

## Chapter 2

# Setting the Theoretical Framework and Methodology



## 2.1 Introduction

In general, this research uses the empirical data collected to connect theories about how the regulated actors comply with regulatory laws and rules and the factors that affect the regulated actor's compliance behavior. Before analyzing the regulated actors' regulatory compliance and compliance motivations, it is necessary to introduce the theoretical and methodological foundations prepared for the whole project. The first part of this chapter addresses the theoretical framework. The framework focuses on three core concepts: definition, causality and measurement of compliance. It mainly defines what are compliance and regulatory compliance, proposes potential compliance motivations, and explains how to measure compliance in the specific regulatory context. The second part of this chapter discusses the methodology used. This section mainly analyzes three aspects: case selection, case interview and data measurement, as well as the specific coding method. The case selection strategy, the specific case interview phases and interview questions, the detailed data measurement as well as the coding methods are introduced. Finally, the vegetable farmers' self-reported pesticide compliance behaviors are analyzed.

The present chapter concludes that first, regarding the theoretical framework, the definition of compliance varies in different disciplines and fields. In this study, it is regulatory compliance that is studied. This study mainly focuses on the regulated actor's conformance with regulatory laws and rules. Second, by means of examining and comparing the standard models of compliance motivations, this study follows a compatible and coherent compliance paradigm by integrating both deterrence and social norms models. Specifically, such an integrated paradigm comprises eight individual compliance variables: operational cost-benefit calculation, deterrence, descriptive social norms, morals, general duty to obey, procedural justice, ability to obey and legal knowledge. These variables are subdivided into three categories: amoral calculation, legitimacy and capacity. Third, in this study, compliance is measured in the sense of the specific pesticide regulatory context for vegetable farmers.

Regarding the methodology, broadly, this study takes an interdisciplinary approach, combining law, sociology, psychology and public administration scholarships. Specifically, a stratified sampling method is employed for selecting vegetable farmers. Altogether, 119 vegetable farmers in 10 villages in 3 counties of Hunan Province in China were selected. Another 31 informants or insiders were also interviewed to provide complementary materials during the case interview period. In addition, three specific case interview phases were introduced: pilot study phase, in-depth case interview phase, and material supplementary and data analysis phase. The three phases coherently connect with one another, with the preceding phase preparing for and supporting the following one. In the pilot study phase, some background information and a refined interview question outline is prepared; in the in-depth case interview phase, a specific dialogical strategy is employed for conducting in-depth interviews with respondents, which enables the interview to flow in a natural way and continue on fluently; some supplementary materials and

data are also collected after the whole interview period, and then together with other materials and information, they are analyzed both quantitatively and qualitatively by descriptive data analysis, texts and quotes, and crisp set Qualitative Comparative Analysis(csQCA) logic and tools. Next, the detailed data measurement and coding methods for variables examined in the research are described. Finally, based on the vegetable farmers' self-reported compliance and using the methods and strategies, it was found that the majority indicated compliance with rules on the use of types of pesticides, with the percentage much higher than with these on disposal and time interval.

The remaining parts of the chapter are arranged as follows. Compliance is operationalized into three aspects: definition, causality and measurement. This is succeeded by the specific methods of case selection, case interview and data measurement as well as coding. Finally, the vegetable farmers' self-reported pesticide compliance behaviors are analyzed.

## 2.2 Operationalization of Compliance

As Table 2.1 below shows, the explanation of compliance varies from context to context. For example, social psychologists view compliance as the effect of a social influence on reaching goals and attaining social or personal gains. As Aronson et al. (2012) explained, social psychologists treat people as a whole and focus on examining how thoughts, feelings and behaviors allow individuals to attain compliance or make them vulnerable to comply with others' demands. Nevertheless, a common linkage exists among these different definitions, that is, behavior obeying a particular request, which is important for understanding compliance in the regulatory context. The concept of compliance is crucial for understanding the link between rules and the regulated behavior.

**Table 2.1** Summary of compliance definitions in different fields

Fields	General definitions
Medical science	The extent to which a patient follows medical advice including using medical appliances, drug compliance, etc.
Social psychology	Generally refers to responses in reaction to social influences in our daily life
Science of organizational behavior	Mainly refers to corporate compliance with corporate management and requirements
Regulatory law	The extent to which the regulated actor is in compliance with regulated rules and regulations
International law	The extent to which member countries of the United Nations are in accordance with international rules and treaties
Physics	The inverse of stiffness or a stiffness-like characteristic
Psychiatry	The extent to which a patient carries out the prescribed treatment of the psychiatrist
Business administration	The extent to which a business' performance accords with the organization's plans and expectations

**Table 2.2** Explanations of compliance in some leading regulatory studies

Author(s)	Country	Specific regulatory context	Level	Approach	Specific definition
Hutter (1997)	UK	Environmental	General	Process	It is a process of negotiation and discretion, and differentiated in different situations
Cialdini and Trost (1998, 2004)	America	General	Individual	Situation	A particular kind of response to a particular kind of communication request, which even though explicit or implicit, is urging a response in a desired way
Braithwaite et al. (1994)	Australia	Australian nursing home	Individual	Process	The extent to which each home meets the regulatory standards
Parker and Nielsen (2009a)	Australia Denmark	Business	Organizational	Process	The result of a process of construction and negotiation between official regulator and regulatee
Parker and Nielsen (2009b)	Australia Denmark	Corporate	Organizational	Process	Law and government agencies regulate corporate compliance behavior by means of corporate compliance management system
Lange (1999)	UK	Environmental	Organizational	Process	A “link concept” which addresses the relationship between rules and social practices
May (2004)	America	Social and environmental	Individual	Situation	Regarding regulation as a social contract for which compliance is based on a shared commitment to carry out the provisions of the contract
Tyler (1990)	America	General	Individual	Situation	How citizens respond to the law
Biegelman (2008)	America	Corporate	Organizational	Situation	A state of being in accordance with established guidelines, specifications, or legislation
Van Rooij (2013)	–	General	General	Process	The causal interaction between input (legal norms) and output (the regulated behavior)

Throughout the existing literature on regulatory compliance, compliance has been discussed from various perspectives and has been studied through the use of differing contexts, levels and approaches (e.g., Kagan and Scholz 1984; Tyler 1990; Braithwaite et al. 1994; Hutter 1997; Lange 1999; Winter and May 2001; Gunningham et al. 2005; May 2005; Thomson et al. 2005; Parker and Nielsen 2009a). Yet there is still no uniform definition. An acknowledged definition does not exist (see below in Table 2.2 concerning different explanations of compliance defined by some regulatory scholars).

### ***2.2.1 Question One: What Are Compliance and Regulatory Compliance***

The term “compliance” is a core concept in this study. Understanding the concept of compliance is crucial for supporting debates on regulation and enforcement. The literal meaning of compliance generally refers either to a state of being in accordance with established rules, regulations or legislation or to the process of becoming compliant. Nevertheless, the meaning varies in different disciplines and fields, and accordingly how to analyze and compare compliance behavior vary with different methods of definition. Thus, how to understand and define compliance is essential in this regard. Table 2.2 summarizes some general understandings of compliance in different fields and disciplines.

As shown above, there is clearly no unified definition of compliance. Some scholars understand compliance as a process of how the regulated actors respond to regulations, while some literature defines compliance as a situation or desired state that the regulated actor should conform to the law, regulation, or demand. Yet common linkage exists among these varied definitions, that is, evaluating compliance requires understanding whether the regulated actor accords with the demands encoded in law. This study defines compliance as the situation of a regulated actor’s conformance with regulatory rules and laws. As applied to the specific context of pesticide regulation in rural China, this study studied the vegetable farmers’ compliance with pesticide regulatory rules and laws at the national and local levels.

### ***2.2.2 Question Two: Why Compliance***

#### ***2.2.2.1 Two Models***

It is in our everyday life that the state authority exercises power over people and commands them to comply with the law. For regulatory compliance, the ideal situation is that the regulator can make sure the regulated actors comply with the regulations, and the regulated actor can make never-ending efforts to meet

regulatory demands regardless of limitations in energy, time, and resources, while in practice this might be too idealistic. The fact is that the law is very often unclear and ambiguous. It cannot simply be applied to the “real world” by interpreting its meaning. Thus, a critical issue of regulatory compliance is why some people obey (or disobey) the law while others do not. Throughout the current compliance literature, many scholars have made efforts to approach this question. Some of them abstract and summarize different standard models of compliance motivations (see Table 2.3 below).

**Table 2.3** Standard models of “why obey the law”

	Standard models	Level	Assumptions	Specific arrangements
Tyler (1990)	Instrumental	Individualistic	Rationality	Maximization of self-interest
	Normative	Communal	Social or normative control	Motivated by normative or social influences
Lee (2008)	Deterrence theory	Individualistic	Rationality	Maximization of expected utility
	The theory of norms	Communal	Social norms	Behave according to social norms that prescribe which action is appropriate
Kirchler et al. (2008)	Power model	Individualistic	Rationality	Rational weighing of the costs and benefits of evading
	Trust model	Communal	Voluntary	Contribute to the share out of a sense of obligation
Van Rooij and Van Geelder (2012)	Legal model	Individualistic	Perceived calculation; procedural justice; general duty to obey	Maximization of expected utility of obeying or disobeying the law; procedural justice and general duty to obey which operate regardless of costs and benefits
	Social model	Communal or individualistic	Social norms; morals	Calculation of costs and benefits of violating social and moral norms or unconscious shaping of behavior (for descriptive social norms, injunctive social norms and morals); capacity to know and be able to comply with the law

As Table 2.3 shows, Tyler (1990) argued that the regulatory compliance literature comprises two basic perspectives of compliance motivation: instrumental and normative. The former refers to the regulated actors' pursuit of self-interest and making decisions by calculating the cost and benefit of compliance and violation. The latter usually assumes that actors' compliance is motivated by their internal morality, consideration of justice or fairness of the authority, or other social influences. Lee (2008) claimed that there are traditionally two ways of approaching the question of why some actors comply with regulations and others do not: deterrence theory and the theory of norms. According to his summary, deterrence theory is based on the rationality assumption which posits that the regulated actor makes choices in order to maximize their utility. In addition, he developed the term of the theory of norms, which refers to a group of counterarguments of the deterrence theory. He argued that the regulated entities behave according to social norms rather than individualistic rational calculation. Psychologist Kirchler (2008) proposed a framework for tax compliance in which both the power of the tax authorities and trust in the tax authorities constitute dimensions for understanding regulated actors' enforced and voluntary compliance. These dimensions also interact and jointly influence the level of tax compliance. Van Rooij and Van Geelder (2012) argued that there are two ideal-typical models of compliance motivation: the legal model and the social model. The legal model motivates the regulated entities through the perceived costs and benefits of obeying and disobeying the law as well as procedural justice and general duty to obey; the social model motivates compliance by means of social norms and morals. Moreover, the capacity of the regulated actors also matters, including the ability to obey as well as the ability to know the law. In general, these dichotomies often constitute the deterrence model and social norms model.

Traditionally, the legal and economic literature mainly focuses on the standard deterrent mechanism, which is based on the assumption of rational choice theory. That is, regulatory actors comply because of the threat of legal sanctions. It usually assumes that the greater the possibility of sanctions for violations, the greater the obedience of the law they know and are able to comply with (e.g., Bentham 1988; Becker 1968; Thornton et al. 2005; Scholz 1984). Becker (1968) primarily developed a formal theoretical framework explaining compliance behavior. He argued that criminals behave basically like other individuals in that they attempt to maximize utility subject to a budget constraint, while deterrence theory cannot fully explain compliance. First, the empirical evidence shows that sanction certainty is a more important driver for compliance than sanction magnitude, and this has not been fully explained by deterrence theorists (Vandenbergh 2003). More importantly, there are many cases where despite low deterrence, there is still compliance, even at a considerable cost to the regulated actor. The deterrence model cannot predict every aspect of observed compliance behavior. For example, in Casey and Scholz's (1991) study on tax compliance, they argued that the standard deterrence does not explain why an increase in compliance is not attributed solely to the severity of the sanction, it is also influenced by descriptive or procedural variables

(how the risks of noncompliance are described or how the decision-maker's preferences are expressed) which traditional expected utility models ignore.

In contrast, the social norm model generally argues that regulated actors obey the law backed by mild sanctions (or even without sanctions) because of social norm activation. Vandenberg (2003) conducted theoretical research on norms in the environmental regulatory context. He argued that we should also add norms to the standard deterrence, and summarized and refined a typology which consists of eight types of environmentally related social norms. In addition, Robinson and Darley (1997) claimed that the regulated compliance resulted from the normative social influence and internalized moral standards and rules more than from the threat of legal sanction. Another psychologist, Tyler (1990), argued that there are two perspectives on why people follow the law. One is the instrumental perspective which is known as deterrence; the other is the normative perspective which is concerned with the influence of what people regard as just and moral as opposed to what is in their self-interest. He suggested the necessity of exploring what citizens think, understanding their values, and examining the connection between the normative commitment to legal authorities and law-abiding behavior. Sutinen and Kuperan (1999) integrated deterrence theory with theories from psychology and sociology that account for both tangible and intangible motivations influencing individuals' compliance behavior. The model accounts for moral obligation and social influence in addition to the conventional costs and revenues associated with illegal behavior.

A structured comparison of the standard deterrence paradigm and the social norms paradigm is shown in Table 2.3 below, accompanied by a proposed and improved integrated model.

As shown above, a point of critique that can be raised against both paradigms is their narrow focus. The deterrence model is confined to the threat of sanctions, but it does little to explain which social variables may influence compliance behavior; while the social norms paradigm only takes social norms into account, without addressing questions as to how cost-benefit analyses influence the regulated actor's compliance. The challenge for the current regulatory compliance research has been providing an integrated theory that overcomes the conflict between the two traditional standard paradigms of compliance (see the integrated model in Table 2.4). A coherent framework is needed, in which different motivations for action are compatible. Recent years have seen some efforts made by a few academic scholars. Van Erp (2008) showed that there is an interaction between social norms and deterrence, with stronger deterrence effects if social norms support legal norms, and law enforcement activates social norms, for instance through shaming and reputational sanctions. Gunningtham et al. (2005) examined regulated firms' perceptions of how various instrumental, normative and social factors motivated corporate environmental actions. They argued that there are various, often interwoven strands that must be taken into account in understanding what motivates corporate environmental behavior. In addition, how they play out depends very much on the size and sophistication of the companies themselves and the characteristics of the industrial sectors in which they are located. In Nielsen and Parker's (2012a) exploration of business firms and their managers' compliance motives, they



**Table 2.4** Two ideal types of compliance paradigms (deterrence vs social norms)

Paradigm	Core assumptions	Performance	Limitations
Deterrence	Threat of sanctions	The greater the possibility of sanctions for violations, the greater the obedience of the law which they know and are able to comply with	Sanction certainty vs sanction severity; low or mild sanction but compliance; limited prediction of every aspect of observed compliance
Social norms	Activation of social norms	The more social norms are consistent with the law, the greater the compliance with the law which they know and are able to comply with	Limited understanding of the interaction of deterrence and social norms
Integrated model	Both deterrence and social norms are compatible	There is an interaction between the threat of sanctions and social norms	Unlike the singular deterrence or social norms paradigm, it is comparatively broader and more comprehensive

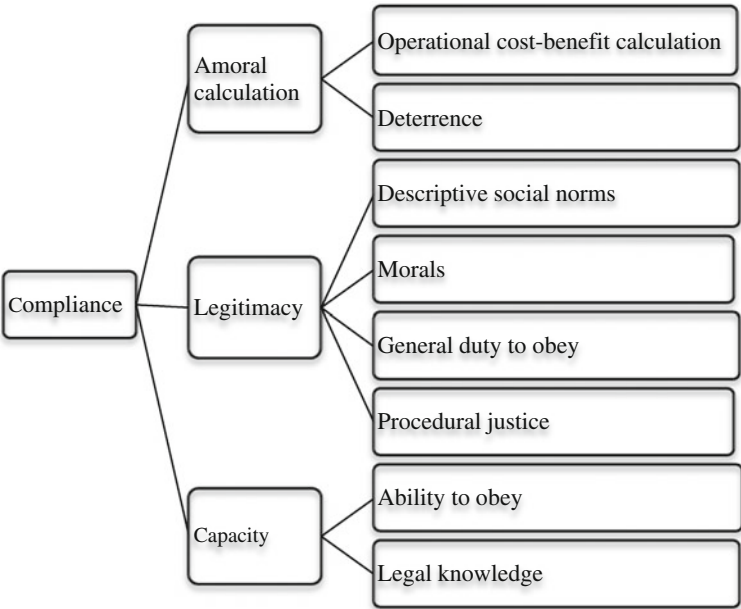
developed and distinguished three categories of motives: economic (maximizing economic or material utility), social (earning the approval and respect of others), and normative (normative understanding of “do the right thing”). The next section will continue to discuss relevant variables or categories that could be incorporated into the integrated compliance model.

**2.2.2.2 Eight Variables and Three Simplified Categories**

In order to incorporate both deterrence and social models, this study intends to systematically explore the mechanisms of action by which social norms accord with legal norms and actually influence compliance behavior. It draws on the existing regulatory literature to propose a conceptual framework that accounts for regulatory compliance behavior.<sup>1</sup> A review of the existing literature shows that there are at least eight variables accounting for compliance: operational cost-benefit calculation of compliance, deterrence, descriptive social norms, morals, general duty to obey, procedural justice, ability to obey and legal knowledge.<sup>2</sup> Each of the selective variables is either identified by or referred from the existing empirical studies.

<sup>1</sup>The approach taken in the study is inspired by Vandenbergh (2003), who proposed a conceptual framework consisting of a testable typology of social norms that influence corporate environmental compliance.

<sup>2</sup>This variables proposed mainly refer to Prof. Benjamin van Rooij’s ideas (2012). His work has already been published (for more details, please see Liu, Ben (Van Rooij, Benjamin). “Hegui: Cong falū he shehuixue jiaodu de jiedu (Compliance: An interpretation from the legal and social studies perspective).” In Hegui, Quanqiu Gongsi Fanzhan Xin Qushi (Compliance, The New Development Trend of Global Companies), edited by He Jiang and Zhile Wang, 90–101. Beijing: Zhongguo Jingji Chubanshe (China Economic Publishing House), 2012).



**Fig. 2.1** Components of structured conceptual framework

These variables reflect plausible alternative factors which might affect compliance. All eight variables constitute the proposed framework, with which their influences on compliance need to be verified. In particular, it is notable that there are many compliance motivations in reality, but the research has chosen to use and analyze the most important motives and their implications without attempting an exhaustive exploration. And the focus of this study is not an extended evaluation of any variable, but rather setting forth a testable conceptual framework of the most influential variables and examining how they may influence compliance behavior.

Specifically, based on Kagan and Scholz’s (1984) three images of the regulated actor, these eight variables are further simplified into three broad categories: (1) amoral calculation, which includes the operational cost-benefit calculation of compliance and deterrence; (2) legitimacy, which consists of descriptive social norms (social legitimacy), morals (moral legitimacy), general duty to obey (systematic legitimacy) and procedural justice (procedural legitimacy); (3) capacity, which comprises ability to obey and legal knowledge. The structured components of the proposed conceptual framework of motivations or determinants of compliance are illustrated in Fig. 2.1. A specific and typical research subject will be used to test the proposed framework: vegetable farmers’ pesticide regulatory compliance. Notice that the proposed framework serves not only as an instrument in this study, it also has implications for compliance research in other regulatory fields.

In light of the proposed conceptual framework, the next section will look at the three categories and eight compliance determinants in regulatory compliance studies which have investigated how the variables contribute to compliance behavior.

### **Amoral calculation**

Amoral calculation theory assumes that an individual behaves as a rational actor who takes actions along the lines of profit-seeking (Kagan and Scholz 1984). Amoral calculators pursue the maximization of benefits and the minimization of costs. In the regulatory compliance context, the regulated entity's calculation consists of perceived costs and benefits of obeying or disobeying the law. This study defines amoral calculation as comprising operational calculation of profits and loss and deterrent effects that deter people from violating the law.

#### *Operational cost-benefit calculation of compliance*

In general, an operational cost of compliance refers to expenditures for capital and administration as well as reductions or delays in production to comply with government requirements such as legislation or regulation; an operational benefit of compliance refers to some indirect and particular institutional benefits from the current system. Notice that here the costs and benefits related to detection and sanction are excluded, but will be discussed independently when analyzing deterrence. The operational calculation of profit and loss of compliance will be measured by adapting questions from the existing literature to the Chinese pesticide regulatory context, which was operationalized into perceived yield loss, price increase, income increase, or cost increase.

#### *Deterrence*

Amoral calculation is not just about the calculation of the operational costs and benefits, it also contains the threat of deterrence imposed by the enforcement authority for evading the law. Along with the operational cost-benefit calculation of compliance, deterrence is also an important aspect that should be taken into account.

Deterrence theory posits that the regulated entities comply because of the threats and sanctions imposed by the enforcement agency. The most striking findings with respect to deterrence theory are the detection probability and the effect of violation sanction. In Thornton et al.'s (2005) study on how the threat of legal sanctions motivates regulated business firms to comply with the law, the perceived possibility of detection and sanction severity were analyzed. Three related aspects of the role of deterrence are considered here: the perceived probability of violation detection, detection source, and the impact that the sanction would have on the regulated actors.

### **Legitimacy**

The regulated entities act in a larger normative and social milieu. Another important explanatory and predictive device that has been suggested to be influential in shaping compliance is the regulated actor's legitimate evaluation.

Much of the existing literature frames and examines legitimacy variables that function as social and normative control in addition to the deterrence model. For example, Tyler (1990) focused on the influence of morality, justice and obligation as opposed to self-interest. Sutinen and Kuperan (1999) integrated moral obligation and social influence with deterrence theory. Grasmick and Bursik (1990) proposed that significant others and conscience function as agents of social control in a manner similar to the State.

In this study, the regulated actor's legitimacy evaluation consists of four elements: descriptive social norms (social legitimacy), morals (moral legitimacy), general duty to obey (systematic legitimacy) and procedural justice (procedural legitimacy). Social legitimacy derives from the force of social groups; moral legitimacy derives from a person's desire to behave in a way that accords with his or her own sense of personal morality. Such a personal norm is an internalized sense of obligation characterized by voluntary compliance. Systematic legitimacy exists when a person views the legal system of the state as legitimate; procedural legitimacy exists when a person views the legal authority he or she is dealing with as having a legitimate right to dictate his or her behavior.

#### *Descriptive social norms<sup>3</sup> (social legitimacy)*

Human behavior is shaped and influenced by regulated actors' social legitimacy evaluation. Such an evaluation has been conceptualized in a variety of ways. In Cialdini and Trost's (1998) study of social norms, they were defined as rules and standards that are understood by group members and guide and/or constrain social behavior without the force of laws. Descriptive social norms generally refer to what most people do (Cialdini et al. 1991). How descriptive norms affect compliance involves the extent to which others are perceived as doing their part. In Tyran's (2002) study of the effects of mild and severe legal sanctions on the provision of public goods, people tend to obey the law if they expect many others to do so even though they are backed by mild sanctions. Scholz and Mark (1998) argued that taxpayers' compliance is greater when larger percentages of other taxpayers are believed to pay what they owe. Consistent with this is a presumption that one would be more likely to feel a duty to comply if others are perceived as doing their part. In addition, the desire of regulated entities to earn the approval and respect of others is also an important consideration (May 2005), even when the imagined others are not their friends and family but are generalized society members. In this study, the influence exerted when the peer groups are perceived as doing the regulated actor's part will be examined.

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<sup>3</sup>In contrast to descriptive norms that specify what is done, they also discussed the "injunctive social norms" that refer to what ought to be done. These constitute the moral rules of the group or the society (see Cialdini et al. 1991). Here the influence of injunctive social norms on compliance is not discussed as normally personal morals are influenced by and are consistent with injunctive social morals.

*Morals (moral legitimacy)*

Moral legitimacy refers to an individual's judgement about the right and wrong of compliance demands. If the law is regarded as a legitimate source of rules, that is, if it has "moral credibility", a person should be more likely to regard the law as an appropriate input. The influence of moral assessment on compliance behavior is examined in the extensive literature on moral judgment. Sutinen and Kuperan (1999) argued that morality and moral norms are very common throughout society and may be a significant motivation explaining much of the evidence on compliance behavior. There is evidence, largely collected by Tyler (1990), that people are inclined to accept the law as a source of moral authority that they themselves take seriously. He reviewed the literature that relates a person's belief that a law reflects a valid moral rule to obey that law, and argued that it is an internalized obligation to follow one's personal sense of what is morally right or wrong.

This study proposes to understand regulated actors' moral legitimacy by measuring their perceptions of internalised sanctions that enforce norms, which could include conscience, shame and guilt in response to violation behaviors.

*General duty to obey (systematic legitimacy)*

General duty to obey is a normative orientation that is shaped by people's belief in the legitimacy of the state to impose regulations. It assumes that the vast majority obeying the law attribute their actions to their sense of obligation to adhere to the rules, even without a strong enforcement and specific enforcement actions. Considerable research indicates that such systematic evaluation strongly influences compliance decisions (Vandenbergh 2003). Tyler (1990) examined the obligation to obey the law by asking to what degree they felt they should comply with directives from police officers or judges, irrespective of their personal feelings. This study seeks to examine the regulated actor's general perception of the law regardless of the content of the rules and the enforcement environment.

*Procedural justice (procedural legitimacy)*

According to Tyler (1990), procedural justice can be distinguished by contrasting normative and instrumental approaches. The instrumental perspective suggests that assessments of procedural fairness are based on the favourability of the outcomes received: where people feel that they have control over decisions, they believe that the procedure is fair; where they feel they lack control, they believe it is unfair. The normative perspective on procedural justice views people as being concerned with aspects of experience which include neutrality, lack of bias, honesty, efforts to be fair, politeness, and respect of citizen's rights. In Tyler's Chicago survey, procedural justice was examined as support for the legal authorities, including the police and the courts. In addition, the respondents' evaluation of the quality of service from the authorities was also measured. The study will adapt Tyler's questions on the perceived fairness of relevant legal institutions to measure regulated actors' views on procedural legitimacy, which comprises their support of the local regulatory bureau as well as their evaluation of the quality of service from the authorities.

## Capacity

Although legal sanctions or economic constraints or social control or internal norms often predict the formation of an intention to comply, capacity constraints could affect whether the intention is translated into action. According to Vandenberg (2003: p77), “lack of financial or technological resources as well as the complexity of legal requirements constitute a barrier to compliance, even though there is an intention to do so”. The regulated entities may want to comply with the law (morals) or may feel pressure to comply with the law (social legitimacy), but since they have a lack of capacity to comply, it will not happen (Winter and May 2001). The legal and economic literature takes the rational actor as its central paradigm, and typically analyzes legal problems based on the implicit assumption that individuals know the law and adjust their behavior accordingly. Little attention has been paid to the development of the influences on lay beliefs about the law (Kim 1999). If regulated entities lack the capacity to comply with the law, it will be insufficient to achieve full regulatory compliance, even though they may still comply because of social norms. This study defines compliance capacity as consisting of two elements. One is the ability to obey the law; the other is knowledge of the law.

### *Ability to obey*

Generally speaking, ability to obey consists of the regulated actor’s ability to obtain financial, technical or information resources to carry out the requisite action to comply with the law. Some scholars have conducted empirical studies examining the regulated actors’ compliance performance (Winter and May 2001; Dasgupta et al. 2000; Chan et al. 2000). This study aims to gauge both the technical abilities and financial resources of the regulated actors.

### *Legal knowledge*

The second component of capacity relates to the regulated entities’ legal knowledge. Some scholars examined the regulated entities’ knowledge and perception of the law as well as their influence on compliance (Winter and May 2001; Winter and May 2002; Spence 2001). This study seeks to examine the regulated actor’s knowledge of relevant laws and rules in the Chinese pesticide regulatory context.

These are brief introductions to the individual compliance variables. More explicit theoretical explanations as well as the specific measurements will be given in the next three chapters (for more details, please see Chaps. 3, 4 and 5). How these variables interact and relate to each another will be revealed and discussed subsequently.

## 2.2.3 *Question Three: How to Measure Compliance*

This section focuses on the “how” question, that is, figuring out how to measure compliance. It is necessary to start by setting the scene for such a discussion. Two essential aspects should be taken into account. First, the specific regulatory setting

in the study must be elaborated. In addition, exploring the regulated actors' compliance motivation requires a sound understanding of their compliance behavior within a given regulatory context. Accordingly, this section is divided into two parts: one defines what pesticides are; the other explicitly analyzes the specific measurement of pesticide compliance behavior. In this study, the vegetable farmers' pesticide compliance is examined.

### 2.2.3.1 Definition of Pesticide

The literature on pesticides has a range of definitions. Beaumont (1993) defined pesticides as chemical substances used to kill or control pests. According to the Joint FAO/WHO Food Standards Programme, a pesticide was defined as “*any substance intended for preventing, destroying, attracting, repelling, or controlling any pest including unwanted species of plants or animals during the protection, storage, transport, distribution and processing of food, agricultural commodities, or animal feeds or which may be administered to animals for the control of ectoparasites*” (FAO/WHO 2011: p23). Hough (1998) defined pesticides as any substance used in the control of pests, including defoliant, plant growth regulators, and various substances which deter insects from certain locations or attract them away from crops. He created four categories according to their chemical composition: natural, biological, inorganic and synthetic (organic) pesticides, with synthetic pesticides playing the dominant role and comprising chemical substances manufactured from combinations of carbon, hydrogen and oxygen with other elements. In this study, pesticide mainly refers to these synthetic pesticides which form the majority, as only some of the synthetic pesticides are highly toxic and banned from being sprayed on vegetables.

### 2.2.3.2 The Measurement of Pesticide Compliance Behavior

Generally speaking, a regulated actor's regulatory-related behavior can be understood in two ways: one is regulatory performance, the other is regulatory compliance. The former refers to the actual levels of regulatory behavior, regardless of whether the behavior is in accordance with the regulatory laws and rules or not. And the latter refers to the behavior of compliance with regulatory laws and rules.

In the existing literature examining pesticide usage, pesticide performance has been studied most frequently. One of the earliest studies exploring the relationship between variables and pesticide usage is from Tait (1978). He measured pesticide usage as the average use of standardised insecticide and/or fungicide. Burrows (1983) argued that sales data, including average pesticide price per pound, the consultant fee per acre and the expected yield in pounds per acre, are the most appropriate way of measuring pesticide usage. In a study on the use and fate of pesticides in vegetable-based agro-ecosystems in Ghana, Ntow et al. (2006) examined the extent of use of pesticides and their pesticide management practices,

for example, the types of chemicals that farmers use, pesticide use practices, to what extent farmers rely on the chemicals, and the timing of pesticide spraying. Erbaugh and Donnermeyer (2002) measured pesticide usage by asking farmers to name crops they had sprayed and the different pesticides they used on each crop. In a Chinese study on the safety of vegetables and the use of pesticides by farmers in China, usage was simply divided into two categories: non-highly toxic pesticide user and highly toxic pesticide user (Zhou and Jin 2009). In another empirical study on the extent to which GE (genetically engineered) crops in China can lead to a reduction in pesticide use, the pesticide use was measured in three ways: frequency of spraying (times), quantity and cost of pesticide application for cotton (Huang et al. 2003).

In this study, regulated entities' pesticide compliance behavior is examined with respect to pesticide rules and laws in China.<sup>4</sup> It is difficult to achieve an ideal and complete definition and list all relevant aspects concerning pesticide regulations and rules. Thus, this study focuses on three key aspects of the respondents' pesticide compliance: use of types of pesticides, disposal of pesticide containers and time interval. Meanwhile, with respect to the diversity of vegetables and corresponding pesticide regulations for different vegetables, it is hard to examine the specific use of pesticides for any one vegetable. Thus, for these farmers who plant a range of vegetables, their general use of pesticides was examined.

### Short Summary

This section set the theoretical framework for the whole research project and mainly operationalized compliance into three aspects: definitions of compliance and regulatory compliance; motivations of compliance; measurement of compliance. Following this strategy, this section applied them to the specific pesticide regulatory context in China and mainly focused on vegetable farmers' pesticide compliance.

## 2.3 Methodology

In the recent empirical literature concerning regulatory compliance, most studies conduct research in a quantitative way with a large number of respondents, while some use a qualitative method with one or several cases chosen for in-depth study. They are characterized by either external validity (representativeness of the broader terrain) or in-depth exploration and more nuanced understanding. In order to gain the advantages of broader representativeness, better validity of answers, and understanding the subjective perspective of regulated entities, this study takes an intermediate qualitative and quantitative approach. The sample size must be big enough to guarantee representativeness, but small enough that researchers are able to conduct lengthy interviews in person. Ultimately, in-depth interviews with a

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<sup>4</sup>For more details about pesticide laws and rules, please see Chap. 1 on the legal framework of pesticide and vegetable safety regulation in China.



moderately large number of cases were conducted. This allowed us to obtain very rich materials, produce a balance between the breadth and depth trade-off, and explore the main variables. We also paid attention to the case-control design. As Benson et al. (2009: p188) argued, three criteria must be met for the case-control design: there must be a hypothesis that predicts a particular cross-sectional distribution; the distribution must be distinguishable from other distributions that would falsify the hypothesis; the data set must be able to show this distribution, if the hypothesis is true. The case-control design of the study will be presented next.

### 2.3.1 Case Selection

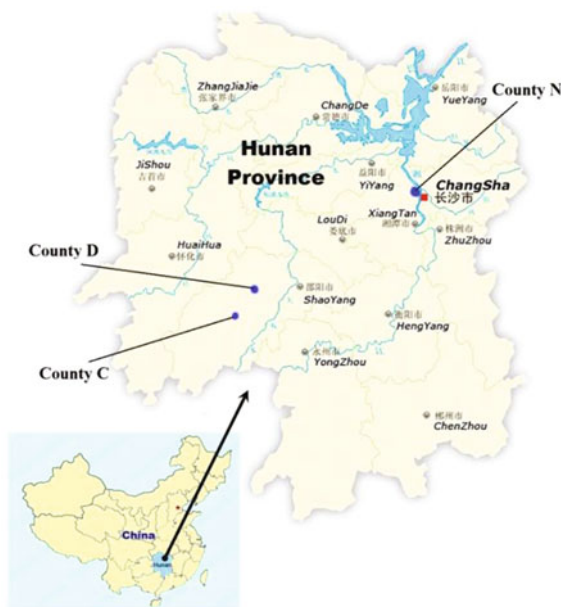
As stated, the study seeks to explore how the variables flagged in Fig. 2.1 contribute to the vegetable farmers' pesticide compliance. The data for this study were taken from in-depth interviews conducted with selected cases in Hunan Province from December 2011 to November 2012. Hunan Province is a traditional agricultural province blessed with a pleasant climate, geographic advantage and convenient transportation favorable for vegetable cultivation. The average annual growth of vegetable acreage and vegetable yield was 3% and 5.7%, respectively, between 2005 and 2011. Vegetable acreage amounted to 17,907,000 Mu<sup>5</sup> and the total yield reached 33,374,000 tons in 2011, changing their national yield rankings from 8th to 7th. The vegetable industry in Hunan province has become the second largest industry of agriculture, forestry, animal husbandry and fisheries (Agricultural Economic Team of the Statistical Bureau of Hunan Province 2012). To capture the variation within the sample of Hunan vegetable farmers, a particular strategy was developed. First, the study focused on vegetables farmed in villages by individual or cooperative or association villagers, as well as vegetables farmed in agricultural cooperatives. Three types of vegetable farmers were interviewed: (1) individual vegetable farmers who usually plant small-scale vegetable fields in the family unit and transport and sell the vegetables themselves; (2) vegetable farmers who are organized and associated in agricultural cooperatives or associations. They also often plant small-scale vegetable fields in villages. These cooperatives or associations provide means for agricultural production like seedlings, pesticides or fertilizers, as well as transport and sell vegetables for them; (3) one or several farmers who established agricultural cooperatives and rented medium-scale or large-scale fields in the villages as well as hired several local farmers for vegetable planting. They are often rural people and are encouraged or even financially supported by the local government. Three counties (N, C and D)<sup>6</sup> in Hunan province were selected on the

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<sup>5</sup>Mu (亩) is a Chinese unit of area measurement. 1 Chinese Mu is approximately 0.16 acres. Thus, 17,907,000 Mu is approximately 2,865,120 acres.

<sup>6</sup>Names of counties, villages, and individuals described in this study have been coded as letters or combinations of uppercase letters and numbers to respect the confidentiality of the data collection process.

**Fig. 2.2** Map of distributions of respondents (N, C and D counties in hunan province, China)



basis of vegetable yield and levels of economic development to overcome the environmental challenges (see Fig. 2.2 below).

As illustrated above, N County is one of the top 100 counties nationwide and the third most developed county in Hunan province. It provides vegetables not only for the local residents but also to meet the demands of other cities and areas in Hunan Province. C County is an ethnic minority autonomous county and has been one of the poorest counties nationwide for years.<sup>7</sup> It mainly produces tomato, eggplants and white radish which are marketed wholesale and transferred to neighboring areas like Guangxi Province, coastal areas like Guangdong Province or even exported to Hong Kong. D County is a moderately developed one with vegetable farmers mainly producing and selling vegetables on the local agricultural market. Altogether 119 vegetable farmers in the three counties were selected on the basis of the three types of farmers. A stratified sampling strategy was employed (see Table 2.4).

In terms of village selection, two relevant variables were used: production yield and per-capita GDP. Seven villages (three villages (N.D, N.L, N.X) in N County, three (D.S, D.T, D.L) in D County and one (C.D) in C County) were selected for the interviews of individual vegetable farmers, while one village (village N.R) in N County and two (villages C.X, C.M) in C County were selected for cooperative or

<sup>7</sup>In order to use poverty relief funds in a unified way and effectively aid the poor and needy, the Chinese government formulated the standard of the key poverty-stricken counties to be aided by the state, and identified a number of such counties. The standard was defined based on the per-capital annual net income at the county level.

**Table 2.5** Sampling method of vegetable farmers

Sampling object	Way of sampling
Sampling of villages	Vegetable production yield; per-capita GDP; accessibility
Sample size of each selected village	The population of vegetable farmers in each village
Sampling of vegetable farmers in each selected village	Designated sample size; age; distribution of vegetable farmers in each village

association vegetable farmers. Accessibility was also an important factor that was taken into account. These villages are situated in the interviewers’ hometown or nearby where the interviewer can easily overcome the dialect and cultural obstacles and be quickly accepted by the local people. Second, the sample size of each village was decided by its population of vegetable farmers. Once the sample size was set, individual vegetable farmers in each village were finally selected by taking account of their age distribution. It is notable that for the villages with cooperatives or associations, all cooperative or association vegetable farmers were selected and interviewed. Moreover, 7 vegetable farmers in three counties who established cooperatives and planted vegetables on 20 acres or more were selected and interviewed according to accessibility.

In addition, this study also collected data or materials from the pesticide regulators who inspect and impose sanctions on these who evade the rules, and other informants or insiders who know much about regulatees and their compliance behaviors. In this study, 31 informants or insiders were selected by their availability or accessibility to take part in the research (a convenient sampling) and then interviewed. They included local agricultural bureau officers, village committee members, pesticide store owners, or other relevant insiders or informants. An overview of these sampling cases is introduced in Table 2.5.

Notice that almost all the vegetable farmers interviewed are male as in rural China, male laborers are traditionally responsible for spraying pesticides in the fields. 31 interviews with insiders or informants were conducted for collecting complementary materials (see Table 2.6). They are familiar with vegetable planting skills and pesticide application technology and frequently communicate with vegetable farmers. They are also the ones who trust the interviewer and are willing to provide truthful and inside information explaining the vegetable farmers’ compliance behaviors.

**2.3.2 Case Interview**

Some of the interviews were conducted with the respondent in his or her place of work like vegetable fields, village committee offices or local agricultural bureau offices, while others were conducted at home, where the interviewees felt most comfortable. During the period that the case interviews were held, in-depth

**Table 2.6** Overview of sampling cases

Vegetable farmers							
Types of farmers	No. (%)	Age	No. (%)	Education level	No. (%)	Acres of fields	No. (%)
Individual farmers	70 (58.8)	≤40	19 (16.0)	Primary school or less	51 (42.9)	≤10	108 (90.8)
Small cooperative/association (SCA) farmers	42 (35.3)	40–60	75 (63.0)	Middle school	49 (41.2)	10–20	4 (3.4)
Medium or large cooperative (MLC) farmers	7 (5.9)	≥60	25 (21.0)	High school or more	19 (16.0)	≥20	7 (5.9)
Relevant insiders/informants							
Types	Agricultural bureau officers	Village committee members	Pesticide store owners	Cooperative/association insiders/informants	Pesticide distribution company officers	Others	
No. (%)	15 (48.4)	10 (32.3)	2 (6.5)	2 (6.5)	1 (3.2)	1 (3.2)	

*Notes* Percentages do not always add up to 100 because of rounding. Total number of vegetable farmers = 119. Total number of relevant insiders/informants = 31

interviews were also conducted with relevant insiders or informants. They often provided abundant information. When compared to the data set collected by interviewing vegetable farmers, no conflicts were found, and generally they reinforced each other. Even though efforts had been made to make sure the sample covered the broadest range of types of vegetable farmers in Hunan Province and to represent the pesticide compliance better, it is important to be aware that the data were collected from a stratified sample of respondents, and any conclusions mostly represent these selected areas and vegetable farmers rather than other areas in Hunan Province or even in China.

In order to develop and refine the fieldwork, this study collected data in three phases, with each building on the preceding phase. Note that these phases are not as strictly defined as they may seem below. They actually interacted with one another, which inevitably resulted in overlaps.

### **2.3.2.1 Phase One: The Pilot Study Phase**

In the first phase, a pilot study was conducted to understand and elaborate relevant factors concerning the economic, legal and social milieu of pesticide regulation and the vegetable farmers' pesticide compliance behavior.

The literature was reviewed to learn about current compliance research and the advantages and disadvantages of this research field. Next, professors and scholars who specialized in food safety, regulation or rural development in China were consulted. After finishing the drafting of the interview questions and selecting the locations for the case interviews, the interview questions were evaluated, which was quite an essential step. A small sample of vegetable farmers (15 from the selected areas) was used to pre-test the interview questions. Pre-testing is an important step before conducting the investigation, and it should always be conducted if the available resources allow. Finally, intensive individual interviews with local governmental officers, pesticide sellers, and vegetable cooperatives or associations were conducted to collect first-hand materials and information.

This phase has three purposes: the first one is to understand the local economic, historical and social background, the second one is to gain knowledge of pesticide laws and rules, and the third one is to figure out the domain of pesticide enforcement and collect information about the structure of the local pesticide enforcement agencies.

### **2.3.2.2 Phase Two: The in-Depth Case Interview Phase**

Based on the background understanding and preliminary pilot study during the first phase, the interviewer reviewed and refined the questions for the in-depth interviews. Subsequently, in-depth interviews with vegetable farmers and other relevant parties were conducted.

The main techniques employed in this phase included participant observation during farming activities and in-depth interviews in the form of conversations and dialogues. In particular, a special dialogical scheme was used for the in-depth interview. Unlike surveys with the choice of answers to most of the questions being fixed (close-ended) in advance, in this study vegetable farmers were interviewed by asking open-ended questions in a dialogue format. These questions were always kept the same to enable comparison later (*please see Part D Flowcharts on Specific Interviewing Questions for Vegetable Farmers in the Appendix*). The dialogue should always start with some initial questions, and then be allowed to flow in a certain order so the informants can continue the dialogue on their own. During this process, the interviewer pays attention to the conversation continuity and gives some timely appropriate guidance when the interviewee digresses from the subject. A well drafted semi-structured interview outline had been pre-examined in the pilot study before the administration of the case interview. Over the whole year of fieldwork, a good response was obtained owing to the trust built on the long-term interaction between the interviewer and interviewee as well as the use of anonymous interview questions designed to avoid offending respondents. All of the interviews were recorded and transcribed for later data analysis. The total of 119 interviews provided not only full answers to the set questions, they also revealed some additional qualitative information that proved helpful for interpreting the findings. Complementary interviews with the local governmental pesticide regulatory officers, related insiders in vegetable associations or cooperatives, and pesticide sellers were also conducted (*please see Part G Additional Interviews in the Appendix*).

In addition, similar to some empirical studies that examined the regulated actor's demographic, social or economic background variables (Erbaugh et al. 2002; Zhou and Jin 2009; Wei and Lu 2004), this study took into account the vegetable farmers' age, degree of education, family financial status, acres of vegetable fields, types of vegetable planted, years of experience, places for purchasing pesticides, etc.

The interview questions were designed in English and then translated into Mandarin Chinese, the national language which is understood by the majority of rural farmers. The vegetable farmers interviewed are the heads of the household and/or the ones most responsible for vegetable farming. The interviews followed a similar format based on the interview outline, but also drew attention to some new topics and findings encountered during the interview process, and probed for more in-depth responses to understand the vegetable farmers' pesticide compliance. Some useful information which was generated during the interview process but excluded from the interview outline was noted down by the interviewer for future analysis.

### 2.3.2.3 Phase Three: The Complementary Material Collection and Data Analysis Phase

The complementary material collection phase together with the previous two phases constituted the whole data collection period. In this phase, the interviewer returned to the case study location and collected some complementary materials for these essential but missing points and new topics that appeared after the interviews.

Data analysis requires sorting out and analyzing on-the-spot materials and information collected during the investigation, so the overarching questions can be explained and answered by combining the relevant literature and theories. Specifically, three data analysis methods were used in this study:

- *Descriptive data analysis (frequency analysis): it was used to analyze the vegetable farmers' demographic information (age, degree of education, acres of vegetable fields), relevant compliance variables designed in the compliance model, pesticide compliance behavior and the associations between the two.*
- *Text analysis or quote: it was used to provide some detailed and sufficient materials for analyzing the vegetable farmers' compliance motivations, pesticide compliance behavior and their associations.*
- *The specific QCA method: it was used to analyze and explain to what extent the compliance motivations interacted and combined to shape the vegetable farmers' pesticide compliance.*

### 2.3.3 Data Measurement as Well as Coding Method

As already mentioned, the study aims to use the collected empirical data to connect theories about what the compliance variables are and how they interact to affect compliance behavior. First, in accordance with current pesticide regulatory laws and rules in China, three pesticide behaviors were chosen as proxies for pesticide compliant behavior: use of types of pesticides,<sup>8</sup> disposal of pesticide containers<sup>9</sup>

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<sup>8</sup>For the prohibited pesticides, according to No. 199 of *Zhonghua renmin Gongheguo Nongye bu Gonggao* (Announcement of Ministry of Agriculture of the People's Republic of China), 23 types of pesticides are prohibited by the state; according to No. 194, No. 199, No. 274, No. 322 and No. 632 of *Zhonghua renmin Gongheguo Nongye bu Gonggao* (Announcement of Ministry of Agriculture of the People's Republic of China), 14 types of pesticides are prohibited for application on vegetables, fruit trees, teas and traditional Chinese herbal medicines.

<sup>9</sup>For the relevant legal rules, see Article 7, Chap. 4 of *Nongyao Anquan Shiyong Guiding* (Provisions for Safe Use of Pesticides) in 1982; Article 26, Chap. 5 of *Nongyao Guanli Tiaoli* (Regulations on Pesticide Administration) in 1997; Article 18, Chap. 3 of *Zhonghua Renmin Gongheguo Nongchanpin Zhiliang Anquanfa* (Law of the People's Republic of China on Quality and Safety of Agricultural Products) in 2006.

and time interval between pesticide spraying and vegetable picking.<sup>10</sup> Second, eight independent variables were selected as plausible motivations that might affect the vegetable farmers' pesticide compliance. Sometimes fictitious case scenarios were used to avoid asking about the respondent's own deviant behavior and overcoming the problem of socially desirable answers. The specific measurement of compliance behavior as well as the eight compliance variables and the specific coding method are attached as an appendix (see Parts B, C and D, Appendix). It is noteworthy that deterrence and operational cost-benefit calculation are premised on the notion that the regulated actors are amoral calculators; descriptive social norms, morals, general duty to obey and procedural justice are built on the idea that the regulated actor is a political citizen who makes a legitimacy judgment; ability to obey and legal knowledge indicate the regulated actors' capacity (Kagan and Scholz 1984).

## 2.4 Vegetable Farmers' Pesticide Compliance Behavior

This research conducts a compliance-exogenous method, as termed by Parker and Nielsen (2009a). In other words, compliance is not understood as a dynamic and changeable concept but rather as a predefined variable and then used as either a dependent or independent variable in discovering causal relations between it and other variables.

As has been frequently adopted in many empirical studies of regulatory compliance (e.g., Kuperan and Stinen, 1998; Murphy 2005, Winter and May 2001, 2002; Nielsen and Parker 2008; Parker and Nielsen 2009a, etc.), a self-reported compliance measurement was employed in this study.<sup>11</sup> Any type of social science research faces challenges, and a fundamental criticism usually accompanying self-reported compliance is that biased data sources like socially desirable answers and shaky information like memory lapses might happen (Parker and Nielsen 2009a). As normally it is difficult to obtain a reliable and practical measure of compliance behavior when the objective official data are inaccessible or incredible, this suggests that the self-reported compliance could be a reasonable proxy for actual compliance.

In the study, regulatory violations were studied rather than criminal violations. Three pesticide behaviors were chosen as proxies for pesticide compliance behaviors: the use of types of pesticides, disposal of pesticide containers, and the time interval between pesticide spraying and vegetable picking. Self-reporting was collected by open-ended interviews. These three norms are not the most sensitive ones in farming practices, and thus farmers talked quite openly about them.

<sup>10</sup>For the relevant legal rules, see Article 27, Chap. 5 of *Nongyao Guanli Tiaoli* (Regulations on Pesticide Administration) in 1997; Article 25, Chap. 4 of *Zhonghua Renmin Gongheguo Nongchanpin Zhiliang Anquanfa* (Law of the People's Republic of China on Quality and Safety of Agricultural Products) in 2006.

<sup>11</sup>For more details about measurement, please see Sect. 2.3.3.



**Table 2.7** Vegetable farmers' compliance with pesticide regulations

Pesticide behaviors	Compliance performance	No. of cases (%)
Use of types of pesticides	Non-complaint	16 (13.4)
	Compliant	103 (86.6)
Disposal of pesticide containers	Non-compliant	68 (57.1)
	Compliant	51 (42.9)
Time interval	Non-compliant	70 (58.8)
	Compliant	49 (41.2)

*Notes* Percentages do not always add up to 100 because of rounding. Total number of respondents = 119

Moreover, the advantage of the factual-reporting approach is that the chosen compliance proxies do not directly question whether the respondents comply with the regulations or not. The questions asked can be measured in binary code, which avoids referring to the norms and thus a normative or moral point of view about what is right and wrong.

As suggested by Parker and Nielsen (2009a), the best solution to solve the bias and shaky information problem is to try to find information about compliance from different sources and stakeholders with differing viewpoints. In the study, a general validity check was done by interviewing a range of stakeholders including enforcement officials or other relevant insiders or informants, and the consistency of the findings helped alleviate some problems with the self-reported measurements, e.g., the high compliance found for the MLC vegetable farmers was also indicated by some regulators. Also, self-reported data have the advantage that the respondents themselves generally know the most about their own compliance performance. And the fact that many farmers openly talked about noncompliance showed a willingness to at least discuss this. Nevertheless, we should keep in mind that this research relies on self-reported measures which may reflect answers based on the respondents' own knowledge about the questions.

Before analyzing the influence of different compliance variables on pesticide compliance, it is necessary to elaborate the vegetable farmers' pesticide compliance. This is summarized in (Tables 2.6 and 2.7).

As shown, the majority did not indicate compliance with the relevant regulations in terms of both disposal of pesticide containers and time interval (57.1% and 58.8%, respectively, total  $n = 119$ ). On the other hand, the vast majority of vegetable farmers (86.6%) indicated compliance with the regulations on the use of types of pesticides. Compliance levels are higher for this regulation than for the others because the state has issued strict regulations on this, and pesticide manufacturers are forbidden to sell extremely toxic as well as five highly toxic pesticides.<sup>12</sup> Generally, the state has removed the sources of these pesticides, and thus

<sup>12</sup>In 2002, according to Announcement No. 194 and No. 199 of the Ministry of Agriculture (MOA) of the People's Republic of China, 37 types of extremely toxic and highly toxic pesticides were prohibited for use on vegetables, including 18 extremely toxic ones that are completely

vegetable farmers can hardly get access to them on the market except for these pesticides that are prohibited for application on vegetables but allowed on some other plants.

Specifically, the vast majority of vegetable farmers who indicated noncompliance (15 of 16) are these who apply the highly toxic pesticide carbofuran. Only one farmer indicated the use of parathion methyl that was prohibited by the Ministry of Agriculture in 2002 and has been prohibited from being sold nationwide since 2007. The majority of 68 vegetable farmers who indicated noncompliance with the disposal of pesticide containers usually indicated throwing pesticide containers away wherever they spray. Compliance with the time interval was defined as a compromise because currently in China it is difficult to achieve an ideal safety interval<sup>13</sup> The compliant farmers indicated trying to harvest vegetables one week after spraying pesticides and also spraying pesticides only after harvesting the ripe vegetables. The majority of 70 vegetable farmers who indicated noncompliance usually harvest vegetables within two or three days after pesticide spraying.

### Short Summary

This section analyzed the methodology employed in the research. Case selection, case interview and the specific data measurement as well as the coding methods were described. Then based on the specific methods and tools defined and employed, the vegetable farmers' self-reported pesticide compliance behavior was analyzed, which provided a preliminary understanding of their pesticide compliance performance.

## 2.5 Chapter Conclusion

The aim of this chapter is to develop the framework of the theories used for explaining compliance and to elaborate the methods employed for data collection and analysis. There are limitations to the chosen theoretical and methodological design. First, an integrated compliance paradigm in which eight independent variables are incorporated is proposed, but this limits the theoretical exploration. Other possible compliance variables like injunctive social norms are excluded and ignored. Second, the empirical research is a multiple case study and features both quantitative and qualitative advantages. To overcome the representative

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(Footnote 12 continued)

banned by the state, while the other 19 highly toxic ones were prohibited for application on vegetables, fruit trees, teas and traditional Chinese herbal medicines. In 2003, based on Announcements No. 274, No. 322 and No. 632 of the Ministry of Agriculture (MOA) of the People's Republic of China, 5 of the 19 highly toxic organophosphorus pesticides, methamidophos (甲胺磷), parathion-methyl (甲基对硫磷), parathion (对硫磷), monocrotophos (久效磷) and phosphamidon (磷胺) were completely prohibited for use in agriculture.

<sup>13</sup>For more details concerning the measurement of time interval, please see Part C The Specific Coding Method for Independent and Dependent Variables in the Appendix.

disadvantage, a medium-sized group of respondents was selected by stratified sampling. In-depth interviews were conducted in the format of dialogues, which enabled the interviewer to collect detailed and nuanced information or anecdotes. Nevertheless, it is necessary to be aware that the data analysis is based on a sample of 119 in-depth interviews. No statistical inference beyond the sample is pursued. Third, the dependent and independent variables involved are measured and coded by a nominal scale: positive/negative for descriptive data analysis or present/absent for QCA. There is no variation defined between these extremes.<sup>14</sup> However, practically, a variable is sometimes more positive/present in one case and less in another. Then the researcher is required to deliberate the measurement and coding of the data.

*-Some theoretical implications*

First, this research broadly analyzed compliance by three aspects: definition, causality and measurement, which respectively solve the “what”, “why” and “how” issues concerning compliance. This also set a good pattern for understanding and studying compliance in different regulatory contexts.

Second, following some leading scholars who adopted a more comprehensive theoretical model for analyzing compliance and compliance motivations of the regulated actors (Winter and May 2001; Nielsen and Parker 2008, 2012; Parker and Nielsen 2012b; Gunningham et al. 2003), the present study used a comprehensive method, instead of analyzing the singular deterrence model or the social norms model, and also adopted it to a specific Chinese regulatory context.

*-Some methodological implications*

First, by means of combining and employing qualitative and quantitative methods and tools, this research conducted in-depth case interviews with a medium-sized group of respondents. The strength of such an approach lies in the possibility of tracing the process of events, causes and influences as well as gaining an in-depth understanding of the subjective and contextual conditions that shape the compliance variables, and enlarging the representativeness at least in the investigated areas.

Second, in order to deal better with the challenges in measuring compliance and compliance motivations, the study adopted a dialogical method which used natural language and encouraged trust. A semi-structured interview consisting of factual and coherent questions was conducted among respondents. The dialogical strategy enabled the interviewer ask sensitive questions in a more natural way without sending any suggestive messages about right and wrong or legal and illegal. This made it much easier to obtain truthful and honest information.

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<sup>14</sup>However, it is possible to define ordinal interval scales when using Fuzzy Set QCA (Ragin 2007).

Third, in this study, the data collection period consisted of three continuous phases: pilot study, in-depth interview, and complementary data collection phases. It provided a good opportunity to collect sufficient data and materials.

Fourth, while separately analyzing different compliance variables and their influences in shaping compliance, this research also considered how compliance variables behaved in conjunction to contribute to compliance behaviour. This latter aspect will be analyzed in Chap. 6 by employing a specified method of qualitative comparative analysis.

Building on the theoretical framework and methodology constructed in the present chapter, the following three chapters will separately analyze and focus on how differently the variables designated in the three simplified categories behave and thus affect the regulated entities' compliance behavior.

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