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ORIGINAL RESEARCH ARTICLE

How Management Situations Change Dispositives : Public Management in the case of Animal Epidemics

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Abstract

Against a backdrop of change in the French public health governance system, this article examines the dynamics of public-sector dispositives in managing livestock epidemics, situations that are typically fraught with doubt and often lead to crises of governance ('mad cow' disease, 'bird flu', foot-and-mouth, etc.). In such complex, interorganizational situations, marked by uncertainty and tight management time frames, fresh organizational and managerial activity is constantly required, making it a challenging task to characterize and understand the dynamics of the management dispositives that are activated along the way.

In order to produce a detailed and dynamic mapping of dispositives, we draw on the theoretical framework of 'dispositional analysis', developed by recent rereadings of Michel Foucault's concept of the dispositive. To this, we bring the micro and situated perspective of the 'day-to-day administering', introducing Jacques Girin's concept of the 'management situation'. We thus hypothesize that management situations are sites of intensive dispositive recombination and offer a useful interpretive frame for dispositive dynamics. Our methodology is based on a longitudinal and comparative analysis of three animal health disease management situations in a particular region (a health crisis, the reemergence of a disease, and an endemic disease situation).

Our analysis reveals an architecture of health dispositives whose relationships change as the management situation evolves. Three modes of recombination are identified, produced through the mechanisms of problematization (reformulating the problem) and stakeholder participation. This article makes visible the complex links between the evolution of the situations and the dynamics of the dispositives and provides food for thought in building a more robust governance of public animal health problems, combining situational and planning approaches.

Keywords: *Management dispositive; Management situation; Dispositional analysis; Public-sector management; Animal health; Longitudinal study; Health governance*

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A key focus for research on organizations is the understanding of their stability or instability. We can therefore consider organizations and the relationships between them to be ongoing sites of *organizing* activities, and their character, as a consequence, to be radically 'impermanent' (Weick, 1979, 2009). Despite this impermanence, organizing activities are nevertheless framed by 'dispositives' in Foucault's sense (1994). We intend to address a little-explored aspect of the concept of the management dispositive by situating our analysis at the level of ongoing actions, exploring how they unfold in their everyday context. This micro and situated approach reflects a later trend in Foucauldian studies (Collier, 2009; Rabinow, 2003) and is, thus, viewed as an issue of current interest in

dispositive-related literature analysis (Raffnsøe et al., 2016). Moreover, a situated approach appears particularly suited to the study of complex management challenges where situations are constantly evolving, and the adaptation of management dispositives becomes a major issue.

The concept of the dispositive is often used to portray stable socio-material structures that impact or drive relationships between individuals and groups in organizations (Aggeri & Labatut, 2014; Le Breton & Aggeri, 2018; Moisdon, 1997; Ragainne et al., 2014). However, at the scale of action in the making, and in the light of the 'practice turn' and organizing study, the question of the stability of the dispositive arises, since *organizing* also emerges from the situation. From this perspective, the 'nature' of the dispositive, that is its form and strategic objective (Aggeri, 2017;

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Dumez, 2009), no longer seem so obvious, since they are potentially highly unstable.

Dispositional analysis (Raffnsøe, 2008) follows in the footsteps of Michel Foucault, whose main purpose in proposing the concept of the 'dispositif' was to provide a method to trace the complex arrangements between 'the said as much as the unsaid', the human and the nonhuman, and material and symbolic artifacts. Dispositional analysis offers a framework to produce mappings of the heterogeneous elements that make up a dispositive, allowing a more in-depth analysis of its morphology. However, seeking to map such dispositive morphologies lead to an overly static vision of their nature. To overcome this difficulty, several authors have emphasized the need to adopt a dynamic approach to dispositional analysis, especially by addressing the interactions between the constituent elements of dispositives, and between different dispositives (Collier, 2009; Villadsen, 2021). In order to understand how dispositives change, we introduce and explore the concept of the management situation (Girin, 1990; trans. Girin, 2011) as a 'site of problematization' (Collier, 2009), therefore as the 'driver' of dispositive recombination (or reconfiguration).

The empirical analysis we propose focuses on an unusual subject for management studies: situations involving the management of animal epidemics (epizootics) with substantial health and economic impacts (foot-and-mouth disease, blue-tongue, swine fever, bovine tuberculosis, etc.). These particularly complex situations are comprised of problems often labeled as poorly structured or 'wicked' (Rittel & Weber, 1973) because they do not fit into preestablished organizational and management frameworks, thereby provoking crises of governance. Placed under the authority of government animal health departments and agencies, the control and management of such situations involve multi-actor management dispositives (developed by state services, veterinarians, farmers, laboratories, etc.). In France, the management of such situations is controlled by the State's regulatory systems, historically built on 'vertical' and strong interventionism by national government departments and agencies. However, the recent 'New Health Governance' reforms for animal and plant health (Guériaux et al., 2012), which are still finding their way in terms of practical implementation promote more distributed and 'horizontal' forms of management at a regional scale. Dispositional analysis at the scale of epizootic management situations can thus support improvements in the design of epizootic management dispositives and, more broadly, provide food for thought on the ways that this multi-actor governance is operationalized.

We develop our argument in five stages. First, we present a critical literature review on dispositional analysis, which highlights the importance of the exercise of mapping dispositives and eliciting their morphology. We then explain how we apply our framework to the field of animal health governance and set out the methodology for our longitudinal case studies of

three epidemic situations in Corsica occurring between 2012 and 2017. Our findings are then presented in two sections. The first, in narrative form, provides a description of managerial activity that tracks the evolution of the situations as closely as possible and reveals the processes by which dispositives form and their elements are recombined. The second, in analytical form, concentrates on an original mapping of dispositives that distinguishes between 'main' dispositives and 'support' dispositives that must be set up by managers to establish conditions conducive to the implementation of the 'main' dispositives. We then identify three modes by which dispositives are recombined and demonstrate that the main mechanism for recombination is (re)problematization with stakeholder participation. In the final section, we discuss our findings, identifying the management situation as the site of dispositive recombination. This research is framed by the 'situation turn' of Foucault's work (Collier, 2021; Rabinow, 2003), offering an original way to make organizing activities visible through management dispositives mapped at the level of the management situation. Last, we conclude that there is a need for public authorities to work with stakeholders to build local coproduction capacity, to enable the design and implementation of adaptive dispositives, even within the State regulatory framework.

Theoretical framework: mapping and interpreting management dispositives through a situational prism

The concept of the dispositive has been widely employed in organization studies. However, questions remain regarding the characterization of dispositives, their morphology and dynamics, and their usefulness to the interpretation of management actions 'in the making'. In order to understand and explain the dynamics of organizational and managerial activity, we shall map dispositives, viewed through the prism of situated action, using the concept of the 'management situation' (Girin, 1990).

Identification, characterization, and analysis of dispositives

The concept of the *dispositif* has a long history in the social sciences, going back to the work of Michel Foucault. In 1977, he proposed a definition of the *dispositif* as 'a resolutely heterogeneous whole comprising discourses, institutions, architectural arrangements, regulatory decisions, laws, administrative measures, scientific statements, philosophical, moral and philanthropic propositions, in short: the said as well as the unsaid [...]'. He also states that: 'The dispositive itself is the network that can be established between these elements' (Foucault, 1994 [1977], p. 299). In his work on crime and on the grain supply, Foucault (2004 [1979]) identifies three prototypical dispositives – the law, discipline, and security. The term 'dispositive'

here designates a clearly identified, namable technico-organizational arrangement that regulates relationships between individuals and groups in organizations. But for Foucault, to speak of a 'dispositive' is also to trace the complex way in which 'the said and the unsaid', the human and the nonhuman, and material and symbolic artifacts are configured (and in particular, how these elements are arranged, or 'disposed', in relation to one another). The dispositive is thus both an object of research to be rendered visible and a method based on interpretive activity.

The concept of the dispositive owes much to its subsequent development by Deleuze (1989), who stresses the importance of the mapping of its elements and emphasizes its dynamic and evolving nature. In France, it underwent a revival with the gradual appearance of successive volumes of *Dits et écrits* (Foucault, 1994, 2001), inspiring a range of successful academic publications, including a substantial issue of the journal *Hermès* (1999), a special issue of *Terrain et Travaux* (Beuscart & Peerbaye, 2006), an edited book in management studies (Hatchuel et al., 2005), and another on information and communication dispositives (Appel et al., 2010). Internationally, we can also note the reading proposed by Agamben (2007) and, of course, a large body of works on governance drawing on the legacy of the Foucauldian concept of power (Collier, 2009; Knights, 2002; Pezet, 2004; Raffnsøe et al., 2016, 2019; Välikangas & Seeck, 2011; Villadsen, 2021). A French school of thought on management tools and instruments (Berry, 1983; Chiapello & Gilbert, 2013; Girin, 1995; Moisdon, 1997) was also inspired by this Foucauldian turn, with work on the instruments and devices of government (Lascoumes & Le Galès, 2004) and strategic management (Aggeri, 2017; Hatchuel, 1999; Hatchuel et al., 2005). This is not to confine the interest of the dispositive for management studies to the investigation of management instruments; this approach is just one of numerous prisms available for analysis (Gilbert & Raulet-Croset, 2021). However, the concepts of dispositive and management instruments may share a common theoretical basis, in particular when addressing the appropriation of management instruments or dispositives (De Vaujany, 2005; Grimand, 2012), and their completeness or incompleteness (Barbier, 2007; Moisdon, 1997).

In the light of this well-established direction of research, we have chosen to focus on the 'morphology' and dynamics of dispositives (Aggeri & Labatut, 2014). Our aim is to analyze precisely how the network of heterogeneous elements comes to be constituted, asserted, characterized, and analyzed in the search for an organizational order, and how it operates a 'sedimentation of social relations' or, in other words, how it comes to form 'a relational entity that is distinguished precisely by virtue of a well-defined relationship between its isolated parts' (Raffnsøe, 2008, p. 58). For the observer, the problem is to describe and interpret the formation of these assemblages (Vandenbergh, 1992), to characterize the sedimentation

process, to name the relational entity (the dispositive), and to give it meaning. Our approach is hence in line with recent developments in Foucauldian studies, which give weight to 'dispositional analysis' (Collier, 2009; Raffnsøe, 2008; Raffnsøe et al., 2016; Villadsen, 2021): 'dispositional analysis makes it possible to map the arrangements that configure these practices [both discursive and non-discursive, carried out by actors in the course of their activities]' (Raffnsøe, 2008, p. 62).

But while researchers have clearly identified, in their study of dispositives, the importance of the latter's historical origins (Dumez, 2009) and evolving character (Aggeri & Labatut, 2014; Villadsen, 2021), matters are less clear when it comes to eliciting the mechanisms by which dispositives evolve. This dynamic process has been investigated in terms of power relationships between individuals (Knights, 2002; Ragaigne et al., 2014), in evaluating the performativity of dispositives (Aggeri, 2017) and in examining interactions between different dispositives (Villadsen, 2021). But the dispositives discussed are entities that have already been identified and characterized, and the object of the research is to gain an understanding of how they achieve, or fail to achieve, the performance for which they were designed (Foot & Doniol-Shaw, 2006). By contrast, we propose here to deal with the dynamics of dispositive formation, described as a 'sedimentary process' by Raffnsøe et al. (2016), and with the evolution of dispositives through the practices of managers in their day-to-day *organizing* activities (Czarniawska, 2008; Johnson et al., 2007). This requires the dispositives, their 'morphology', and evolution to be characterized in the light of situated actions.

Mapping moving dispositives: Dispositional analysis within the dynamics of the management situation

The mapping of dispositives remains, however, no easy endeavor (Aggeri, 2014; Dumez, 2009). The mapping of dispositives remains, however, no easy endeavor (Aggeri, 2014; Dumez, 2009). Some authors suggest that this task should be framed either through the intentionality of risk control (Barbier, 2006) or by the strategic project to which the dispositives relate (Aggeri, 2014; Aggeri & Labatut, 2010), both referencing the strategic dimension of the dispositive described by Foucault ('... a sort of – shall we say – formation which has as its major function at a given historical moment that of responding to an urgent need', Foucault, 1994, 1994, p.195). But this approach through prior intention is questionable, since the strategic project is often revealed as we analyze managers' practices 'along the way' (Avenier, 1999; Bouty et al., 2019).

We therefore adopt the opposite approach, analyzing the dynamics of dispositional arrangements at the level of 'the day-to-day administering Supprimer: of lives', a domain that Raffnsøe et al. (2019) consider to be important for contemporary

dispositional analysis. One particularity at this level is that each of the elements within the arrangement potentially evolves at a different pace: the various parts of the dispositive are transformed and evolve, accumulating functions or adopting new objectives, while other parts dwindle or even disappear.

By situating our analysis at the scale of the 'day-to-day administering', we are led to consider the dynamics of the dispositive in relation to the concept of the situation and, more specifically, of the problematic situation. We remember that Rabinow (2003) and Collier (2009) clearly identified a 'situation turn' in Foucault:

The domain of problematization is constituted by and through economic conditions, scientific knowledges, political actors, and other related vectors. What is distinctive is Foucault's identification of the problematic situation, the situation of the process of a specific type of problem making, as simultaneously the object, the site, and ultimately the substance of thinking. (Rabinow, 2003, p. 19)

In the field of management studies, Jacques Girin was one of the first to propose a rigorous and complex conceptualization of the management situation in a seminal definition that already included a dispositional approach to managerial activity: 'A management situation is considered as such when the participants are united and must accomplish, in a determined time, a collective action leading to a result submitted to an external evaluation' (Girin, 1990, p. 198). Since then, scholars have expanded our understanding of the concept of the management situation (Barbier, 1998; Journé, 2007; Journé & Raulet-Croset, 2008) by demonstrating from interactionist (Goffman, 1991) and pragmatist (Dewey, 1938) perspectives that actors interact, formulate, and reformulate the problems that constitute the management situation, while, at the same time, they produce organization. The management situation and organization thus emerge simultaneously (the problem becomes manageable because the organization evolves and vice versa). Drawing on Foucauldian studies, Collier (2009) suggests that the analysis of dispositives should be focused through what he calls 'sites of problematization', where *thinking* is the 'driver' of dispositive recombination. We can thus conceive of the management situation as a space of continuous problematization, and as the main prism through which to undertake a resolutely dynamic dispositional analysis.

This type of approach fits with academic works addressing the fundamentally incomplete nature of management dispositives (Barbier, 2007; Hatchuel & Molet, 1986; Moisdon, 1997). The incompleteness of dispositives is revealed through the multiple processes of indeterminacy and subjectification to be observed in the mechanics of organizations (Fouweather & Bosma, 2021; Raffnsøe et al., 2019; Välikangas & Seeck, 2011; Villadsen, 2021). Indeterminacy is produced because problems change their form and meaning according to the dispositives that are brought to bear on them (Villadsen, 2021), while subjectification

arises because subjects come into being by creating meaning for their actions based on their individual views of the situation. Multi-actor situations are thus also characterized by a plurality of points of view that do not necessarily converge.

Thus revived, and firmly anchored by a management situation approach, dynamic dispositional analysis offers an apposite analytical framework to address situations characterized by a high degree of indeterminacy, where problems can legitimately be described as 'wicked' given the challenge they present to managers and their organizations (Rittel & Webber, 1973). Two research questions concerning method and analysis can therefore be proposed:

- how can dynamic dispositional analysis at the level of management situations produce a cartography of dispositives that tackles *organizing* dynamics?
- what are the dynamics, within or between dispositives, that are triggered or fostered by the evolution of the management situation?

The following section describes the particular field of research chosen to mobilize this theoretical framework in the case of highly indeterminate management situations – the animal epidemic (epizooty) management.

Field and method: Longitudinal multiple case study of three epizootic management situations

The challenge of epizootic situations for animal health governance

The field of infectious disease governance in the livestock sector is particularly suited to the dynamic and situated dispositional analysis discussed above, for three main reasons.

First, epizootic management principles form 'epidemiological surveillance systems' (Dufour & Hendrikx, 2007) that are almost exclusively based on (and analyzed by) epidemiological knowledge. While management science has recently provided original insights into the COVID-19 pandemic (Drevetton, 2020; Dumez & Minvielle, 2022; Dumiot & Sarlandie de La Robertie, 2021), it remains conspicuously absent from the field of animal health and epizootics. Here, our choice of theoretical framework offers a move away from the prevailing analytical approach to such 'epidemiological surveillance dispositives' and toward a more fine-grained description of management actions enabled by dispositional analysis (Charrier et al., 2020). In filling the gap left by the management sciences, this study of knowledge-power dispositives will, we hope, be of interest to readers, given the high stakes involved in health crises for both governments and citizens.

Second, public health procedures are regularly put to the test by crises, given that the emergence of pathogens generates high levels of uncertainty, compounded by the actions and reactions of those who are caught up in such situations (Emond et al., 2021; Enticott, 2008; Manceron, 2009). Indeed, the few social scientists to have studied this type of epizootic situation describe a multitude of management problems and intensive activity from public servants (McConnell & Stark, 2002; Ollivier, 2013). A case in point is Ollivier's 2013 analysis of the 2006 bluetongue crisis in France, which describes how public servants became caught up in their attempts to maintain exports, completely displacing the issue of disease control. Epizootic management situations are highly fluid, and different dispositives may be created, activated, or reactivated or may even disappear. The proliferation and dynamics of these dispositives constitute 'matters of inquiry' for the understanding of contemporary public management.

Third, and this is especially the case in France, the governance of epizootics has traditionally been founded on a vertical and hierarchical organizational structure, where the State, in its regulatory capacity, is responsible for the response to epizootics (Darribehaude & Gardon, 2015). Here, national government departments and agencies plan, implement, and direct management dispositives to respond to, prevent, or control an emerging epizootic situation in a given area. However, since the staging of a national debate, the 'États généraux du sanitaire' in 2010, new governance principles have emerged and have been formalized in what is known as the 'Nouvelle gouvernance du sanitaire' (Guériaux et al., 2012), a new framework for animal health governance. The French government planned to hold farmers accountable for the health of their animals and instituted two new organizational structures – the Regional Council for Animal and Crop Health (Conseils régionaux d'orientation de la politique sanitaire animale et végétale or CROPSAV), chaired by the regional prefect, and the Regional Health Associations (Associations sanitaires régionales (ASR)). Our approach provides the opportunity to examine these structural changes that manifest a degree of willingness to devolve decision-making to regional governments and to involve local professional organizations (Berthe et al., 2018). It enables the exploration of problem-solving on a more local level, where *thinking* is produced by different actors and is likely to achieve a closer match between management dispositives and the management situations experienced by these actors.

Case study: three epizootic situations in Corsica

With its extensive pastoral systems that are highly sensitive to the circulation of pathogens (Jori et al., 2017), Corsica's livestock sector is well suited to our research. The sector is characterized by the use of local breeds that are valorized in agri-food chains with high added value under the PDO (Protected Designation

of Origin) label. This applies to some pork production (the Nustrale breed is sold for charcuterie produced under PDO) and to its ruminant systems (with local breeds of goats, cows, and sheep, and several cheeses sold under the PDO or local label). A diversity of pedoclimatic contexts (combining land, soil, and climate factors), the island's geographical position at the interface between Europe and Africa, and the fact that its livestock systems are in contact with wild fauna (producing a pathogen 'reservoir' effect) are also important characteristics for epizootic management in the territory (Casabianca, 2016).

In Corsica, as in all French regions, the design and implementation of epidemic management measures depend on the regional administrations (regional food service - SRAL-, and regional prefect), which coordinate the activities of departmental services (DDCSPP) and veterinarians, and on the central administration in Paris (DGAL). These different services jointly designed and implemented the management dispositives for the three epizootic situations studied: bluetongue, bovine tuberculosis, and Aujeszky's disease. Whereas these three pathogens are subject to national regulations and health policies, each of the Corsican management situations involved a variety of actors, as summarized in Table 1.

The 2013–2014 bluetongue outbreak (BTV)

The bluetongue virus (BTV) has several variants (27 serotypes have been identified worldwide), with differing levels of virulence depending on serotype and animal species. In 2013, serotype 1 was introduced to Corsica from Sardinia. The vectors for the virus are culicoides biting midges and serotype 1 visibly affects sheep ('blue tongue' symptoms, fevers, respiratory disorders, etc.), but is asymptomatic in goats and cattle. When the first outbreak was detected in the Bonifacio region in September 2013, a crisis developed because the European surveillance system had failed to report the spread of the virus in northern Sardinia. The French national authorities (DGAL) then activated the disease control strategy: mass vaccination of sheep, cattle, and goats was carried out in order to halt the spread of the virus and, ultimately, to eradicate it. The authorities expected to be able to rely on the mobilization of the various agricultural organizations to achieve a sufficient vaccination rate. The BTV situation was therefore a crisis, characterized by intensive activity from the animal health authorities (DGAL, SRAL, DDCSPP, and ANSES).

The experimental plan to control Aujeszky's disease (AD)

AD affects pigs and wild boars, among other animals. Caused by a virus, it induces abortions and reduces the fattening rate of pigs. Following 20 years of widespread vaccination campaigns, the French mainland was officially declared free of AD

Table 1. List of the main organizations included in this study

Formal bodies	General missions and roles
ANSES (previously AFSSA): French central agency for food, environmental, and occupational health and safety	Public sector organization responsible for the assessment of health risks. Informs government decision-making (key function).
DGAL: general directorate for food (represented in the regions by SRALs)	The general directorate for food (DGAL) oversees the safety and quality of food at all stages of production and the health and protection of animals and plants, working with central government services in the French regions and <i>départements</i> (SRALs) and with other stakeholders.
DRAAF: regional directorate for food, agriculture, and forests	Regional offices of the central government department for food, agriculture, and forests. Under the authority of the regional prefect, these directorates contribute to the development, implementation, and monitoring of national and local policies on rural development and sustainable land use and development in the regions.
DDCSPP: departmental directorates for social cohesion and the protection of populations	DDCSPPs deliver national services at the local level. They are responsible for the implementation of policies concerning food, nutrition, and animal and plant health. They are coordinated by the SRALs.
INRA (now part of INRAE): national institute for agronomic research	Research institute.
GDS: local health protection group (FRGDS: regional federation of health protection groups)	GDSs form a network of livestock farming groups who provide their members with health and welfare-related technical services, and technical and financial support and advice. They also supply delegated public services.
GTV: local/regional veterinary technical group	Practitioner group providing continued professional development training, information, and advocacy. GTVs enable veterinary actions to be coordinated during campaigns required by national government.
Prefect	Regional administrator responsible for implementation procedures for animal health measures (compulsory vaccination, restrictions on movement of animals, etc.).
PDO: protected designation of origin	Commercial organization for the sale of certain protected products (e.g. Corsican pig PDO, 87 members in 2012).
ODARC: Corsican agricultural and rural development office	Public sector body overseen by the Collectivité de Corse, responsible for the implementation of some agricultural development measures.
CRAs/CDAs: regional and departmental chambers of agriculture	In addition to the provision of some public services, CRAs and CDAs play a major role in the organization of the sectors involved in agriculture at regional and local levels.
FDC: departmental hunting federations	FDCs can be involved in the monitoring and management of diseases in wild animals (e.g. official culls).

Source: Own elaboration.

in 2008. In Corsica, where the virus had become endemic, local authorities proposed in 2008 to carry out vaccination campaigns. However, AFSSA then issued a negative assessment of the draft administrative decree, taking the view that farming conditions in Corsica were not conducive to the success of this sort of mass vaccination. In response, the SRAL and local GDS proposed a trial to test the feasibility and effectiveness of using the vaccine in Corsica. Operating from 2011 to 2013, this trial encountered difficulties, leading to a failure to achieve the outcome sought by the local authorities: that of convincing Corsican farmers and the national authorities to continue the fight against AD. This AD situation can be seen as a last-ditch attempt to control the disease, but with little involvement from the animal health authorities.

Improvement of the monitoring and management of bovine tuberculosis to prevent its reemergence (BT)

Bovine tuberculosis is caused by a bacterium that infects multiple hosts, including ruminants (wild and domestic), swine

(pigs and wild boar), and humans. The quasi-eradication of the bacterium meant that France was declared free of BT in 2001 and since that time, it has led to a gradual decrease in monitoring and control measures. However, in several regions, including Corsica, BT outbreaks in wild fauna and farms led Central administration to reactivate management measures toward the end of the decade that followed. In Corsica, a public coordinator was appointed in 2011 to relaunch and improve existing dispositives. From 2012 onward, a range of actions were carried out (prophylaxis, epidemiological surveys, and tests of new detection protocols). Some of these actions were experimental in nature, involving the exceptional regularization of the position of illegal farmers, local awareness-raising campaigns led by mayors and councils, etc. The BT situation is, then, characterized by its development over an extended period, during which intensive activity occurred within the animal health authority services.

The activities of the animal health authorities vary in character and intensity between situations, despite the fact that all involve a notifiable pathogen subject to the regulatory control of the state, with public accountability for the management of

the situation. Despite their variability, many similarities are to be found between the situations, not least because they are managed in the name of animal health by veterinarians and by the same authority within the same area. Each pathogen has its own particular associated protocols, tools, and rules, and the roles of each organization and public authority, department, or agency are clearly established (see Table 1). They therefore make up a particularly interesting ensemble of situations, given our approach.

Data collection and analysis: a longitudinal case study and heuristic comparison

We have thus observed each situation to be composed of events that are significant for those involved, and we identify these as 'management moments'. Such moments, recognized and experienced by actors, are those where management problems are discussed and reframed, serving as sites of critical inflexion for the management dispositives that address them. We carried out a heuristic comparison of the mechanisms observed in each of these situations as a means to identify similarities rather than differences when comparing situations.

Adopting an embedded research approach, we performed a case study that combined participant observation with stakeholder interviews. First, a temporal thematic analysis was performed for each situation using a narrative approach. This allowed us to identify the constitutive elements of the situations and dispositives and to establish the causal chains connecting these elements.

General methodology and research position

We construct our case-based approach (Yin, 2003) on the comparison of three epizootic situations in which we identify and analyze the emergence of management issues and the associated inflexions of the dispositives that address them. We describe this approach, which is not unlike that of *grounded theory* (Corbin & Strauss, 1990; Goulding, 2002), as 'embedded' (Gardien, 2013), because it combines the documentary monitoring of action-related writings, participant observation, and semi-structured interviews with a variety of stakeholder categories (Romelaer, 2005), over a fairly lengthy field-study period, from 2013 to 2017 (Table 2).

Based on this empirical data, we were able to develop a longitudinal analysis (Forgues & Vandangeon-Derumez, 2007), which we combined with the retrospective and chronological reconstruction of management moments. Using a narrative approach and multi-nominal coding (Dumez, 2013), we created an analytic grid recording the management moments and associated inflexions (change of dispositive purpose or target, stakeholder reactions, and changes in local rules) over time for the three outbreaks.

Construction of the research materials

Notes were taken during participant observation sessions, and their contents were entered in a thematic reading grid (Miles et al., 2014). Materials were added, the grid reorganized as new facts emerged, existing problems became more complex, or new actors, places, tools, etc. appeared. Thus, a theme, such as vaccination for example, would be subdivided into subthemes (vaccine supply system, monitoring of vaccination operations, etc.), whose content was gradually expanded (problems encountered, actors involved, tools used, discourse features, etc.). The semi-structured interviews were conducted in such a way as to enable the respondent to describe 'his or her own story' of the management situation. The interviewees were mainly representatives of the various organizations taking part in the different discussion arenas (steering groups, CROPSAV, CNOPSAV), with the exception of the Aujeszky's disease study, where more farmers were interviewed because, on the one hand, fewer joint meetings were held and, on the other hand, the farmers in question had taken part in the Aujeszky's disease trial. Interview data were collected using note-taking, and interviews were conducted at the respondent's workplace

Table 2. Sources of data for each situation

Sources of data	BTV	BT	AD
Observations of discussions			
CROPSAV – regional council for animal and plant health policy	3	2	
COFIL – steering committee (local)	10	3	
COFIL – steering committee (national)	4		
Crisis unit meetings	1		
Technical unit meetings	1	2	
Other stakeholder meetings (including farmers)		1	1
Workshop (led by INRA)			2
Documents			
Meeting notes (CROPSAV, COFIL, etc.)	12	3	
Reports (ANSES/AFSSA opinions, situation reports, etc.)	2	1	2
Semi-structured interviews			
Farmers	2	2	6
Sector representatives (chambers of agriculture, interprofessional groups, etc.)	2	2	1
Public animal health staff (DGAL, SRAL, and DDCSPP)	3	2	2
ANSES researcher	1		
GDS and FRGDS representatives	2	2	2
Analytical laboratory staff	1	1	1
Wild animal organization staff (ONCFS, FDC, and PNRC)		3	1
Official health veterinarians	2	2	1

Source: Own elaboration.

(veterinary clinics, farms, DDCSPP offices, etc.). Participant observations were carried out through researcher attendance at various discussion arenas, where the researcher was either a participant, for example as an INRAE representative on an official body (CROPSAV, with spoken authorization to observe for research purposes), or an authorized observer (BTV and BT steering groups, for example). Themes previously identified during participant observation were explored in greater depth during the interviews, and new themes were added to the general management situation grid. All subthemes were organized chronologically (using either meeting dates or temporal references in recorded texts), so as to identify both the moments when a new content emerged (a new problem or actor) and inflexion points in management actions.

Coding and categorizing situations and dispositives

For each of these subthemes, we identified both the characteristic elements of a management situation and the characteristic elements of the corresponding dispositives, tracking their evolution.

For each management situation, we identified the constituent elements of the situation (Girin, 1990), the characteristic elements of inquiry and exploration by the actors, and the characteristic elements of interactions between actors (Journé & Raulet-Croset, 2008):

- constituent elements of the management situation: participants (regional prefect, various sections of the DRAAF in Corsica and DGAL in Paris, GDS, GTV, Chambers of agriculture, farming unions, farming organizations: interprofessional groups, associations, cooperatives, etc., hunting federations, ANSES, analytical laboratories, INRAE, etc.); spatial extent (the island, or particular areas, of Corsica); temporal extent (from the appearance of the pathogen to its eradication, for example); criteria for assessment (validation of the results of an action, etc.);
- characteristic elements of a situated process of inquiry: emergence of new problems (e.g. vaccine logistics, database harmonization, etc.); reformulation of problems over time, expressed conjecture (e.g. 'if we don't compensate farmers, we'll have under-reporting of outbreaks'), and sharing of stakeholder knowledge (e.g. explanation of how a pig farm works, etc.);
- characteristic elements of interactions: cases made for and against, knowledge sharing, disagreements and consensus, etc.

For the dispositives, we used an inductive approach to try to identify how their elements were arranged. An example of this exercise is shown in Figure 1, which shows a simplified mapping

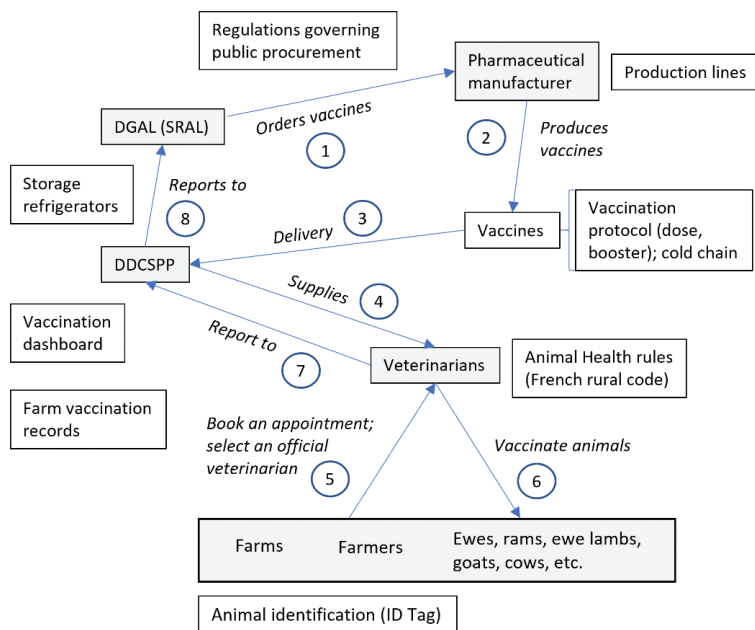
of one such entity, the BTV vaccination dispositive. The dispositive is comprised of a vaccine, veterinarians (who administer it to the animals), and a vaccination protocol. There is a link between the vaccine and the pharmaceutical laboratory, and the latter has asked the government to create a plan for the vaccination campaign, so that it can organize its production lines. The veterinarian works within the framework of a health mandate (Rural Code) to perform a public service mission and has links to government departments and some farmers. The elements of this dispositive also include locations (the vaccine production plant, the meeting room where the vaccination campaign is developed, farms, etc.), discourses, tools (monitoring grids for vaccinated farms, vaccination logbooks, etc.), animals, and the pathogen itself. This set of elements and relationships form an organizational entity that we call the 'BTV vaccination dispositive'.

For each of our three situations, numerous dispositives were characterized using visual maps, which offer an extremely useful way of reporting the empirical results of qualitative research (Barbier, 1998; Parmentier-Cajaiba & Cajaiba-Santana, 2020). Several visual maps and diagrams, including temporal elements, were also created to show the links between the heterogeneous elements assembled in the dispositives and between the disparate elements of the management situation. Thus, themes coded in relation to the management situation (e.g. two actors interact during a meeting on a given problem and propose a solution) are coded in the dispositional analysis (as modified elements and relationships), in a dynamic way (through the temporal thematic grid). These diagrams allowed us to put forward both synchronic and diachronic readings of the constituent elements and dynamics of the dispositives and the management situation (see Box 1).

This narrative approach thus provided a general understanding of the dynamics of the situation, a synthesis of its salient points, and data allowing us to identify, distinguish, and map the different organizational entities, our dispositives. An analytical approach then enabled us to take a closer look at the elements of the dispositives as they engaged with each situation and to refine our understanding of the elements that distinguished and linked them. Last, the characterization of the elements of the management situation (participants, expansion of the affected area, interactions between participants, investigative approaches, etc.) enabled us to interpret the dynamics of the dispositives involved and to understand how their 'morphologies' evolved. We thus gained a picture of the variations and regularities in the three situations.

Analyzing management situations: A narrative approach

This section presents the empirical data for each animal health emergency studied in the form of narratives of the evolution of the dispositives and situation.



Locations:

Prefecture or DDCSPP meeting rooms, livestock farms, veterinary clinics, etc.

Quotations:

“The aim is to achieve 80% vaccination coverage” (DGAL)
 “When will you understand that farmers prefer to vaccinate at dry-off” (farmer–union representative)
 “We need to know whether you are going to launch a second vaccination campaign so we can allocate a production line” (pharmaceutical manufacturer)
 “We have asked for vaccination to be carried out under the animal health inspection regulations” (veterinarian)

Actors

Tools or group of tools (rules, protocols etc.)

→ Actions

① ... ⑧ Chronology of actions

Figure 1. Example of dispositive mapping: the BTV vaccination dispositive. Source: Own elaboration.

Box 1. Coding and categorizing financial compensation for farmers

During a local steering-committee meeting for the BTV vaccination campaign, a farmer representative called for financial compensation to be paid for sheep deaths from the public purse, which started a discussion among committee members on the subject. We coded this issue as a new problem constituting an extension of the situation. The discussion content was coded under different categories (debate on farm cash flow, political claims, how to define the value of an animal, etc.). During the discussion, it was decided that a working group should be formed to work on this problem. We coded this information as the emergence of a new dispositive, the compensation dispositive. At the next meeting, the head of SRAL updated members on its plans, and we coded this as an active dispositive with its attendant elements (forms to be filled in by farmers, amount of compensation, etc.). Semi-structured interviews with DGAL representatives allowed us to identify the mechanisms underlying the creation of this dispositive, and these show, among other things, that this dispositive served as a way of getting farmers involved in the vaccination campaign.

The BTV health emergency: a highly dynamic management apparatus

The arrival of BTV in September 2013 ‘took everyone by surprise’ (interview, National Animal Health Office, February 26, 2015). The surveillance dispositive, which relied on the systematic inspection of cattle in slaughterhouses, failed to detect the virus. During a crisis meeting at the Ajaccio Prefecture on September 11, 2013, national civil servants (DGAL-SRAL) faced criticism from some farming organization representatives, elected representatives of regional institutions, such as ODARC (Office du développement agricole et rural de la Corse), and veterinarians (‘The distribution of information was deplorable’, veterinarian, crisis meeting in Ajaccio, November 11, 2013). Very quickly after ANSES issued its expert opinion on the strategic response to adopt (referral no. 2013-SA-0173), and after some discussion with stakeholders on the crisis committee, the national authorities decided to carry out mass vaccinations of the three species

that might be directly affected (sheep) or act as reservoirs of the virus (cattle and goats). The decision to vaccinate all three species followed recommendations of the ANSES expertise (although opinion remained divided in the initial debates), but the decision to proceed with mass vaccination was made by national government and local actors in response to the rapid spread of the virus (and to the strong likelihood that identification of some outbreaks had been ‘missed’), whereas ANSES had recommended vaccination in areas around infected farms as a first step.

Calling the vaccination dispositive into question

‘Fortunately’, stocks of vaccines were directly available, thanks to a production surplus at the pharmaceutical factory producing vaccines for use in Italy (‘We’re lucky that the vaccine is available’, farmer representative, COPIL meeting, September 17, 2013). The vaccination campaign was planned to last 6 months

(October-April) and placed under animal health rules: vaccination was compulsory and to be carried out by veterinarians under public health mandate, with all costs covered by the State. The vaccination dispositive would be impacted by numerous changes as the management situation evolved. For example, unexplained goat deaths were observed on farms by farmers and veterinarians. This reduced their commitment (letter from the GTV to the DRAAF, February 9, 2014) and caused authorities to express a view of goat vaccination as 'still compulsory except where the health status of the animals is deemed too poor; [...] at the discretion of the veterinarian and under the latter's responsibility' (head of SRAL, local steering committee, February 10, 2014). But above all, the dispositive was to be hotly debated as part of a clash between the administrative and zootechnical temporal reference frameworks. Indeed, early October is the lambing season, a time when ewes are potentially physiologically weakened. Farmers' representatives argued that it was better to delay the start of the vaccination program in order to avoid the risk to ewes, but also to wait to vaccinate lambs until they were old enough ('When will you understand that farmers prefer to vaccinate at dry-off [early summer]', representative of a farmers' organization, CROPSAV, 2015). Furthermore, some farmers considered it to be too late to vaccinate because the disease was already in circulation across the whole region. For them, the control strategy therefore made no medical sense ('What impact will the vaccine have on infected herds?', farmer representative, local steering committee, September 16, 2013). Indeed, since infected farms were placed under APDI regulations (prefectorial act concerning infected farms), farmers who wanted to be released from these regulatory constraints (and to benefit from financial compensation) had to vaccinate their animals when the virus was already circulating on their farms. One consequence of this clash of temporal reference frames had two aspects:

- delay in vaccination, deplored by government representatives (by early December 2013, only 10% of sheep farms had been fully vaccinated: 'this is very unsatisfactory', head of DGAL, National Steering Committee, December 9, 2013),
- excessive workload for veterinarians in the first quarter of 2014 ('I must insist on the fact that vets won't be able to do all the vaccinations in January-February', veterinarian representative, local steering committee, December 2, 2013). Veterinarians were caught between an increase in BTV vaccination requests and their bovine tuberculosis surveillance activity, which required two visits to each farm. On the latter point, and despite the orders issued by the health authorities, veterinarians would find themselves having to carry out the injection of the BTV vaccine and the injection of the tuberculin test at the same time.

The addition of a 'vector control' dispositive

Arguing that the vaccination strategy had achieved all it could, farmers' representatives requested state funding for an insecticide used on livestock farms, to disinfect animals and buildings (since the virus is transmitted by *Culicoides* midges); 'in the absence of a massive upstream vaccination campaign, [...] only the rapid treatment of animals that are sensitive to pyrethroids can be contemplated as a short-term means of control' (farmers' representative, September 16, 2013). The prefect quickly acceded to this request. But the distribution of such a product fell outside the regulatory framework and, therefore, generated tensions between some stakeholders:

The veterinarians didn't like the way this control measure worked. The government distributed the product free of charge, via the FRGDS, without a prescription, even though precautions need to be taken (duration of residual activity, particularly in relation to milk). In particular, there's the generic product available, [XXX], which is cheaper; but the government gave farmers what they wanted. (Veterinary interview, October 25, 2016)

Handling multiple related problems

Vaccine and vector control were not the only dispositives to be activated. Throughout the course of this management situation, numerous dispositives would be activated or created to respond to emerging issues. We can cite, for example, the dispositive of negotiations with the Sardinian authorities, initiated by the French authorities in November 2013 at the request of farmers, who wanted to continue their lamb exports to Sardinia (also affected by BTV). Compensation measures, too, while not initially planned, were agreed in principle at the end of October 2013, and an associated compensation dispositive was activated in December 2013. For the farmers, the purpose of these measures was to maintain cash flow and prevent the loss of their farms. For central government, an additional objective was 'to encourage Corsican farmers to vaccinate, to avoid [the disease] spreading to mainland France', whereas 'if BTV were to arrive in mainland France, it had been decided that there would be no compensation for farmers' losses' (DGAL interview, 26 February 2015). Finally, we should mention the creation, in December 2013, of a specific dispositive devoted to cattle movements from Corsica to the mainland. This dispositive was based on systematic PCR analyses (organized and financed by central government and carried out by veterinarians), with responsibility for transport logistics lying with the farmers.

In summary, we can say that the BTV management situation was thus characterized by highly dynamic dispositives, that is their constituent elements recombined, and the relationships between the dispositives themselves evolved. Thus, new elements and relationships came to be included in the dispositives

(e.g. bovine PCR), dispositives were altered (e.g. mass vaccination), and some disappeared (e.g. vaccination of goats). There were numerous interactions between officers and practitioners working for the statutory animal health management authorities (SRAL, GTV, and GDS) and other stakeholders (such as the various farming organizations).

Aujeszký's disease: Failure of a static strategy

In September 2014, FRGDS and SRAL organized the final meeting of the trial plan for the control of Aujeszký's disease. Few farmers were present, despite being invited (two of the 30 who took part in the plan). Other participants in this meeting were two veterinarians (including the president of the GTV) and representatives from the LDA, DDCSPP, and INRA. The final verdict on the trial was that it had been a 'semi-failure' (our term) – the vaccine was effective, since some heavily infected farms were free of the virus after 3 years, but a third of participating farmers left the project midway through.

A 'semi-failure': Some farmers withdraw from the plan

The plan called for the implementation of four dispositives: the vaccination of breeding and slaughter pigs; serological testing of animal immunization; restriction of animal movements between farms; and measurement of farms' zootechnical performance. The serological tests and zootechnical performance measurements were the principal reasons for farmers to leave the plan. Animals had to be penned and weighed one by one (on free-range farms): 'I left the plan midway through because weighing the piglets was too constraining' (farmer interview, April 27, 2015). During the 3 years of the plan, no meetings were held for the 30 farmers involved in the plan to discuss this (or any other) problem, and decisions to abandon this dispositive were not taken collectively. Blood tests were sometimes carried out by veterinarians with no experience in the pig sector and sometimes resulted in injuries to the animals. Finally, despite their initial commitment, there was insufficient input from veterinarians, leaving the medical procedures (vaccinations and blood samplings) for some farms to be carried out by FRGDS technicians.

Attempting post-plan continuation of mass vaccination

Once the zootechnical performance measurement dispositive had been abandoned, FRGDS attempted to generate data through a qualitative survey. This revealed that farmers who had vaccinated their pigs throughout the plan period wished to continue to do so. Despite this encouraging response, at the end of the plan, there seemed to be no legacy pathway: 'The plan is over and we don't know what to say to farmers who

now want to vaccinate' (interview with regional authority staff, April 15, 2015). Indeed, the fact that a third of farmers had abandoned the plan was a disincentive for DGAL to finance mass vaccination ('If we have one farmer who is vaccinating in his corner and three others who aren't, there's no point', ANSES expert, Aujeszký plan review meeting, September 19, 2014). Equally, the failure of the zootechnical performance measurement dispositive meant that pig farmers were not convinced of the point of fighting the disease ('the pivot needs to come from the profession, involving the most influential farmers, members of the PDO, who are more productive and have the greatest persuasive power; the FRGDS [...] and the Chamber of Agriculture [...] It will only work if they feel involved', regional authority staff interview, April 15, 2015).

The management dispositive surrounding the Aujeszký plan was therefore relatively 'static' in its implementation, only dealing with the problems that emerged on an individual level, with no shared discussion among participants that could allow the problem to be re-problematized. Thus, for example, one of the few problems to be dealt with collectively was the change in supplier for the serological analysis kits after initial supplies proved to be of insufficient quality (FRGDS interview, April 14, 2015).

The BT outbreak: Innovative measures and a more dynamic evolution of public health actions

The detection of BT in livestock relies on three dispositives: carcass analysis at the slaughterhouse (symptoms of the disease); prophylaxis on farms, the frequency of which is set according to risk (based on a tuberculin test carried out by veterinarians); and epidemiological investigations surrounding detected outbreaks (carried out by the DDCSPP). When an outbreak is detected and confirmed, the regulations call for the slaughter of all or part of the herd (to rid the farm of disease) and compensation for the farmer. If a herd is not completely slaughtered, the farm is closely monitored (regular testing) and can regain its formal healthy status if further tests are negative after a certain period of time.

During the COPIL meeting on January 30, 2015, where the agenda was to boost the intensity of the effort to combat BT, voices were raised between the president of the Chamber of Agriculture and the Chair of the FRGDS. The former argued that 'monitoring needs to be adapted to the local farming system', while the latter retorted, 'I'm sorry, you're a cattle farmer; you have to carry out controls [i.e. prophylaxis, etc.]. I don't mind defending the farmers who are keeping the villages alive, but there's a job to be done!' This altercation occurred at a point when SRAL had been working for the previous 3 years to implement a strategy designed to improve all monitoring and control dispositives in response to concerns over the re-emergence of BT on the island. Numerous problems had been

identified by those involved, which had led to the adaptation of existing dispositives and the creation of new ones.

New dispositives, the IFN test, and support for veterinary prophylaxis

Very quickly, operational problems with the tuberculin tests (IDS) became apparent:

You have to handle the animals twice, three days apart, if you want to do it properly – it's pretty burdensome [...] it placed severe constraints on vets [...]. We have a huge problem with cattle identification: farmers declare that they have 50 animals, when in fact they sometimes have 60 or 70. So we don't check them all, and when we come back three days later, not all of them are there. It's not easy either, even for the farmers, with the livestock system they use [i.e. extensive grazing, where cattle are scattered across large, sometimes unfenced, areas], to gather the whole herd 3 days later. (Veterinary interview, July 28, 2015)

This problem was clearly identified by the SRAL and the FRGDS. The SRAL regional coordinator then suggested the use of a new tool, the interferon (IFN) test, which was at that time being used only on an experimental basis. This involves a single blood test only: 'It was interferon, for us at least, that got things back on track' (DDCSPP interview, July 07, 2015). The introduction of this new test was accompanied by several measures to improve BT detection, including training, awareness-raising, and support for veterinarians while carrying out prophylactic treatments, along with a renegotiation of veterinarians' remuneration ('Since we became aware of the issue, I'd say 3 years ago, vets have been committed to doing this properly. We've also been better paid for this work', veterinary interview, July 28, 2015).

Systematizing the epidemiological investigations dispositive

As a complement to prophylaxis, a system of epidemiological investigations by DDCSPP agents was created:

Surrounding an outbreak, we carry out epidemiological investigations upstream, downstream and in the vicinity of the farm. [...] That's a whole lot of farms where nothing was detected while prophylaxis was going on, and so we say to ourselves that there might be something, and we go back to do tests, with the vet. (DDCSPP staff interview, July 15, 2015)

This dispositive is also interesting because it takes into account the interactions between wild and domestic animals: when a wild boar tests positive, the DDCSPP agents carry out surveys of the cattle farms in the area. Implementation of this dispositive is, however, very time-consuming for DDCSPP agents.

Abandoning the communication dispositive on the mandatory use of slaughterhouses

Communicating the risk of human contamination was a key measure. The focus was on the need to prevent on-farm slaughter, still being practiced by some farmers, and to shift operations to the slaughterhouse, a major tool in epidemiological surveillance. At the COPIL meeting of January 15, 2014, SRAL proposed a press release targeting farmers that featured visual illustrations of 'backyard' slaughter and its risks. However, following angry condemnations of the release by some farmers' representatives as an insulting caricature of their profession, this dispositive was abandoned. The SRAL then proposed that the professional organizations should take over responsibility for the communication of this message via a range of channels (awareness-raising by the GDS, professional journals, etc.).

Animal identification and registration: A pilot project in two micro-regions

Despite the operation of all these dispositives, and their relative success (increase in BT detection), a major stumbling block was identified over which actors seemed to have no control, namely, the organization and coordination of the Corsican cattle sector: Comprising nearly 1,000 farmers with very varied practices, the sector's development has been fraught with political rivalries. These difficulties were then compounded by the problem of unregistered livestock farmers, whose herds' health was not being monitored. Such herds were, as a consequence, potential reservoirs for BT: 'It's difficult to identify farmers who deny [keeping animals]. We can't issue fines [...] And we are aware that some butchers and traders don't go through the supply chain's proper channels' (COPIL meeting, January 15, 2014). To avoid the difficulties caused by systematic fines, the SRAL proposed a pilot amnesty: working with local councils, chambers of agriculture, and the GDS, farmers would be offered the opportunity to register their animals, even if their provenance was not clearly established ('[...] it's really quite surprising, they have been able to identify and register cows with no known history [...]', veterinary interview, July 28, 2015). The operation is viewed as a success, particularly in Cap Corse, as many owners regularized their status, and some have ceased to operate. As a result, the BT screening dispositives were efficiently deployed in these areas. A specific regulatory tool was even created for this pilot action, in order to calculate compensation for animals slaughtered after testing positive (the negotiated price being different from the official price, given that these animals were not supposed to exist).

The Sylvatub dispositive: Relaunching and consolidating a regional network

From 2012, wildlife surveillance was carried out through the Sylvatub dispositive. Problems soon arose over information

feedback, hunter awareness and training, and the management protocol for the analysis of the wild boar found dead or of doubtful status. The Sylvatub meeting of July 29, 2014 resulted in the definition of the roles of each organization (GDS, GTV, departmental laboratories, DDCSPP, etc.). Of particular note were the appointment of volunteers from several organizations (hunting federations, INRAE...) to serve as 'advisors' (i.e. people who could be called on by a hunting team to inspect an animal of doubtful status) and ORDARC's funding of waste pits for hunting teams (to prevent animal remains being left in the wild).

Dynamic dispositional analysis: Empirical results

These narratives highlight the importance of "day-to-day administering", which is central to our approach. They offer insights not only into a wide variety of dispositives, but also into some of the significant developments and dynamics of each situation. We next turn to dispositional analysis of the data as a means to map and characterize all our dispositives, producing an overall cartography. However, this mapping cannot be fixed, as problems will emerge during the course of a situation, leading to the recombination of the dispositives. It is our intention to characterize the operational patterns of these recombinations through the lens of the evolution of the management situation.

A cartography of public epizootic management dispositives

Although the three management situations are different, a number of typical patterns can be observed in the management dispositives that were implemented. The mapping exercise enabled us to differentiate between two broad categories of dispositive, described as 'main' and 'support' dispositives. Main dispositives are structured around a tool, knowledge, or organization from the veterinary world, and their objective is to manage sick or at-risk animals. Support dispositives are organized around a variety of tools, knowledge, and organizations from other professional worlds, and their objective is to create conditions favorable to the implementation of the 'main' dispositives.

'Main' dispositives

These are the core dispositives of management strategy. Here, they are based on specific tools, expertise, and procedures that are directly linked to the management of sick animals or their identification: vaccines for BTV and AD or a tuberculin test for BT, for example. These dispositives are made up of a combination of several tools, expertise, and protocols framed by a professional veterinary culture: procedures for vaccine use, compulsory veterinary visits to farms, specific regulations

to prevent the movement of animals, vaccine supply procedures, etc. They generally involve actors who have a clearly defined role in one of the three arms of French public health support system, comprising the SRAL and the DDCSPP (public health administration), veterinarians under public health mandate and GTVs, and the GDS (farmers). Three types of dispositives can be distinguished: medical dispositives (based on a medical tool or protocol, such as a vaccine); public health dispositives (based on nonmedical management procedures); and surveillance and monitoring dispositives (based on the production of information on the situation). Table 3 provides a summary of these different dispositives in the three situations.

'Support' dispositives

The purpose of the 'support' dispositives is to enroll the actors targeted by the 'main' dispositives (farmers in particular) and to promote the 'main' dispositives in such a way as to create the right conditions for their implementation. When mapped, these support dispositives reveal that many problems arise during the course of the situation, particularly 'related' problems. Such problems are sometimes formulated through the foresight activities of health authorities (SRAL, GDS, and GTV), but they are often defined by other actors, such as farmers via their representatives (interprofessional groups, associations, unions, and cooperatives) or by hunters. Related problems can be economic, technical, or administrative, and several types of dispositive are then created or activated to deal with them. These include communication dispositives (intended to raise farmers' awareness and get them to adopt the 'main' dispositives); dispositives based on the technical-economic activities of farms (intended to maintain farmers' financial positions); and strategic coordination dispositives (intended to enable discussion of emerging problems, and the possible modification of operations). Table 4 summarizes the various dispositives we have identified.

Strategic interdependence between dispositives

Mapping thus allowed us to identify coherent groupings of elements and relationships, which we characterize as dispositives, on the basis of their common function in solving problems that emerge during the management situation. This grouping of dispositives seems to form a kind of supporting infrastructure for management actions and can be characterized by two properties.

The first is the strategic interdependence of these dispositives, bound together by the relationships we described earlier as 'strategic'. Indeed, the failure of one 'support' dispositive can lead to the failure of all dispositives (e.g. the failure of the zootechnical performance measurement dispositive in the case of AD). But the abandonment of a dispositive may also have no impact on the resolution of the situation as, for example, in the case of the

Table 3. 'Main' dispositives in the three outbreak situations

Dispositive type	BTV situation	AD situation	BT situation
Medical dispositives Centered on the use of a medical tool and associated protocols (vaccination)	Objective: to protect animals against the virus Method: mass vaccination (sheep, cattle, and goats) over 7 months, carried out by official veterinarians Note: vaccination of goats would be unofficially discontinued; vaccination of cattle would be poorly monitored	Objective: to protect animals against the virus Method: vaccination of breeding sows and pigs for charcuterie over 3 years – 30 farms Note: FRGDS technicians would, in some cases, replace veterinarians in administering injections	
Health dispositives Centered on planned management procedures and based on the outcomes of medical dispositives and the evolution of the situation	Objective: to prevent the spread of the virus Method: executive ban on animals leaving the farm (prefectoral order – – formal declaration of infection [APDI])	Objective: to prevent the spread of the virus Method: commitment by farmers not to sell live animals, while the plan is being implemented	Objective: to prevent the spread of the virus Method: slaughter and diagnosis of animals identified as positive, and executive ban on movement of animals (APDI)
Surveillance and monitoring dispositives Centered on a range of tools/protocols designed to produce information on the evolution of the epidemiological situation	Example 1: Objective: to detect and prevent the introduction of the virus onto the island Method: inspection of cattle carcasses in slaughterhouses Note: this cattle inspection dispositive failed to detect the introduction of the virus (which was detected by a veterinarian in September 2013, in the South of the island) Example 2: Objective: to monitor the progress of the vaccination campaign Method: veterinarians reported their vaccination activities to DDCSPP; DDCSPP compiled the data to assess the vaccination rate	Objective: to assess the development of vaccine immunity Method: blood tests on all vaccinated animals Note: this dispositive would prove very burdensome for farmers	Example 1: Objective: to detect BT on farms Methods: epidemiological investigations performed by DDCSPP officer in areas surrounding detected outbreaks Example 2: Objective: to detect BT on farms Method: carcass inspection in slaughterhouses Example 3: Objective: to detect BT in wild fauna Method: training and awareness-raising for hunting groups; establishment of the 'Sylvatub' advisory network

Source: own elaboration.

abandonment of goat vaccinations against BTV: vaccination continued in the sheep sector; and the situation was effectively resolved.

The second is the incompleteness of the dispositives. The implementation of the original form of the management dispositive produces an extension of the management situation, and new problems of various kinds are then formulated and reformulated, collectively or otherwise. This incompleteness and, above all, the sometimes fumbling efforts of actors to reduce it during the course of the situation are highlighted by the dynamic focus of our dispositional analysis.

The management situation as a site of dispositive dynamics

In the trial-and-error dynamics of ongoing organizing activity, the morphology of dispositives is thus not fixed. Our

dispositional analysis allows us to distinguish three modes of dispositive recombination. These three modes and their temporal shifts depend on the emergence and formulation of problems encountered by the actors as the situation unfolds. Through three examples, one from each case, we show how the management situation serves as a site of successive problematizations that trigger these recombinations. We then show that stakeholder participation is a key factor in this dynamic of recombination.

Three recombination modes

The dynamic mapping of dispositives at the level of the situation enables us to identify three types of dispositive recombination that are to be found in each of our situations – adjustment of existing dispositives (e.g. communication

dispositive, BT case), addition (e.g. financial incentive dispositive, BTV case), and abandonment (e.g. zootechnical performance measurement dispositive, AD case). These recombinations are brought about by successive

problematizations that address many aspects of each management situation.

The three modes illustrate the fact that relationships between dispositive components have varying degrees of

Table 4. 'Support' dispositives in the three outbreak situations

Dispositive type	BTV situation	AD situation	BT situation
<p>Communication dispositives</p> <p>To raise awareness among farmers (via media outlets or official letters) to persuade them to adopt prescribed management measures</p>	<p>Examples:</p> <p>Letters from government bodies; articles in local newspapers; press releases.</p> <p>Note: one objective was to create bonds of solidarity between farmers in the three sectors (sheep, cattle, and goats) to encourage them to take part in mass vaccination</p>		<p>Examples:</p> <p>Articles proposed for use in the local press with awareness-raising illustrations to encourage farmers to use slaughterhouses</p> <p>Note: farmers' representatives would be offended by the proposed materials, and government officials would then suggest that farmers themselves run the communication campaign</p>
<p>Dispositives based on the technical and economic activities of farms:</p> <p>To protect farms' financial positions or improve production</p>	<p>Sales support dispositives</p> <p>Example: negotiation dispositive with Italian authorities to ensure that Corsican sheep farmers could continue to export their lambs to Sardinia, so that farms under movement orders did not incur the additional costs of keeping lambs on the farm</p> <p>Note: this dispositive was also intended to prevent farmers from under-reporting suspected bluetongue cases</p>	<p>Example: zootechnical performance measures dispositive for vaccinated farms trial</p> <p>Note: very burdensome dispositive that would cause the withdrawal of a third of participant farmers from the trial</p>	<p>Example: financial compensation dispositive for slaughtered cattle</p>
	<p>Dispositives involving technical-economic incentives</p> <p>Example: financial compensation dispositive for dead animals</p>		
	<p>Dispositives involving regulatory incentives</p>		<p>Example: registration opportunity dispositive pilot project for unregistered (illegal) farms</p>
<p>Strategic coordination dispositives: forums to coordinate actions, sites for collective decision-making, sites of dispositive recombination</p>	<p>Examples: local steering committees, crisis units, CROPSAV, CNOPSAV</p> <p>Note: numerous problems emerged and were discussed, obliging public sector managers to revise existing dispositives or to create new ones</p> <p>Example: decision to create an antigen bank as preparation for the rapid production of a BTV vaccine, in the event of new outbreaks (steering committee, April 14, 2014)</p>		<p>Examples: local steering committees, CROPSAV</p> <p>Note: numerous problems emerged and were discussed, obliging public sector managers to revise existing dispositives or create new ones</p> <p>Example: ODARC funding for waste pits for hunting teams (steering committee, January 30, 2015)</p>

Source: Own elaboration.

stability. For example, vaccination in the BTV case is marked by functional relationships formed through strict compliance with numerous protocols: dose, time between two injections, maintenance of the cold chain, registration of vaccinated animals, and a mandatory operator (health veterinarian). But even this type of relationship can be made more 'flexible'. In the case of AD vaccination, for example, the vaccine protocol requires a booster shot every 4 months. But the difficulties inherent in organizing such operations in free-range pig farming systems led to a decision to administer the booster at 6-month intervals. Moreover, some injections were carried out by technicians, to compensate for the low participation rates of some veterinarians. The BT case, too, illustrates shifts in the status of functional relationships – while holders of illegal animals in Cap Corse were asked early onto regularize their status, government sanctions were not imposed immediately ('flexibilization') but were only introduced in a second phase ('rigidification').

Problematizing and recombining dispositives

To illustrate the intensive efforts of the participants to formulate the problems to be addressed and the effects of these activities on dispositive recombination, we next describe and map three complex interactions between the evolution of a situation and that of its associated dispositives, tracking the disappearance/appearance of particular dispositives. Each of the three examples is taken from a different management situation.

Blue tongue vaccination: abandonment of vaccination for goats

The initial formulation of the problem focused on the issue of AMM (French authorization for sale) and on government responsibility if a drug was prescribed using the 'cascade' decision tree protocol (i.e. whether central government would be held legally responsible where a vaccine authorized for sheep but not for goats was administered to goats). The formulation then shifted to a problem of goat mortality that could not be accounted for by an expert investigative dispositive, before being transformed into a problem of veterinarian responsibility and credibility with farmers. These successive reformulations of the problem by the local steering committees led to recombinations in the goat vaccination dispositive (Figure 2): first, the cascade protocol was coupled with the activation of a pharmacovigilance dispositive (led by central government, with veterinarians reporting pharmacovigilance cases); second, an ANSES expertise dispositive based on farm visits was added (ANSES researcher, local veterinarian, representatives of the dairy interprofessional group, and GDS); and last, the goat vaccination dispositive was abandoned (following the withdrawal of the veterinarians).

Aujesky's disease: abandonment of economic performance measurements

As it was initially formulated, the problem is related to the failure of the pig sector to mobilize and organize in the fight against Aujesky's disease, this being a contributing factor to AFSSA's unfavorable expert opinion on mass vaccination. A dispositive intended to persuade farmers of the virtues of vaccination was therefore added, based on the measurement of zootechnical performance on farms involved in the trial. This dispositive created major organizational problems that led to the gradual discontinuation of on-farm measurements. Decisions to stop the measurements were taken at farm level, with the farmer notifying the GDS technician. No collective discussions were held to reformulate the problem or adjust the dispositive over the 3 years of the trial. Only at the end of the trial did the FRGDS conduct a satisfaction survey among farmers in an attempt to compensate for the lack of zootechnical data and demonstrate the benefits of vaccination (Figure 3). While the results of this survey were positive, the main feature of the trial's outcome was the fact that some 10 farmers dropped out along the way. Here, the problem of mobilizing the profession was formulated in such a way that the solution was to provide scientific evidence of the benefits of vaccination, but the failure of this dispositive suggests a different formulation of the problem – that the mobilization of the pig sector depended not only on scientific evidence of success (given that most of the remaining farmers wished to continue vaccination) but also on the creation of a shared dynamic, especially the building of bonds of solidarity and proximity among farmers. In this case, the problem was only reformulated once the trial had ended, during the final meeting (September 19, 2014).

Bovine tuberculosis: Addition and disappearance of a pilot program

BT detection dispositives are not very effective because one major problem in the detection of the disease is that some farms do not register their animals and are therefore illegal. Rather than activating administrative sanctions across Corsica, the SRAL's regional coordinator proposed a pilot dispositive in the area of Cap Corse to test a coordinated plan of action involving local elected representatives to test coordination between the various actors (GDS, health veterinarians, administrative technicians, and administrative veterinarians). The aim was to offer farmers the opportunity to regularize their status and to support them in the management of health procedures. The dispositive was a success, since some farms registered their animals, while others ceased to operate, and the detection of BT in the area improved. However, the dispositive could not be extended to the whole island, due to the limited resources available (particularly in the DDCSPP). At this scale, it was decided to test the implementation of an intraruminal bolus (a form of lifelong identification chip) as a solution to the

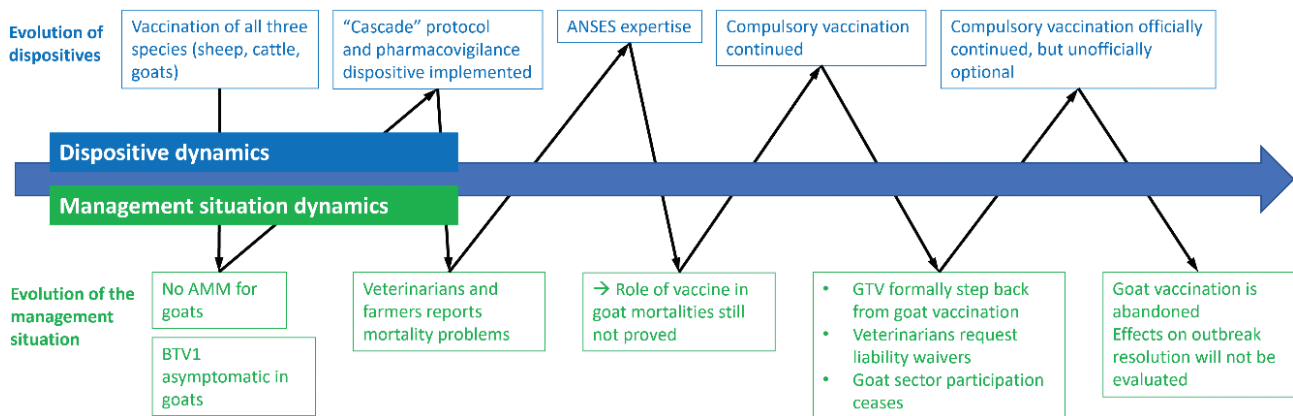


Figure 2. Evolution of the goat vaccination dispositive as a function of the problems encountered in the management situation (BTV case). Source: Own elaboration.

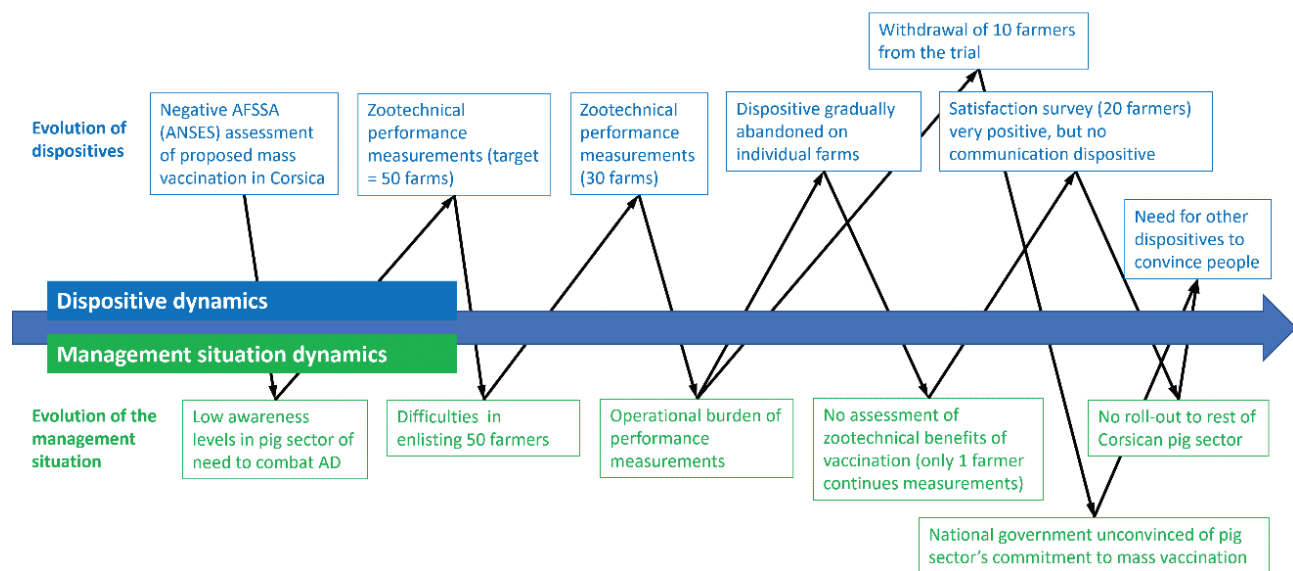


Figure 3. Evolution of the zootechnical performance measurement dispositive as a function of the management situation (AD case). Source: Own elaboration.

problem of animal identification. Thus, when worked through at different scales (corresponding to different spatial extensions of the management situation), this problem produced different dispositive recombinations (Figure 4). On a micro-regional scale, the dispositive included the actions of local elected representatives to raise local awareness and support. However, on an island-wide scale, a new dispositive was formed that centered on a technical solution, the bolus, without the involvement of local elected representatives.

In each case, these examples show that the implementation of 'main' dispositives calls for the creation, adjustment, or disappearance of other dispositives. These three modes of recombination can be observed across the dispositives that were implemented

to resolve management situations (Figure 5). They are governed by a general dynamic of continual problematization that is just as essential as the initial problematization.

A central driver of dispositive dynamics: stakeholder participation

In our case studies, organizations other than government departments were responsible for reformulating problems and recombining dispositives – the decision taken to vaccinate using GDS technicians in the AD situation, for example, or the abandonment of goat vaccination by veterinarians in the BTV situation. But, above all, these recombinations show that, while government officers and agents do attempt to manage different types of animal

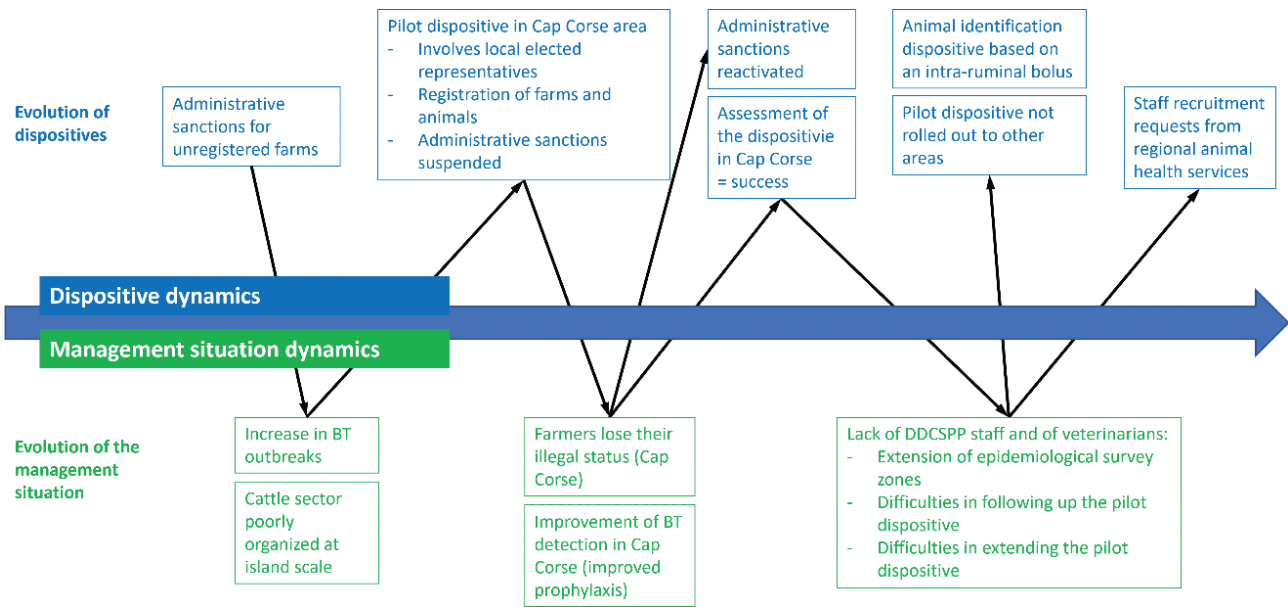


Figure 4. Evolution of the identification and regularization of dispositives addressing livestock farms, according to the problematization in the management situation (BT case).
Source: Own elaboration.

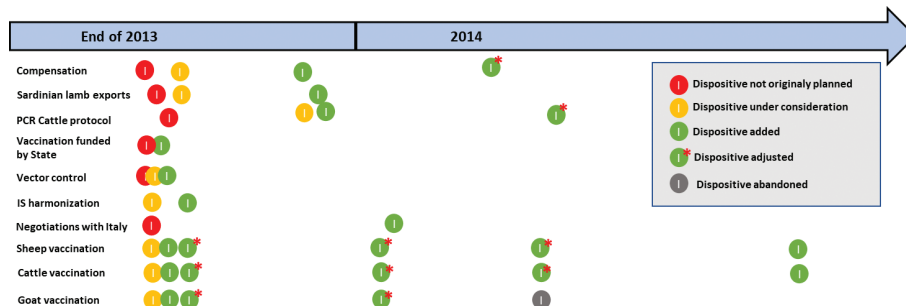


Figure 5. Dispositive additions and modifications in the BTV management situation.
Source: Own elaboration.

health problems, they cannot anticipate all the problems that contribute to management situations. For example, the AD case demonstrates the failure of central government and FRGDS managers to consider important features of the pig sector in Corsica, especially the free-range character of its farming systems. In the BTV case, we can cite the conflict between administrative and zootechnical rationales. Here, the farmers explained to the regional government that vaccination of the three types of animals on a sheep farm (rams, ewes, and ewe lambs) should not be carried out at the same time. As a result, they obtained a change in the dispositive, allowing several veterinary visits to be funded rather than the single visit originally planned.

The participation of stakeholders other than those who operate the animal health sector (government administrators, GDS members, and veterinarians) thus played a major role in the dynamic recombination of dispositives in each situation. It is

therefore clear that, in all configurations of our situations, the general mechanisms of dispositive recombination and situation problematization depended on the ability of public animal health administration managers to involve stakeholders in the process.

Discussion: The contribution of dispositional analysis at the scale of the management situation

All the aforementioned examples show that the mapping of dispositives on the basis of situational practices (Raffnsøe, 2008) allows us to gain an understanding of their dynamics that goes much further than the investigation of their 'morphology' (Aggeri & Labatut, 2014) as defined *a priori* by their initial purpose. Our dynamic and situated dispositional analysis has thus enabled us to map the activities of

organizing in an original way, first by distinguishing a variety of dispositives, but also by understanding their dynamic processes.

The making visible of a ‘dispositive ecology’

At the scale of the management situation, dispositional analysis makes it possible to highlight the dynamics of the recombination and creation of dispositives, thus providing a basis on which to think about *organizing* in the treatment of wicked and complex problems. This approach allows us to avoid considering managers to be totally free in their situational actions (Baly et al., 2016). Conversely, it enables us to avoid thinking of dispositives as being designed by a ‘grand architect’ (Aggeri, 2014; Barbier, 2007), or, in Foucauldian terms, to avoid considering a ‘biosecurity’ dispositive, stable and ready to organize the behaviors of actors, and whose variations stem only from its regulatory application.

The tracing and interpretation of the *organizing* activity of ‘multiple architects’ caught up in the situation (central government services, veterinarians, representatives of farmers, hunters, etc.) are therefore made possible through dispositional analysis (Raffnsøe et al., 2016). Enriching dispositional analysis theory with empirical data, our study also offers a methodological contribution to the establishment, in a robust and systematic way, of the relationship between the characteristic elements and evolving configurations of a management situation and the elements that make up the dispositives associated with it.

In terms of method, this called for a coding and categorization exercise that combined direct observation of management moments with the tracing of the evolution of the management situation and a retrospective investigation that placed emphasis on the critical viewpoints of participants as the situation evolved. Diagrams, schemas, and cognitive maps then made the management moments and sequences intelligible and interpretable. In particular, they made it possible to construct a robust narrative of the ‘situation-dispositive ensemble’ and to identify how the dynamics of the management situation recombined dispositives while redefining their function. In the observation of these dynamics, narrative proved to be an important tool in the move from relatively raw observational data to more elaborate, meaningful analysis. One current trend in methodological research draws on the pragmatist notions of indeterminate inquiry and situation to give actors in the field an important place in the construction of the narrative and the attribution of meaning, where the researcher is only one voice among many (Arnoud & Peton, 2020). Here, we relied on a narrative thread that was gradually built up and made intelligible through diagrams and graphs (based on our observations), enabling the researcher-participant to understand the situation and thus enter into dialogue with the actors’ narratives during meetings, just after

a meeting (when some of the actors are chatting in a parking lot) or during interviews. In assigning meaning to our situations, we undoubtedly ascribed greater authority to the researcher, who was in a position to use the graphic and narrative tools to retrospectively retrace over time the interviewees’ assessments of the situation and any controversies that arose.

By considering the situation through time, we avoided the attribution of a predominant and causal role to dispositives identified exclusively from a biosecurity perspective, such as public health management tools (abattoirs, prefects’ decrees, the rural code, etc.). Working at the scale of the management situation, we could make visible a sort of ‘ecology of dispositives’, where ‘main’ dispositives and ‘support’ dispositives had fundamentally strategic relationships, in Foucault’s sense (2004). Although they were founded on historically consolidated knowledge and organizations (veterinary knowledge, vaccines, slaughterhouses, etc.), sanitary governance dispositives (which are mostly ‘main’ dispositives) were dependent on the implementation of a number of ‘support’ dispositives responding to classes of problems involving other, non-epidemiological issues (Charrier & Barbier, 2021). At this stage of our analysis, we noted that main dispositives could become flexible (sometimes to the point of disappearance, as in the case of goat vaccination), while ‘support’ dispositives that had been thought to be flexible could become rigid (compensation for farmers, for example). It would be useful to further investigate these dispositive characteristics using a methodology that enables a focus on the study of negotiation processes.

The management situation as the site of dispositive dynamics

By confirming that the management situation can be considered to be a ‘site of problematization’ where dispositives are recombined (Collier, 2009), we have shown the situation to be a useful lens through which to apprehend the incompleteness of dispositives and to characterize participants’ efforts to reduce this incompleteness (via addition, adjustment, or abandonment). As suggested earlier, our study sheds light on two characteristics of such recombinations. The first relates to their temporality: the dynamics of problematization give rise to fresh problems while reformulating others, with the consequence that problems do not all emerge at once (and some may even be the outcomes of previous recombinations), leading to what Alter describes as ‘dyschronies’ (Alter, 2003) in the overall assembly of dispositives. The second relates to the flexible or rigid nature of the relationships between the elements: even in main dispositives, such as vaccination dispositives, rigidity is not immutable (the vaccination protocol is rigid in the BTV case, but flexible in the AD case).

Our study also shows that the 'morphology' of dispositives depends not only on their strategic function but also on their relationship to a management situation that evolves as a result of interactions between participants. This is effectively a 'problematization-function' coupling, 'which determines how heterogeneous elements [...] are grasped and recombined' (Collier, 2009, p. 89), and, in our view, it constitutes a configurational principle of dispositives to which we should attach as much methodological as theoretical importance. Here, the aim is, in fact, to retrace the way in which the various actors have tried to make sense of the situation, both individually and collectively, sometimes turning into 'communities of inquiry' (Lorino, 2018) that may also include the researchers. By attributing meaning to the situation, they cause it to evolve and induce new dispositives to emerge.

Dispositives being relational in essence, the interactions between dispositives have certainly already been widely studied as a means to explain their evolution (Villadsen, 2021). But, by taking the act of problematization as the mechanism for dispositive recombination, we have been able to go further. We could, of course, have mapped our dispositives differently and shown, without linking them to the dynamics of the management situation, that sanitary dispositives interact with other dispositives, such as 'market' dispositives (sale of lambs in Sardinia, BTV case) or 'animal production' dispositives (free-range pig farming practices in the context of a charcuterie PDO), thus generating a multivariate structural explanation. But Girin's concept of the management situation (1990), and its subsequent development using interactionist and pragmatist approaches (Journé & Raulet-Croset, 2008), is useful precisely because it demonstrates that dispositives do not interact 'on their own', and that, in fact, it is the dynamic (re)problematization work of the actors/participants involved in the management situation that activates them and causes them to recombine.

We must last add that the situation is not the same for all those involved in its resolution, since participants draw on different interpretive frameworks when formulating the problems to be managed (Girin, 2000; Journé & Raulet-Croset, 2008). By embarking on processes of inquiry to make sense of the situation, whether individually or collectively, and by interacting, participants produce successive problematizations that drive the evolution of management dispositives based on the transformational demands that arise from their own activities of inquiry, negotiation, and challenge. At certain points in an outbreak, 'communities of inquiry' bring together groups of actors involved in a situation and can influence its dynamics, particularly when participants agree on relatively convergent visions of the meaning to be ascribed to it. Managerial and organizational capacities can therefore be observed to be highly distributed in situations, even in a field as regulated as animal health governance, with its links to both food safety and human health.

Conclusion

The management situation, considered as a 'site of evolving problematization', is therefore, according to our analysis, the site of recombination processes of dispositives. By situating our dispositional analysis at the level of actors' situational practices, we have produced an original cartography of dispositives that is distinct from the many forms described in the literature, from Michel Foucault's great prototypical dispositives of government down to Giorgio Agamben's pen. Our dispositives are in fact 'caught up' or generated in the situation and are highly fluid and interconnected. Dispositional analysis at the scale of the situation provides then a perspective for the study and dynamic analysis of day-to-day administering. At this scale, before being made manageable, problems can be identified, debated, and reframed (Kurunmäki & Miller, 2011; Miller & Rose, 2008) or can sometimes even be recognized as 'unmanageable'. Thus, the participation of stakeholders – and particularly those with no mandate in health management (farmers' associations, interprofessional groups, hunters, etc.) – can be decisive in the dynamic recombination of dispositives. We have thus been led to propose a methodology that allows a dynamic approach to dispositives through the lens of the management situation. Such an approach is, however, open to justifiable criticism, given the difficulties of combining agency and structure in a temporal approach while undertaking complex detailed description.

Despite these limitations, this research highlights an ecology of dispositives whose governance extends beyond the limits of regulatory control. Consequently, even where government departments are responsible for resolving the situation (this being their mandate), we might suggest that the developers of the new animal and plant health governance program in France (Guériaux et al., 2012) could make greater use of these *ad hoc* collective experiences, creating thematic working groups within regional animal health associations. Emerging lessons from the management of hospital systems during COVID-19 also suggest this (Dumez & Minvielle, 2022). This would be a first step toward a networked governance structure that would enable real progress to be made on the issue of sharing responsibility for the success or failure of public management dispositives (McGuire, 2006). Indeed, if stakeholders are to be held accountable for the health of their animals, as suggested by the formalization of structures for New Health Governance, and if the aim is to adapt management dispositives to local situations, then these stakeholders should be involved not only in the implementation of management dispositives but also in the design stages of animal health management strategies, and even in their ongoing evaluation. For animal health managers, the situational approach proposed by our research makes visible the challenge of finding a balance between pragmatic solutions and a

self-contained 'top-down' form of planning and security governance. Our study thus opens up valuable conceptual and methodological avenues for the establishment of the 'robust governance solutions' (Ansell et al., 2021) we need, and for the analysis of the 'bricolage' practiced by public managers to cope with uncertain situations. Its value lies in the fact that the type of management problems it addresses is linked to the continual (re)problematization of the situation and the increasing complexity of the actor network concerned, problems whose management critically depends on achieving the balance between centralization and distributed agency (Carstensen et al., 2022).

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