak location, i.e. where locust gregarization occurs. An expedition led by entomologist G.B. Popov, after many months across the Sahara, came to the conclusion that, whereas other species of locusts do have readily identifiable

outbreak areas, the desert locust in fact does not (Roffey, Popov, & Hemming, 1970). What that and other similar ecological surveys revealed is that, pending adequate ecological conditions the insect can gregarize at any location within its recession area. The implication is that countries in the recession area where gregarization occurs must then maintain prevention units to first find and then either monitor or control gregarizing and gregarious populations (Van Huis et al., 2007).

In this sense, preventive control concentrates especially on the *transiens gregarians* phase of the locust polyphenism, i.e. the transitional phase between the solitary and the gregarious phases. Actors and commentators often describe these preventive efforts as "a race against time": the earlier the response to gregarization, the better its result will be (Baron, 1972). This approach requires a highly diffuse and flexible apparatus able to produce, gather, and interpret and act diverse strands of information based on highly specific technical knowledge. This is done by highly mobile, well trained and coordinated teams that prioritize their survey and control efforts to areas that they assume to exhibit conditions that a locust would find suitable to gregarization.

The ability of managers to carry out this work depends on constant monitoring and forecast of always-changing micro-climatic and micro-ecological conditions in heterogeneous environments across vast landscapes. Surveys are then guided by satellite-derived remote sensing and forecasts of weather patterns and vegetation indexes, combined with the experience of survey teams. These teams are trained to find plausible outbreak locations at a given time, based on previous knowledge of which areas are prone to be conductive to breeding under given climatic conditions, weather and vegetation mapping. An additional source of information is also invaluable: reports from local populations in the desert. For example, in Mauritania, it is estimated that over 40%

of the information used by teams of the national locust control center CNLAA are provided by nomadic herders active in the gregarization areas (Mohamed Abdullahi Ould Babah, senior locust control specialist, personal communication, Nouakchott, July 2012). This highlights the importance of establishing and maintaining good relations with local populations. The success of early preventive action in locust management, consequently, hinges on the expansion of lines of communication across multiple modes and the capacity to combine and act on the information gathered.

Proponents of preventive approaches have argued that intervention at the outbreak stage is effective in containing plague development, claiming that preventive measures were a major factor in the swift decline of the 1988-1989 plague, for example (Lecoq, 2001; Lecoq & Duranton, 1997). In their 2008 article “Preventive control and desert locust plagues”, senior acridologists Magor, Lecoq, and Hunter (2008), reviewed the arguments in support of preventive control strategies to manage desert locust populations. Based on modeling of outbreak dynamics, they argue that interventions right at the outset of any and all upsurges are the most effective and financially and ecologically sound approaches to manage this insect. These authors write that if countries and organizations were to invest sufficiently in preventive control, i.e. more than they currently do, this would greatly reduce the amounts spent on widespread invasions when and where they do occur. These invasions, they concede, are likely to always re-occur even with an excellent preventive apparatus, but preventive control has greatly reduced their frequency, extent and duration since the 1960s, yet its potential effectiveness has not been fully realized because donors and governments are less prone to finance prevention during long periods of recession.

Ceccato, Cressman, Giannini, and Trzaska (2007) reviewed the circumstances of and reasons for the slowness of the international response to the 2003-2004 desert locust upsurge in West Africa. They conclude that "using seasonal rainfall prediction to forecast desert locust sooner" would "provide a longer lead time to affected countries and the donor community" (2007, p. 7). Similarly, Showler argued that lessons from the 1986-1989, 1992-1994, and 1997-1998 campaigns show that "implementing proactive control might be associated with reduced pesticide application, economic costs, environmental risks, and duration and extent of the locust threat" (2002, p. 97). As locust infestations increase in size and density, the reasoning goes, the financial costs of depredations and treatment increase rapidly. So does the environmental impact of chemical pesticide use. It is on this assumption that proponents of early prevention base their argument that this orientation is the more cost-effective and the less environmentally damaging.

For example, Roger Pasquier, of the National Agronomy Institute of Alger, is credited with the formulation of what he called "rational control" of locusts and grasshoppers ("la lutte rationelle"). This "revolutionary method", which overlaps significantly if not fully with the preventive orientation, was said to "diminish the spectacular nature of fight against the gregarious locusts", but it also yielded a "no less spectacular reduction of the costs of this insect control" (Maurel, 1973, p. 4).[23] The statement above in the eulogy of Professor Pasquier, is augmented with the precision that the adoption of this rational strategy in response to the Moroccan locust in 1935 led

[23] "La lutte rationelle", Maurel (1973) writes, is a "méthode révolutionnaire qui ôte son caractère spectaculaire à la lutte contre les grégaires de l'espèce, mais réduit de façon non moins spectaculaire les dépenses consacrées à cette lutte" (p. 4).

to locust control operations in that year to only cost 0.5 million Francs, compared to 20 million in 1929 (Maurel, 1973).

As I mentioned above, some pro-prevention locust experts consider that the orientation favored by other self-identified pro-prevention acridologists is actually a curative one. One of the ways this distinction is made has to do with the conflation of, or at least a slippery relation between, *preparedness* and *prevention*. These critiques refer to a view of prevention that has more to do with preparedness, i.e. early preparation to ensure efficient yet *reactive* response to upsurges after they have formed. An example of this can be found in the title of an important review document authored by Magor, Ceccato, Dobson, Pender, and Ritchie (2007) and published as part of the FAO's Desert Locust Technical Series, which was titled *Preparedness to prevent desert locust plagues in the central region: An historical review*. The contested notion in question is illustrated in the phrase "preparedness to prevent".

During interviews, pro-prevention locust experts have highlighted that this notion of 'preparedness' differs from their own conception of the preventive orientation, which they see as *proactive*: early intervention before upsurges occur to diminish the risk that these upsurges materialize in the first place. Interviews with francophone actors in locust management report that they suspect linguistic factors may underlie this conceptual distinction. "Preparedness", they argue, is a state of organization that can work as "prevention" more easily in English than in French. In this sense, prevention can be understood as either a series of proactive efforts to ensure preparedness, which is a status, or a proactive activity to prevent certain outcomes (in this case, locust upsurges). Interviewed francophone locust experts stress the importance of "lutte préventive", which best translates as the more active notion of "preventive control". This point is

consistent with a pattern observed during my study, wherein acridologists associated with the primarily francophone Clcpro attributed the curative orientation to what they alternatively referred to as their "Anglophone colleagues" ("nos collègues anglophones") (NA, senior locust control specialist, personal communication, Bamako, October 2011) or "the Anglo-Saxon school of thought" (CV, locust control officer, personal communication, Agadir, August 2013). As we will see below, there is indeed a pattern wherein many of the elements of the curative orientation, whether by acridologists that self-identity as pro-preventive or pro-curative can be found among actors and organizations associated with the England and the British zone of influence within the desert locust habitat, i.e. in East Africa and significant portions of West and South Asia. It is perhaps not a coincidence that the example of scientific literature that refers to "preparedness" mentioned above (J. Magor et al., 2007) pertains to a document that reviews the history of locust in the central region, which covers East Africa and the Arabian Peninsula where "Anglophone" acridology has been especially influential. Although the nature of that distinction remains unclear, the perceived and reported greater preference for the preventive orientation in the predominantly Francophone Western Region, versus the lesser interest in the Anglophone Central Region may have contributed to the historical outcomes of these two disciplines, as I discuss further below.[24]

[24] Interestingly, Joyce Magor, the lead author of this "preparedness" report was also the lead author of the 2008 article "Preventive control and Desert Locust plagues", discussed below, which was criticized by a P. Symmons, a proponent of curative acridology. In other words, placing Magor in the "curative" camp would be undue simplification.

Curative Orientation

The second orientation, the curative, is commonly used to refer to efforts to suppress or eliminate upsurges or plagues once they are well established. Again, what problematizes discussions of this approach is that the great majority—but not the totality—of experts and managers that would be categorized as pro-curative by other experts and managers actually self-identify as pro-prevention. In other words, there are few self-designed proponents of the curative orientation. The closest to that we can find are vocal critiques of early preventive approaches. Even though they are rather marginal in locust management and policy circles, paying attention to these explicit critiques of the preventive orientation provide an entry-point to better understand what this curative orientation entails and implies.

A commentary titled "A Critique of 'Preventive control and Desert Locust plagues'" was published in the journal *Crop Protection* (2009). This short piece was written by the senior acridologist P. Symmons in response to the Magor et al. article "Preventive control and Desert Locust plagues" (2008), which had been published in the same journal only a few months prior.

As the title of the commentary suggests, its author sought to rebut the premises and conclusions of the argument for early preventive action put forward by Magor et al.[25] Symmons argued that commitment to proactive preventive control at the FAO and across the locust control apparatus undermine countries' preparedness to respond to severe locust upsurges. Sustaining the larger and more complex organizational apparatus

[25] This back-and-forth in the pages of Crop Protection eventually led to a special meeting at the FAO where the proponents of these respective positions debated in a panel of experts. A key recommendation at the outcome of that meeting was to seek a better definition of what is meant by prevention (Interview, CL, entomologist researcher, personal communication, July 2010).

required by the preventive orientation, he argues, leads to a misallocation of resources that hinders organizations ability to adequately intervene when and where it really matters: once and after upsurges are well established and a significant invasion is underway. Symmons add:

> Campaign success requires the right methods more than the right strategy. These include aerial detection and demarcation of hopper band targets, the treatment of flying swarms, and probably the use of persistent pesticide 'barriers' against marching bands. *However, populations suitable for those methods are unlikely to occur until late in an upsurge and so have at best limited relevance for 'prevention'* [emphasis added]. (Symmons, 2009, p. 907)

The critique of the preventive orientation provided by Symmons points to a view of locust control that favors a combination of (a) a "wait and see" approach vis-à-vis locust breeding dynamics and (b) an all-out campaign of swarm suppression, preferably waged from the air by a small core of highly trained and well experienced locust control officers that intervene only *after* locust groups have reached a given threshold of size, density, coherence, and/or mobility.

Explicit critiques of the preventive approach such as the one provided by Symmons above are rare. That said, arguments on the importance of intervening at later stages of locust gregarization (but without necessary criticizing the notion of prevention) have been somewhat frequent in the literature. These arguments directly or indirectly support efforts of upsurge suppression or upsurge elimination, and can be associated with strategic orientations that are more curative than preventive.

For example, in her investigation of what led to the abrupt termination of the 1966-1968 plague, Bennett (1976) concluded that the most effective intervention was upsurge elimination, i.e. the control of fully gregarious populations as they infest a greatly reduced area at the end of upsurge and at the beginning of plague development,

not before. The sequence of events outlined by this study was the following: (1) rainfall threshold allowed successful breeding of desert locust, increase in numbers, phase change; (2) “control against non-gregarious infestation failed to contain the upsurge”; (3) “but late-control measures against hopper bands and swarms contributed to plague decline”, the conclusion being that “the most economical strategy for plague prevention might be one of upsurge elimination, that is to say control in selected areas against gregarious locusts only” (Bennett, 1976, pp. 512-513) . In other words, treating the areas of initial outbreak and early upsurges is not justified.

Similarly, a study by Wilps (1997) that looked at mortality rates in bands and swarms following outbreaks, indirectly corroborates these conclusions. It suggests that in most cases, the great majority of gregarious offspring are likely to die regardless of intervention, given high predation rates when hopper bands must cross exposed areas. Wilps also emphasizes the importance of natural predators in keeping early gregarization in check. For example, he pointed out that birds such as desert sparrows can sometimes reduce a population to 1% of its total, and predators can decimate, sometimes eliminate, bands up to 100,000 hoppers (Wilps 1997, p. 16). Wilps further suggests that if preventive control be continued, that it focuses only on large bands, and that small bands be controlled by natural predation, which can reliably ensure a 92% mortality rate.

In sum, these studies support the view that by constraining management interventions to later in the upsurge formation, there is much less uncertainty as to whether a specific locust gregarization does indeed constitute a threat to crops and pastures. The “target-blocks” of intervention are also more easily identifiable. Early gregarizations (outbreaks), according to these views, are very difficult to find, and only a small fraction of these gregarizations are likely to ever constitute a locust plague hazard.

It follows that attention to the non- or early- gregarious locusts requires an apparatus of surveillance, reporting, and response that is too costly, impractical to sustain, and, they argue, of limited usefulness.

Adaptive Orientation

The third approach that can be found in literature and conversations with actors in the locust field is what I call the adaptive or ameliorative orientation. This is in some ways a residual category that groups a range of measures periodically proposed by actors somewhat peripheral to the field, especially economists, environmentalists, and development experts that for one reason or another question the desirability of direct attempts at controlling locust populations. Their reservations are usually based on economic or environmental concerns. For example, in the wake of costly responses to the 1987-1989 upsurges several authors have carried out cost-benefit analyses which concluded that attempts to control these invasions were not necessarily justified (Hardeweg, 2001; Joffe, 1995; Krall, 1995; Krall & Herok, 1997). These authors attempted to calculate the direct and indirect costs of locust upsurges (i.e. impacts on agricultural productivity) and the direct and indirect costs of chemical treatments.

One of the most recent and advanced synthesis of these concerns is provided by the economic evaluation of Hardeweg (2001), titled “A Conceptual Framework for Economic Evaluation of Desert Locust Management Interventions”. The 177-page document reviews most of the criticisms of conventional strategies of locust control and calls for alternative. For example, questionning the validity of the food security argument to justify expenditures on locust control, Hardeweg contends that “It has not been proven that the current control strategy is actually preventing losses on farmers’ fields” (2001, p. 17). Citing Krall (1995) (who is elsewhere credited by Hardeweg as having

commissioned and supervised his study), he adds that “It is also doubtful whether desert locust attacks can cause widespread food insecurity”.

Based on these analyses, proponent of the adaptive orientation call for alternative approaches to human-locust relations. The alternative have not been clearly articulated, but tenants of these views tend to argue for programs that compensate producers, either via relief assistance, micro-finance, or insurance programs. In my search of documentation of such insurance regimes, again the most advanced consideration was provided by Hardeweg (2001). Section 3.2.1 of his study, titled “Crop insurance schemes” (pp. 35-39) and section 3.2.2, titled “Public relief disbursement after localized severe damage” (pp. 39-41) discusses the rationale for and implications of distinct crop insurance schemes, namely hail insurance, multiple peril, and desert locust insurance, and contrasts their benefits and drawback with the ones of relief operations and continuation of control (p. 41). Appendix 5 of the document also provides the template of a Contingent Valuation Method survey to evaluate farmers’s valuation of risk premium and their willingness to pay for such premiums. There is no evidence that the implementaiton of these schemes has been attempted in programs.

Calls for compensation and insurance against locust invasions are not new. The two-volume treatise on grasshopper invasions in colonial Algeria by Herculais (1893) reports several instances of similar considerations. Correspondance among colonial officers reported in these volumes show how authorities thought that the campaigns to eradicate the invasions were too costly (p.175). This position was especially highlighted in the light of calls to renumerate the thousands of “indigenous laborers” for the task of collecting, stomping and burying locust eggs and nymphs, and calls by colonialists for extended support by the government. The officers discussed alternative approaches to

these campaings, which included requests for insectivore birds to be introduced in the colony[26] and considerations of ways to marketize grasshoppers carcasses as fertilizer (p. 176). Others requested that a special “grasshopper tax” be imposed to farmers to pay for campaigns (p. 329).[27] Herculais also reports that in 1874 the Governor General of Algeria asked the prefects to consider the establishment of Mutual Insurance Companies financed by small contributions from the farmers, that would protect them from the impacts of depredations.[28] This proposal by the Governor General was received with some reservations by the prefects, however. For example, the Prefect of Algers responded that “the establishment of such Mutual Insurance Companies could constitute a danger, because the farmers, assured to be compensated, no longer would fight the scourge with the same energy, their interests would be saved at the expense of public wealth.”[29] These late 19th century considerations of “grasshopper insurance regimes” reported by Herculais share much with the contemporary considerations of similar financial responses. Interestingly, the historical suggestions seem to have ended in the same ways as the contemporay ones: without significant follow-up, let alone actual implementation.

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[26] Page 736 in Herculais (1893) includes a memo from a colonial officer asking a subordinate about the whereabouts of some of these introduced birds. This memo suggests that the introduction may have not yielded the sought results.

[27] Herculais, p. 329: “D'autre part, des particuliers avaient également soulevé la question de l'impôt sur les propriétés: M. Angelbert (24 juillet 1874) notamment avait proposé au Conseil général d'Oran, de créer sous le nom d'Impôt des Sauterelles, un impôt de 1 franc par hectare, dont le produit devait servir à payer le ramassage des oeufs, les indigènes recevant une somme détérminée par kilogramme d'oeufs.”

[28] Herculais, p. 329: “Saisi de la question, le Gouverneur général avait prié les Préfets (4 mai 1874) ‘d'étudier s'il ne conviendrait pas de chercher à établir des Sociétés d'Assurances mutuelles qui, au moyen d'une légère cotisation des agriculteurs, les mettrait à l'abri, par l'attribution des indemnités, des pertes auxquelles ils sont souvent exposés.’”

[29] Herculais, p. 329: “Dans la pensée du Préfet d'Alger, la constitution de Société d'Assurances mutuelles pouvait constituer un danger, car les cultivateurs, assurés d'être indemnisés, ne combattraient plus le fléau avec la même énergie; leurs intérêts se trouveraient sauvegardés au détriment de la fortune publique. ”

In their modern incarnation, calls for adaptive approaches to desert locusts are strongly intertwined with concerns about the impact of toxic insecticides on people and their environments. The texts of several economic evaluations mentioned above discuss these eco-toxicological concerns to both justify and enhance their cost-benefit analyses of locust control. Similarly, authors that highlight the eco-toxicological impact of pesticide use in locust control are the ones who cite most prominently these economic evaluations (El Bashir, 1997; Pesticide Action Network UK, 1998; Peveling, 2005). Together these diverse groups and organizations are grouped in so far as they call for alternative approaches to locusts (El Bashir, 1997; Everts & Ba, 1997). In this sense, engagements with human-locust relations whose primary objective is reduce the toxic effect of locust control can be considered, to some degree, as adaptive. Consider for example this except from a document released in by the Pesticide Action Network UK (1998) title "Desert Locust Control in Africa:

> After the 1950s chemical pesticides raised expectations that locust plagues could be controlled by spraying breeding areas, or spraying the swarms in the air. Money was spent on chemicals, equipment, and organisational infrastructure to monitor outbreaks. But increasingly donors and locust-affected countries are questioning whether money may not be better spent in improving crop storage, or crop insurance, local food aid or other more appropriate forms of assistance. (Pesticide Action Network UK, 1998, p. 1)

The same document questions whether locust management efforts have effectively made a difference in containing or suppressing invasions: "There is little evidence that chemical controls—as opposed to winds, rain or lack of food—have wiped out plagues" (Pesticide Action Network UK, 1998, p. 1). Questioning whether locusts do cause damage at a national scale, the organization praises attempts "to assess the damage caused by locusts and set this in a national context, to see whether money may be better spent in other ways" (Pesticide Action Network UK, 1998, p. 1). Among these

attempts, it highlights the conclusion by an evaluation of the GTZ that “No large scale famines have been caused by locusts during the last 50 years, and probably not during the last 150 years”.

This adaptive orientation is persistent yet rather marginal in applied acridology. Locust control experts interviewed for this study have tended to describe these ameliorative prescriptions with some annoyance, reporting that it is something that always resurface, and with which they must compose, but that they think is based on mistaken assumptions and that are not feasible in the current situation. Because this orientation is rather peripheral to the epistemic community of locust control experts under study, my engagement with it is minimal. That said, examining this third approach and examining how acridologists disagree with tenants of that approach help determining, by contradistinction, the rationales underpinning the other two sets of orientations (preventive and curative).

Nature of the Debates

The typology of the three orientations described above helps understand the relation between competing visions and prescriptions of locust management. The relation between these visions is best understood a continuum of positions that are combined and recombined by organizations and individual actors as they carry out and represent their work. The three positions are best understood as linked sequentially *and* co-existing simultaneously. Preventive efforts make sense during recession periods. And most agree than when upsurges do occur, i.e. when preventive control ‘fails’, attempt to suppress and eliminate these upsurges before a plague forms are necessary. During locust recession periods when only solitary individual locusts can be found (if at all), dissenting voices that argue for curative or adaptive strategies become marginal. Again,

the debate about these approaches pertain to the level of priority that each orientation should be given, and how the use of financial, material, and intellectual resources ought to be allocated for each.

Proponents of preventive locust control describe two types of criticisms that they often face and whose preponderance, they argue hinders their work. First is the idea that preventive control is always bound to be "victim of its success" (EL, locust control officer, personal communication, Rome, July 2012): when prevention works, the rarity and diminished magnitude of locust upsurges encourages governments to minimize the importance of locust management, and consequently to diminish budgets allocated to this work. Second, when upsurges do occur, many are quick to question the entire notion of preventive control, taking the occurrence of upsurge as evidence of the uselessness of this approach.

These two challenges have often been compared by interviewed locust managers to the ones faced by forest fire protection services:

> It is the same problem with forest fires, fire prevention in France, preventive and active control. When all fires are prevented, there are no fires, fire prevention budgets are reduced... The other aspect is that there is always a risk, it is never zero ("le risque zéro n'existe pas"). So, when, in a given year there is a fire that burns 50,000 hectares, people say: your preventive approach, it does not work. (NA, senior locust control specialist, personal communication, October 2011)

For these manages, cost-benefit evaluations are biased because they only measure the damage caused by these hazards whereas they should also incorporate an evaluation of how much of this damage has been avoided by preventive measures: "The question is not the number of hectares destroyed, but the number of hectares protected" (NA, senior locust control specialist, personal communication, October 2011).

As another senior acridologist puts it, while curative approaches are often

necessary, may succeed at their pursued goals on their own, and are “less complicated”, the preventive approach holds the promise of being durable and diminishing the magnitude of upsurges:

> Prevention is costly to sustain. It takes a lot of energy. The act of prevention that works, it’s an act that allows the country to put in place an apparatus that is perennial, that is durable, and that allows the country to manage its own problem in the future. Personally, I consider that it justifies the investment. But it’s more complicated. Much more complicated. Curative action, you come with aircrafts, insecticides, and you leave after, it’s over. Sometimes, you need that. When prevention has not worked, and, there you are, you have to be ready to do curative interventions, and request help from others. If the countries are poor, they can’t carry out these curative interventions because they don’t have the means to do that. But they must at least have the means to do prevention, because the more they have the means to do preventive control, the more does the risk of invasion decrease—although the risk always will exist; we start of course from the principle that invasions will always happen one day. (SJ, entomologist researcher, personal communication, July 2010)

The debates between proponents of these respective orientations resurface during and after significant locust upsurges, which even the staunchest advocates of preventive control recognize is always bound to. In these conditions, a great number of ‘new’ actors are appointed (or appoint themselves) to comment, evaluate, and re-invent how locust control ought to be carried out. These people include foreign aid policy experts, state officials, FAO delegates, and consultants specialized in diverse fields from food security, project management, governance, pesticide safety, and so on. What happens then, according to interviewed acridologists, is that these newcomers come “to find out what did not work in preventive control”, and then see what else can be done.

It is under these circumstances that other strategic orientations start to receive attention as possible alternative to preventive strategies, thus diluting the professional consensus on that orientation to locust management. Donor agencies may second-guess whether the low intensity, constant, funding streams that they provide in support of

preventive measures is really justified, and may ask whether a curative approach may be more cost-efficient instead (MC, foreign aid officer, personal communication, Rome, June 2012). Others with a particular sensitivity to health and environmental concerns may be worried about the vast quantities of chemical pesticides being brought in and diffused across the region, and call for alternatives to chemical intervention, such as insurance regimes. During and in the wake of these upsurges, then, perspectives that tend to be dormant during recession periods resurface, and the 'soft consensus' of preventive control is then explicitly challenged until the next recession (or shortly thereafter). The diversity of interpretations is somewhat "masked" by the absence of locust activity.

The arguments for and against each of these strategies tend to be based on similar combinations of computer modeling of locust population dynamics and assumptions about the organizational requirements needed to contain these dynamics. These debates are often highly technical in nature, but proponents of one or another orientation tend to draw on social and institutional arguments to augment their technical considerations. For example, returning to the debate between Magor et al. (2008) and Symmons (2009), the initial analysis (by Magor et al.) emphasized issues of costs. The critique of that emphasis by Symmons stressed the challenge of maintaining the organizational structure of an effective apparatus of locust management during long periods of locust recession. Moreover, Symmons questions the validity of focusing control efforts on earlier stages of locust life-stages because of the difficulty of clearly "demarcating target blocks" that this focus entails. He attributes to persistence of this focus on 'hoppers' to technological and political factors:

> It is, at first glance, hard to understand why hopper control has remained the chief technique for combating a plague. In part, the reason is a failure

> to appreciate how radically the withdrawal of dieldrin has changed hopper control; in part, the reason is a failure to acknowledge control failure. To some extent this is deliberate: in the words of Sir Boris Uvarov, 'Swarms never leave countries, they only invade countries'. There is political pressure on those in charge of operations to claim success. (Symmons, 1992)

Elsewhere, the call by Michel Lecoq for a greater attention to the institutional/social dimensions of locust management concludes by recognizing that such a conceptual shift is indeed occurring:

> The old locust control concepts are based on 'phases', 'outbreak areas', 'ecological conditions', 'crop protection', 'preventive control', 'emergency planning', etc. New concepts are being introduced, involving 'natural risk management systems', 'stakeholder strategies', 'governance', 'regional public assets', 'strategic analysis', etc. We consider that these new concepts highlight the recent development of what could be called a truly new locust-control paradigm. The old paradigm was focused on the locust and its ecology, studied with the aim of gaining insight. The new paradigm is more focused on humans and the interactions between them and locusts. The focus of locust control studies, if a sustainable solution is to be found, should not simply be the locust, but also humanity, its real motives, competing interests an organization strategies. (Lecoq, 2005, p. 185)

I concentrate on these institutional and social dimensions. What do the genealogies of these preferences, and their respective organizational requirements and effects tell us about the political geography of locust control? What models of social-ecological relations underpin the selection and stabilization of these approaches? What kinds of power-knowledge are respectively favored by these competing approaches, and how do the instrument-effect thus produces influences how institutions respond to the swarming of locusts? These questions call for a consideration of the literature on the relations between institutions and ecosystems.

Institutions and Ecosystems

Ecosystems are immensely complex and dynamic patterns of biophysical processes that tend to self-organize in semi-stable states. As people seek to manage—control, produce, prevent—specific ecological dynamics, they simplify, or 'carve off' parts of these patterns. This is how sub-sets of complex social-ecological relations become framed as 'natural resources' or 'natural hazards'; these are abstractions from a much greater whole. In other words, environmental management invariably requires some simplification of ecological complexity. Managers and resource users operate on a model of nature. This invites questions of why and how certain models become stabilized and selected over others. In the case of acridology, the question becomes how locust experts go about 'carving off' some elements of the immensely complex, unpredictable, emergent, and biogeographically stochastic breeding and gregarization dynamics of the insect to turn them into objects of management intervention.

Institutional visions of nature

The scholarship on nature-society relations, and on institutions and ecosystems in particular, provides useful points of reference on this issue. Several authors in this vast field have addressed the diverse ways in which the logic and imperative of social organizations shape how ecological processes are seen, constructed, and managed. For example, James Scott's *Seeing Like a State* (1998) discusses how states and other similar types of what he calls "high-modernist" organizations tend to favor to favor abstract, schematic, simplified knowledge, and standardized configurations that increase legibility, which together makes people and things more easily brought under replicable management regimes. Scott contrasts this state-vision as a 'view from nowhere' that differs from the 'learning by doing' that, he contends, is more attuned to micro-

variations in local conditions. Scott calls this abstract, technical, and universal, "one-size fits all" approach to knowledge *techne,* and he calls the second approach *métis*. Scott's distinction between *techne* and *métis* has been aptly criticized as overly simplistic, if not completely erroneous (Laitin, 1999; Tilly, 1999). A more careful examination of the relationship between these two ways of knowing and doing, the abstract and the practical, do not exist in isolation from one another but always re-combine and complement one another (Ingold, 2000). Despite these and other similar flaws, Scott's formulation has been quite influential in political ecology and related fields, especially because it provides a vocabulary useful to talk about how complexity is approached in management practice.

This metaphorical formulation of organizations fostering certain ways of 'seeing' ecological and social interactions over others has been used by other authors that do or do not draw directly on Scott. For example, James Ferguson's article "Seeing like an oil company" (2005) extends and problematizes Scott's thesis. Ferguson stresses how extractive capital in Africa operates in ways that are far from constrained by the territorial legibility of state space but that 'hops' from one "spatially segregated mineral-extraction" enclave to another" (p. 379). Eric Carter's geo-historical examination of government responses to Malaria in 19th century in northeastern Argentina (2008) similarly documented how authorities created the legible spaces necessary for state-vision by attempting to administer malaria.

Another similar use of ocular metaphors can be found in Morgan Robertson's consideration of "Nature that capital can see" (2006). Robertson study's examined the relation between attempts to commodify wetland ecosystem services and the difficulty of

producing ecological knowledge—in this case taxonomic designation of aquatic plants—that is sufficiently stable to serve as benchmarks for market transactions.

A thread common to the texts mentioned above (and many other in nature-society scholarship) is that modern organizations tend to prefer views of nature that are relatively simplified over, views that 'work with' complexity. Influential authors in environmental sciences and environmental studies have criticized reductionist, "command and control" tendencies in environmental management (Costanza, Norton, & Haskell, 1992; Holling & Gunderson, 2002; Holling & Meffe, 1996; Ludwig, 2001). These critics usually attribute part of the blame for what they consider as brittle, non-adaptive approaches to ecological knowledge and practices to biological science's assumption of ecosystem equilibrium, or a "balance of nature" (Botkin, 1990; Levin, 1999; Pimm, 1991).[30]

A reader of the types of critiques mentioned above could reasonably expect that locust managers favor strategies that are more reductionist over others that are less so. After all, this management is under the purview of central state agencies (including military or semi-military regimes not adverse to extremely top-down forms of rule!). This raises the question: as they seek to deal with such an overwhelmingly complex management problem as the one presented by the desert locust, do acridologists prefer and pursue approaches that are comparatively more simplistic, top-down and reductionist versus those approaches that are more attuned to the contingent, variable,

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[30] Similarly, scholarship on traditional ecological knowledge (and/or indigenous knowledge) has argued that many cultural approaches to knowing nature are more holistic and attuned to social-ecological variability and unpredictability than the "Western" tradition of scientific thought (Berkes, 2008; Berkes, Colding, & Folke, 2000; Gadgil, Berkes, & Folke, 1993; Toledo, 1992). Some of my own previous work contributed to that literature (Peloquin & Berkes, 2009).

local, and interdependent character of social-ecological processes? It turns out that the findings from this study challenge this expectation that acridologists would favor the most reductionist, simplistic, 'brittle' approach to locust management.

Returning to the distinction between the preventive and the curative approaches to locust management discussed above, I reported earlier that the preventive approach is by far the dominant orientation among experts, practitioners, and policy-makers. As I explain in greater detail below, the preventive orientation calls for a greater sensitivity to and engagement with social-ecological complexity than the curative approach. Again, this dominance of the preventive approach, then, runs counter to the expectations of reductionist state-vision discussed above. Why is that so? I will address this question in the remainder of the chapter with two purposes in mind: (1) to identify and explain the processes underpinning the preference of this relatively more 'complexity-friendly' orientation of locust management amongst organizations, and (2) to explore the implications of these processes for our understanding of how what kind of nature is preferentially seen by the institutions of development.

This notion of ecologically reductionist vision was addressed differently in a study by Shaw, Robbins, and Jones (2010) on how institutions 'see' one type of insect: the common mosquito. The study in question provides a useful entry point for the discussion to follow. Shaw et al. examined the distinct forms of mosquito management respectively favored by the agencies responsible for mosquito control in the two main metropolitan areas of Arizona (Phoenix and Tucson). These two positions encountered in ethnographic research among mosquito managers in Arizona respectively echo the positions of two famous historical figures in applied entomology broadly and malaria eradication: William Georgas (1854-1920) and Frederick Soper (1893-1977).

Drawing on the work of Gilles Deleuze and Felix Guattari (1987), they explore the differences between two spatial ontologies of mosquito management at play in these agencies. One ontological approach is the "'transcendent verticalism' underwriting the partitioning of space in support of chemical spraying of adult populations" (Shaw et al., p. 375). This underpins a military-like and grid-based management orientation that seeks to emulate a "view from nowhere" concerned with intervening only when mosquito density in a given spatial block crosses a given threshold. This 'transcendent verticalism' is associated with the U.S. American epidemiologist Frederick Lowe Soper. The authors described the other ontological approach as "'an immanent horizontalism' underwriting an intimate strategy of detection and destruction of breeding sites" (p. 375). This underpins a management orientation concerned with tracking and early termination of larval development, which in turn entails monitoring and controlling breeding micro-habitats. This on-the ground horizontalism is associated with U.S. American military physician Georgas.

The ontological typology of mosquito management provided by Shaw et al. is helpful in guiding our examination of how the different approaches of locust control relate to one another. The two approaches to mosquito management that they have identified have much in common with the preventive orientation and the curative orientation respectively.

The curative orientation entails remotely tracking locust gregarizations and *not* intervening unless outbreaks cross a given threshold in size and density, at which curative responses entail massive campaign of upsurge suppression and elimination, preferably using aircraft. This orientation has much in common with the verticalist, transcendent, top-down, 'view from nowhere' of mosquito control identified by Shaw et

al. The curative orientation thus concentrates management capacity and action, and limits itself to a comparatively narrow set of practices and knowledge, which makes it comparatively more reductionist, both in its engagement of locust ecology and in the type of management prescription practices it supports.

Alternatively, the preventive orientation of locust management swarms requires a nuanced understanding and constant modeling, prediction, and ultimately, synchronization with, the dynamics of phase change, gregarization, upsurges, and re-solitarization of locust populations. This orientation calls for a greater alignment and engagement with the complexity of locust ecological dynamics, rather than its simplification. It thus favors organizational arrangements whose manifestation mimics the horizontalist, rhizomatically expanding immanence of the locust, for example by requiring the training and hiring of vast team of locust surveyors informed by scientific research on locust biotopes and bio-geographical factors of gregarization. Doing so, the horizontalist ontology operates by directly engaging with the conditions produced by ecological complexity, such as emergence and indeterminacy.

Returning to Shaw et al.'s discussion of the spatial ontologies of mosquito management, Gorgas's horizontalism and Soper's verticalism respectively match the requirements of the preventive and curative orientations of locust management. This is illustrated by the authors' citation of an article in the New Yorker magazine on Soper, titled "The Mosquito Killer":

> Gorgas, Soper's legendary predecessor, said that in order to fight malaria, you had to learn to think like a mosquito. Soper disagreed. Fighting malaria, he said, had very little to do with the intricacies of science and biology. (Gladwell, 2001, p. 44, cited by Shaw et al. 2010, p. 377)

Shaw et al. state their normative preference for the horizontalist ontology, arguing that it enables a view that is more attuned with the immanent, "rhizomatic" nature of mosquito

population dynamics than the arguably more rigid and monolithic vertical transcendalism: Gorgas's "on-the-ground horizontalism", they contend, "is more attuned to capturing the immanence of the bug's life" (p. 378).

Again, the ontological typology of mosquito management is useful in providing a conceptual vocabulary to better understand the relation between competing orientations of locust control. That said, their article tells us very little, if anything, on *why* some approaches and understandings of pest problems and solutions become stabilized and selected over other by organizations. The assertion, just made above, that the preventive orientation in locust control shares much with the horizontal ontology of mosquito management tells us very little about why and how this orientation has become dominant in acridology circles. Neither is answered the question of why organizations of locust control *do not* favor the orientation that is more compatible with the reductionist preferences of state-vision, for example. To answer these questions I turn to the relation between (1) the respective spatial logics of these competing orientations of locust management, and (2) the institutional constraints and incentives that operate on locust expertise. Put differently, to what kind of institutional problem is the preventive orientation the solution? I approach these two sets of items conjointly and examine how they are interrelated. This allows to understand why the preventive orientation is dominant despite, if not because, it better engages with ecological complexity. At the same time, this investigation sheds light on under-theorized dimensions of the political geography and political economy of ecological expertise in supra-national institutions of development, and the relation between these institutional processes and developmental statecraft.

The Political Economy of Locust Expertise: Cycles of Crisis and Oblivion

A key challenge to maintaining the professional viability of locust-related expertise is the difficulty of sustaining its relevancy during periods when political authorities are not concerned by or interested in the locust problem. In other words, locust scientists must find ways to "stay afloat" (Levine, 2007) vis-à-vis client and funding agencies despite prolonged dormancy of the locust problem. The particular dynamic of this relation between locust science and political authorities has been described by entomologist Michel Lecoq as a cycle of crisis and oblivion (Lecoq, 2005). To explain this, I first describe how the locust problem becomes 'forgotten' by organizations and how it emerges as key domain of intervention. Following this, I explore how the scientific and technical experts in acridology at Cirad, in Montpellier, France, compose with this dynamic. I conclude by explaining how the stabilization and selection of the dominant approach of locust control—the preventive orientation—contributes to diminishing the forgetting, maintaining attention on the locust problem and on the importance of locust expertise as its solution.

The Forgotten Locust

The locust problem periodically becomes a non-issue for political authorities and funding agencies. Much of this forgetting occurs during the much longer and protracted periods of "non-crises" when the dormancy of the locust problem makes it a non-issue for states, donors, and populations. This is compounded by the fact that acridologists are specialized on a pest that, in addition to not being a visible issue most of the time, tends to not be of concern to one agricultural industry in particular, as locusts are relatively omnivorous and not tied to specific sites or crops. Other scientists doing applied research on pest management in tropical agriculture tend to be closely associated with

one crop or commodity. For example, some teams concentrate on coffee, bananas, cotton, and so on, and consequently deal with pests in so far as they affect or threaten this specific crop. In most cases, even if pest threats can be cyclical, these researchers have a relatively well established constituency, through industrial and commercial interests, to sustain their work. It is hardly the case for locust experts, whose client agencies lack such consolidation. Put differently, the locust problem is often quite peripheral to political authorities because the insect is so elusive and because the threat it continues to pose during recession periods does not concern a specific public.

Proponents of both preventive and curative approaches agree on the severity of the institutional challenge posed by the forgettability of the locust problem. In fact both sides frame their argument in terms that pertain to how their respective strategic preference best resolve this institutional challenge. While most work on locust control is concerned with avoiding protracted locust plagues (persistent, multi-generational and mobile groups of locust bands and swarms), scientific experts in the field of locust ecology and control argue for one or another strategic orientation often based on how the institutional requirements of their favored approach helps sustaining a viable international locust control apparatus. Before expanding on this, it is necessary to pay greater attention to how the locust problem becomes relevant.

The Techno-Politically Relevant Locust

There are two main modes in which the locust problem receives attention from government agencies and international organizations. The self-evident mode is when locust swarms form an invasion of spectacular proportion, threatening food security in a given region. This was the case in the massive invasions in the 1940s, mid-1960s, 1987-1989, and 2003-2005. This is the “crisis” mode of the cycle of forgetting and crisis

identified by Lecoq (2005). In this mode, countries and organizations that have, throughout the preceding recession, chosen to not invest in research and monitoring on the dormant threat was constituted by the locust, scramble to catch up, become suddenly obsessed and panicked by invasion, and have no qualms about devoting many more times the quantity of resources that they chose to not spend during recession, because they must "do something" in response to the now very visible and tangible problem. The importance of responding to the crisis is self-evident when upsurges do occur. The spectacular nature of the swarms and plagues, and the appeal of that spectacle to media, politicians, and relief organizations alike make it that invasions foster a great interest and great financing of locust expertise. In that sense, the curative approach is the "natural" outcome of invasions, and as such it does require much "cultivating": upsurges are spectacular events that lead to often equally spectacular responses by political authorities and extensive coverage by the press.

The other mode whereby locust expertise gains and maintains its relevancy operates somewhat autonomously from the upsurge cycle. It pertains to the interest that political authorities, interest groups, policy makers, may have in the instrument-effect of the applied scientific expertise and interventions on locust populations. This relationship is slightly more elusive.

Locust upsurges are highly sporadic, both in their periodicity and their spatial distribution, and their depredations may impact populations as diverse as citrus growers in Morocco, nomadic herders in Mauritania, and subsistence farmers in Burkina Faso. This *diffuses* the interest in and concern for the locust problem in time and space, and across diverse publics whose ability to engage with let alone sustain entomological specialization is quite limited. In this sense, as I mentioned above, applied acridology

can be considered an “orphan discipline” within tropical agronomy, in part because this entomological sub-field is not tied to a specific commodity or group of commodities, and consequently lacks a well vested constituency with commercial concerns (SJ, entomologist researcher, personal communication, June 2012).

What the locust problem provides, however, is a field of techno-political experimentation and performance whose specificities make it quite appealing to authorities under certain conditions. In the introduction and third chapter of this dissertation, I mentioned ways in which the locust problem presents opportunities to innovate, perform, and represent discursive practices of social rule that would be more difficult to achieve without the enlisting of the locusts and locust experts. Examples of such purposes include the French state secretary of defense’s mention of locust control exercise as exactly the type of joint-military-civilian collaboration that is increasingly in demand in the 21st century, or the French Resistance urgent summoning of locust experts to create a federal apparatus of techno-scientific benevolence in the face of an important crisis of sovereign legitimacy during the Second World War. As I argue below, it is this type of innovative techno-political relevancy that locust experts seek to cultivate to sustain interest in their work despite long periods of locust inactivity. My analysis of interviews and documents pertaining to locust experts suggests that part of what makes one strategic orientation of locust control preferred over another by actors and organizations is the perceived or demonstrated ability of said orientation to foster this type of relevancy.

Since at least the mid-1970s, international development organizations and programs have been the principal clients, or at least funders of, locust expertise. I argue that the dominance of the preventive control orientation in international locust control

is, at least in part, a product of the better fit of this orientation with the logic and imperative of these development agencies.

Multi-Species Switching Strategies and the Pursuit of Relevancy

Looking at how locust experts at Cirad "stayed afloat", i.e. how they ensured that their expertise remained relevant in the face of such haphazard locust population dynamics provides some guidance to our analysis. This calls for a brief description of the institutional context of French locust expertise.

The profession of acridologist in France, was from the early 20th century to the 1960s, embedded within the colonial field of tropical agriculture (Vayssière 1980). Zolotaresky, Pasquier, and others found work in colonial agencies in the African continent. Following the independence of the colonies in the late 1950 and 1960s, much of this tropical agronomic science was repatriated and merged into what became first Gerdat, then Cirad-Gerdat and eventually Cirad. This center was established under the purview of the French Minister of Cooperation and Development.

In 1962, five French entomologists received a grant from the United Nations Development Programme (UNDP) to carry out doctoral research on the Migratory Locust (*Locusta migratoria*) in Madagascar. Upon completion of that program, one researcher chose an academic research career in a University, and the other four joined what would eventually become Cirad (initially Groupement d'étude et de recherche pour le développement de l'agronomie tropicale: Gerdat), where they formed the Prifas, "operational acridology" program. The designation Prifas has been applied to different appellations over the years, but it most commonly referred to French Programme of Interdisciplinary Research into the Locusts and Grasshoppers of the Sahel (*Programme de Recherches Interdisciplinaires Francais sur les Acridiens du Sahel*). It was initially

conceived as a program of support to Oclalav (CL, entomologist researcher, personal communication, Montpellier, September 2011).

The Prifas was established in 1968, and it has undergone several waves of transformation from then to the present. In 2005 it became Cirad-Acridologie (which was translated in English as Locust Ecology and Control Research Unit), a research unit. This unit was transformed again in 2011, as it was "downgraded" to research team within the "Bioagresseurs: analyse et maîtrise du risque" research unit. For the sake of simplicity and to retain historical continuity, I group these different manifestations and appellations under the designation Prifas.

When I first arrived to the office of the then Research Unit of the Baillarguet Cirad Campus in Montferrier-sur-Lez, in the semi-rural outskirt of Montpellier, France, in summer 2010, there were nine employees, including researchers, lab and computer technicians and an administrative assistant. These numbers have fluctuated up and down over the years. From the early 1970s to early 1980s, the program increased the size of its staff from four to eight. This increase in size continued until it reached a peak around 1991, with 22 people. This large size was seen by critics within Cirad as not viable in the long run, especially given the reliance on project funding. Since then it has oscillated around 10-12.

The mandate of this program/unit/team was somewhat consistent throughout, however. Its researchers carry out research on locust ecology and biology, which although can be rather fundamental in orientation, is meant to be directly applicable in helping developing countries minimize agricultural losses caused by locusts. To this end, the larger Cirad organization provides the infrastructure and a portion of the operational budget, which ought to be augmented by project-specific grants. Although the actual

breakdown of this distribution oscillated greatly over the years, Cirad usually provides around 20% of the funding, whereas 80% comes from partners and grants (SJ entomologist researcher, personal communication, Montpellier, September 2011).

This touches on one key manifestation of this cycle of crisis and oblivion in locust science: the stochastic nature of donors' interests in financing applied research on locust control. Again, during upsurges and plagues, bilateral and multilateral aid organizations are eager to spend dozens of millions of dollars in response to the locust problem, but hesitate to spend even a fraction of that during periods of locust recession. This renders difficult the ability to sustain research-based expertise over the long run. As on acridologist put it during an interview:

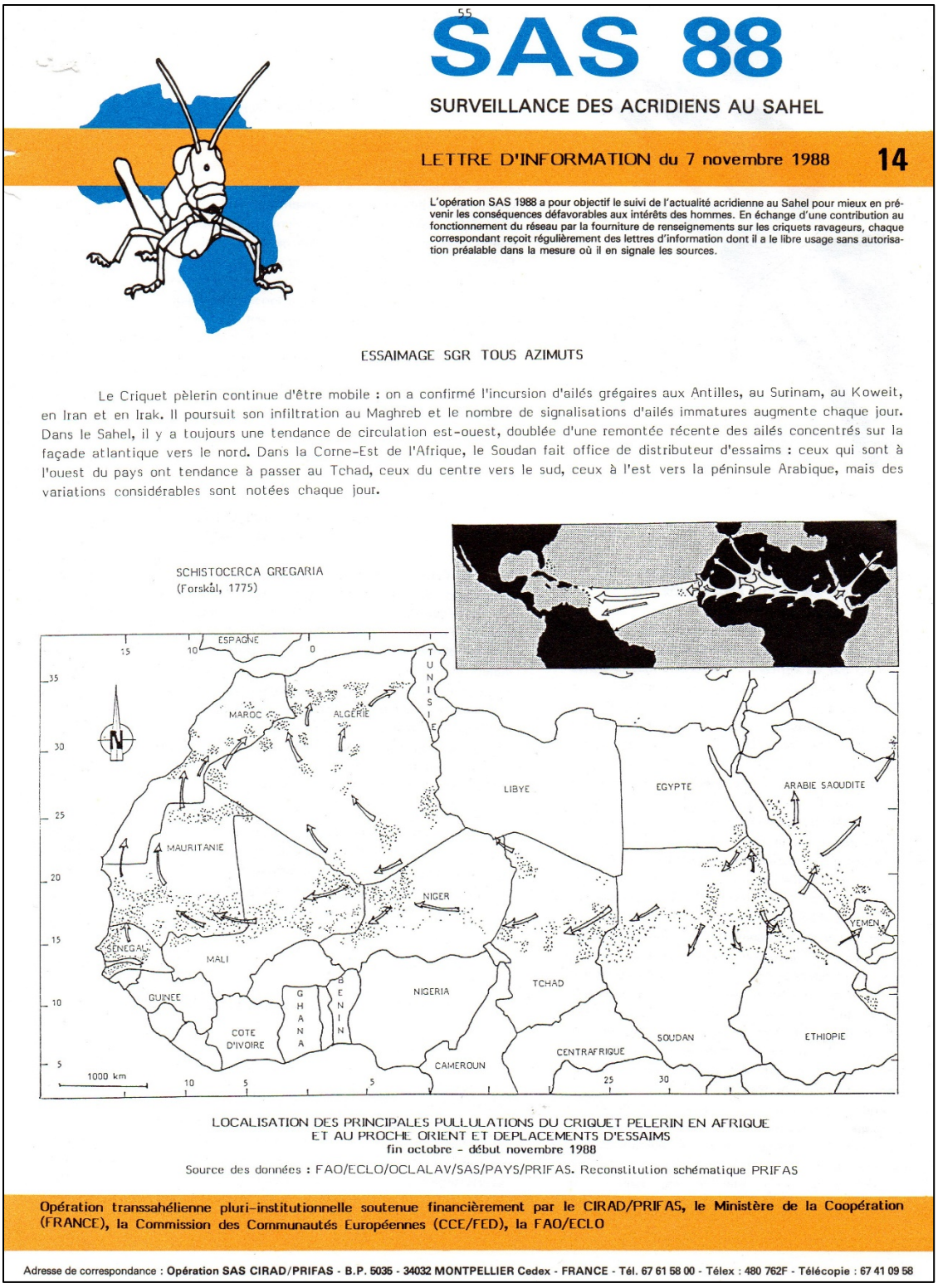
> The funding we are working on today, it's the funding from the last invasion. But now, if there is no invasion in the next two years, we'll be in a bad shape... it's complicated, the situation is complicated. (SJ, entomologist researcher, personal communication, Montpellier, July, 2010)

This quote should not be simply interpreted as saying that acridologists are happily dependent on invasions for funding sources. Rather, it suggests that a key institutional challenge that they face is the ability to receive funding when long period of recession diminishes donors' attention to the problem. The question that this brings about, in turn, is how these scientific actors go about ensuring that their budgets remain viable despite locust inactivity?

Based on my examination of the work produced by Cirad-Prifas over the years, informed by institutional historical documents (Duranton, Launois, Launois-Luong, & Lecoq, 1996; Duranton, Launois, Launois-Luong, & Lecoq, 1978), and interviews with its members, I have identified two patterns that provide some plausible, even if partial,

responses to these questions. The first is a practice of species-switching, the second is a pattern of alternating donor partnerships over time.

By species-switching, I mean that the locust experts at Cirad have alternated over the years their focus on diverse species of the dozen or so locust species that can and do become problematic at one time or another. This pattern became apparent to me when I analyzed the content of the Prifas bi-monthly newsletter (SAS, Surveillance des Acridiens au Sahel, 1986-1996). This newsletter (see figure 4.2) had the function of keeping partners informed about developments in research and in locust activity throughout the region of locust habitat. Reading the sequential bi-weekly editions of this document, one could not help but notice, or at least get the impression, that the alarm is raised about one species for a certain time length of time—a length of time whose duration is bound to increase with actual locust activity. As this level of 'alarm' recedes, the newsletter loses focus on a particular species and diffuses attention to several minor ones until the next 'spike' of concern.



SAS 88

SURVEILLANCE DES ACRIDIENS AU SAHEL

LETTRE D'INFORMATION du 7 novembre 1988 **14**

L'opération SAS 1988 a pour objectif le suivi de l'actualité acridienne au Sahel pour mieux en prévenir les conséquences défavorables aux intérêts des hommes. En échange d'une contribution au fonctionnement du réseau par la fourniture de renseignements sur les criquets ravageurs, chaque correspondant reçoit régulièrement des lettres d'information dont il a le libre usage sans autorisation préalable dans la mesure où il en signale les sources.

ESSAIMAGE SGR TOUS AZIMUTS

Le Criquet pèlerin continue d'être mobile : on a confirmé l'incursion d'ailés grégaires aux Antilles, au Surinam, au Koweit, en Iran et en Irak. Il poursuit son infiltration au Maghreb et le nombre de signalisations d'ailés immatures augmente chaque jour. Dans le Sahel, il y a toujours une tendance de circulation est-ouest, doublée d'une remontée récente des ailés concentrés sur la façade atlantique vers le nord. Dans la Corne-Est de l'Afrique, le Soudan fait office de distributeur d'essaims : ceux qui sont à l'ouest du pays ont tendance à passer au Tchad, ceux du centre vers le sud, ceux à l'est vers la péninsule Arabique, mais des variations considérables sont notées chaque jour.

SCHISTOCERCA GREGARIA
(Forskål, 1775)

LOCALISATION DES PRINCIPALES PULLULATIONS DU CRIQUET PELERIN EN AFRIQUE
ET AU PROCHE ORIENT ET DEPLACEMENTS D'ESSAIMS
fin octobre - début novembre 1988

Source des données : FAO/ECLO/OCLALAV/SAS/PAYS/PRIFAS. Reconstitution schématique PRIFAS

Opération transsahélienne pluri-institutionnelle soutenue financièrement par le CIRAD/PRIFAS, le Ministère de la Coopération (FRANCE), la Commission des Communautés Européennes (CCE/FED), la FAO/ECLO

Adresse de correspondance : **Opération SAS CIRAD/PRIFAS - B.P. 5035 - 34032 MONTPELLIER Cedex - FRANCE - Tél. 67 61 58 00 - Télex : 480 762F - Télécopie : 67 41 09 58**

Figure 4.2 Cover page of a SAS newsletter of Cirad-Prifas

To illustrate this pattern, I sought to quantify the mentions of distinct locust species in each issue of the newsletter from 1986 to 1996. To arrive at a representative "weight" of each mention, I counted one unit for each paragraph, graphic, caption, or country of observation, paying attention to all the different expression used to refer to a given species. Each curve on the graph represents the mentions of each species in a given issue of the newsletter. The species are identified by the abbreviations used in the newsletter and in many elements of locust literature in these years. SGR stands for Schistocerca gregaria, the desert locust; OSE for the senegalese grasshopper, *Oedaleus senegalensis*; LMI for the migratory locust *Locusta migratoria*. These are the three species most commonly mentioned in the newsletter. After this are ASI *Aiolopus simulator*, HDA African rice grasshopper, *Hieroglyphus daganensis*, KAN *Kraussaria angulifera* and ZVA variegated grasshopper, *Zonocerus variegatus*.[31]

[31] Prifas carried out a survey among its corresponding organizations to collect data on the number of observed species of pest locusts and grasshoppers. 40% of the observations (n=347) pertained to OSE, followed by KAN (9.5%, n=82), and SGR (8.1%, n=70). Given the variability of locust population dynamics, the severity of the threat posed by a given species is not commensurable with the frequency of reported observations over a given time period.

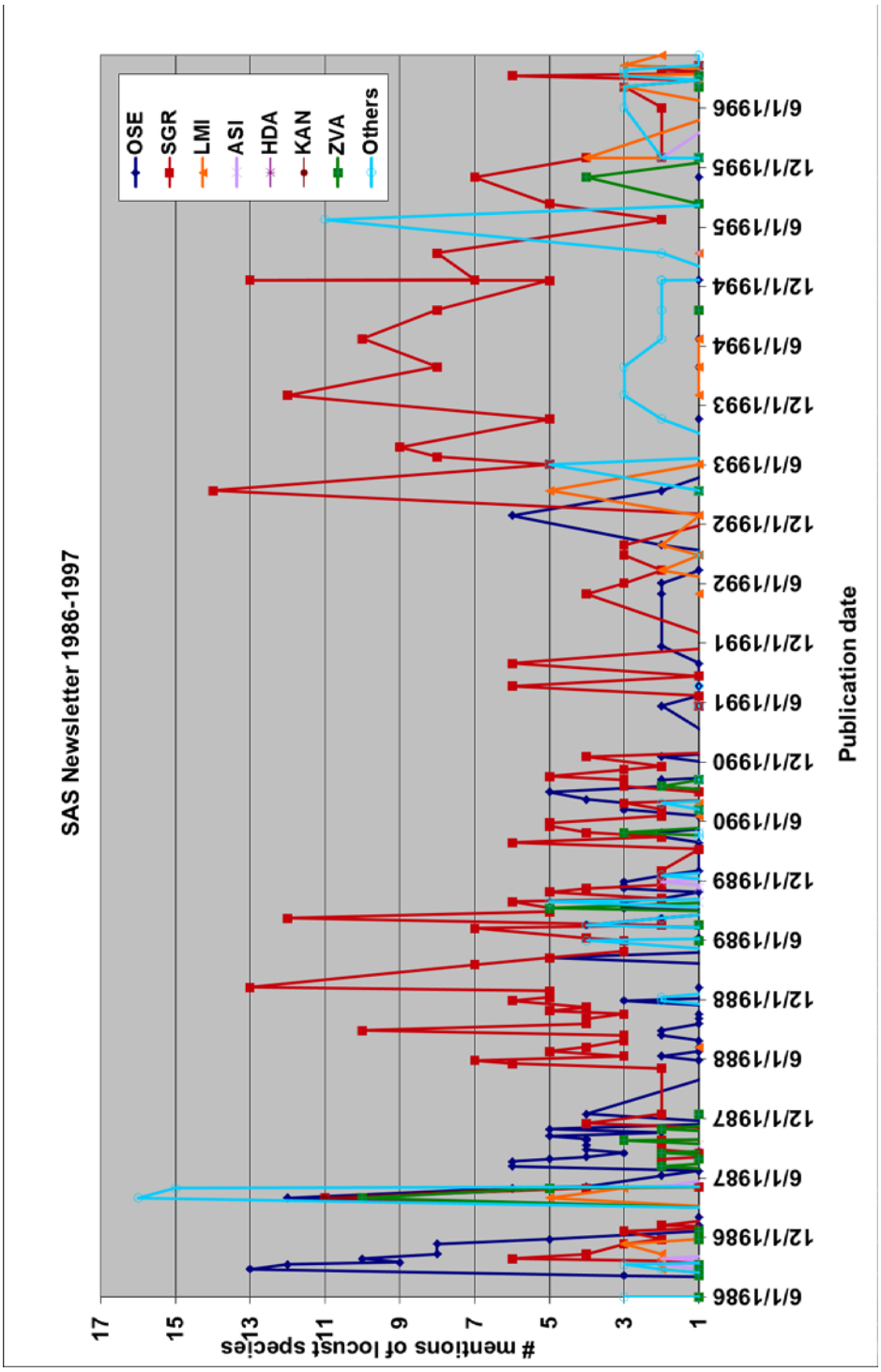


Figure 4.3 Monthly variation in the locust species of concern in the SAS newsletter of Prifas, 1986-1996

This switching of species of concern over time eventually led to settling on different "flagship species" at different eras of their history. Starting with the migratory locust (LMI) in the 1970s through mid-1980s, the unit began to focus more on the senegalese grasshopper (OSE) in the 1980s. That focus started to diminish at the time that the newsletters started. It is in the mid-1980s that the Prifas started to refer to the desert locust (SGR) as its "flagship species", which is clearly represented by the dominance of mentions of this insect starting at that period.

A pattern that was striking when analyzing these documents was that following a peak in focus and activity for a given species, Prifas seemed to predict, seek, and raise awareness about, which species could be the next one worthy of attention. For example, ZVA is occasionally "pushed for". The newsletter of July 7, 1987 states that "*Zonocerus variegatus* will be the locust of the year 2000". SGR dominates for the following two years, starting with the issue of July 22, 1987. The December 15, 1987 issues proclaims that the coming year 1988 will be "the year of the desert locust".[32] The first issue of 1989, published on January 7, which is entirely devoted to the desert locust, expresses the unit's wish that "the year 1989 marks the victory of men over locusts".[33] Following the decrease of the desert locust upsurge in that year, the May 31, 1989 issue of the newsletter calls for greater attention to these other species "in the shadow of SGR", expressing concerns especially over five other species that include OSE, ZVA, and three that are rarely mentioned in other issues. ZVA returns to the forefront on July 9, 1989, devoting three pages to a survey on this species, which is discussed in detail again in April 27, 1990 issue, after which it is only mentioned twice until November 1995.

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[32] "L'année du criquet pèlerin"
[33] "Que l'année 1989 marque la victoire des hommes sur les criquets!"

These shifts in species of concern accompany changes in geographic foci and changes in the types of organizations that commissioned the work of Prifas scientists. This donor-switching behavior is also key to understanding the institutional dynamic of locust control, and leads us to the main point of this chapter. In the meetings of locust managers and experts that I observed, on several occasions the question of "who would be interested" in this or that initiative, and whether such interest would invite sufficient funding guarantee to make said project viable was object of lively discussion. For example, research associates disagreed over whether a new project in Madagascar would be of interest to the usual donors, or debated who would be prone to co-finance the publication of a given book project. To get a sense of what kinds of organizations finance research in locust control, I noted the funding partner of each of the book and booklet published by the organization since 1968. This exercise is limited in that it only provides a glimpse of all the donors and partners for the great diversity of research activities undertaken by the center over the years, but it helps in that it provides a somewhat consistent metric to gauge donor interest in the work of Cirad locust experts over the years.

Table 4.1 *PRIFAS Book Publications per Funding Organization, 1974-2011*

Year	CIRAD-GERDAT[a]	France Foreign Affairs and Cooperation	FAO	GTZ	Netherland/CTA	EU	Rhone-Poulenc	Others
1974		1 (500)						
1975		3 (1500)						
1976								
1977		5 (5000)						
1978		8 (9600)						
1979								
1980								
1981								
1982		2 (2000)						
1983								
1984								
1985								
1986								
1987		2 (9000)	1 (2500)					
1988		1 (5000)		1 (5000)	3 (24000)			
1989					2 (16000)			
1990		1 (2000)						
1991	1 (7000)	1 (2500)				1 (2500)		1 (2000)
1992		1 (4000)		1 (unk.)		1 (500)		1 (2000)
1993		1 (50000)				1 (50000)		1 (50000)
1994		1 (500)				1 (200)		1 (200)
1995								
1996	1 (5000)				1(50000)	1 (50000)		1 (unk.)
1997		2 (450)					2 (unk.)	1 (250)
1998								
1999							1 (unk.)	
2000								
2001								
2002								
2003								
2004	1 (unk.)							
2005					1 (unk.)			
2006								
2007								

2008								
2009								
2010					1 (unk.)			

Note. Co-publications are attributed equally to all parties. Editions in different languages are counted as separate publications. [a] CIRAD-GERDAT is mentioned when it is listed as sole funding source, i.e. in 1991, 1996, and 2004, in promotional material for the unit.

The French Development Agency ("Agence Française de Développement": AFD) provided the bulk of the funding, often all of it, through the 1980s. In the 1990s, Dutch and German foreign aid agencies, and the European Commission (which eventually became the European Union) joined AFD in funding many of the works.

What these data indicate is that the main clients of French applied acridology have been development agencies of European countries and organizations. In the next section I explore the political ecological implications of this alignment between locust control and developmental structures, highlighting the 'crossroad' at which locust experts arrived in the late 1980s following the 'developmentalization' of their work, namely the contradiction between their relation to chemical pesticide firms and the improvement logic of development organizations.

Development and Locusts

I have discussed in chapter three how the highly mobile nature of the locust problem and the resulting ability of swarms to invade vast areas has embedded acridology in efforts to foster political authority that also operates at distance. In that chapter I focused on the relation between the institutional and technical aspects of locust control and the processes mid-Century processes whereby the formal structures of colonial rule started to become replaced with something different. This post-colonial geo-political configuration took the form of newly independent nation-states, especially

in the 1960s, combined with re-invented supra-national structures. “Development” rapidly became a key unifying features of how these structures have been produced and how they operate (Escobar, 1995).

The threat that the desert locust poses to food security in underdeveloped countries has made locust science and technology a highly relevant field of developmental intervention. The first branch of the UN dedicated to north-south cooperation and poverty alleviation, i.e. international development, was the Food and Agriculture Organization (FAO), founded in 1945. International efforts to control the desert locust are coordinated and supervised by this organization since 1955, when it created its Desert Locust Control Committee (DLCC). In the following years the locust problem also became a field of intervention of many other development programs and organizations including the World Bank, the African Development Bank, and several bilateral aid agencies of France, Netherlands, Germany, Sweden, Canada, USA, Japan, and so on.

Competing Logics of Transnational Intervention

In its broadest sense, international development in sub-Saharan Africa and other parts of the ‘developing world’ includes two complementary yet somewhat competing logics (Callaghy, Kassimir, & Latham, 2001; Center for Global Development, 2013; Collins, 2013). First is the logic of crisis response such as emergency humanitarian relief. This logic is reactive. Second, is the logic of improvement mechanisms and programs designed to improve landscapes and livelihoods in poor regions. This logic is pro-active, and seeks long-term action.

The tension between these two logics of emergency humanitarian relief and more structuring programs of long-lasting development is quite ubiquitous within and across

many programs and organizations, including acridology. The continuum that links the preventive orientation of locust control to the curative orientation shares much with this continuum that links humanitarian crisis response to pro-active initiatives of improvement in development. More specifically, the curative orientation shares more with the logic of crisis, and preventive control, more with the logic of development. The figure below illustrates the relation between these two axes:

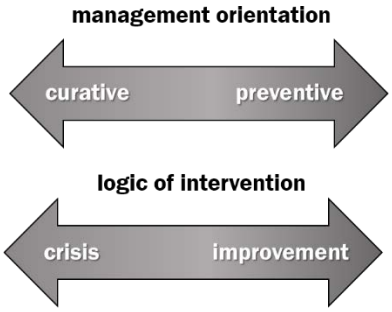

Figure 4.4 Orientations of locust management and logics of transnational intervention in development

Again, the curative and the preventive orientation are not mutually exclusive, but rather constitute a continuum of complementary orientations that become more distinct from one another at each of these poles. Although these strategies of locust management are often acted upon in a chronological sequence (preventive action takes place before curative action, following locust upsurges), the diagram above places the curative orientation on the left and the preventive orientation on the right for a different reason. This has to do with both the historical trajectory wherein preventive approaches became increasingly emphasized by organizations over the 20th Century and, as I discuss in greater detail below, the shift in emphasis in the type of power-knowledge produced by and productive of transnational order.

I mentioned earlier that even though most locust experts and managers tend to be in favor of preventive approaches to locust control, what they mean by prevention often differ from their colleagues. One understanding of 'prevention' was described as more akin to 'preparedness'. In this sense, adopting the preventive strategy entails cultivating and maintaining the ability to respond effectively to upsurges. This understanding is more closely associated with the curative pole in the diagram above. The urgency of responding to locust upsurges often justifies or enables relatively top-down, often rudimentary or blunt interventions. Proponents of the curative orientation instead argue for what they call a small, centralized, team of highly trained locust control officers that are prepared to "wage campaigns" against locust resurgence only after locust populations have reached a certain threshold in density and size (Symmons, 2009). For Symmons and others, the spatial-temporal stochasticity of the insect is best met and dealt with via an inward-oriented, intensive configuration of techno-power that constitutes a solid core prepared to rapidly intervene wherever necessary. These responses in turn undermine the establishment of "improved" social arrangements—a key objective of developmental intervention.

Emergency responses to locust invasions are often criticized in similar terms. For example, Kremer's analysis of the economics of locust control following the 1987-1989 invasion, came to the conclusion that "emergency response as a long-term strategy for crop protection in the Sahel is financially unsustainable, stunts recipient institutions and is probably economically wasteful" (Kremer, 1992, p. 214). The comment about how this type of response "stunts recipient institutions" component is key here. It echoes the points that I discuss below, by proponents of the preventive orientation that the massive

flows of resources sent to affected countries and interventions by external organizations during curative responses overshadow and undermine local capacity.

The other conception of 'prevention' stresses the importance of rapid intervention at the early stages of locust gregarization, e.g. at the onset of the transiens gregarians intermediate phase. This calls for more research, as early identification of outbreak areas could benefit from a better understanding of locust biogeography, it requires all sorts of interventions and programs of capacity building that call for technical assistance.

In this sense, the preventive orientation of locust control is more closely associated with what Tania Li (2007) calls the "will to improve" that makes development intervention a site of governmental practice and subjectification. Proponents of prevention see their strategy as contributing to progress toward a more developmentalist, improving, type of intervention. During my interviews with locust experts many Acridologists defending the preventive orientation occasionally did so in these terms, framing preventive control as the benevolent, capacity-building approach that they view as better than the substitution of crisis-response. Consider how this acridologist speaks of the justification of preventive control:

> The goal is to help these countries develop, in every sense of the word. And where we can intervene is, if we teach them to set up and carry out a prevention strategy against the desert locust, it will allow them to go further in other domains. And we consider this as an entry point, an element we give them, a tool we give them. After that, they will be able to circumvent that philosophy, to use it, and apply it elsewhere, and learn to develop with it. It goes well beyond the problem of the desert locust. (SJ, entomologist researcher, personal communication, Montpellier, July 2010)

A different interview revealed a very similar sentiment:

> Our philosophy in this is that helping the development of countries, through the intermediary of agriculture, through the intermediary of

> countless things, but to try to give them the keys, the elements that will allow them to build their own development. (SJ, entomologist researcher, personal communication, Montpellier, September 2011)

During the same conversation as the first quote above, the curative approach was criticized as being fatalist, 'giving up' on the goal of development based on belief that countries considered as 'backward' would not be able to gain and sustain the skills and institutional capacity to ensure prevention:

> There is this other policy that says: 'anyways, those countries have too many problems of development, and they will not be able to establish a prevention strategy'. They start from the observation that countries will be unable to do their prevention strategy, as they are unable, we must be ready to intervene'. So they say: 'let's not bother spending money on countries that, no matter what, will have too many problems to be able to do prevention; instead, let's prepare ad hoc team, with aircrafts, that are ready to wage treatment campaigns when invasions do occur'. (SJ, entomologist researcher, personal communication, Montpellier, July 2010)

What is the Curative Orientation 'Good At'?

Interestingly, entomologists arguing for a preventive strategy, and against the curative orientation, often recognize that the curative approach may succeed at minimizing crop depredations by locusts, but that it fails at the broader social objective pursued by acridology as development:

> Yes, you take a team of professionals, you go and do treatments, the upsurge will be controlled. But that's not the goal. (SJ, entomologist researcher, personal communication, July 2010)

As the first part of the phrase above suggests, technical management capacity of locust control based on curative principles has proven possible to sustain institutionally. Case in point: the Desert Locust Control Organization of Eastern Africa (DLCO-EA), based in Addis Ababa, Ethiopia. This organization, which recently celebrated its 50th anniversary, has been in charge of many if not most of the locust control operations in the East

African region where the British school of acridology, such as provided by the Anti-Locust Research Centre, has been the most influential. The Charter of the (DLCO-EA) limits it to, as Symmons point out: “assisting national locust units in an emergency”, and thus has no requirement during recession periods. This makes the organization in line with curative principles that are more closely associated with that ‘school’. The DLCO-EA operates almost exclusively as a service of aerial-based locust swarm suppression. It is composed of only a handful of pilots and aircraft engineers that maintain a fleet of airplanes, based in Ethiopia and that travel to wage campaigns against locust outbreaks across ten countries members of the organization. This makes it a relatively small organization, easy to maintain both in terms of skills and morale and that focuses on maintenance of a limited set of equipment and practices.[34]

The curative orientation then, produces and organizational configuration that is relatively small and concentrated. This smaller managerial core is easier to maintain during periods of recession, and by specializing almost exclusively in campaigns of locust upsurge elimination, skills and equipment necessary for these campaigns remain in use and are thus maintained. This approach, however, leaves very little for scientific expertise and research, and thus disconnects locust science from the production of authoritative knowledge, which in turn challenges its professional viability.

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[34] To sustain itself the DLCO-EA has expanded the scope of its operations to other similar pest control operations: “Initially, the Organization was mandated to promote control operations and forecast techniques against upsurges and plagues of the desert locust, Schistocerca gregaria (Foreskal). Later, the mandate was extended to include better management of infestations of other migratory pests, such as the larvae of the African Armyworm moth Spodoptera exempta (Walker), the Grain-eating birds Quelea quelea (Linnaeus) and the Tsetse fly that transmits the deadly human sleeping sickness, Trypanasomiasis or Nagana to livestock” (DLCO-EA, 2012). It is worth mentioning that while this is indeed and expansion of activities, it is one that remains concentrated on one set of practices and technology.

The preventive orientation, on the other hand, calls for a great diversity of programs and activities that keep a lot of people busy. Preventive control requires constant surveillance combining remote-sensing, on the ground surveys, training, and control operations, most of which can be aligned with other programs of capacity building. Together these practices contribute to the maintenance of scientific and technical expertise and operational teams and equipment despite the absence of resurgence "crisis". These combine with regular surveillance and intervention missions and various projects of training, evaluation and other similar programs that together populate a busy annual schedule and justify constant funding, both of which are necessary for the network to stay afloat. These programs and activities best align locust management with the institutional logic and imperative of development, which in turn help acridologists ensure that their expertise remains relevant.

For the developmentalist locust experts, then, the curative orientation is not only problematic on technical terms alone, but it is grounded in political assumptions that some criticize "colonial", if not simply racist:

> (the proponents of the curative orientation) they consider that we should return to the 1960s, to DDT, whites that arrive with planes and say: 'move over'. That's horrible. It's inadmissible. For us, the principle is: 'if someone is hungry, you teach him to fish, you do not give him fish'. (The curative approach is) a policy of substitution, and for us, it's unacceptable. Our philosophy in this is that helping the development of countries, through the intermediary of agriculture, through the intermediary of countless things, but to try to give them the keys, the elements that will allow them to build their own development. (LN, entomologist researcher, personal communication, July 2010)

Below I further engage the conceptual similarities—shared horizons—between the preventive orientation of locust control and developmental modes of government. I explore how the two are not only linked in their goal of social improvement. They also share a spatial logic that associates them with an evolution of mechanisms of power as

they move from an emphasis on discipline to one on security (Foucault, 2007). This operates through a different engagement with the biology of the locust than the one favored by the curative orientation (Shaw et al., 2010).

By "locking in" on the horizontal nature of the immanent locust swarms, i.e. by seeking to monitor, locate and prevent outbreaks, 'preventive' locust managers produce a network of technologies that proliferates via multiple apparatus and discursive practices that link political subjects and biology. The greater engagement of social and ecological complexity fostered by this preventive orientation better links locust expertise, on the one hand, and the various programs, investments, and discursive practices that together constitute international development, on the other. This outward-oriented, expansive approach to keeping locust techno-power alive though proliferation and diffusion of year-long programs and regular monitoring and preventive control interventions is not the only possible way of keeping these networks afloat, but it is the one preferred by those actors.

Locusts and the Spatial Logic of Developmental Governmentality

The foregoing suggests that preventive control is the dominant orientation in locust management in part because this approach calls for a more complex institutional arrangement that expands outward in other spheres of societies. This, I argue, best aligns acridology within the logic and mandate of development programs and organizations, thus maintaining a constituency for, and consequently the relevancy of, expertise on this agricultural pest hazard.

The dichotomies presented above, opposing horizontalist and verticalist spatial ontologies, and techne and metis, intuitively make the case for a tension between two mode of looking at, knowing, and responding to the desert locust. They cast these two

modes of power-knowledge as not only as *a priori* stable geo-historically and as more or less mutually exclusive, and fail to account for how these two positions co-constitute one another in practice. The techne/metis distinction of Scott is itself premised on a very crude set of oversimplifications that follow the high modernist approach to complex social-ecological realities that Scott decries (Laitin 1999). Similarly, the two spatial ontologies—verticalist and horizontalist—identified by Shaw et al. (2010) just "sit there": they are not explained, nor do they explain. In this sense, these ontologies are themselves treated as transcendent entities (despite the authors' contention that an immanent approach to mosquito's being is preferable).

To break away from these overly dichotomous classification of power-knowledge at play in locust management, the conceptual language developed by sociologist Michel Foucault helps to think of the subtle interplay between the different modes of power constitutive of social order. Foucault, especially and most clearly in his later lectures at the College de France, compiled and translated as "Society Must Be Defended" (1975-1976) (Foucault, 2003) and "Security Territory Population" (1976-1977) (Foucault, 2007), provides much insight on the competing and complementary mechanisms of rule that together produce what he refers to as government, i.e. the structuring of the possible field of action of subjects.

In the light of these theoretical works I argue that the stabilization and selection of preventive control as the dominant strategic approach in locust management has co-evolved with developmental imperatives via the influence of a commonly "shared conceptual horizon" (Pellizzoni, 2011) that itself can be best understood as compatible with the socio-spatial attributes of the governmental logic discussed by Foucault. Again, along the conceptual axis sovereignty-discipline-security, the curative orientation as a

mode of power-knowledge sits closer to the sovereignty pole than the security one. The preventive orientation, closer to the security pole. The diagram below illustrates the relation between these different axes:

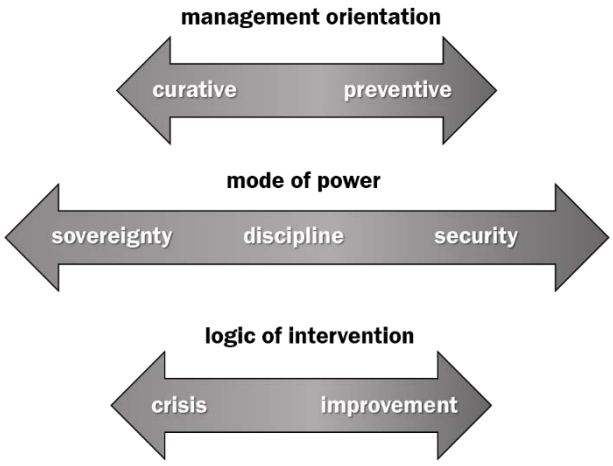

Figure 4.5 Orientations of locust management and modes of power

Speaking of the essential differences between discipline and security, Foucault adopts a strikingly spatial vocabulary that greatly helps with formulating the reasoning so far:

> Discipline is essentially centripetal... I mean that discipline functions to the extent that it isolates a space, that it determines a segment. Discipline concentrates, focuses, and encloses. The first action of discipline is in fact to circumscribe a space in which its power and the mechanisms of its power will function fully and without limit. (Foucault, 2007, p. 67)

This spatial logic of discipline as mode of power could be represented as such:

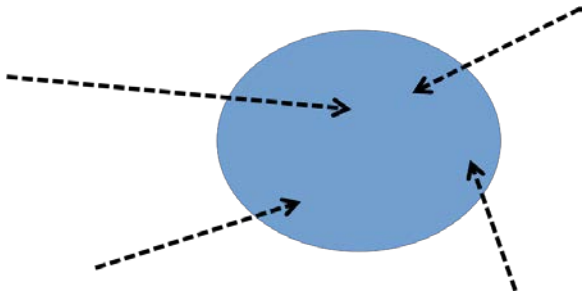

Figure 4.6 Spatiality of discipline, after Foucault, 2007.

This is a form of power-knowledge that operates by closing in, by concentrating action. The curative orientation of locust control operates on a spatial logic that shares much with this spatial logic of disciplinary power in two interrelated ways. First, by limiting intervention to a clearly marked target-block within which control efforts ought to be concentrated as powerfully as possible. These target-blocks are the precisely delineated spaces were managers ought to wage campaigns to kill all locust, while leaving the rest untouched. Consider, for example, the illustration below of the spatial modelling provided by the pro-curative entomologist, P. Symmons (2004) to illustrate how to detect and demarcate desert locust bands as “target blocks”:

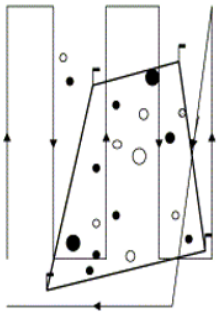

Figure 4.7 Demarcating target blocks by vehicle search, from Symmons, 2004, p. 188

Symmons delineates target blocks in function of a given threshold of gregarious locust density. Locust control intervention, in this view, are only necessary or desirable where and when this threshold has been crossed. The diagram above shows how survey teams (the arrows in the figure) can delineate the sector wherein mature and immature groups of locusts (represented as hollow and full circles) are so concentrated as to warrant a target block (represented as a trapezoid in the figure). According to this strategy, insecticidal interventions within these target blocks are necessary, where intervention outside these blocks is wasteful. In other words, the figure above illustrates an approach

to locust population control that delineates a space within which, as Foucault would put it, "...power and the mechanisms of (...) power will function fully and without limit" (Foucault, 2007, p. 67).

The second way in which the curative orientation of locust management lines up with the centripetal spatial logic of discipline is in that it concentrates, focuses, and encloses not only the intervention on the insects themselves, but also the organizational structure of locust management. Curative locust control calls for the concentration of programs and staff in small core of highly proficient and well experienced professional. Again, this can be seen in Symmon's calls for "a cadre of officers" with extensive and highly specialized knowledge of target", a "pseudo-military organization" in which information can be "passed and assessed rapidly" (Symmons, 1992, p. 211) and that is rapidly deployed only when and where an invasion emergency is declared. He reasons that when apparatuses of locust control expand beyond that they become impossible to sustain during periods of recession.

Let's now turn to the relationship between security and prevention. Returning to the lecture mentioned above, Foucault followed his description of discipline as centripetal by contrasting that with security:

> In contrast, you can see that the apparatuses of security, as I have tried to reconstruct them, have the constant tendency to expand; they are centrifugal. New elements are constantly being integrated: production, psychology, behavior, the ways of doing things of producers, buyers, consumers, importers, and exporters, and the world market. Security therefore involves organizing, or anyway allowing the development of ever-wider circuits. (Foucault, 2007, p. 67)

A graphic representation of the statement above could look like this:

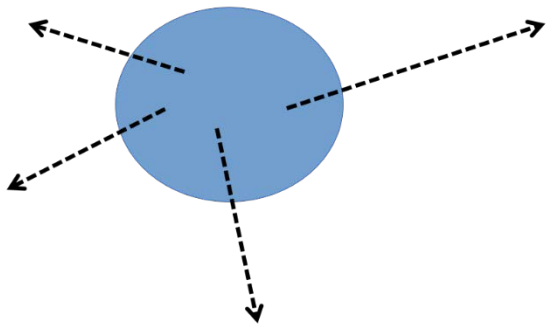

Figure 4.8 Spatiality of security, after Foucault, 2007

Power-knowledge associated with security extends outward, and immerses itself in the "milieu" (Foucault, 2007, p. 36). The logic and demands of preventive control share with security in that they are centrifugal, again in two ways. First, attempts to model and predict the distribution of ecological conditions suitable for breeding leads to an engagement with that insect population in its most diffuse form, in immensely low densities across vast and disparate patch habitats sparsely distributed across very vast territories. Second, the managerial structure required to maintain a preventive apparatus calls for a proliferation of program, projects, formations, that further immerse this techno-scientific field in numerous social fields.

Again, this expansive spatial logic of security is highly compatible with how proponents of preventive control speak of their favored orientation. For example, consider the following comment made by one acridologist addressing the current limitations for effective preventive control:

> The (locust control) apparatus involves (A) the donors, (B) technical service, and (C) the populations, farmers, producers. But all the burden, in the current situation, is on the technical service. They are the only ones given all the responsibility. That is a problem, that the technical service is both distinct from the local and international levels. (The problem now) is that National Locust Control Units are disconnected from the international level, and from the populations. According to our perception, what is necessary is that locust control exceeds the scope of

> that technical service. (CL, senior locust control specialist, personal communication, July 2010)

Similarly, a team of consultants charged by the FAO to review the efficacy of the first phase of the Empres-RO program praised the initiative of and broadening of skills among staff, but it also raised concern that the national units of locust management in the Western Region must not just keep growing as this would prove to be institutionally unsustainable:

> It should be noted that the size of the apparatus of locust control in the front-line countries cannot increase forever. The financial means availably device in the countries of the front line cannot increase forever. The financial means currently available encourage their development, but in the interest of their long-term survival, we must, paradoxically, be careful to not overly strengthen them. Similarly, the [Western Commission] Clcpro will not be able support the future costs of all the international experts it currently has at its disposition, and it should consider the possibility of handing over its tasks to national experts during the second phase [of the Empres program]. (Cossé, Lazar, & Salé, 2008, p. 7)[35]

The prevention/security pairing is also illustrated by returning to the distinction between the crisis response and improvement response mentioned above." We saw that actors in the field associated the preventive orentation of locust management with social improvement. Indeed, prevention calls for the proliferation of mechanisms of reporting, production of knowledge, communication channels, teams of prospectors on the ground, networks of satellite, radio, and internet-based database and maps. These requirements line up with and contribute to the proliferation of mechanisms and programs of livelihood and landscape improvement whereby development operates. Indeed,

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[35] Cossé et al., 2008, p.7 : "Il faut remarquer que la taille du dispositif antiacridien dans les pays de la ligne de front ne peut augmenter éternellement. Les moyens financiers disponibles aujourd'hui poussent à leur développement mais, dans l'intérêt de leur pérennité, il faut paradoxalement se garder de trop les renforcer. De même, la Clcpro ne pourra supporter à l'avenir les coûts de tous les experts internationaux dont elle dispose actuellement et il faudrait réfléchir à la possibilité de passer le relais à des experts nationaux durant la deuxième phase (du project Empres)."

development has been shown to work as a form of government produced by myriad initiatives of training, consultancies, reports, and evaluations (Michael Goldman, 2005; Li, 2007; Mosse, 2004). Together these enable what is perhaps best captured by Timothy Mitchell's expression of *Rule of Experts* (Mitchell, 2002).

In other words, preventive control in locust management contributes to what Whitehead calls, after Foucault, "government with science" (Whitehead, 2009): it best integrates expertise about the desert locust in (1) the institutional settings produced at the intersection of post-colonial state agencies and multilateral development organizations, and (2) the political economy of expertise in these settings.

By favoring a preventive orientation over a curative orientation, locust experts strive not for further simplification of the particular ecological dynamics of their concern but rather for some measure of additional engagement with and celebration of their complexity. The governmental logic and effect, in the Foucauldian sense, of development programs, produces a context in which the more complexity-friendly preventive locust control is favored, as this approach best ensures the integration of locust expertise at the intersection of development and international environmental governance.

Interestingly, in this optic the type of technoscience favored by developmental logic—preventive control—is right between the curative measures more closely associated with comparatively brute judicial/sovereign power, on the one hand, and what I earlier grouped and described as adaptive measures, predicated on insurance and similar calculation of risks directed at producers. This adaptive orientation is in this sense further along the sovereignty-discipline-security axis: it shares much with the mechanisms of government of advanced liberal societies in a way that makes it an even better fit with security than the preventive orientation. That said, for acridologists, the

institutional landscape within which acridology operates is “simply not there” to allow such adaptive programs (SJ, entomologist researcher, June 2012), that they perceive as “requiring arrangements that are perhaps too sophisticated” (CL, entomologist researcher, personal communication, June 2010). The way in which this alternative is dismissed by acridologists suggests the possibility that it is out of step with the type of governmental logic pursued by development, i.e. that this orientation would be more at the right place in the advanced neoliberal economies of the “developed” world.

It is important to stress that governmentality refers to a *recombination* of the three modes of power, sovereignty, discipline, and security. In this sense, security does not replace or cancel sovereignty and discipline, but adds to, builds on, these two other modes of power. It becomes the privileged but far from exclusive mode of rule. Even the most bio-political regimes of rule still make a great use of coercive force, territorial control, and exemplary punishment—all things associated with sovereignty and discipline. Rather, governmentality is the outcome of ceaseless and dynamic recombination of countless techniques and practices that span the spectrum of these three modes of power.

The implications are two-fold. First, a Foucauldian understanding of how these fields are practiced as power-knowledge in the making of modern governmentality problematizes simplistic dichotomies of top-down or vertical versus horizontal or bottom-up. Rather these logics must be understood as intertwined and co-constitutive. The question to ask then is what type of social-ecological relation is fostered by this selective emphasis? I discuss this question in so far as it pertains to locust management by turning attention to the political economy of expertise in that field.

Despite being nominally preventive, the technicians of the FAO-DLCC secretariat gain and maintain their relevance within the broader organizational network of locust governance by producing forecasts primarily used to sound the alarm to donors and emergency organizations. The DLCC is thus more aligned to a crisis-response type of logic. This is best achieved by standardized information covering a vast geographic scope. The more standard, consistent, and synthetic the data the better it is.

Different Outcomes in Hindsight

The fit between preventive control and developmentalist orientations may explain in part why French acridological expertise has remained more or less institutionally viable, and survived to this day. Alternatively, British acridological scientific research, even though it left a much more important record of scientific publications and enjoyed an arguably greater reputation, has not. Despite the pioneering work of the Anti-Locust Research Center (ALRC) of the Imperial British Bureau of Entomology, this remarkable institution of colonial entomology has been increasingly marginalized within British public science since the 1970s. Since its establishment in the early 1950s, the ALRC directed by its founder, the Russian émigré Boris Uvarov. Uvarov is known as the father of modern acridology (who first formulated the phase theory of locust change) and much of contemporary locust control is informed by research carried out by the center.

The center has, starting in the 1970s, been repeatedly merged with, and 'diluted' or 'dissolved' in other organizations, first by expanding into a Center of Overseas Pest Research, which then merged with other similar institutions to form the Tropical Development and Research Institute (TDRI), which merged with yet others again in 1988 to form the Overseas Development Natural Resources Institute (ODNRI), which

became Natural Resources Institute in 1990, until it was transferred to University of Greenwich. In this new landscape of British locust expertise, research on locust ecology tends to use the desert locust as an laboratory for fundamental genetic or molecular biology research, but this work has very little if at all implication for what the French locust experts call 'operational acridology', the application of locust science to manage the agricultural pest hazard presented by the insect.

These two institutional trajectories are the outcome of complex social economic and political differences and different traditions of scientific research in Britain and France respectively. But it so happens that, much of the argument for curative locust control have been in one way or another associated with British acridologists or institutions in their historical zones of influence. On the other hand, acridology in France and the former French colonial Empire in West and Northwestern Africa from Pasquier, Zolotarevsky in the 1940s-1960s to the Prifas team since the 1970s, has been firmly entrenched in the preventive camp. Some even speak of "prevention fundamentalism" to refer to what they consider an obsession in some of these Francophone West African countries, where they claim, locust control centers seek to prevent "every and all locust outbreaks" (CL, entomologist researcher, personal communication, June 2010).

The genealogy of that distinction between the British and French zones of influence is in itself very intriguing, and it was discussed, albeit very briefly, in chapter 3.[36] What is most relevant here is that, it so happens that the one tradition in the

[36] The difference in orientation between these the British and French schools of acridology were speculatively attributed to distinct models of colonial rule (Crowder 1964), distinct biophysical environments, especially distance of zones of outbreaks to zones of cultures (CL, entomologist researcher, personal communication, July 2010), the surplus of airplanes and pilots in the British Empire after the Second World War, many of them retrofitted to crop protection in the colonies, versus a relatively extreme paucity of aerial capacity on the French side (Baron 1972).

discipline of locust science that happens to be more preventive (French) has been successful at keeping the relevance of scientific expertise about desert locusts in development networks, whereas the one that tended to be more curative has (British) has not. This is not to say that there has been no locust management organizations operating on curative principles. I am only referring to the production of scientific knowledge by experts in acridology working in support of management capacity, i.e. the type of work carried out by Cirad, and previously by the Anti-Locust Research Centre.

In other words, as mentioned before, the curative orientation can sustain some components of the locust management apparatus, i.e. technical services, such as the DLCO-EA or the Desert Locust Information Service of the UN-FAO, both of which thrive by enclosing and concentrating information and techno-power from very vast regions into a centralized core. But this approach leaves not much of a role for science. This invites the hypothesis that the curative tendency of British acridologists at the ALRC, and its influence on their management recommendations added to selective pressure against the institutional survival of British applied acridology. Because I have not directly researched these British organizations and the broader social-political contexts in which they evolved, plausible claims on the validity of this hypothesis are beyond the scope of this study. The other side of that equation—the successful co-evolution of developmental logic and the long-standing preference within Francophone acridology for the preventive, rational orientation—is supported by my findings, however.

In the remainder of this chapter, I discuss a more recent turn in this co-evolution wherein acridology is increasingly articulated with a governmentality that operates on a logic that is not only developmentalist in nature but also environmentalist. This turn shares much with what critical development scholars have identified as the role that

discourses of ecological sustainability have been increasingly playing in the formation of authoritative knowledge at the basis of development as a mode of transnational government (Dressler, 2013; Michael Goldman, 2001, 2005).

What Clients for What Expertise? Pesticides versus Environment and Development

A growing concern about the environmental toxicity of pesticides used in locust control, echoing the ban on Dieldrin in 1987, and rising consciousness about the issue and so on, made these development organizations more interested in alternatives to heavy use of toxic chemicals. This turn toward a 'greener' acridology can be attributed to multiple factors including a rise in environmentalism worldwide, but also the realization of the ecological and financial costs associated with not only massive spraying campaigns of toxic insecticides but also the challenges of stocking and discarding obsolete chemical compounds. It is during this period that research for bio-pesticides and alternative to pesticide, e.g. adaptation and cost-benefit evaluations became more ubiquitous.

The technological gap created by the ban of dieldrin in the 1980s drew interest in the work of acridology experts from another category of actors: pesticide-manufacturing companies. The story of Rhone-Poulenc's effort to "push" the chemical insecticide Fipronil provides an example of this to which I turn below.

The gap produced by the ban on dieldrin in 1987, and the alleged role of that ban in considerably weakening the effectiveness of the locust control apparatus at the same time of a significant resurgence of desert locust populations in several areas is said to have led to the large invasion of 1987-1989. Some manufacturers sought to position themselves in the potentially lucrative market by developing, and pushing for, the adoption of an alternative. Fipronil, a phenylpyrazole-based, broad-use chemical insecticide, had been developed in the preceding years 1985-1987 by the Lyon-based

chemical and pharmaceutical manufacturer Rhone-Poulenc. The firm soon became interested in having the product adopted as the main pesticide to replace dieldrin in the wake of its ban, and made appeal to the experts at Cirad to test, evaluate, and eventually make recommendations on, this product. It is not uncommon for entomologists to test, and publish the results on the toxicity and effectiveness of one or another pesticide.

That said, according to people interviewed, including other Cirad employees, Prifas scientists went over and above the normally accepted level of cooperation with chemical manufacturers (field notes, July 2010, September 2011, July 2013). This led to international tension within Prifas, criticism within the larger Cirad center, and across the locust governance world in general. Evidence of such criticisms have been collected in internal review documents of the research units within Cirad, and, even though the story is over twenty years old, it still resonated in several of the interviews I carried out in Europe and Africa.

The implications of this anecdote are two-fold. It provides another example in which the particular economy of expertise that shapes acridology makes it challenging for experts ensure that their work remain relevant for other organizations, and they have to constantly strive to re-align themselves with other causes, depending on given dynamics of interest at a given time. These alignments and re-alignments may not in themselves determine the work done by the scientists. But one can presume that this shift has had an incidence in modifying the sets of constraints and incentives under which the scientists operate, which in turn may make one set or recommendations more practical than another.

Siding with Rhone-Poulenc turned out to be a bad move for Prifas researchers. I attribute this outcome to two main factors that do not necessarily have to do with the

commercial/corporate nature of the venture but that are instead linked to the orientation of locust control, and its relation to the intersection of environmental governance and international development as discussed here so far.

First, it turns out that Fipronil was deemed too toxic to non-target species for most markets, including its potential role in bee colony-collapse disorder. It became a controversial substance, and the environmental concerns surrounding it became object of considerable attention from media, NGOs, and other national and international organizations. Locust control had in the past been more lenient with toxic chemicals that had the properties required to be effective. Although most persistent organochlorine pesticides such as DDT and dieldrin were being banned in most countries throughout the 1970s, dieldrin was granted a special derogation for locust control operation until 1987. (Most legislations had banned other uses of dieldrin about ten years prior). Such leniency, should it have been repeated for Fipronil in the same way as it was applied to dieldrin, could have provided a useful market for Rhone-Poulenc. Even though desert locust control is not a relatively important consumer of pesticides compared to the amounts used by agricultural producers themselves, it could have at the very least helped recoup their investment should the substance not be approved for most of the intended purposes. Alliance with Prifas was deemed strategic in such a move. The move did not work out however, and Prifas suffered from that.

Second, and related to the main point of this chapter: the field of acridology, broadly speaking, has been increasingly embedded in the logic of development since the 1970s. The move away from colonial logic of rule to a developmental one has been made though a gradual, and uneven, but nonetheless evident, shift toward more “positive” governmental power. This eventually created an uneasiness vis-à-vis many of the top-

down, vertical, chemically intensive types of interventions that were central to the "rule of experts" cultivated in the 1940s and 1950s, and under which can be inscribed many of the discursive practices enacted by efforts to wage aerial campaign of swarm suppression during and after the Second World War. Following this shift, an increasing degree legitimacy and resources—or technological relevancy—could be gained within the specific global apparatus of government responsible for locust control by lining up with environmentalist discourses and concerns about chemical toxicity than the other way around. I return to this intersection of developmental and environmental governmentality at the end of the next chapter.

Discussion

This chapter shows that locust science, by virtue of being embedded in and carried out via the networks of international development, is conditioned to favor, and to line up with, the governmental logic of development produced in what Tania Murray Li called "the will to improve". This developmentalization of locust management calls for and rewards a greater emphasis by locust experts on the preventive orientation.

The preventive orientation is the official discourse of most organizations and actors in the field of acridology. But that 'consensus' is a weak one, in two different ways. First, most of the time, i.e. during recession periods, most locust control specialists that are active and have a say in the matters during these periods agree that preventive control is the "way to go", and work under that assumption, but actually hold different assumptions about the meanings and implications of given conceptualizations and vocabularies. These differences become more pronounced as locust populations become increasingly gregarious.

In fact, scientific expertise on locust control has been sustained by its ability to line up with both logics of transnational intervention: crisis and improvement. Because states and institutions are adapted to a crisis-mode, the curative mode is sort of *de facto* dominant. Curative approaches are seen as "easy", simple, and sporadic, compared to the much more all-encompassing prevention, which requires active cultivation.

I have argued that reductionist takes on complex socio-ecological processes (e.g. techne/state-vision) may not be the most advantageous to organizations as they seek to line up with the logic and demands of modes of power that are "governmental" rather than, say, simply state sovereignty or the relatively limited powers and short term gains that pesticide-related wealth accumulation strategies and sovereign/disciplinary modes of state power. Development, and global environmental governance do, together and alone, provide such a governmental logic in which more complex, adaptive, and capillary approaches to management of natural resources and hazards can prove much more beneficial and or useful to political and technological authorities than comparatively simplistic, concentrated, reductionist approaches to ecological management. At the same time, as government operates via recombination of these diverse modes, assumptions that top-down/vertical/techne as opposed to horizontal/immanent/metis tend to themselves be much too simplistic as end-product of analysis.

In this context, locust control experts and technicians bolster their techno-scientific currency, or relevance, in the medium to long run, by lining up with the discourses of 'developmentalism' and 'environmentalism' that occupy an important place, unsurprisingly, in these networks of international development and environmental governance that have come to fund and frame the management of this agricultural pest hazard. These 'positive' and rhizomatic or capillary powers operate via a

proliferation of programs and projects that best ensure the relevance of expertise to political authorities, and thus their long-term viability.

In the next chapter I examine how this developmentalization of locust science shapes the institutional landscape and practices of national locust control units in desert locust affected countries in the West African Sahel.

CHAPTER 5

LOCUSTS, AID, AND THE TOPOLOGY OF DEVELOPMENTAL STATECRAFT

This chapter explores what kind of stateness is produced by national and international efforts to control desert locust populations. I am especially interested in understanding the spatial configuration, or topology, and spatial logic, in which is embedded the participation of locust state actors in transnational structure of governance and expertise, and the influence of the resulting logic on the socio-spatial dynamics of locust management.

I draw primarily on interviews with locust experts and managers in countries of the West African Sahel. These sources are augmented with observations at meetings in, and surveys of documents about, organizations of locust governance in West Africa. The organizational and geographical scope of this investigation pertains primarily to the work coordinated by the FAO Commission for Controlling the Desert Locust in the Western Region ("Commission de Lutte au Criquet Pèlerin en Région Occidentale": Clcpro). I also incorporate elements from other locales and organizations when appropriate, but these are only provided to augment and contextualize my analysis of the dynamics in the Western Region.

The chapter is divided in two main parts. The first part is titled "State Space, State Visions, and Locust Swarms". It considers the question of whether the extension or reproduction of "state-space" or "state-vision", in the sense usually attributed to territorial sovereignty, play a central role in shaping the work of locust managers. My findings suggests that these strategic demands of territorialized state-power are *not* key drivers of West African locust control. Should these demands be at play in shaping

regional locust management practices (which remains a possibility), the influence of these demands is clearly eclipsed by other concerns among managers and experts.

The second part of this chapter is titled "Technological Authority, Development, and the Governance State". It examines how locust managers working in state agencies operate and deal with very similar concerns than the ones identified among the 'international' scientific researchers in chapter 4. These concerns pertains first and foremost to the need of gaining and maintaining relevancy and connectedness within professional networks that populate locust control, and by extension the transnational structures of governance that support these networks, in so far as this ensures a well-established constituency for their work. I argue that these strategies are not necessarily incompatible, but also not exactly congruent with, the assumption that the state's locust surveillance efforts are motivated by the imperative to extend its territorial sovereignty. I discuss some of the theoretical implications of these findings on locust management for our understanding of the political geography of technical and scientific practices in development.

State Space, State Visions, and Locust Swarms

In this section I address the relationship between (1) the monitoring and control of desert locust populations in the West African regions of the Sahel and the Sahara and (2) the challenges that the topography and the political dynamics in areas that usually harbor locust outbreaks present to state power. First I describe the nature of the difficulties that these areas present to state agencies. Second, I engage with theoretical works on the nature of state power that highlight the influence of the imperatives of the state for legible and orderly spaces: what authors have called state-space, and in turn its relation to state-vision. I explore the possible implications of these works for our

understanding of locust control. Third, I discuss how locust managers explain and contend with a particular feature of the "non-state" nature of locust outbreak areas, i.e. threat to personal security in these zones due to political instability.

Locust Outbreak Areas are Difficult to Access and Control

Notwithstanding difference of understanding among experts and technicians about which approach is best to control locust populations, preventive control is the strategic orientation that is officially promoted and pursued by the Desert Locust Control Committee of the FAO and its member organizations. Locust experts and managers generally agree that the best strategy of locust management entails intervening early before groups become so large and mobile that control operations become more costly and difficult. Disagreements are mostly about *how early* action must be carried out to be, in effect, preventive (Van Huis et al., 2007).

In this context, then, it can be said that for the most parts locust managers are trying to monitor locust populations to predict, find, and hopefully contain or suppress gregarizations, or outbreaks, in their early stages to prevent upsurges, or invasions. For example, the former executive secretary of the Clcpro, Thami Ben Halima, stresses that preventive control primarily entails the "surveillance of the locust breeding areas to locate and destroy the first outbreaks that begin their phase change before forming swarms and bands" (Thami Ben Halima, senior locust control specialist, personal communication, November 2011).[37] For Ben Halima, intervening during the "transition phase" of the locust polyphenism (*transiens gregarians*) is crucial to the success of

[37] "Surveiller les zones de multiplication du criquet pèlerin, localiser et détruire les premières pullulations qui commencent leur transformations phasaire avant de devenir des essaims et des groupes."

preventive control.[38] In this sense, the preventive approach focuses on the locusts' ability to undergo phenotypic transformation and *works with* this biological particularity of the insect.

Again, the preventive orientation imposes challenges. First, solitary locust populations are often almost impossible to find in the vast deserts of the recession areas. Finding the miniscule portion of solitary populations that might be undergoing gregarization at a given time is even more difficult. Second, these outbreak areas tend to be in locations that are very difficult for managers to access. These are very arid, excessively hot, rugged terrains where vehicle travel is difficult, trails are hard to follow when they exist, and water and fuel points are sparse. The Adrar des Iforghas region in northern Mali provides an extreme example of this aridity. Many of these outbreak locations are also in areas where the state is openly challenged by segments of local populations, areas of prolonged strife, banditry, rebellion and so on. For example, the Somalia-Eritrea border, northern Chad, southern Algeria, the Darfur region in Sudan, and again, northern Mali. Despite great differences on the internal dynamics of these locations, in general those are areas where the state faces severe challenge in establishing its authority.

This situation begs the question of whether and under what condition these politically and physically difficult terrains present constraints and incentives to locust managers in the front-line countries of the Western Sahel. In the introductory chapter I summarized the research question pertaining to this issue as: "What is the relationship between the spatial dynamics of locust outbreak and invasions, on the one hand, and the

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[38] "La phase de transition est capitale."

dynamics at the basis of socio-political territorialization on the other?" To answer this question, I first considered the hypothesis that locust surveillance would be co-produced with the state's effort to enact territorial power in these difficult areas. Should such mechanism of co-production be existent, I thought, their effect could be identified in analysis of the practices and discourses of experts and managers. Before answering this question, however, a consideration of the nature of the remoteness and political instability of these locust outbreak areas is helpful.

Again a key feature of efforts to manage the desert locust is that the outbreak areas of this insect tend to be concentrated in remote locations where the management capacity of 'central' political authorities such as colonial and state administration is challenged. A humorous and anecdotal, yet somewhat revealing, mention of how this 'remoteness' has been perceived by locust managers is provided in the book *Harry the Locust: The Light-Hearted Adventure of a Locust Officer*, by Frank Bailey (1957). As the title indicates, this is an account of the author's experience as a locust control officer in East Africa and Southern Arabia after the Second World War. Bailey reports becoming a locust officer after the end of his military service in the British Army in East Africa during the Second World War. While in Nairobi at the close of his service, he was informed that there had "been a plague of locusts in East Africa from 1943 to 1947", and that "another one was developing, for the desert locust was breeding from Morocco to China" (Bailey, 1957, p.1). After being provided with this information, Bailey was asked if he was interested in becoming a "locust killer", which he accepted, stating how this job corresponds to his interest for a tough, hardy job in exotic and remote locations.

Bailey writes that he often was under the impression that his supervisor, “the man in Nairobi”, sought amusement in dispatching him to the most random, faraway places he could find:

> He had a large wall map of Kenya, Tanganyika, Uganda, Ethiopia, Eritrea, Somaliland, Saudi Arabia, Aden Protectorate and a few other odd corners, and it seemed to me that he must peer closely at it, call for his stronger glasses, look for the smallest name he could find, as far removed as possible from all other names, and murmur: ‘"Hmm! Look what I've found. A place called Abdul Cadr! Anyone ever heard of it?’ His subordinates would shake their heads: he would rub his hand. ‘That's all right then. Tell him to go to Abdul Cadr’.
>
> A loaded Landrover, followed by a powerful wagon with petrol, water, rations, tents and similar miscellanea of desert travel, stopped at a collection of mud huts. I was at Abdul Cadr. (Bailey, 1957, p. 12)

Some of these remote locations are inhabited by populations hostile to external authorities. This challenges the work of locust officers:

> The breeding season was approaching and reinforcement of staff were sent to me from my Aden base so that no hopper should escape if we could prevent it. They came by aeroplane, the only means of communication (apart from radio) between Hadhramaut and Aden, for the road had been made unusable by bandits. These bandits were the concern of the West Aden protectorate, and the only thing that concerned us in the East was that the Aulaqi tribe, whose territory spreads from sea to the Yemen border, were ‘against the Government’ and were shooting at anybody trying to use the road through their mountains. We were very much dependent upon the weekly aeroplane from Aden, for it was the monsoon season when dhows cannot sail between Aden and Mukalla. (Bailey, 1957, pp. 98-99)

Similar situations wherein ‘tribes were against the Government’ have often occurred on the other side of the continent as well, including in the area of primary concern to this study in Western and Northern Africa. In the Senegal-Mauritania region, important parts of the Senegal River valley, including Saint-Louis, were under French monopoly since the 17th Century. In the adjacent, desert regions of the Adrar in Northern Mali and Southern Mauritania, “pacification” efforts—imperial warfare against

local populations and authorities, and in turn revolts, raids, and attacks from these groups—lasted well until the late 1930s, despite claims since 1912 by the French that the region was effectively under their control.

During the 1936 Fourth International Locust Conference (*Proceedings of the Fourth International Locust Conference*, 1936), French entomologist P. Peyerimhoff spoke of progress in efforts to establish an effective early prevention approach to locust control. The entomologist stated that two obstacles had until then prevented the realization of such an approach: (1) limitations in biological knowledge and (2) the challenge of operating in largely insecure areas (p. 3).

At the time of his address in 1936, Peyerimhoff was hopeful that these obstacles would be overcome due to breakthroughs in the previous fifteen years. These breakthroughs, he assumed, held the promise of an effective "rational locust control operation". These were: (1) the 1921 phase theory of Uvarov (i.e. an improvement in biological knowledge), (2) improvement in communication and transportation infrastructure, and (3) the "pacification" of the locust breeding regions, especially in the dangerous zones. By the 1920s, the French imperialists were successful enough to be able to claim control over these contested areas. This, he reasoned, would help locust managers meet their objective of preventing locust upsurges.

The claims by French military (and entomological) authorities about the degree of 'pacification' have often been exaggerated, however. Populations in many of these areas have more or less remained successful in challenging the authority of both colonial Empires and the post-colonial state.

Following the independence of both the French Soudan (Mali) and Mauritania in 1960, the newly formed states had a rather tenuous grip on these remote regions. Mali,

for example, struggled to impose its legitimacy among the northern populations, and its attempt at doing so led to a civil war in the 1960s, which resurfaced in the 1990s, and again in 2011.

In current times, these threats and hostilities come from groups in diverse, shifting, and overlapping alliances and competitions, characterized by occupational specializations that are alternatively described as bandits, drug traffickers, rebels, separatist insurgencies, and jihadists. For example the Malian state capacity to control the recession area of desert locusts in the northern parts of its territory has been challenged for the years by organized militant secessionist groups such as the Azawad National Liberation Movement (Mouvement National pour la Libération de l'Azawad, MNLA), a key player in the recent installments of what is commonly referred to as the Tuareg Rebellion in the Sahel—a long-standing series of civil war outbreaks and truce in the region since independence of Mali in 1960 (Bøås & Torheim, 2013; Konaté, 2000; Mariko, 2001; Whitehouse, 2012). Since the late 1990s, these insurgencies have increasingly overlapped, at times in opposition and other times in collaboration, with emergent forces in the region's militant Islamist groups. These have included the Algeria based Salafist Group for Preaching and Combat (Groupe Salafiste pour la Prédication et le Combat, GSPC) which more or less morphed into Al Qaeda in the Islamic Maghreb (AQIM), and a vast array of splinter groups and semi-autonomous formations that include The Movement for Oneness and Jihad in West Africa (Mouvement pour l'Unicité et le Jihad en Afrique de l'Ouest, MUJAO), Ansar al-Din (defenders of the faith), and so on.

What is of interest for this study is that the zones of influence of these hostile groups in West Africa strongly overlap with, and are especially concentrated in, the

'frontline' countries of locust control (i.e. countries that persistently harbor locust outbreak areas) in the Sahel and Sahara: Mauritania, Mali, Niger, and Chad, and extending into Southern Algeria and Southern Libya. This overlap raises questions on the political geography of locust management, especially about the spatial configuration of the techno-power that accompanies locust control.

Locusts and (Non-) State Space

Many of the areas described above correspond to what James Scott (1998) calls 'non-state spaces'. Even though Scott does not explicitly define non-state space, he uses the term in opposition to state-space, which he uses to refer to areas where the state's imperative of simplification, legibility, and consequently domination and appropriation are relatively well fulfilled (Scott, 1998, pp. 186-189). For Scott, some types of landscapes are more amenable to successful state vision. These tend to be relatively flat, open, and agriculturally productive areas such as agricultural valleys, floodplains, and riparian zones. In contrast then, non-state spaces are areas where the state has difficulty in establishing and maintaining its authority. This difficulty results from physiographical features that thwart simplification efforts, such as mountains, forests, seascapes, as well deliberate strategies and active fostering of illegibility and intractability especially meant to evade the panoptic gaze by which the state constitutes itself (Scott, 2009).

Deleuze and Guattari (1987) speak of the relation between striated ("espace strié") and smooth space ("espace lisse") to describe this dynamic that Scott describes as the encounter between state and non-state spaces. For Deleuze and Guattari, state-power is produced by, and productive of, a "striation", a structured differentiation of space that provides the basis for ordering previously illegible and uncaptured 'smooth' spaces. It

follows that there is broad overlap between Deleuze and Guattari's 'smooth' and Scott's 'non-state' spaces on the one hand, and between 'striated' and 'state' spaces[39].

Scholarship in political ecology, science and technology studies has documented how the measuring, surveying, ordering, and other forms of 'rationalizing space' that follow from technical and scientific practices often co-evolve with, and are co-produced with, the performance of political authority (Adas, 1989; Alatout, 2008, 2009; Carroll, 2006; Jasanoff, 2004c; Whitehead, 2009). An especially compelling and relevant case of this has been provided by the work of geographer Eric Carter.

Writing about the colonization of northwestern Argentina in the late 19th and early 20th Century, Carter (2012) showed how mosquito eradication efforts at the basis of malarial control campaigns enabled and enhanced the state's ability to 'see' and 'order' people and things hitherto recalcitrant to such domination. The presence of mosquito-borne malaria in the area called for and allowed the creation of a "malarious zone" that enabled political authorities' extension of state vision and, consequently, state-space. The special sanitary geographical delimitation thus produced provided an effective mechanism for the "standardization, transformation, and bureaucratization of space, territory, and landscape" (Carter, 2008, p. 278). Doing so, the technologies of malarial

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[39] The argument that banditry and rebellion adjacent and in areas of locust outbreak in the Sahel and Sahara contribute to enhance the 'non-state' quality of the spaces, invites two precisions. First, even though rebel activity in these areas defy the central state in its present incarnation, there is no indication that these actors operate on a logic that is at odds with the territorial sovereignty per se, or with the modern state-form more generally (Elden, 2009, pp. 33-61). Second, some specialists on the region, for example Julien Brachet (2013), argue that the Saharan spaces do not always evade state control as much as is commonly assumed. The agents of these states usually remain active throughout these territories, he points out, even though they "often act differently than what international institutions expect from them". I contend that the consideration of locust outbreak zones and adjacent areas as non-state or 'smooth' spaces still apply notwithstanding these two caveats. The main reason is that these concepts do not merely apply to areas that are completely outside of state power, only that they are relatively more difficult for the state to delineate and order.

control contributed to render the region, and its population, legible, and thus, governable.

That work invites the hypothesis that the 'extra-statist' (or even anti-statist) propensities of locust ecology, and the overlap of its biogeography to areas where the state is challenged by terrain and people, makes locust control in the Sahel a useful field for state power to establish itself as it responds to these challenges. In other words, the problem that locusts pose to the state may possibly be understood as one of the multiple and overlapping manifestations of rhizomatic immanence of the "war machine", i.e. the force that escapes the apparatus of capture that is the state (Deleuze and Guattari, 1987). This begs the question, then, of whether the 'fight' against locust is indeed enlisted, discursively or otherwise, in the fight against other challenges to stateness, be they human or topographical.

Locust control involves the mobilization of extensive networks of terrestrial and aerial surveillance across multiple national territories, and insecticidal interventions that combine civilian, scientific, and military effectives, all of which are supported by international funds and equipment. This situation makes it plausible that this pest management networks calls for and legitimize techno-social practices that together bolster the authority and legitimacy of state actors. Consider the argument made in chapter 3 that the French Resistance enlisted the locust "enemy" in discursive mobilization of allies and Empire against the Nazi enemy. Or again, the statement of the French State Secretary of Defense in the introductory chapter, when the desert locust was presented as precisely the kind of civil-military issues that provide an ideal field for joint French-Tunisia military exercises in the Desert.

The question to ask in this context then is the following: does the 'deterritorializing' action of the locust hazard invite its enlisting as a 'negative resource' by state authorities whereby they can enact responses that also apply to other similarly evasive threats to state sovereignty? In other words, does the shared spatiality between the locust and recalcitrant state subjects and spaces in the Sahel and Sahara invite the incorporation of locust control efforts in state attempts to 'striate' these 'smooth', non-state spaces?

Moreover, should that be the case, would these attempts produce constraints and incentives that shape how crop protection agencies and national locust control units approach the problem? Surely, some effect of that strategic purpose of locust control of the state would be traceable within the discourses and practices of the bureaucracies, certainly.

It is this type of questions that I set out to answer when I travelled to Mali in 2011, and then to surrounding countries in 2012 and 2013. I expected that ethnographic research in state agencies mandated with locust control in these countries would reveal how the imperatives of state-sovereignty produced incentives for locust managers to act in ways that extended, strengthened, or reproduced state space. Given that locust control involves the mobilization of extensive networks of terrestrial and aerial surveillance, as well as insecticidal interventions that combine civilian, scientific, and military personnel all supported by international funds and equipment, one could expect this pest management system to be put to use to call for and legitimize techno-social practices that bolster nation-states' claims to these regions.

To find out whether this was the case, I adopted a methodology largely inspired by studies of bureaucratic practices in state agencies (Chalfin, 2010; Gupta, 1995;

Mountz, 2010) especially those concerned with natural resource management (Clarke & McCool, 1996), development organizations (Li, 2007; Mosse, 2004) and scientific research centers. I interviewed locust managers and observed the internal dynamics of their workplace during meeting and daily activities, and also analyzed their activity reports, budgets, and correspondence.

This material suggests that although locust managers must carry out their work in these non-state spaces, with all the risks it entails, their work is very unlikely to be driven by the demands of a monolithic, all-seeing, sovereign state power. Rather, the primary commitment of these managers pertains to participation in, and connection to, the transnational structures of governance and assistance that coordinate and support national locust control efforts. What this suggests is that technological authority of these state actors—locust managers—is derived from these external connections to these international structures. These findings point attention to a different spatial logic of state practices and representation than the territorial logic commonly emphasized in political ecology (Carter, 2008; Peluso, 1993; Peluso & Vandergeest, 2011). I discuss this spatial logic, and its implications for the topology of developmental statecraft, further below.

Insecurity in Outbreak Areas

Interviews with locust managers, observations during professional meetings and review of organizational documents confirmed that in general, "insecurity" in and surrounding the outbreak areas severely challenges locust management in the Sahel. In order words, locust managers must carry out their work in these non-state spaces, with all the risks this entails. Consider the northern region of Mali, where most of the country's locust and control activities are concentrated. Mali's main locust control operational station is in Gao, supported by have auxiliary stations with pesticide depots

in Kidal, Tessalit and Aguel Hok. Most of the prospection, the search for locusts, takes place in the area surrounding those three localities.

This is also one of the most politically instable areas in the region. For example, the last all-out war that started in 2012, began with attacks on Aguel Hok and Tessalit, after which rebels took over Kidal, followed by Gao, Timbuktu, and kept progressing southward until intervention by several thousand international troops helped reverse situation. It could be said that rebels attacking the Malian state progressed followed the exact reverse path that locust managers follow as they progress northward from Bamako, to Gao, and up to Kidal, Tessalit and Aguel Hok.

When I was in Mali in 2011, a new regional station in Gao, the central hub of locust management operations in the country, was just being finished. Locust managers told me however that they cannot really use the new building because it is situated out of the city limits (about three kilometers away), and the risk of ambush and attack is too great. The concerns of these managers turned out to not be unsubstantiated. Even before the city of Gao fell to rebel fighters, the 33 vehicles of the station were stolen, in one night, from the guards and drivers who were held at gunpoint. The station itself was later taken over, and that they emptied sixty-seven 200 liter-barrels of insecticides on the ground, presumably to use the containers to store and transport fuel (DB, locust control officer, personal communication, Rome, June 2012).

This situation was somewhat extreme in Mali, and became more so after 2012 when the full war started in the North. The 2012-2013 war in the region is such extreme manifestation of this instability that that period ought to be considered separately (as the state had completely lost control of these regions then), and as such I concentrate on

dynamics up to late 2011. That said, these distribution of these events is indicative of the relatively tumultuous nature of these locations, and is thus worth mentioning.

During a 2011 interview with a Malian locust control officer based at the Gao station, he explained that the main problem now is insecurity, before they lacked funds, personnel, training, and materials, now they have all that, thanks to programs such as the AELP and Empres-RO, but they are limited in their capacity to use these resources in locust breeding areas:

> As of now, we are really well equipped. We have ALL the necessary materials to really effectively carry out our work. It's only insecurity that's blocking us. The materials, the teams, all the conditions are met for our work except for that. (RM, locust control officer, personal communication, Bamako, October 2011)

As another officer puts it in a different interview:

> The locust gregarization zones are the same as the zones of insecurity. I often say, this insecurity is to the advantages of the locusts. We are unable to do our work because of insecurity. (OS, locust control specialist, personal communication, Bamako, November 2011)

By insecurity, these officers refer to the risk of, as well as specific instances of, attacks, kidnapping, and robbery. For example, in 1991, a locust survey team composed of French and Nigerien nationals was attacked near a well at In Abangarit in Northern Niger, during which attack a French logistician was killed (Roy 2001, p.160).

This insecurity is not specific to locust managers: it is a condition that almost all governmental and non-governmental organizations and almost all other parties visiting the region have been increasingly facing in the past decades. Locust managers must constantly revise their practices are constantly revised to minimize these risks.

The 2006-2011 African Emergency Locust Program (AELP), under leadership of the World Bank, had recommended that locust prospectors be under military protection

to minimize the risk to locust prospection teams in the notoriously tumultuous region of Kidal in northern Mali:

> We operated with a military escort of four troops. Eventually, the army said it was too light. We eventually increased to twenty-four troops. Along with the guide, the prospector, and the logistician). That came up to twenty-seven. (RM, locust control officer, personal communication, Bamako, October 2011)

This heavy-handed approach had proven perhaps even more problematic, however:

> Nonetheless, they kidnapped a team in 2007, with the twenty-seven. (...) The team stayed a month with (the kidnappers), but they were freed after that and there were no problems. (RM, locust control officer, personal communication, Bamako, October 2011)

This event was also reported, although in a rather minimized manner, in the evaluation report of the AELP (World Bank, 2011). The report cites among the factors that hindered timely project implementation "political instability and civil unrest in Chad, Mali, Mauritania, and Niger, which prevented key field activities and hampered regular supervision by the Bank" (p.6). A footnote adds the following precision to that item:

> In Mali, the project was directly affected by insecurity (project staff had been retained by kidnappers for over a month and vehicles were stolen in two different circumstances). It should be pointed out that the Bank established some palliative solutions, through audio/video conferences and, in the case of Mauritania, reverse missions to Senegal (World Bank, 2011, p. 6)

I was told that in the light of that kidnapping, the military escort was then considered more of a liability than an asset, and that such a heavy protection should thus be avoided:

> We then thought, these are people hostile to the military, so we thought, if we rely on local leaders, with information campaigns, we would be able to do our work without being attacked. (RM, locust control officer, personal communication, Bamako, October 2011)

That solution also turned out to be unsuccessful, however: "Still, even with this approach they kidnapped a team" (RM, locust control officer, personal communication, Bamako,

October 2011). According to this locust control officer as well as other people with experience in the region with whom I talked, the motive of these attacks is the theft of vehicles, fuel, and other equipment. Based on this, the most plausible solution is to do without these valuable materials whenever possible:

> The theft of vehicles is the main problem. If you get rid of vehicles and fuel, you will not have problems. (RM, locust control officer, personal communication, Bamako, October 2011)

Their solution is to rent out vehicles from local populations:

> We currently operate with a system of vehicle rental. The large trucks, the Unimogs, those are not sought by the bandits. We drive the prospectors from Gao to Kidal by Unimog truck. These Unimog trucks are not sought after by the bandits, so we can drive those to reach Kidal. When we arrive in Kidal, we rent vehicles from the nomads, so that we can carry out our operations. We are sure of not being attacked because these are their own means, and they need those. If we bring our own vehicles, they will steal them, if it is theirs, they won't attack. So far we this strategy has worked well. It is difficult for us to leave our vehicles behind and go in vehicles that are more constraining, but it allows us to avoid important problems.
>
> Now we don't need the (military) escort. The escort is to protect the means, as soon as the means belong to the local populations, we don't have problems. Without the escort, we don't have problems. (RM, locust control officer, personal communication, Bamako, October 2011)

In the light of this information, I sought confirmation that prospection and treatment activities are not in themselves the source of hostilities. My interlocutor offered the precision that:

> No. These are bandits, people who want easy money. They have the opportunity. We have 4x4s that are well sought after by traffickers. Really, these vehicles are really sought after in the zone and can be sold very rapidly at a good price.
>
> If we do not have with us the means that people are seeking, we are left alone. That's why when use the (lighter) Mitsubishi (vehicles), also, we don't encounter problems. But in that kind of terrain, we need good vehicles. (RM, locust control officer, personal communication, Bamako, October 2011)

This is a situation where state agents (locust prospectors) leave their official vehicles behind to ride in the cabin of the old and beaten pickup truck of a local nomad, trying to minimize their presence and delicately navigate local cultural and political complexities, going where the drivers and local authorities agree and allow them to go. In this situation, it is difficult to argue that locust management in the Sahel is motivated by the demands of this monolithic, all-seeing, sovereign state power, including the performance of this power via technological benevolence. In other words, the foregoing does not give credence to the hypothesis that locust surveillance and control is enlisted by the Malian state in its effort territorialize space and surveil populations.

In Mauritania and Niger, the situation may be slightly different as in those countries the military escorts have been more used more successfully to support locust survey teams. That being said, they still encounter problems and are limited in where and when they go. The closest to such a contribution that I could find pertains to military access to and adoption of assets, funds and equipment of locust control. For example, in Northern Niger, locust prospection has been done under military escort. The National Locust Control center of Niger pays these military detachment substantial sums, using funds obtained via international programs. Similarly, a great portion of the funds that the Mauritanian locust control center, the CNLA, obtained from the Empres project was spent on aircraft. I was told several times that these aircraft are nominally the property of the CNLA, but that the Mauritanian army is the de facto owner of these planes, for which they charge very high pilot and storage fees. These ‘deals’ may indirectly incorporate locust management in the strengthening of military grip on contested spaces, and certainly help the legitimacy of national control within the state apparatus. Yet, they do not in and of themselves provide evidence that political instability in locust

outbreak areas represent a “negative resource” that would benefit locust managers and thus shape their work.

Moreover, the ways managers and experts across the western region of locust management talk about their work and explain their professional concerns suggest that even if the territorial/sovereign imperatives of the state do provide incentives shaping how the locust problem is approached by managers. Rather, it appears that these incentives are overshadowed by the ones that come from outside the state: the heavy reliance on foreign aid in these poorer countries directly shapes the political geography of locust expertise. To understand the contribution of locust management to African statecraft then, requires attention to not just the demand of territorial sovereignty, but also the dynamic and uneven relation between geo-politics and geo-economics, or the logic of territory and the logic of capital (Arrighi, 1994; Cowen & Smith, 2009; Harvey, 2005; Moisio & Paasi, 2013). I argue that it is that relation that shapes the particular constraints and incentives with which actors of locust governance must compose.

Technological Authority, Development, and the Governance State

As I have shown in the previous chapters, the political geography of locust management has, from the early 20th century to the present, oscillated within the interstitial space between the nation-state and transnational structures of governance. In its current form, the professional network responsible for applied acridology operate across the junction of (1) the networks of international development and (2) the technical agencies of developmental states. What this means is that the kind of state that is (partially) produced by and productive of the technological authority of entomologists and pest control specialists in the West African Sahel is best understood as the outcome of the encounter between post-colonial state building and the various modes of

transnational intervention that operate under the rubric of development (see chapter 4). In other words, the governmental effect of locust expertise (Mitchell, 2002; Rose, 1993) is shaped by the interactions between forces that are internal to the state apparatus and forces that are external to it.

In this context, we must consider two interlinked sets of question to understand the institutional demands that this dynamic presents to locust managers, and in turn how these institutional demands shape locust management. The first set of questions asks how technicians and experts working for the state pursue, and obtain, legitimacy and relevancy within the broader apparatus of the state (Clarke & McCool, 1996). The second set of questions asks how state actors and agencies pursue, and obtain, external support from foreign or international entities (Duffy, 2006; Keeley & Scoones, 2003; Levine, 2007). Addressing all these questions together allows us to arrive at an understanding of what kind of stateness is produced by and productive of locust control expertise and operations.

The Imperative of Connectedness and Relevancy in Locust Control

In chapter four I discussed how one of the most important institutional challenges faced by locust experts was establishing and sustaining a constituency for their work. This is especially difficult because (1) desert locusts do not particularly affect a well-defined public (e.g. by threatening a specific commodity) and for the most part, not an especially wealthy one, and (2) the spatial-temporal stochasticity of locust outbreaks is characterized by long periods of recession during which the locust problem is forgotten by states and organizations. In that context, locust experts must strive to remain relevant to social and technical organizations even during protracted periods of non-crisis, i.e. when locust invasions do not occur. I argued that since the 1960s, actors

of applied acridology have been successful and 'remained afloat' in institutional networks by cultivating the fit between the preventive orientation in locust control and development as mode of government.

Attention to the political economy and political geography of locust governance that shapes the work of locust managers in locust-affected countries of the West African Sahel indicates a very similar dynamic than the one observed in European scientific research centers. Success in the 'locust world' relies a great deal on access to resources, connections, and opportunities that are most often provided from outside the state, within channels that share much with the networks of international development.

Ethnographies of development and scientific practices provide useful insights on how to conceptualize and theorize this dynamic and the institutional demands that it produces. David Mosse (2004) reflecting on his work as part of an expatriate consultancy team of the British Overseas Development Administration on a development project in India provides a description of the concern that has much in common with the kind of concern reported by locust managers:

> Beyond personal commitment to particular development goals and to the new project as their vehicle, our broad ambition (in my view) was to demonstrate professional competence and so secure an enduring relationship with the donor and project agency/area. This offered sites and access for natural resources and social development research/learning as well as consultancy income. (Mosse, 2004, p. 26)

The institutional demands and imperatives acting on locust managers and within control agencies include, to a large degree, professional concerns about similar connections to donors and projects than the ones pursued by Mosse and his colleagues. This is not surprising, nor unique to the locust world. For example, this condition resonates with key dynamics whereby actors within 'epistemic communities' seek and enact techno-political authority based on expertise (Adler & Haas, 1992; Haas, 1992; Shackley, 2001).

How do actors of locust governance conceptualize, represent, and negotiate their pursuit of institutional relevancy? These items often come up in accounts about successes and failures by individuals and organizations. A typical expression used by acridologists talking about their colleagues is how one may have 'earned points', or alternatively, 'lost points'. For example, the director of a national locust control center was said to have "gained point" by being the national contact person for the World Bank's African Emergency Locust Project (DR, retired locust control officer, personal communication, Nouakchott, July 2012). I understand these metaphorical gains or losses of 'points' as increases and decreases in relevancy in the networks. These gains or losses are usually attributed to a combination of individual (or institutional) initiative and skills, for example, 'leadership' or 'seriousness', and changes in organizational orientations and structures.

For example, interviews with locust managers across the region revealed a perception that the Mauritanian Locust Control apparatus (understood as the staff of the center and affiliated experts) gained prominence following the joining of the countries of the Maghreb and the Sahel in a joint regional commission of locust control, the Clcpro, following the merger of Clcpano (Commission de Lutte au Criquet Pèlerin en Afrique du Nord-Ouest) and Oclalav. Mauritania, being right at the intersection of these two regions, went from being peripheral to the work of both organizations to being at the geographic center of the newly expanded one. The dedication and reliability of the Mauritanian locust managers, including especially under the leadership of the National Locust Control Center Director Mohamed Abdellahi Ould Babah Ebbe is noted by many as outstanding also, but the successful application of these assets has greatly been

enhanced by larger structural determinants of institutional connections (CV, entomologist researcher, personal communication, July 2013).

The Mauritanian national locust control unit is often held as the most successful western, sahelian country in the international locust control scene, both within the state apparatus and on the international scene. This can be attributed to (1) their ability to convince state officials that their work is important and non-partisan, which explains the team's ability to survive' multiple regime changes after each military coups over the years; (2) their ability to perform "good governance", i.e. providing the international donors with the indicators of transparency, accountability, and bookkeeping that they demand (this is the first thing that was brought to my attention during my visit to the Center, starting with the prominently displayed collection of old vehicles that are said to still be in functioning order); and (3) persistent locust breeding in the territory, and the relatively unfettered ability to access those areas. "State sovereignty" in the sense of physical control of space is only instrumental in this third item, and is not an essential requirement of that element, although it helps.

More than just connection, what actors and agencies pursue is being an essential node in the transnational linkages of knowledge, resources, decisions, and intervention about locust populations. This question of indispensability frequently comes up in discussions with locust managers and in agency reports. This dynamic is not limited to African state agencies; it is in fact ubiquitous at all levels of the locust management network.

For example, an officer in a national locust control unit explained to me that the most important thing to have is

> the 'scoop' (la primeur) on locust activity, it is essential that I get this information before others, before the Director, before the journalists,

> before the DLCC (referring here to the Desert Locust Information Service, DLIS, of the Committee). My job is to get the 'scoop' on the locusts, and then bring that to the other organizations. (OL, locust control officer, personal communication, June 2012)

Similar conversations about the institutional dynamic of locust management in the Western Region pertained to the role and relevance of the FAO's Desert Locust Committee. Presentations by the staff of the secretariat of the DLCC at meetings and in documents on the Committee (and available on the FAO website) often highlight the relevancy and indispensability of the Committee as the interface of affected countries and donors. For example, a 12 page glossy brochure was published by the Locust Group of the FAO Plant Production and Protection Division (which hosts the DLCC) during the 2003-2005 invasion. Titled *Hunger in their Wake: Inside the Battle Against the Desert Locust*, (FAO, 2004) the brochure explains the importance and the urgency of acting against desert locust invasions. The narrative structure of the document, and the analysis of the problem and solution it present emphasizes the importance of the FAO in resolving this problem. For example a box on page 6 of the brochure is titled "FAO: 50 years in the locust business". The text states that

> For over 50 years FAO has been a world authority on Desert Locust, providing leadership, continuity, global information and forecasting, technical support, training, funding, and a neutral forum much needed by locust-affected and other interested countries. With offices around the world, FAO monitors Desert Locust Activity in 30 countries from Senegal to India. (FAO, 2004, p. 6)

The box prominently displays quotations from populations and state agents praising the work of the organization. These quotations are typical of the types of documents produced by development organizations that frame problems in ways that best match the type of solution provided by the organization (Ferguson 1990). Beyond the usual discourses of humanitarian significance to donors and populations, however, some

elements of the brochure also highlight the relevance of the FAO within the international locust control apparatus. In other words, elements of the text seem directed at locust managers. Elsewhere in the brochure, Abdelaziz Arifi, senior adviser on locust to the Moroccan Ministry of Agriculture and Rural Development, is quoted saying:

> We prefer to go through FAO when we want to lend our experts to other countries. It's faster and they pay living expenses for the expert. (FAO, 2004, p. 7)

These quotations are interesting in the light of conversations with locust experts and managers that question the relevancy, let alone the indispensability of much of the FAO locust work. An example of such questioning is provided by this citation of an interview with a locust control officer:

> The DLCC, what is it for? What does it do? It is a website that sends monthly reports and then big meetings. All the actual work is done at the (level of the regional commission) the Clcpro. Why do countries have to pay contributions to two levels? It is difficult for my Division to justify the double expense to my government. (OL, locust control officer, personal communication, June 2012)

Basically, the secretariat of the DLCC claims its indispensability by positioning itself 'above' the international locust management network, acting as a central clearinghouse for communication, information, and resources. To do so, it seeks to act as a 'funnel' collecting standardized information about locust and locust control activities across the three main regions of locust management. Actors at other echelons, such as national units, question, and/or present a competing alternative to that formulation, arguing that other levels— especially the regional commissions—have greater relevance.

Materials from Cirad's Prifas also provide numerous examples of acridological actors seeking to gain and protect their established relevancy in technical networks and various constituencies. This is of course consistent with the standard understanding of how bureaucracies work (Clarke & McCool, 1996), but the spatial logic produced by this

concern is of interest to understand the political geography of expertise in locust control, and across development networks in general, and in turn the relation of techno-scientific expertise to statecraft in developing contexts.

Cirad-Prifas has produced hundreds of thousands of brochures, books, posters, stickers, comic books widely diffused across Francophone Africa, many of these can still be found to this day in locust control stations. The SAS (Surveillance des Acridiens au Sahel) newsletter published by the Prifas frequently from 1986 to 1996 and mailed to hundreds of addresses across Europe and Africa also served to increase the visibility and highlight the usefulness of this research unit. In it, acridologists of the Prifas reported on their work, commented on issues pertaining to locust management, and concentrated information about locust observation and treatment activities, similar to the Desert Locust Bulletin published monthly by the FAO's DLCC. These documents provide many indications of the concerns and priorities of these actors.

For example, during the 1987-1989 invasion, the Prifas newsletter of 7 November 1988 includes a call for a "code of honor of locust control" ("Vers un code d'honneur de la lute antiacridienne") (SAS 88, number 14, p.56). The text denounces the "exploitation of locust plagues" by what it calls "predators", saying that the plague situation should not be exploited to serve the particular interests of institutions. Especially, the text continues, civil authorities ought to be wary of "newly self-appointed locust experts" whose ill-informed advice can exacerbate the problem in many different ways. By distinguishing the false experts, the newsletter implicitly highlights by contrast the established scientific authority of Prifas and its allies, thus stressing the importance of this node in the international network.

This question of relevancy and indispensability of expertise has been addressed elsewhere. For example, the fourth chapter of Bruno Latour's *Science in Action* (1987), titled "Insiders Out", looks in detail at the work that is necessary to make scientific research socially possible through alignments with broader socio-economic forces and actors that go well outside the laboratory. In their review of power differentials among natural resource management agencies in the US government, Clark and McCool (1996) also stressed how the ability of actors in natural resource management bureaucracies gain managerial autonomy and political power relies on their ability to cater to a well-defined and politically efficacious constituency. This study adds to this literature by taking a political geographical approach to understand the spatial logic productive of and produced by these efforts to maximize relevancy and connection within transnational networks of techno-scientific expertise. This can help shedding light on the role of techno-power at the intersection of post-colonial state-building and modes of government that incorporate and exceed the nation-state, what Ferguson and Gupta (2002) call transnational governmentality.

The African Developmental State and Transnational Governmentality

Although locust control is usually a state mandate, this field of pest management is tightly interwoven with international structures and programs of development. This is in part because the immense range of the desert locust covers many of the world's poorest countries. Moreover, within these regions, the countries that tend to harbor desert locust outbreak areas—the 'frontline' countries of locust management—are often the countries with the least capacity to carry out control activities within their territories.

In the Western Region, the area of focus of this study, the front-line countries are Chad, Mali, Mauritania, and Niger, all classified as 'least developed countries' with low national income figures and recipients of important foreign aid (see table below).

Table 5.1 *Income and Official Development Assistance (ODA) of the front-line countries in the Western Region*

	GDP PPP	GDP PPP Per Capita	Ranking GDP PPP Per Capita	Net ODA % GNI (2011)	Net ODA and official aid received (current US$, 2011)
CHAD	$21 billion (2012 est.)	$2,000 (2012 est.)	194	4.9	468,410,000
MALI	$18.28 billion (2012 est.)	$1,100 (2012 est.)	214	12.5	1,270,100,000
MAURITANIA	$7.82 billion (2012 est.)	$2,200 (2012 est.)	190	9.3	381,050,000
NIGER	$13.34 billion (2012 est.)	$800 (2012 est.)	221	10.8	645,970,000

Note. *From* World Bank (2013).

In contrast, the 'invasion' countries of the Maghreb where locust swarms can travel after forming in the outbreak areas are considerably wealthier, and although they receive considerable quantities of aid and assistance (except for Algeria), these amount to a much smaller proportion of the national economies.

Table 5.2 *Income and Official Development Assistance (ODA) of the invasion countries of the Maghreb*

	GDP PPP	GDP PPP Per Capita	Ranking GDP PPP Per Capita	Net ODA % GNI (2011)	Net ODA and official aid received (current US$, 2011)
MOROCCO	$174 billion (2012 est.)	$5,400 (2012 est.)	155	1.5	1,427,360,000
ALGERIA	$277.4 billion (2012 est.	$7,600 (2012 est.)	137	0.1	196,560,000
LYBIA	$78.63 billion (2012 est.)	$12,300 (2012 est.)	104		642,170,000
TUNISIA	$107.1 billion (2012 est.)	$9,900 (2012 est.)	120	2.1	918,250,000

Note. From *World Bank (2013).*

The third group of countries in the Western Region of locust control is the invasion countries in the Sahel—these are also LDCs, and exhibit similar economies to those of the frontline countries: low income and greater proportion of development assistance to total income.

Table 5.3 *Income and Official Development Assistance (ODA) of the invasion countries of the Sahel*

	GDP PPP	GDP PPP Per Capita	Ranking GDP PPP Per Capita	Net ODA % GNI (2011)	Net ODA and official aid received (current US$, 2011)
BURKINA FASO	$24.69 billion (2012 est.)	$1,400 (2012 est.)	205	9.6	995,660,000
SENEGAL	$27.01 billion (2012 est.)	$2,100 (2012 est.)	193	7.3	1,049,280,000

Note. From *World Bank (2013).*

These numbers, and the difference in income that they represent, matter because whereas invasion countries in the Maghreb have national capacity to combat invasions—for example the Moroccan national locust control unit, which is under the Civil Protection Minister, has maintained and effective and continued existence since the early 1950s. Although these countries have received aid to bolster locust control capacity, most often as part of regional programs, national budgets are arguably sufficient; in fact these countries have been key contributor in financial and material resources to regional locust control capacity, i.e. helping frontline countries' ability to prevent and contain invasion risks.

In the sub-Saharan countries of the Sahel, the situation is quite different. In these countries, state capacity to monitor and manage locust population dynamics is much more dependent on foreign sources of income and resources. It is this condition that suggests that the effective existence of locust control agencies in the Sahel is contingent on its actors' ability to obtain and maintain connections within these international networks.

Much literature addressing these dynamics focusing on the state in sub-Saharan Africa point to strategies best described by political scientist Jean-Francois Bayart (2009) as "extraversion": rent-based modes of action by political authorities. This is often accumulation of wealth through tenure of political power' (Bayart, Ellis, and Hibou

1999, p.8) and oriented toward the “external environment”—entities and processes that lie outside the nation-state—and from which can be derived what amounts to major resources “in the process of political centralization and economic accumulation” (Bayart, 2000, p. 219).

An equivalent concept is described by Frederick Cooper's consideration of the African state as a “gatekeeper state”, i.e. a state whose power and legitimacy are tributary to relations with external forces. Cooper stresses the historical trajectory from colonial extractive policies to post-independence reliance on foreign, most often extractive, investments, duties, visas, and foreign aid (Cooper, 2002, 2005).

These concepts of extraversion and gatekeeping are of great help to describe and explain the strategic concerns of state actors in developing countries. That said, this literature tends to be overly normative, focused on explaining corruption and the weakness and/or failures of post-colonial states. For example Bayart emphasizes how these dynamics of participation-based rent contribute to reproducing the relations of dependence of African states vis-à-vis the entities outside the region, such as former colonial metropolises.[40] Elsewhere Catherine Boone (1998) argues that the wealth-accumulating political class Senegal tend to not do so via investment in production but by rent capture, deriving income from their holdings and or social position, using property and other forms of institutional leverage for profits. It is commonly understood by populations that although civil servant positions do not offer the most lucrative salaries, they provide access to other advantages, including per diem, access to free fuel

[40] See Cox and Negi (2010) for a useful critique and alternative to these analyses.

and car, and lodging ("Le Salarié Malien, trop de charges pour un faible salaire", 2013).[41] These resources are very often derived, either directly or indirectly, from sources external to the state, such as supranational organizations.

The argument I am making in the remainder of this chapter is that the relation between the technological authority of state agencies and legitimacy and support from international structures of governance—what corresponds to Bayart's concept of extraversion—is characteristic of a topology of statecraft that is the same regardless of the moral legitimacy or the legality of the transactions sought in these relations. In other words, the tendency to interpret participation by state agents in transnational structures as something that undermines the power of the state misses out on how the technological authority of the developmental state is in fact produced by these transnational relations. This invites a consideration of the ways strategies of extraversion by African state actors yield not only rent-seeking practices such as corruption, and graft (Benjaminsen, Goldman, Minwary, & Maganga, 2013; Blundo & de Sardan, 2001; Boone, 1998), but are also central to the ways state actors simultaneously pursue and achieve professional development and obtain the means to fulfill their management mandates.

Below I describe some strategies and practices of extraversion whose outcomes can best be described as 'corruption'. Following this, I engage other approaches to transnational connections that can provide a more open and less normative account of the relation between state and transnational manifestations of techno-power. I then discuss a number of similar connections pursued and achieved by locust state actors to

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[41] « Les fonctionnaires de l'État parviennent à arrondir les fins du mois grâce aux frais de missions et autres avantages (logement d'astreinte, eau et électricité gratuites, bons d'essence par exemple) »

structures that are outside of the state, i.e. occurrences of extraversion, and for which the qualification of corruption does not apply very well. Together these show that the technological authority that states derived from and enact within locust control efforts is intertwined with the connections that locust control actors and agencies within the state cultivate and pursue within the constellations of programs and structures of technical assistance and foreign aid.

Extraversion and Rent-Capture

The practices of rent capture by locust officials are indeed part of the institutional landscape of West African Locust governance, or at least they have been in some times and places. Accounts of these dynamic focus on the cycles of spending in locust management. Revenues to locust control agencies tend to peak after a locust invasion, as the various organizations of technical assistance and foreign aid 'jump in' to help build the capacity to deal with these invasions management in the affected countries. During periods of locust recession, the spending also recedes, and the materials and skills at the basis of operational preparedness begin to erode as well. Locust expert Michel Lecoq refers to this pattern as a 'cycle of forgetting' and 'invasion crises' (2005): states and multilateral organizations constantly 'forget' about locust-related risks during recession periods, and instead of "conduct(ing) early operations to benefit inhabitants" they invariably act in delayed fashion, starting to work "later when 100-fold more funds can be obtained from donors" (Lecoq 2005, p. 185). This raises the question of where does the surplus of resources and monies yielded by these boom cycles ends up? What happens to these "100-fold more funds"?

Some answers to this questions are at least suggested by reports, rumors, and commentaries on how responses to locust invasions often provide opportunities for

personal enrichment. An example of this is provided by an Algerian editorial accusing a minister of misallocation of foreign aid designated for response to natural disasters lists locusts (criquets) among the potential sources of the minister's outstanding enrichment, along with expired drugs, date-based ethanol, laundered money and so on (M'Sili, 2009).[42]

In Mali again, inquiries on corruption within the government reported irregularities in the allocation of funds for locust control. Funds from the European Union amounting to 650,000,000 F CFA (1.35 million USD) were spent via an emergency fund later deemed anti-constitutional (Takiou, 2009). Reports also indicate missing invoices for pesticide purchases and advances to regional direction and operational posts that were not justified. The then minister of agriculture Seydou Traoré is said to have enriched himself via the capture of these locust control resources. He is now commonly referred to as "Seydou Criquet" in the press ("Criquet pèlerin" being the French name for the desert locust).

I directly encountered some indication, at least tangential, of such rent capture during my field work. The most compelling example was a recently-built cement structure meant to serve as a new locust control station. The construction of this compound was part of a massively funded international project to enhance locust control capacity on the African continent. The structure stands out in the landscape of shrubs and dirt laterite structures of the nearby villages. I had learned about this station a few days prior to my visit, during an interview with the director of the national agency

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[42] M'Sili : "On ne saura pas s'il a hérité de Crésus ou tout simplement du trésor du effélène bis, ou s'il s'est tout simplement enrichi grâce aux criquets pèlerins, aux médicaments périmés, à l'éthanol à base de dattes, au pétrole qui s'évapore, à l'argent blanchi. . . ou aux bateaux de pêche truqués"

responsible for this pest control. The interviewee was proud to refer to this station as an example of the country's readiness for locust invasions, for which he also credited the multi-million dollar loans and donations from various international organizations and bilateral foreign aid agreements following the last locust invasion. The manager of the station in question happened to be present during that interview with his superior, and he suggested that I visit the station so that I can see for myself. The excerpt from my field notes provided below provides some information on this new structure.

> The building was so 'new' that it was in fact nowhere near complete. Yet, many of the 'finished' parts were already in disrepair. Faucets and toilets were installed but no pipes connected the building to anything outside. Doors were bent and not sitting straight in their frames, allowing sand to accumulate within the building, in some places several centimeters thick. My host has a mat on the floor and a small electric stove in an area of the lobby that he constantly sweeps to keep sands away. The garage door to the (empty) pesticide compound is stuck half-way open, and its railing also seems irreparably bent.[43]
>
> In the office space, chairs are missing, yet other pieces of furniture are still in their original packaging. There is electricity, which I am told, finally arrived only four weeks prior, and only after multiple letters making that request to the central administration.
>
> I realized that no one actually worked at the station except for my host, who was prior to our arrival away in the capital for a couple of days. He explained that because of the difficult conditions given the poor shape of the building, he cannot expect his employees to be on duty, so despite official rules, he allows them to stay at home 'on call'. These calls ought to be infrequent anyways, the area having not seen any desert locust in close to eight years.
>
> Looking through the station's window, I started to notice villagers walking toward the station from different hamlets in the distance. After their arrival, we exchange greetings, and they walk inside to find my host. As I look inside the building, I notice that the visitors collecting cell phones that were plugged in the power outlets on the wall. (I had previously noticed the profusion of chargers and phones of various sorts plugged in almost all of the outlets, but did not gave it much thought then.) Another visitor is talking with my host by the station's kitchen

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[43] In comparison, the pesticide depot of the former locust control station in the region had no door and was overflowing with empty blue metal 200-litre barrels of insecticides, as I was able to observe when we stopped at that former installation to fill our water tanks before arriving to the new station.

> refrigerator. As they talk, the field officer opens the freezer door to take out two small bags of what I assume to be ice. He gives the bags to the visitor and put in his pocket what I assume to be some unknown quantity—probably minimal—of the local currency. A similar transaction is made by the other visitors that had picked up their cell phones left there for the last few days. My host, upon seeing my observing this business, smiles, saying "you didn't see anything". (Field notes, 2012)

Subsequent reflection and discussion about these observations strongly suggests that spending on the construction of the new field station happened in ways that various contractors were able to 'skimp' on the quality of materials and on finished construction. As payments stopped coming to them, they left the building unfinished, and a combination of poor quality of construction with lack of use and upkeep led to the structure rapidly falling apart. This is unfortunate, according to my host, because the previous station that the new one was meant to replace was quite acceptable, comparatively speaking, but "experts from the project" had estimated that the proximity of the original station to the town made it a contamination hazard, which called for a new building further away in the savannah, built according to recent health and safety norms.

Another element revealed by these observations is that the manager of (and sole staff at) this remote outpost has, as one would expect, established relations with the neighbors, for company and exchanges of various items. These relations happen to include the provision of minor services whose compensation supplements the managers' official salary and help compensate for his unfortunate situation while also making the station of use to villagers.

Even there are several examples wherein the pursuits by state actors of resources and assets from structures outside the state result in rent capture, a narrow focus on rent is insufficient to explain the behavior of state managers in international programs. I

argue that there is something more deeply structural at play in these practices of extraversion, which has to do with the fundamentals of what the technological power of the developmental state.

The Governance State

Harrison (2004) call the *governance state* a type of state whose legitimacy and sovereignty are to a large degree conferred and conditioned by participation in global structures of governance such as the World Bank and the International Monetary Fund. Capture of foreign aid and other resources of technical assistance then may be understood as not only a practice of individual graft, but also a built-in source for national and public goods and service in developing countries and political legitimacy of and within the state. What I argue is that a focus on the spatiality of these state practices show that rent-seeking and corruption actually share a great deal in logic with the relations whereby state actors achieve 'legitimate' technological authority, professional advancement, and similar marks of success vis-à-vis state-building and 'good governance'. These dynamics are commonly produced by conditions of access to foreign aid, participation in programs designed to improve governance, economic and social development, as well as ecological sustainability.

In this context, then, agencies and actors of the state successfully contribute to the authority and legitimacy of the state when they realize connections and participation in these transnational structures and programs. In this sense, then, strategies of extraversion contribute not only to enhancing the stature and relevancy of specific actors and agencies within the state apparatus; they also contribute to the making and reification of state power itself. This conclusion differs markedly from accounts of

extraversion that focus on how extraversion and transnational governance in general undermine or compete with the sovereign power of the state.

The imperative and strategies of agencies to enhance their relevancy vis-à-vis international programs was described by Levine in her study of governments responses to pressure for community-based resource management in marine protected areas (Levine, 2007). In line with other scholars of the social-political dimensions of international conservation initiatives (Igoe & Kelsall, 2005), Levine looked at the implications of the shift in these initiatives and donor policies away from direct support of developing states toward more decentralized, privatized, and community-based/participatory approaches to resource management and biodiversity conservation. Her analysis focuses on the strategies adopted by Zanzibari state actors to maintain and reinvent their access to international funds. Especially, Levine's study shows how the *Environmental Management for Sustainable Development Act* adopted by the Government of Zanzibar "strategically enables external organizations to be designated as protected area managers while maintaining a role for the state as an intermediary in reaching local communities" (Levine, 2007, p.562):

> While neoliberal development policies work to peripheralise the role of the state, state actors remain intent on maintaining their roles as intermediaries between 'local communities' and international donors, which gives them access to international development funding as well as direct influence at the community level.[44]

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[44] Levine, 2007, p. 582: "The failure of development programmes is frequently blamed on host government 'corruption' and 'mismanagement' without recognising the ways that neoliberal policies have contributed to corruption and mismanagement through the creation of extra-legal transnational networks, which include actors from the ostensibly separate realms of state, NGO, and for-profit sectors (Brockington and Igoe 2006; Ferguson 2006). In Zanzibar, the state's struggle for continued relevancy has created an unexpected dynamic between the state, international donors, and local communities that threatens the long-term sustainability of community-based conservation programmes."

A similar dynamic has been described by Sally Moore's study of the "international production of authoritative knowledge" and how the government of Burkina Faso participated and responded to this production (S. F. Moore, 2001). As Watts puts it, Moore shows how the Burkina government is

> especially adept at responding to the latest government discourse by cooking up projects to acquire Official Development Assistance (ODA) monies: it might be community development, it might be decentralization, but either way the state is skilled at reworking discourses and texts to gain access to global development resources through the World Bank, USAID, or CILSS (Watts, 2001, p. 287)

The passages above by Levine and Watts help describe and highlight two issues that are key for my analysis of locust control: (1) the imperative of relevancy, as node in transnational linkages that are often very dynamic, that 'hops' rather than 'flow' across space, to borrow from Ferguson (2006)[45], and (2) the types of demands for social and environmental transformation fostered or required by these linkages.

In one way, this "material dependence on international support" can be held as creating or deepening a patrimonial logic" that contributes to further shifting "accountability 'upward' to donors rather than 'downward' toward constituents" (Kassimir 2001, p.108). Rather than focusing on the normative or moral aspects of these practices, Kassimir provides an explanation of how these relations come about:

> The international community needs individuals to serve as interlocutors. The support of international activist organizations depends in part on the trust that develops between them and local leaders. But the relationships can deepen hierarchies within local organizations and can foster competition for the resources and the legitimacy that the international

[45] In his consideration of the implications of globalization for Africa, Ferguson stresses how the connections of the region to the rest of the World are not as straightforward as usually assumed. For instance, considering economic linkages, Ferguson stresses that capital is not so much "globe-covering" but rather "globe-hopping" (Ferguson, 2006). He illustrates his point with a discussion of enclaves of very spatially narrow investment, such as mineral exploitation. But the imperative of connecting to the trajectories of capital, in so far as it applies to the resources of international organization, also operate in a similar way in locust control.

> arena bestows. (Kassimir, 2001, p. 108).

Kassimir speaks of organizations that are different than the state, namely civil rights, environmental protection and religious NGOs, and their relationship with local authorities. That said, even though the World Bank and the FAO are not usually designated as "activist organizations", the processes described by Kassimir apply equally well to our understanding of the "social institutions of globalization" (Bayart, 2000) that are at the basis of international locust governance:

> Familiarizing themselves with the priorities of international organizations and their discourses, some non-state actors represent their situations and the interest of their members strategically in order to gain access to resources and politically useful networks. (Kassimir, 2001, p. 108).

Taking this logic beyond rent and corruption, Kassimir continues:

> Such strategies may, but need not be, part of accumulation and governing strategies for organizational leaders. Indeed, they may be part of very real political projects—improving the status of women, extending the control of natural resources by 'indigenous' groups, even strengthening civil society (Kassimir, 2001, p. 108).

In this sense, seeking 'connections' and 'participation' is not necessarily a 'bad' (or 'good') thing. But it clearly presents implications for our understanding of the relationship between expertise, development, and state-making. To understand the logic and imperative of the developmental state, and the role of technological authority therein, it is necessary, then to account for the important contribution of external leverage and "outward" pursuits of political legitimacy and power to colonial and post-colonial statecraft. Two examples help better illustrate this point, while also highlighting the political geographical logic produced by the incorporation of state locust expertise in the making of developmental governmentality.

Before turning to these examples, an important precision is in order. While I argue that strategies of extraversion and concerns for external leverage and connection

are key factors shaping the concerns and professional practices of state-mandated locust control officers, I do not claim that concerns about locust population dynamics and responses to invasions in affected countries are in and of themselves solely or even primarily motivated by these international opportunities. In other words, the regional response and collaboration within the populations of and across these multiple countries to minimize crop depredations by these insects should not be understood as in itself produced and made possible by donors and development experts from abroad. Rather, what I argue is that concerns about and response attempts to locust invasions by local and regional actors invite intervention by foreign entities—donors and experts—that in turn provide opportunities for state actors to capture resources and gain legitimacy vis-à-vis the state structures and international organizations.

One of the reasons this precision is important is that locust control actors and other nationals in locust affected countries have repeatedly stressed that great efforts and contributions to regional locust control capacity and responses by the governments and populations of poor countries are too often overlooked in accounts that only mention the contribution of rich countries ("the donors") and multilateral aid agencies.

For example, returning to the historical trajectory of the Oclalav, a senior locust control specialist recognized that France created and financed it at first, but rapidly added that "eventually, the member countries made substantial contributions" (NA, locust control expert, Rome, June 2012). These contributions, this specialist argued, were constitutive of what became the regional solidarity across the Sahel and the Maghreb, that, he and many other argue is the actual success story and the actual foundation of locust control in the region. For example, speaking of how international organizations take the credit for the response to the 2003-2005 invasion (response

which, according to many, came too late and brought in too many resources compared to what was needed, leading to other problems), this Malian locust control officer stresses that:

> The first response (to invasions) and the most important one, comes from the population, national solidarity. People would donate 1000 F CFA (approximately 2.00 USD), we opened a bank account and people were donating. There were radio and TV programs organizing these collections. (DT, locust control officer, Bamako, September 2011)

The effectiveness of this local response was limited by the lack of material means, however:

> Young volunteers wanted to help but we only had an old vehicle, a very old truck for treatment. Other materials had been lost or become obsolete in the preceding years. (DT, locust control officer, Bamako, September 2011)

The first, and thus most crucial, transfers of these material resources, especially pesticides, were provided by neighboring countries such as Algeria and Libya,

> International organizations and European and North American donors waited nine months before responding to the invasion. The response by the neighboring countries was immediate. Locust upsurges were starting in Mauritania, in Mali and Niger in October (2003). As early as November, Algerian prospection and treatment teams were active in Mali and Niger, and Moroccan prospection and treatment teams also went to Mauritania. In February, Morocco sent treatment airplanes to Mauritania. It was a very efficient task repartition.
>
> Libya also sent teams to Mali, planes to Senegal, and to Mali. Algeria sent equipment, pesticides, fuel. There was an outstanding solidarity. Even Senegal sent a team to Mauritania, from the South to the North. In sum, this regional solidarity, that we estimate at 30 million dollars, came very rapidly and efficiently compared to the contribution of the international community. (Thami Ben Halima, former executive secretary of the Clcpro, Bamako, October 2011).

For Ben Halima, the mandate, and the raison d'être of the Clcpro is too coordinate and finance this regional solidarity (Thami Ben Halima, former executive secretary of the Clcpro, Rome, June 2012). Yet, according to many, these responses, and the specific

resources that would help them become more effective, are too often ignored or minimized in European accounts of the response to the invasion (DT, locust control officer, Bamako, September 2011). This regional dynamic of cooperation is itself worthy of a study similar to this dissertation. Unfortunately it largely falls outside the scope of this study. The point here is that understanding the mechanisms whereby state actors seek and obtain leverage and resources from transnational structures, the primary objective of this chapter, should not be interpreted as an argument that these transnational structures are themselves the primary, let alone the sole, drivers of locust management in the region.

Structural Legacies, External Leverage, and Locust Techno-Power: Mali

The institutional history of locust control in Mali provides an informative look at how the relation between the technological authority of the state and the positioning of the locust management within the apparatus of the state is derived from leverage from and connections to transnational or transterritorial structures of governance.

In chapter 3, I described how the National Anti-Locust Board ("Office National Anti-Acridien": ONAA) that was hastily created by French authorities in the Second World War had no management capacity of its own, but sough instead to coordinate and oversee the locust control activities of the territorial governments. The territorial government responsible for locust control in what eventually became the countries of the Sahel, that include Mali (as well as Senegal, Mauritania, Burkina Faso, and Niger) was the federal government of the French West Africa ("Afrique Française Occidentale": AOF), based in Dakar, Sénégal. The government of the AOF had a federal service of locust control, which eventually became established as the Anti-Locust Organization ("Organisme de Lutte Anti-Acridienne": OLA) in 1952 (see chapter 3). In 1959, France

and the governments of the increasingly autonomous territories of the former AOF agreed to revive the colonial and regional anti-locust structure of the OLA as a post-colonial (or post-independence) regional/transnational organization. This led to the creation of the Joint Organization for the Control of Locusts ("Organisation Commune de Lutte Antiacridienne": OCLA). In 1965, OCLA merged with the Joint Organization for the Control of Birds ("Organisation de Lutte Antiaviaire": Oclav). This merger yielded the Joint Organization for the Control of Locusts and Birds ("Organisation commune pour la lutte anti-acridienne et anti-aviaire": Oclalav), which remained effective until the 1980s.

Oclalav operated as an extra-territorial entity that controlled pest locusts and birds across ten countries of West Africa. Its staff were granted diplomatic passports allowing them to travel and carry out their work across the territories of all ten member countries. The organization was heavily financed and supported by France, especially in its early years when most of its professional staff were French nationals (see chapter 3). The organization had bases, pesticide depots, and eventually, airfields and aircraft, distributed across the areas of locust activity in the Western Sahel. It is these structures that Sahelian governments inherited and took over when donors and members had agreed to end the organizations. What is interesting from the standpoint of this study is how this contribution of locust control to post-colonial statecraft was the absorption by states of a former regional structure (Oclalav) that was itself a revived remnant of a colonial federal structure (the OLA of the AOF). The institutional history of contemporary the locust control agency in Mali, the National Locust Control Center ("Centre National de Lutte au Criquet Pèlerin": Cnlcp) as revealed by interviews with some of the Center's officers and managers, provides detail on how this absorption and transformation occurred. In turn, these conversations shed light on how developmental

states are made by their participation in and adoption of international structures and resources.

At the same time as the Oclalav was beginning to end in 1987, the Republic of Mali created its Plant Protection Service ("Service de Protection des Végétaux": SPV), as a branch of the Minister of Agriculture. A senior locust control officer, trained as agronomist, as many of his colleagues, explains the transitions that followed from this. His account provides a glimpse on how the institutionalization of locust control capacity and expertise within the Malian state evolved in relation to not only locust population dynamics (upsurges and recessions) but also the negotiations between different goals by political actors within and outside the formal apparatus of the state.

> I joined the Plant Protection Service in 1987-1988, shortly before the Oclalav was dismantled, which corresponded with the year of the onset of the (1987-1989) invasion. There were station in Gao, Yélimané, Kidal, former Oclalav stations, with a landing strip, and pesticide stocks. I stayed in Gao from 1988 to 1999. (DT, locust control officer, personal communication, Bamako, November 2011)

In 1999, this officer joined the newly created regional unit of locust control in Gao (within the Plant Protection Service):

> In 1999, we created a regional unit in Gao. We took over the structure from Oclalav. This agency in Gao was focused on the locusts. The objective of the department was to transform the (former Oclalav base) in a base for the Plant Protection Service. (DT, locust control officer, personal communication, Bamako, November 2011)

This creation and operation of this regional locust control unit, however, received little if any support from within the state. Rather, it was made possible by resources from international organizations such as the FAO:

> I arrived in Bamako in 1999, I was appointed at the regional locust control unit ("Unité regionale de lutte au criquet pèlerin") within the Service. The regional unit was created in 1999. Unfortunately, we did not receive any funding from the state, only minimal support from the FAO. We were unable to take money out of the state's coffers. So we were not

operational.

> In 2002, we became a national unit, with three people. We did not even have one computer. We had to wait for the Technical Cooperation Programs of the FAO to get a computer. The FAO helped us a lot, in 2002 and 2003. (DT, locust control officer, personal communication, Bamako, November 2011)

Another illustration of the place and role of Malian locust control as source of income to the state, rather than an expense, is provided by a special request made for funding of operational costs by the Malian Locust Control to the Ministry of Agriculture in August 2002 (Republic of Mali, 2002).

The communiqué of the request stresses the importance of carrying out locust surveys given the high risk of resurgence and possible invasion in the north of the country, and states that the 20-day, 4-team survey expedition is estimated to cost 4.7 million F CFA (equivalent close to 10,000 USD). What is striking is that the statement is almost apologetic in the request of these funds even though these surveys are nominally a duty of the country's Minister of Agriculture. The text explains that these costs are usually paid for by the FAO but this year that contribution was not possible and the expected funds from the Empres-RO program are not yet available, and due to these unusual circumstances, the proposed program "must be financed by the national budget" (Republic of Mali, 2002).

The statement above, combined with other mentions of how the Minister of Agriculture perceived the funding dynamic of locust control strengthens the claim that the interest of the central state in locust control has a lot to do with access to funds from international sources.

Cannibalization, promotion, competition: AELP and CNLCP. As one walks into the head office of the Centre national de lute au criquet pèlerin (CNLCP) of Mali, in

Bamako, it would be difficult to not notice the numerous and prominently displayed posters promoting and praising the work and contribution of “the donors”. The main stairwell of the building opens on a four meter wide banner of the African Emergency Locust Project (AELP), a multi-lateral development program of the World Bank, the African Development Bank, the Islamic Development Bank and several others. Across the walls, posters of Empres, stickers promoting Usaid can be found file cabinets and desks, and promotional calendars from similar international programs. The Center itself, as well as most of the furniture and equipment it contains, have been largely paid for by funds from the AELP that came in the wake of the 2003-2005 invasion. As an acridologist told me, “the World Bank arrived with the last invasion” (CL, entomologist researcher, personal communication, 2011).

That contribution would be hard to miss as well, as each piece of equipment, computer, chair, bookshelf is adorned with a sticker stating the project and a UPC code for purpose of inventory. This type of display of “the donors” is ubiquitous in developing states agencies, and the CNLCP is not very different in this aspect. I mention these posters and stickers because they are a visual manifestation of the linkages whereby locust techno-power operates at the interface of the state and international development programs.

Following the 2003-2005 invasion, it was recognized again that the stochasticity of locust invasion and recession periods, and the cycles of ‘crisis’ and ‘oblivion’ that this engenders, directly challenges the states’ ability to sustain locust management capacity in the long run. Moreover, a recurrent problem with that type of configuration was that the resources provided and set aside for locust control would become ‘cannibalized’ by other branches of the Plant Protection Service during periods of locust recession.

Returning to the Malian locust control officer quoted above, he explained how this dynamic called for a specialized locust control center autonomous from the rest of the crop protection service within the Minister of Agriculture:

> It is (in 2002 when we became a national unit but with no funding) that we started to make the case for an autonomous center. But people did not see the importance, they thought there is nothing to do against the locusts. But there are things we can do. (DT, locust control officer, personal communication, Bamako, November 2011)

Several initiatives of reform implemented within the various commission, programs and projects of the Clcpro, Empres-RO and AELP, together sought to transform the institutional configuration of locust management to ensure its durability regardless of these cycles of invasions and recession, and in turn minimize the risk of such "institutional cannibalizing" taking place. One of the key elements of this restructuring was the creation of autonomous units of locust control as a distinct item in the national government's budget, as opposed to under that of the plant protection service.

Interviews with locust managers present at the time indicated that this promotion of locust management by the creation of a National locust control center first met some resistance from within the plant protection service, in that the service would then lose access to an occasionally important source of funds and equipment. Moreover, this advancement coincided with a massive influx of spending on locust control in the region in the wake of most recent invasion (via Empres, the AELP, and other related projects).

One implication of this dynamic is that locust crises, and the interest that international donors have to respond to this problem, create opportunities for locust managers to 'climb' and 'gain points' within the apparatus of the state. Consider for

example the 'de facto' promotion that this locust control officer received at the onset of the last invasion:

> When the invasion started in 2003, I was subordinate to the sector's supervisor. Shortly after, a memo was sent, stating that I would be responsible for the response to this crisis. This brought me to the same level as my superior. (DT, locust control officer, personal communication, Bamako, November 2011)

Similarly, once the creation of the center became decided upon by the national government, which passed this as a law in 2006, the positions of upper management in this newly formed state agency became highly sought, for the same reasons. These include potential access to occasionally massive sources of funding and equipment. For example, right as the funding of the AELP project was about to start, a newly appointed Minister of Agriculture sent a memo to the effect that the current director of the center (a veteran of locust control since the early 1980s) was to be replaced with someone, according to interviewees, "of the minister's entourage" (EL, locust control officer, personal communication, November 2011).

The initial and legitimate director of the newly created Center, Mr. Fakaba Diakité, sent a letter of protest to the World Bank manager of the AELP project. This resulted in response letters from both the project manager and from the FAO, stating the importance that Mr. Diakité remains in place given his unique experience and excellent track record. One interviewee spoke of a "four-month stand-off" opposing on the one side the World Bank, the FAO and Mr. Diakité, and on the other side, the Minister of Agriculture and his preferred candidate. I was told that after the World Bank threatened to withdraw from the project, the "standoff" was eventually resolved through "a compromise" (EL, locust control officer, October 2011). The "World Bank candidate", Mr. Diakité, offered the position of executive director to the Minister's protégé, who kept

the position until the end of the World Bank project, at which point he was replaced by Mr. Toumani Sidibé, another veteran of the pre-Cnlcp Malian locust control.

The foregoing provides a rather nuanced illustration of the specific mechanisms whereby the technological authority conferred by locust management to the state and to individual actors within the formal state structure is directly tied to connections to transnational networks of expertise, technical assistance and foreign aid. In the last example, the relationships that the director of the 2002 National Unit of Locust Control (at a time when locust control sustained very little interest among other state actors) had cultivated within the FAO and the World Bank allowed him to climb within the structure of the state in ways that overcame or circumvented domestic favoritism when.

Another way in which participation in international programs of locust governance provides external leverage and opportunities to climb within the structures of the state pertains to opportunities for technical training that constitute the basis of professional advancement. For example, the AELP and Empres programs provided scholarships for select locust control officers employed by the agencies of participating governments, to complete certificates, as well as masters or doctoral studies in various sub-fields related to acridology. Most of this training took place at the Institute Vétérinaire Hassan II in Agadir, Morocco, which offers graduate programs in applied acridology. An example of this path to promotion provided by international programs is provided by this other officer:

> I was a locust prospector in Kidal, for the Plant Protection Service. In 2006, the AELP project provided me with a bursary to go to Agadir for two years, to get my Master's in acridology. My return to Mali coincided with the separation of the two services (the locust control unit and the crop protection service, which led to the creation of the Cnlcp), so they kept me here in Bamako, at the National Center. (RM, locust control officer, personal communication, Bamako, October 2011)

These training programs provide opportunities for individuals to obtain a more desirable position in state structures. They also provide opportunities of access for other opportunities, such as consultancies and other international programs. In this sense, successful locust managers develop in these linkages connections useful for professional advancement, similar to the one described by Mosse (2004) about the primary professional concern that he assumed to share with his development expert colleagues. At the same time, it is through these individual strategies of extraversion, so to speak, that the technical capacity, and consequently authority, of these state agencies, is constituted.

Acridological Gatekeeping: Senegal

Senegal provides an interesting case of how this geography of locust resources plays out. As an "invasion country", i.e. one that does not harbor usual sites of locust gregarization, it has still played a relatively significant role in West African locust control, owing largely to the role of Dakar as the capital of French West Africa during colonial time, and as having the headquarter of the Dakar-based regional organization, the Oclalav (1965-1986).

The current regional commission in charge of coordinating locust control operations in the Western Region is the Clcpro. That commission was created by the merger of the former Oclalav and the Clcpano. This merger joined the locust control structures of the Sahel with the ones of the Maghreb, thus coordinating management efforts across the habitat range of the insect in the region. The merger has been held as a great initiative by all parties interviewed. That said, some Senegalese locust managers that were historically affiliated with the regional Oclalav have expressed reservations about this regional restructuring. As a retired locust control officer points out:

> Joining the Sahel and the Maghreb, it was a good idea, but we wanted to be at the head. Our organization was very effective, and we would have been able to control the invasions that happened in 1988 and 2004 (DM, former Oclalav officer, personal communication, Dakar, July 2012).

One of the reasons behind these reservations is that the merger greatly diminished their relevance within the regional and international apparatus of locust control. Three 'vignettes' from that country raise interesting points on how states agents explain and act on this imperative for connectedness and relevancy within international networks of development.

Oclalav as ghost organization. The first vignette pertains to the continued existence of Oclalav as what I call a "ghost organization". This international organization of locust and bird control was nominally terminated in 1986, following a reunion of the member states and donors in which it was decided that it would be preferable to change the regional structure of locust control to a state-based structure under the coordination and supervision of the UN-FAO. In chapter four I argued that part of the appeal of this move was that the sought effect of a better alignment of locust control with development as it is predicated primarily on capacity-building at the level of the nation-state under supervision, foreign aid, and expert knowledge of multilateral programs and organizations (Goldman 2005).

The member countries and the donors of the Oclalav, especially France's Foreign Affairs, stopped funding what they considered as an "overly large and inefficient organization" (MC, foreign aid officer, personal communication, Rome, May 2012). Reading documents and talking with people in the networks of acridology when I began my field research, I assumed that this organization, or institutional traces of it, would be long gone.

During my field work in Dakar, however I was surprised to discover that it would be possible for me to not only visit the headquarters but also meet with and interview the Interim Acting Director of the organization, a position he occupied since 2003, when the previous Interim Acting Director passed away.

In an interview at the organization head office in July 2012, the Interim Acting Director of the Oclalav explained that the organization is regulated by an international agreement, with its own constitution and by-laws agreed upon by all parties. He argued that even though France and the member countries have stopped paying their dues and the operational capacity of locust control was transferred to the member countries' plant protection services and national locusts units, the organization cannot be dismantled until the international treaty at the basis of its constitution be amended in an assembly of its international board of directors. The surprisingly still-standing organization is a living-dead, ghost organization.

According to the interim director, since 1987—over thirty-five years—the staff of the Oclalav has continued their mandate, occasionally sending letters to the member states requesting that they pay their dues to the organization. I was told that the staff, five to six people, meets twice a week to do that. Their objective is to obtain the funds necessary to convene a final meeting of the member countries where they can vote to terminate the organization. For the last twenty-five years, the staff of the organization has waited for the member states to meet these engagements. In the meantime, the staff of the secretariat has been making a living by renting out the lot in front of the head office, to a restaurant and a fruit vendor, and some of the office space as short term residential apartments.

The demise of the Oclalav also greatly marginalized the hitherto relatively central role played by Senegal in West African Locust Control. The next two vignettes briefly describe three attempts to re-situate Senegalese organizations in this network. The first presents an additional example of the logic of extraversion that characterize techno-scientific statecraft relationship to international structures.

Attempts to re-establish acridological relevancy. Much re-organization in the Western Region of locust control had been under way since the late 1990s. Proposals to merge locust control organizations in the Sahel and in the Maghreb to form the Commission de Lutte au Criquet Pèlerin en Région Occidentale (Clcpro) were first formally written out in 1997, leading to the restructuring in in 2001. After the 2003-2005 invasion in the region, it became clear that locust control would receive even more attention and funding programs for a few more years, as it indeed did, especially with the multi-donor and multi-million African Emergency Locust Program (AELP) spearheaded by the World Bank and the African Development Bank. In this context, actors of the Senegalese state made several attempts to re-establish the status of that country as an important node in the international networks of locust governance.

Again, these efforts are highly congruent with what Bayart describes as strategies of extraversion whereby state actors are primarily concerned with finding ways to maximize access to resources from external processes (Bayart, 2000), and Moore's documentation of states ability to cultivate the discourse and programs that maximize access to the funds of donors (S. F. Moore, 2001).

In fact, according to a senior locust control specialist based in Mauritania, the interest of the World Bank in investing in the "locust problem" in the wake of the 2003-2005 invasion was the outcome of not only the large scale of the invasion, but also

persuasion from the Senegalese President himself, Mr. Abdoulaye Wade. Prior to that, the Bank was not interested in locust management, I was told, primarily on the grounds of the cost-benefit analyses I mention in chapter 4 (Hardeweg, 2001; Joffe, 1995):

> Joffey had made a study for them. The study said it was not economically sensible to invest in locust control.
>
> In 2003, they forgot about this report a little. In part due to political pressure, I would say. Of the Senegalese. President Wade, I think that it is him that pushed, that convinced the World Bank to put 60 million dollars right away in the seven Sahelian countries affected by the desert locust. I believe there was a very strong political will to bring the World Bank in locust control. (HD, senior locust control specialist, Nouakchott, personal communication, July 2012).

In 2005, a regional meeting of locust experts and donors was convened in Dakar by the President of Senegal himself, Mr. Abdoulaye Wade. The meeting was officially titled "International Scientific Conference on the Desert Locust". Comparing the notes about and reports on the meeting made by different attendees from various countries provides a fascinating view into how acridology actors themselves view what can only be explained as a pursuit by the Senegalese government of situating itself as a gatekeeper state. Most interesting is the mission report authored by Cirad's Tahar Rachadi (Cirad OM 40 5002). The report first notes that many participants at the meeting were unaware of the international structure of locust governance already in place (e.g. the DLCC and Clcpro). Following this remark, the report stresses how the most significant aspect of the meeting was the wish of Senegal to play a more prominent role in Sahelian locust governance via the creation of a Dakar-based Sub-regional Desert Locust Control Committee (Comité Sous-Régional de Lutte anti-Anti-Acridienne, or Corsella). It is also mentioned that despite the clear opposition from almost all visiting attendees at the meeting, the assembly president and secretary, both Senegalese, ignored these

disagreements. Requests for mention of the existence of international structures of locust governance in the official minutes of the meeting were also ignored.

Regional gatekeeping and the environmentalist turn of locust governance. These attempts by the Senegalese state to re-establish itself as regional gatekeeper of West African locust control were also characterized by a move to align the country's potential contribution to the locust management apparatus with what I mentioned before as a turn toward greater environmental concerns about locust control since the 1990s. A lot of this turn in the recent years was solidified by the World Bank's African Locust Emergency Program (AELP), which made it clear that, as one locust manager states, "the environment is very important now" (SR, locust control officer, personal communication, September 2011, Bamako), and that "as soon as you talk about the environment, people like that, the contracts, the donors, they give a lot of money" (AD, locust control officer, personal communication, Dakar, June 2012).

I previously mentioned above in Chapter 4 that acridology was at a crossroad in the late 1980s and early 1990s. Dieldrin was banned in 1987, following two decades of growing environmental consciousness worldwide. At this point, especially with the new actors that came in after the rather disastrous swarm suppression campaigns of 1987-1989, including what soon after became the European Union, Dutch and German foreign aid agencies and Usaid, many of the programs, resources, and consultant experts that came to contribute to the political economy of locust management in West Africa tended to be much more adverse to, or at least concerned about, the use of chemical pesticides. It is at that point that many efforts were to "de-toxify" locust management; some agencies, especially the German GTZ, started to call for cost-effectiveness calculation of damage versus treatment intervention, insurance schemes, etc. For some commentators,

the US Americans that started to oversee programs were especially taken with what French acridologists considered “a veritable environmentalist religion”.

In agreement with my analysis, that commenter locates this shift toward a more environmentally friendly acridology in the early 1990s. His description of that shift differs from mine, however:

> The end of the Oclalav left a void. In 1988, a plane of Usaid fell at sea near Dakar, and people worried about environmental impact of the pesticides. It is at that time that the Netherlands started to fund research on biopesticides, in the early 1990s. (AD, locust control officer, personal communication, Dakar, June 2012)

The plane in question was one of the four DC-7s chartered by the U.S. Agency for International Development from an Arizona-based company called T and G Aviation Corp. The planes were used to spray “the Senegalese countryside to kill locusts and grasshoppers that threaten to destroy this year's harvests in much of West Africa's Sahel region” (Associated Press, 1986).[46] The plane is said to have crashed about a mile off-shore in the Atlantic Ocean, following engine malfunction shortly after take-off. It is unclear how much insecticide was dropped in the sea with the crash, although an article published a month earlier, in the *Executive Intelligence Review*, about the US contribution to locust control on the African continent indicates that the DC-7 can carry as much as 300,000 gallons of pesticides (Mazel-Hecht, 1986). [47]

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[46] Two years after that crash, two of the remaining three airplanes of the Arizona-based company T and G Aviation Corp. that were chartered for locust-control operation by the Usaid were hit by anti-aircraft missiles while flying over Mauritania during a trip from Dakar, Senegal to Agadir, Morocco (Associated Press, 1988). The Polisario rebel group later released a communiqué admitting to and apologizing for the attack, explaining that they mistook the planes for Moroccan C-130 (“Rebels admit shooting down DC-7”, 1988).

[47] The *Executive Intelligence Review* article in question highlights how “military-style operation” is “needed to stop the locust and grasshopper breeding from exploding out of control continent-wide”.

What is interesting from that statement for our analysis is how this environmental turn is juxtaposed with the "void" created by the end of the Oclalav.

It so turn out that that what first came to Senegal to fill that void, both physically and institutionally, took the form of a project started in collaboration with the FAO and the Netherlands, from 1990 to 20003 to study the eco-toxicological research on the health and environmental impacts of locust control: the Locustox project. Actually, Locustox was established in the same buildings as the main operational station of Oclalav in Dakar (as opposed to the headquarter's office discussed above). One way of looking at this was that Locustox came to replace the void left by the closure of Oclalav by concentrating on resolving the legacy of chemical insecticides that Oclalav and similar organizations had left from decades of activity in the region (AD, locust control officer, personal communication, Dakar, June 2012). The Locustox offices and labs remain to this day, situated next door to the Crop Protection Agency headquarter on Route du Rufisque, in the Dakar suburb of Thiaroye.

Scientists involved with the project explained that the purpose of Locustox was to use ecotoxicological research on locust control (and international funds to support such research) to bolster Senegalese research capacity and authority in ecotoxicology. The long-term objective, I was told, was to eventually expand this expertise beyond locust control per se, and carry out the homologation and certification, licensing of chemical pesticides for the region, if not the whole continent, instead of relying on European agencies for this work.

When I visited the Locustox center in 2012, it had established itself as a private foundation using the laboratory and equipment from the now-ceased temporary project, and had, as it was hoped, extended its scope beyond locust control. The center is now

called Ceres-Locustox, and bills itself as a Regional Research Center in Ecotoxicology and Environmental Health (Ceres-Locustox), although several interviews have suggested that the program has been struggling to sustain itself in the absence of major donors and projects (CV, entomologist researcher, personal communication, Agadir, July 2013; OS, locust control officer, October 2011; AD, locust control officer, personal communication, October 2011).

A number techno-political effects were likely pursued in this initiative. Among these, it is reasonable to assume that a fully successful Locustox project, and the bolstered Senegalese ecotoxicology that would have resulted from it, would have made this one of the fields enhancing the role of Senegal as intermediary between West Africa and Europe, maintaining its historical positioning it enjoyed during the AOF and the Oclalav, and several other historical stages.

The last illustration of the strategic logic pursued by Senegalese locust management actors to situate their organization or state agencies as indispensable nodes in the structures of transnational governance also pertains to this 'environmentalist' turn that has been influential in certain spheres of applied acridology since the mid-1990s.

An important dimension of efforts to de-toxify locust control pertains to the promise of bio-pesticides. Among these were products based on isolates of *Metarhizium anisoplia*, a fungus that causes lethal disease in locust populations (Lomer, Bateman, Johnson, Langewald, & Thomas, 2001). A research program called Lubilosa has explored the potential for these bio-pesticides in African locust control, and eventually anti-locust pesticides based on this fungus became now commercialized in South Africa under the

name *Green Muscle*, manufactured by Becker-Underwood, a division of the BASF company.[48]

Again, around 2005-2007, officials of the State of Senegal made efforts to see to the development of a *Metarhizium* development capacity in the country. A major constraint to this biopesticide is that it is sensitive to time and temperature and thathe site of production must be close to the site of diffusion. Despite efforts under the Lubilosa program to see to such production in West Africa, it has proven impossible. In February 2007, an international meeting/workshop was held in the beach resort of Saly, Senegal, organized by the FAO and presided by Ms. Viviane Wade, the spouse of the country's president at the time Mr. Abdoulaye Wade.

The purpose of the meeting was to evaluate the future of biopesticides in locust control (FAO, 2007). Over 80 participants from several countries and organization were present. Experts discussed the potential of, and problems with the use of metarhizium as a biopesticide. It was also revealed that agencies of technical assistance, including especially the Brazilian Organization for Agricultural Research ("Empressa Brasileira de Pesquisa Agropecuária": Embrapa) had established partnerships since two years prior to help establish metarhizium production in the country. The recipient of that aid and partner responsible for the project was an organization called Foundation Acting for Education and Health ("Fondation Agir pour l'Éducation et la Santé": FAES). The president of that foundation, was, it turns out, Ms. Vivianne Wade, the organizer of the meeting and spouse of the then President of Senegal (FAO, 2007). In fact, several actors of locust governance in the region have referred to the biopesticide production and

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[48] http://www.beckerunderwood.com/productsservices/biological-crop-protection/bio-pesticides/green-Muscle

factory as “Ms. Wade’s Factory” and Ms. Wade’s Biopesticide” (CL, entomologist researcher, personal communication, June 2010; DH, entomologist researcher, personal communication, July 2012; CV, entomologist researcher, August 2013).

Interestingly, an internal report of an organization present at the 2007 meeting in Saly indicates that although Senegalese government officials insisted that a factory producing metarhizium was already in production, visits were not possible due to the then on-going presidential campaign. The report also indicates serious concerns from project managers of foreign technical assistance agencies working on this biopesticide partnership about (a) the lack of evidence of progress with the project and (b) their realization that multiple parallel sources of funds for similar purpose were sent to the same foundation without prior knowledge from these diverse donors.

This may be a coincidence, but it so happens that the foundation FAES was dissolved in 2012 following allegations of fraud that have been targeted at many in President’s Wade entourage following his electoral defeat in 2012 (Cissé, 2012). The main challenge facing Ms. Wade and her foundation at the time was the accusation by the Swiss Foundation “Antenna Technology” that the FAES and Ms. Wade has misused a subvention of 1.5 million Euros that the Swiss Foundation had made to support two factories operated by the Foundation. This subvention was meant to support the industrial production of the dietary health supplement “spirulina”, another project of the foundation in addition to bio-pesticide of locust control and other similar initiatives.

In a story that has been highly mediatized in Senegalese newspapers and tabloids and that includes WikiLeaks revelations and the awkward diplomatic dynamics of postcolonial Françafrique, Mr Couasnet, the French agronomist that had been appointed by Ms Wade to administrate the Foundation has allegedly been marginalized when the

Foundation started to become highly profitable, at which point the son of Ms. Wade, Karim Wade, started to seek a greater role in the administration of the Foundation. Competition and tension about the administration of the Foundation led to the demission of Mr. Couasnet, who was arrested the next day and detained for six month. Eventually, corruption inquiries led to the imprisonment of Mr. and Ms. Wade's son, Karim following his arrest in April 2013. Karim Wade is accused of having illegally amassed 1.4 billion USD during his Father's presidency (Look, 2013).

The role of locust-related projects in this story is somewhat marginal. Yet, it provides an interesting and informative glimpse in some of the ways state actors cultivate and pursue locust-related opportunities for resources and rent, which in turn helps better understand the relation between developmental statecraft and acridological technopower. Interestingly, the French agronomist who became the FAES administrator, Mr. Couasnet, was recruited by the foundation after having been involved in the regional response to the 2003-2005 locust invasion (Seneweb-news, 2012). But what is even more interesting is that the pursuit of alternatives to synthetic chemical insecticides—in this occasion bio-pesticides—was even more directly incorporated, allegedly, in large scale rent-seeking strategies than schemes involving already existing chemical pesticides.

The discussion of these elements from Senegal serve two purposes in this dissertation. First, they provide additional details on the pursuit by African state agencies of credibility, resources, and professional mobility, as provided by these programs of international organization, offering a more extreme case of extraversion given that this country is only an invasion, rather than a frontline country in locust management. Second, the turn to the Locustox program and the claim of Senegalese advance in the development of biopesticides useful for locust control illustrates how

locust control alignment with developmental logic since the 1970s was accompanied with a great deal of environmentalist concern vis-à-vis toxic pesticides and so on. The "green" or "eco" governmentality that gained prominence in the last decades has co-evolved with the making of international development as a similar basis of trans- or supra-national form of government. The discourses, assumptions, and programs associated with both combine in shaping the political economy of applied acridology as a techno-scientific field of expertise, and as such, they contribute to shaping the behavior of managers, consultants, and other actors in the field.

As I discussed above, the increasing alignment between environmentalist and sanitary concerns about pesticide use in locust control and the developmentalization of this pest management sector has provided opportunities for locust managers and experts to remain active, and thus relevant within these structures. For example, when I asked the head of the environmental and health monitoring team of the Malian National Locust Control Center what the team does during periods of locust inactivity, he explained that, unlike other aspects of locust management, "with the environment there is always something to do":

> Even later this week we are scheduled to do a national training to set up quality control teams, what we called Quest teams. It is a quality control team in charge of overseeing pesticide application, to make sure that safety and environmental norms are followed, if technicians wear adequate protection gear, if the sprayers are well calibrated, what products they use and so on. Of course, if there are no treatment, the Quest teams are not active, not in the field if no locusts, but we can do small information and training sessions from time to time to remain mobilized. Same thing, if there are no polluted sites or spills, we will not go out in the field to do decontamination, but it's good to maintain skills, by participating in information sessions. (SR, locust control officer, personal communication, Bamako September 2011)

As encountered elsewhere, this environmental usefulness provides opportunities to expand and proliferate programs, and "keep more people busy":

> We want to put together two more teams, in case a member of the currently existing team needs to be replaced. We have asked the FAO, and they accepted to fund these two teams. (SR, locust control officer, personal communication, Bamako September 2011)

Discussion

In this chapter I examined the relation between locust management and developmental statecraft. I first asked whether locust surveillance and control activities contribute to extending state-vision or state-space in locust outbreak areas that are often difficult for the state to control. I was especially interested in finding out whether this contribution to statecraft would increase the relevancy of locust managers within the apparatus of the central state, and in turn shape how managers carry out their work. My research on state agencies of locust control in the West African Sahel suggests that these demands of territorial sovereignty are unlikely to play a very significant role in shaping locust management in these countries. As the explanations provided by interviewed locust managers on this question indicate, this is not because threats to territorial sovereignty (and safety of state-mandated locust managers) do not matter for locust governance: it is clear that these threats matter a great deal and that locust managers must constantly reinvent their approach to minimize the risks of attacks and robberies in locust outbreak areas. Yet, my findings suggests that locust managers are primarily concerned with the status and power that they can derive from their leverage from and connections to structures outside the state, and that this concern far exceeds anything that could be provided by the territorial logic of a unitary, monolithic state apparatus.

In this sense, state-mandated locust control agents operate on a logic that shares much with the one pursued by experts in the international scientific research centers and multilateral development agencies discussed in chapter 4: they strive to position

themselves as a more or less inevitable node in the highly variable yet occasionally very rich flow of financial resources, techno-scientific legitimacy that accompanies and/or stems from locust activity in these regions. The goals of managers of maintaining and enhancing their place within the state apparatus requires that these managers impose themselves as the intermediary between, on the one hand, international structures of governance, and on the other 'people' and 'things' within the territorial reach of the state. I documented a variety of mechanisms and outcomes supporting and resulting from the role of locust management in strategies of extraversion by actors of Sahelian states. While some of these are clearly in the realm of rent capture and corruption, which are often associated with factors undermining the capacity of the state, I argue that the contribution of locust management to the technological authority of these developmental state is in fact derived from the cultivation and meeting of the modalities of connections and participation in transnational structures of governance, especially of programs of foreign aid and technical assistance. Environmentalist concerns about pesticide use, the ability to enact "good governance" and to be recognized as legitimate experts in locust control, combined with evidence of locust activity, have all been used as leverage for promotion within techno-political structures, and in turn, in shaping the practices and legitimacy of state actors vis-à-vis diverse constituencies, domestic and abroad.

A key implication of this is that an explanation of how technological expertise relates to the fostering of stateness require an explicit attention to the political topology created by these connections to transnational structures, and in turn attention to how the spatial logic of the resulting networks influence how experts and managers carry out their work. I expand on this point in the Conclusions chapter below.

CHAPTER 6

CONCLUSION

This dissertation explored the relation between, on the one hand, the political power and legitimacy that state actors and international experts derive from their application of technical and scientific expertise—what I call technological authority—and the agricultural pest hazard presented by the gregarizations of desert locusts in West and North Africa. It asked: How has the mandate of locust management defined and attributed to organizations over time? Why are some institutional responses to this insect selected over alternative strategies? What political effects follow from this selection? In a broader theoretical sense, I sought to understand what kind of stateness is produced by agencies' responses to ecological actors—such as locusts—that evade the spatial reach of the state. To answer these questions I analyzed historical and contemporary administrative and scientific documents pertaining to locust management and carried out interviews and participant observations in various state agencies mandated with locust control, at a scientific research center, and a professional meetings related to locust control in Africa and in Europe.

Chapters one and two described the management problem presented by the locust, and the methodological and theoretical orientations of the study.

In chapter three, I documented how the ability of the desert locust to evade and transcend the conventional spatiality of the state has made the insect an especially appealing field of intervention for political authorities to innovate, enact, and perform new modes of government that simultaneously incorporate and transcend the nation-state.

This type of techno-political innovation was especially sought after during and after the decolonization of sub-Saharan Africa in the mid-20th century. In West Africa, this has embedded locust control in the historical arc spanning from the last days of formal colonialism to the current configuration of independent states supported by international programs of foreign aid and technical assistance. The institutional and technological responses to these innovations contributed greatly to shaping what eventually became international development. In that process, the mandate of locust control increasingly became incorporated in programs designed to enhance food security and environmentally sound practices of pest management.

Chapter 4 examined the spatial logic that shapes and results from efforts by locust expert to enact management orientations that enhance and maintain the professional viability of their field and their work within they type of institutional networks commonly concerned with the locust problem. I have shown how this favors the construction of the locust problem as an object of developmental intervention, and in turn adoption of approaches to locust management the best fit the imperatives of social and ecological 'improvement' of development organizations. By favoring preventive orientations of locust management, acridologists and the institutions that employ them effectively call for a proliferation of mechanisms of surveillance, participation, improvement, reporting, and training. These mechanisms, as they line up with the goals of capacity building and improvement pursued by development programs not only increase the include the likelihood that their work remains of relevance to state and multilateral organizations responsible for the governance of this international hazard: it also gives experts 'something to do' during the long periods of 'protracted non-crises' of

locust recessions when the locust problem would otherwise falls out of sight for these organizations.

Drawing on Foucaldian theorizations of the mechanisms of rule in modern government, I argue that the technologies of power that are enabled by this construction of and response to the locust problem yield relatively complex institutional arrangements that expand outward in other spheres of societies as they seek to 'improve', 'build capacity', and foster 'better governance'. This makes the dominant approaches to locust management productive of power-knowledge that operates centripetally—that expands and proliferates outwards. This orientation makes locust control a field in which techno-political interventions are 'pushed away' from what Foucault calls disciplinary modes of power, and toward what he calls security. This alignment has the effect of favoring attention to the immanent aspects of locust swarming, which in turn favors a celebration of, rather than an aversion to the complex and stochastic nature of the insect's population dynamics.

In chapter five, I turned to the role and place of locust expertise within the state apparatus. I began this by asking how state managers understand and respond to the challenges to state space and state vision in the areas of locust outbreak. I suggested that locust managers and experts in locust affected countries do not appear to be directly motivated by the territorial imperative of the state for whom they work. Rather, they are primarily motivated by the need to situate themselves as necessary link between (1) the structures of this state apparatus and (2) the transnational networks of governance, especially developmental ones that support and enhance activities and expertise of locust control. In this sense, I have shown that the work of state actors of locust control in locust affected countries of the Western Sahel operate in a logic that is very similar to the

one in which operate locust experts working for international development organizations of foreign aid and technical assistance. In both case, actors tend to select strategies that best fit the modalities of access to development aid and resources. These tend to correspond, discursively as well as effectively to the imperative of improving livelihoods and landscapes over and beyond the mere eradication of locust pests. For example, locust managers are increasingly concerned with efforts to diminish the eco-toxicological impact of locust control. This entails efforts to better monitor and manage the acquisition, application, and storage of toxic pesticides to diminish their negative effects on health and environments, and to seek alternatives of lesser toxicity.

Theoretical Implications and Future Directions

These findings have implications for work in several aspects of scholarship in nature-society relations, critical development studies, and political geography. The conclusion that the mismatch between the spatiality of the locust problem and the preferred logic of the conventional state made locust management an ideal field to invent, experiment, and perform new modes of transnational governance converges on scholarship on the social construction of scale that investigates the political effects of claims about scalar processes (Bulkeley, 2005; Ferguson and Gupta, 2002; Marston, 2000; Rangan and Kull, 2009). These theoretical strands of political geography and political ecology together point to the importance of investigating which socio-political factors justify the selection and representation of a given spatiality over another, and with what socio-ecological effect. Such investigations allow and call for a less deterministic approach to questions of fit between institutions and ecosystems, asking rather (1) what made the institutional scale in question be selected in the first place, and (2) what are the political ramifications – whether intended or effective – of rescaling the

objects and agents of governance (Bulkeley, 2005)? This has implications for our understanding of the political effects of efforts to re-scale environmental governance. It also carries implications for our understanding of the increasing dominance of transnational networks in modern government. Such inquiries, I argue, direct attention to how the effects of the mechanisms of governance favored by these moves across scales and networks may explain and be explained by the stabilization and selection of mandates and solutions within management organizations.

The issue is that these connections contribute to the making of 'stateness' in ways that political ecology and political geography have been missing out on. This matters because there is class of incentives shaping the work of managers that evades common analytics. These have to do with the spatial logic of organizations that managers strive to enact, which in turn environmental problems and what kinds of solutions they favor. Understanding how and why resources are allocated and intervention problems and solutions are selected requires paying attention to this class of incentives.

Work about transnational governmentality by Akhil Gupta and James Ferguson (Ferguson, 2005, 2006; Ferguson & Gupta, 2002; Gupta, 1995, 1998) provides a useful starting point to the spatial consideration necessary for a political geographical understanding of the environment and development expertise that is produced by these connections. In his book *Postcolonial Developments: Agriculture in the Making of Modern India*, Gupta follows a discussion of the different perspectives of global environmentalism in the "North" and the "South" by asking: "are there forms of global discipline and global regulation that are elided by (...) emphasis on national sovereignty?" (Gupta, 1998, p. 313). He answers with a consideration of global environmentalism as "a fundamental 'postcolonial' moment in that it initiates a break

with the spatial order of sovereign nation states that was forged in the anvil of colonialism and fired in the furnace of national liberation" (Gupta, 1998, p. 314). Continuing on his consideration of how Indian farmers relate to global environmentalist discourses, Gupta suggest that

> a better way to understand the work of farmer groups in India would be to see them as part of inermestic (international/domestic) coalitions that are attempting to resist forces of governmentality which are operating across and through the spaces of nation states. (Gupta, 1998, p. 336)

This study concentrates on a techno-political process that is both contrary and complementary to the one mentioned by Gupta above: I did not examine how this transnational governmentality is necessarily contested by local groups, but rather how these transnational mechanisms of ordering are enacted, adopted, and transformed in the techno-scientific practices of developmental state actors, and in turn how these strategies shape said practices. My work thus combined consideration of the contribution of techno-scientific expertise to governmental processes in development (Ferguson, 1990; Michael Goldman, 2005; Li, 2007) with consideration of the spatial logic underpinning the negotiation by and participation of actors of these developmental states in foreign and domestic structures of stateness, or what Hagman and Péclard call "negotiated statehood" (Hagmann & Péclard, 2010). My approach drew on theorizations of extraversion and gatekeeping as modes of post-colonial statecraft in sub-Saharan Africa (Bayart, 2000, 2009; Cooper, 2002, 2005), but sought to extract the spatial analytic provided by these theories from the overly normative discourses about state failures and corruption to which these theories are commonly applied, in part because these discourses undermine a thorough understanding of how the developmental state is made and acts.

An important contribution to this body of work is a more nuanced concern for the question of how do technoscientific experts become aligned with, in their work, with the structuring processes through which this developmental governmentality is produced. In this regard, my reaearch is also in line with similar inquiries in the science studies sub-field of postcolonial technosciences (Anderson, 2002; Moon, 2010; Tilley, 2011). The locust case study adds to this body of literature via a discussion of the incidence of the overlap between strategies and technologies to govern the non-human and the institutional requirements through which scientific expertise is enlisted in developmental governmentality. It thus offers a non-deterministic, relational analytic to the relationship between scientific practice, on the one hand, and the making of transnational political power on the other. The study thus brings a different entry-point to the study of locust control from the standpoint of transnational government, especially the making of government at a distance and organizational network as mechanism of rule (Allen & Cochrane, 2010; Bulkeley, 2012; Callaghy et al., 2001; Duffy, 2011) by highlighting the role of technoscientific engagement with the non-human in fostering these mechanisms.

I argued that in that context, locust management and expertise are “put to work” towards the production of a political geography that is itself governmental. As Foucault points out, government is not directly concerned with territory but, rather, “a sort of complex composed of men and things” (Foucault, 1991, cited in Elden and Crampton 2007, p.6). In the case of locust control, this governmentality enlists an entire array of insects, pesticide containers, trucks, airplanes, pest control agents and development experts that produce and maintain a particular social-ecological order. It is this condition that best describes the institutional logic shaping the work of locust managers.

In this context, I have shown how this historical trajectory has made locust management experts and organizations motivated to adopt locust control strategies that maintain or increase access to development aid and resources from these international programs of development.

These attempts to align techno-scientific expertise with the imperatives of development raises theoretical questions of broad significance for the literature on nature-society relations and on the socio-political dimensions of science. What models of social-ecological relations are favored by developmental logic? What is the relation between the models of nature favored by technical and scientific actors of development and the ones that are privileged within and by state and market institutions? And what is the relation between these "developmentalist" models of nature and the ones that have been privileged in formal regimes of colonial rule? Attention to these questions will help evaluate to what degree my findings about the political geography and political ecology of locust expertise are applicable to other fields of techno-scientific ecological interventions in development networks. At the same time, these questions are important to understand how resources are allocated in environment and development programs, and to identify the factors shaping the selection of social-ecological fields of interventions and the adoption of solution to problems.

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