Appendix A
The Legal Context of the Pesticide Case

A.1 The Legal Framework of the Pesticide Case in China

As illustrated in Fig. A.1, at present, relevant laws, rules and regulations concerning pesticide and vegetable safety regulation in China mainly include:

Laws and rules concerning pesticide and vegetable safety regulation at the national level

- *Food Hygiene Law of the People's Republic of China*[1]
- *Food Safety Law of the People's Republic of China*[2]
- *Agricultural Law of the People's Republic of China*[3]
- *Law of the People's Republic of China of Quality and Safety of Agricultural Products*[4]

[1] *Zhonghua Renmin Gongheguo Shipin Weisheng Fa* (Food Hygiene Law of the People's Republic of China) was the first state-legislated food safety law in the People's Republic of China. It was adopted at the 16th Session of the 8th standing committee of the National People's Congress on 30 October 1995, and according to Article 104, Food Safety Law of the People's Republic of China, it was abolished as of 1 June 2009.

[2] *Zhonghua Renmin Gongheguo Shipin Anquan Fa* (Food Safety Law of the People's Republic of China) was adopted at the 7th Session of the Standing Committee of the 11th National People's Congress of the People's Republic of China on 28 February 2009, and it is effective as of June 1, 2009.

[3] *Zhonghua Renmin Gongheguo Nongye Fa* (Agricultural Law of the People's Republic of China) was adopted at the 2nd Meeting of the Standing Committee of the 8th National People's Congress on 2 July 1993 and was amended at the 31st Meeting of the Standing Committee of the 9th National People's Congress on 28 December 2002. It went into effect on 1 March 2003.

[4] *Zhonghua Renmin Gongheguo Nongchanpin Zhiliang Anquan Fa* (Law of the People's Republic of China of Quality and Safety of Agricultural Products) was adopted at the 21st meeting of the Standing Committee of the 10th National People's Congress on 29 April 2006 and went into effect on 1 November 2006.

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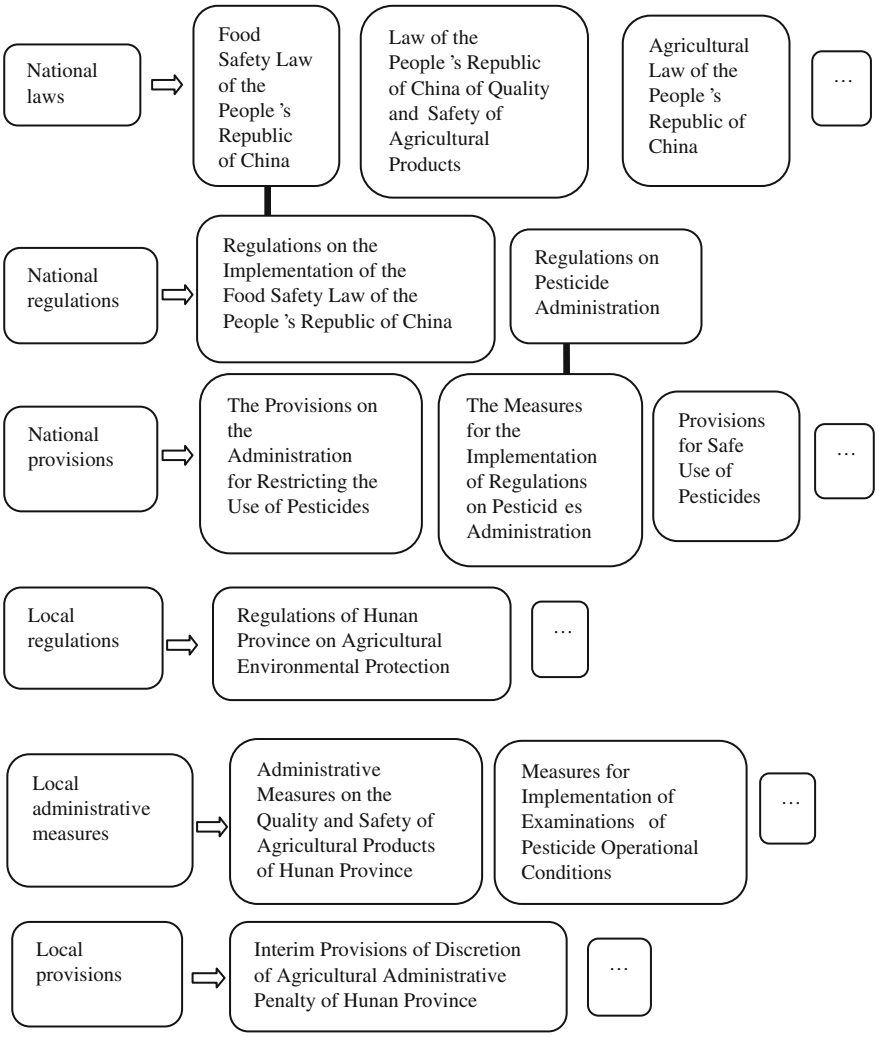

Fig. A.1 The legal framework of the pesticide case in China

- *Regulations on the Implementation of the Food Safety Law of the People's Republic of China*[5]
- *Regulations on Pesticide Administration*[6]
- *The Measures for the Implementation of Regulations on Pesticide Administration*[7]
- *Other related national laws and rules*

Regulations and provisions concerning pesticide and vegetable safety regulation at the local level: taking Hunan province as an example

- *Regulations of Hunan Province on Agricultural Environmental Protection*[8]
- *Administrative Measures on the Quality and Safety of Agricultural Products of Hunan Province*[9]
- *Interim Provisions of Discretion of Agricultural Administrative Penalty of Hunan Province*[10]
- *Other related local regulations and rules*

[5]*Zhonghua Renmin Gongheguo Shipin Anquanfa* Shishi Tiaoli (Regulations on the Implementation of the Food Safety Law of the People's Republic of China) was adopted at the 73rd Standing Committee Meeting of the State Council on 8 July 2009 and has been effective from the date of issuance.

[6]*Nongyao Guanli Tiaoli* (Regulations on Pesticide Administration) was promulgated by Decree No. 216 of the State Council of the People's Republic of China on 8 May 1997 and amended in accordance with the Decision of the State Council on Amending the Regulations on Pesticide Administration on 29 November 2001.

[7]*Nongyao Guanli Tiaoli Shishi Banfa* (The Measures for the Implementation of Regulations on Pesticide Administration) was adopted by Decree No. 20 of the Agricultural Ministry of the People's Republic of China and went into effect on 24 July 1999 and was amended by Decree No. 18 of the Agricultural Ministry in 2002, Decree No. 38 of the Agricultural Ministry in 2004 and Decree No. 9 of the Agricultural Ministry in 2007.

[8]*Hunansheng Nongye Huanjing Baohu Tiaoli* (Regulations of Hunan Province on Agricultural Environmental Protection) was published at the 32nd meeting of the Standing Committee of the 9th Hunan Provincial People's Congress on 29 November 2002 and went into effect on 1 February 2003.

[9]*Hunansheng Nongchanpin Zhiliang Anquan Guanli Banfa* (Administrative Measures on Quality and Safety of Agricultural Products of Hunan Province) was adopted by the 58th standing meeting of the Provincial People's Government and went into effect on 1 August 2005.

[10]*Hunansheng Nongye Xingzheng Chufa Ziyou Cailiangquan Shiyong Zanxing Guiding* (Interim Provisions of Discretion of Agricultural Administrative Penalty of Hunan Province) was promulgated by the Agricultural Bureau of Hunan province on 26 February 2001.

A.2 The Regulatory Framework of the Pesticide Case in China

As illustrated in Fig. A.2, China has a multilevel and multifunctional pesticide and vegetable safety control system. According to relevant laws, rules and regulations,[11] the responsibilities of the relevant regulatory divisions at the national and local levels are introduced as follows:

- *Food Safety Committee of the State Council;* the State Council shall establish the Food Safety Committee, with the responsibilities determined by the State Council.
- *State Administration on Industry and Commerce (SAIC) and subordinate bureaus;* the authorities for the administration of industry and commerce under the State Council shall be responsible for food distribution according to the law and the requirements of the State Council.
- *Ministry of Health (MOH) and subordinate bureaus*; the health authorities under the State Council are responsible for the overall coordination of food safety, food safety assessment, development of food safety standards, publishing of food safety information, development of the certification conditions for qualification of the food inspection and testing agencies, specification of the inspection and testing, and investigating and treating significant food safety accidents.
- *General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ) and subordinate bureaus;* the authorities for quality supervision, inspection and quarantine under the State Council shall be responsible for the supervision and management of food production according to the law and the requirements of the State Council.
- *State Food and Drug Administration (SFDA) and subordinate bureaus*; the authorities for FDA under the State Council shall be responsible for the catering service according to the law and the requirements of the State Council.
- The administrative departments for health, agriculture, quality supervision, industry and commerce and FDA at the county level or above shall strengthen communication and close cooperation, exercise the rights and bear the responsibilities according to the work division.
- *Ministry of Agriculture (MOA) and subordinate bureaus;* the administrative departments for agriculture under the people's governments at or above the county level shall be responsible for the supervision and control of the quality and safety of agricultural products. Agricultural products here refer to the primary products from agriculture, i.e., the plants, animals, microorganisms and their products obtained in the course of agricultural activities.

[11]They are mainly Food Safety Law of the People's Republic of China (cited from: www.lawinfochina.com/), Regulations on Pesticide Administration (translated and published by GOV.cn, Chinese Government's Official Web Portal, http://english.gov.cn/), and Environmental Protection Law of the People's Republic of China (translated and published by CHINA.ORG.CN, http://www.china.org.cn/).

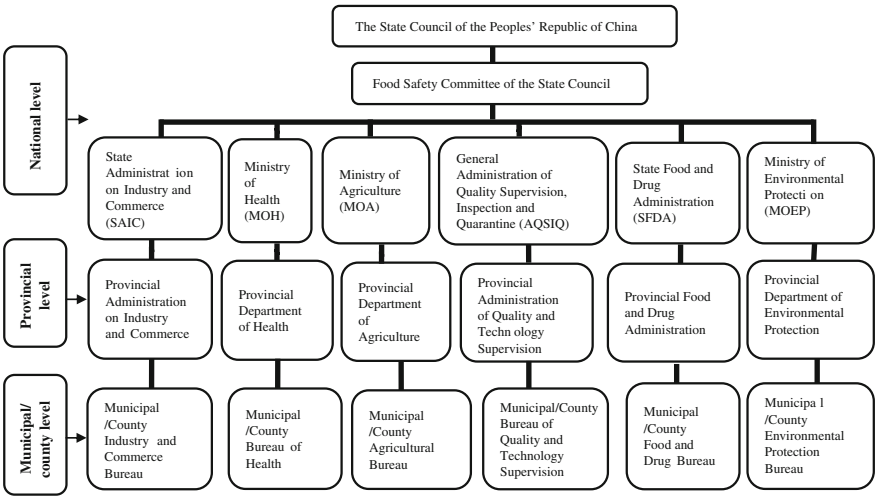

Fig. A.2 The regulatory framework of the pesticide case in China

- Specifically, the competent administrative department of agriculture of the State Council is responsible for the pesticide registration and pesticide supervision and administration throughout the country. The competent administrative departments of agriculture of the people's governments of provinces, autonomous regions and municipalities directly under the Central Government shall assist the competent administrative department of agriculture of the State Council in conducting pesticide registration within their respective administrative areas, and are responsible for the pesticide supervision and administration within their respective administrative areas. The competent administrative departments of agriculture of the people's governments at the county level and the people's governments of cities divided into districts and autonomous prefectures are responsible for the pesticide supervision and administration within their respective administrative areas.
- *Ministry of Environmental Protection (MOEP) and subordinate bureaus also have some responsibilities related to pesticide and vegetable safety*; the competent department of environmental administration under the State Council shall conduct unified supervision and management of the environmental protection work throughout the county. The competent departments of the environmental protection administration of the local people's government at or above the county level shall conduct unified supervision and management of the environmental protection work within areas under their jurisdiction.

Appendix B
Key Variables and Measurements

See (Tables B.1, B.2, B.3, andB.4).

Table B.1 Dependent variables and measurements

Dependent variables	Summary of questions asked in dialogues (see below in details)	Coding method	
		Compliant	Noncompliant
Compliance behavior 1: use of types of pesticides	Which pesticide(s) do you usually use on what vegetables for what pests or diseases? (您现在主要使用的农药有哪些呢?它们分别用来治什么虫呢? 分别用在哪些蔬菜上呢?)	Does not indicate in any way that he/she has applied or will apply any type of illegal pesticides	In any way indicates that he/she has applied or will apply any type of illegal pesticides
Compliance behavior 2: the disposal of pesticide containers	How do you usually dispose of pesticide containers after pesticide application? (您一般打完药后农药袋子怎么处理呢?)	In any way indicates that he/she generally disposes by means of recycling or burying in ground far away from water sources and residential areas or other legal ways	In any way indicates that he/she generally disposes of pesticide containers by throwing away on farm or in village, or other illegal ways
Compliance behavior 3: time interval	What is your general time interval between the last pesticide applying and vegetable harvesting? (您一般打完药后过几天采摘呢?)	In any way indicates that he/she generally harvests vegetables at least a week after pesticide spraying	In any way indicates that he/she generally harvests vegetables within a week after pesticide spraying

H. Yan, *Pesticide Law and Compliance Decision Making*,
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Table B.2 Amoral calculation and measurement

Amoral calculation		Summary of questions asked in dialogues (see below in details)	Coding method	
			Positive	Negative
Operational cost-benefit calculation of compliance		How is your behavior (legal or illegal) in comparison with the alternatives[a] (illegal or legal) in terms of price and effectiveness (for use of types of pesticides)/ cost and earnings (for a time interval)? (跟其他人的做法相比(不合法或者合法),您的做法(合法或者不合法)成本是不是更加低呢?效益怎么样呢?)	In any way indicates comparing with the violation behavior, any of the two specific compliance behaviors is less costly and more effective/profitable[b]/ (Cb-Cc) > (Vb-Vc)[c]	In any way indicates comparing with the violation behavior, any of the two specific compliance behaviors is more costly and less effective/profitable/ (Cb-Cc) < (Vb-Vc)
Deterr-ence	Detection probabilit-y	Assume that someone similar to you violates the use of types/disposal/time interval, is there a possitibilty of being found out? (如果有一个跟您一样种菜的人做了(三种具体的违法行为中的一种),他/她有可能被发现吗?)	In any way indicates a possibility of being discovered by the inspection bureau/other sources	In any way indicates no possibility of being discovered by the inspection bureau/other sources
	Height of the detection probabilit-y	How high is the possibility? By whom? (被发现的可能性怎么样呢?被谁发现呢?)	In any way indicates a high possibility of being discovered	In any way indicates a low possibility of being discovered
	Sanction impact	What negative and the most serious effects would happen if being punished? (如果他被处罚的话,会有什么后果呢?最严重的后果是什么?)	In any way indicates an impact of punishment	In any way indicates no or a low impact of punishment

[a]Notice that only two pesticide behaviors are compared, since it is assumed in advance that there is no interaction of operational cost-benefit calculation and disposal of pesticide containers according to the pilot study, the vegetable farmers indicated that there is no direct and obvious costs and benefits calculation concerning disposal

[b]For the specific coding method for more costly but more profitable middle cases, please see C1 in Appendix C

[c](Cb-Cc) > (Vb-Vc) indicates that the benefits of compliance minus the costs of compliance are greater than the benefits of violation minus the costs of violation

Table B.3 Legitimacy and measurement

Legitimacy	Key interviewing questions	Coding method			
		Positive	Negative	Mixed	Elusive/missing
Descriptive social norms of compliance	Do most similar other vegetable farmers do the same as you do on (any of the three specific pesticide behaviors)? (其他大多数像您一样种菜的也是像您这样做吗?)	In any way indicates that most similar others comply with the rules on any of the three specific pesticide behaviors	In any way indicates that most similar others do not comply with the rules on any of the three specific pesticide behaviors		
Morals	What do you think of people who do (any of the three specific violation behaviors)? (您对做了(三种具体的违法行为中的一种)的行为怎么看?	In any way indicates in such conditions the law should be obeyed	In any way indicates in such conditions the law should not be obeyed		
General duty to obey	Do you agree with the following statement: people should obey the law, even if it is a bad law, even if it is not enforced, or even when the costs of obeying it are high? (您同意这种说法吗: 国家制定了法律,不管它是好法还是坏法,不管政府有没有去执行它,或者说不管我们是不是要付出很大的代价,我们都应该遵守)	In any way indicates positive views on general duty to obey	In any way indicates negative views on general duty to obey		In any way indicates that he/she has no idea about the general duty to obey/it is hard to say/disregard for laws

(continued)

Table B.3 (continued)

Legitimacy	Key interviewing questions	Coding method			
		Positive	Negative	Mixed	Elusive/missing
Procedural justice	Do you agree with the following statements: officers of the local agricultural bureau are honest; decisions of local agricultural bureau are always fair; overall, how do you assess the work of the local agricultural bureau? (您同意这两种说法吗:总体上来说,农业局工作人员是讲诚信的;农业局在下面处理问题时做的决定是公正的. 总体上您觉得农业局的工作做的怎么样?)	In any way indicates positive views toward all three questions concerning procedural justice	In any way indicates negative views toward all three questions concerning procedural justice	In any way indicates positive views toward any one or two of the three questions concerning procedural justice	In any way indicates that he/she has no idea about any of the three questions, or cannot give any judgment as he/she has never dealt with local agricultural bureau officers or the officers never come

Table B.4 Capacity and measurement

Capacity		Key interviewing questions	Coding method	
			High	Low
Ability to obey	Financial ability	What was your family gross earning last year? (您家去年的毛收入大概是多少呢?)	In any way indicates family income $\geq$ 40,000 RMB	In any way indicates family gross income < 40,000 RMB
	Technical ability	If you have technological difficulties, to whom do you often turn for help? Have you ever taken part in any technological training? Organized by whom? (如果您有技术上的困难,一般向谁求助呢?您曾经参加过任何蔬菜方面的技术培训吗?是谁组织的呢?)	In any way indicates low necessity of technical support or indicates high necessity of technical support but sufficient technical training opportunities	In any way indicates high necessity of technical support but insufficient technical training opportunities
Legal knowledge		Do you know if the state has published any rules on use of types of pesticides/disposal of pesticide containers/time interval? If yes, please specify. How do you know this? (您知道国家有关于(三种农药行为中的任一种)方面的法律法规吗?如果知道的话,具体规定是什么呢?您是从哪里知道的呢?)	In any way indicates relevant legal knowledge on use of types of pesticides/disposal of pesticide containers/time interval from the law/other sources	In any way indicates irrelevant legal knowledge on use of types of pesticides/ disposal of pesticide containers/ time interval

Appendix C
The Specific Coding Method for Independent and Dependent Variables

From what is shown in Tables B.1, B.2, B.3 and B.4, if interviewees give untruthful answers, their compliance and compliance determinants are defined in a rigid way, that is, vegetable farmers indicate in any way that any noncompliance should be defined as a violation, and they indicate any compliance in any way, then it should be defined as obedient. Specifically, for these who indicated in any way that they have applied or will apply any type of illegal pesticides on vegetables are defined as noncompliant.[12] The interviewer should first figure out the vegetable farmers' own language on what to call all kinds of pesticides through the pilot study as well as figure out which illegal ones are used most frequently. Respondents were first asked to reply to an open-ended question on which kinds of pesticides they usually use on vegetables. After volunteering types of pesticides as best they can, the interviewer then asked them about the most commonly used illegal ones to assure that all possibly forbidden and restricted pesticides are checked. Vegetable farmers who indicated generally disposing of pesticide containers by throwing them away on the farm or in the village or in other inappropriate ways are defined as noncompliant; these who indicated generally picking vegetables one week after pesticide spraying or spraying pesticides only after vegetable harvesting are defined as compliant. Notice that compliance with the time interval was defined in a compromise way as in current China the situation is that vegetable farmers can rarely comply strictly with the safety interval. Different types of pesticides demand different time intervals. In rural China, most vegetable farmers apply medium-toxic or low-toxic pesticides which demand a longer time interval than biological pesticides. Generally speaking, vegetables should not be picked within a week after spraying medium-toxic or low-toxic pesticides. The questions about disposal of pesticide containers and time interval are not so sensitive and the interviewee often gave truthful answers, because they regard them as normal things that frequently happen in rural areas.

[12]For the selection of types of pesticides, please see the chart of types of pesticides, D4, Part D.

H. Yan, *Pesticide Law and Compliance Decision Making*,
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C_1 Operational cost-benefit calculation of compliance

If indicated in any way: behavior A (compliant) is cheaper/ less costly and more effective/ more profitable than behavior B (violated), it is coded as positive;
If indicated in any way: behavior B (violated) is cheaper/ less costly and more effective/ more profitable than behavior B (complaint), it is coded as negative.

Notice that for middle cases if: behavior A (compliant) is more expensive but more effective/profitable than that of behavior B (violated), it is coded as positive, and vice versa. The coding method here is based on how vegetable farmers themselves weigh both aspects. As they indicated, pesticide effectiveness/earning is the most important aspect that influences their final gain, while pesticide cost is generally not that important. On the one hand, the costs of pesticides only take up a small proportion of their gross income; on the other hand, these who choose the more costly behavior believe that it is more effective and can guarantee their harvest, although they need to pay a higher price. So for them the price is not the key factor that affects their general calculation of compliance.

C_2 Deterrence

$C_{2.1}$ Detection probability

If indicated in any way: a probability of being discovered, it is coded as positive;
If indicated in any way: no probability of being discovered, it is coded as negative.

$C_{2.2}$ Height of detection probability

If indicated in any way: a high possibility of being discovered, it is coded as positively high;
If indicated in any way: a low possibility of being discovered, it is coded as negatively high.

$C_{2.3}$ Sanction impact

If indicated in any way: a sanction impact, it is coded as positive;
If indicated in any way: no or a low sanction impact, it is coded as negative.

Notice that in the research, sanction impact rather than sanction severity is examined. For vegetable farmers who indicated some economic or financial impact like “our vegetables would be prohibited from being sold on the market” or “no one would come to buy our vegetables” or “loss of Guanxi and thus financial loss” or other sanctions ultimately affecting their earnings, it is coded as positive. Nevertheless, based on some vegetable farmers’ indications about how they themselves weigh the impact, they mostly regard the sanction impact as severe as they are generally poor and mainly live from vegetable production.

C_3 Descriptive social norms of compliance

$C_{3.1}$ If indicated in any way: most similar other vegetable farmers comply with the rules on any of the three pesticide behaviors, it is coded as positive;

$C_{3.2}$ If indicated in any way: most similar other vegetable farmers do not comply with the rules on any of the three pesticide behaviors, it is coded as negative.

C_4 Morals

$C_{4.1}$ If indicated in any way: negative views on any of the three relevant violation behaviors, it is coded as positive;
$C_{4.2}$ If indicated in any way: positive views on any of the three relevant violation behaviors, it is coded as negative.

C_5 General duty to obey

$C_{5.1}$ If indicated in any way: in such conditions the law should be obeyed, it is coded as positive;
$C_{5.2}$ If indicated in any way: in such conditions the law need/should not be obeyed, it is coded as negative.
$C_{5.3}$ If indicated in any way: he/she has no idea about this question/it is hard to say/disregarding the law, it is coded as elusive/missing.

C_6 Procedural justice

$C_{6.1}$ If indicated in any way: positive views on all three questions of procedural justice, it is coded as positive;
$C_{6.2}$ If indicated in any way: negative views on all three questions of procedural justice, it is coded as negative;
$C_{6.3}$ If indicated in any way: positive views on any one or two of the three questions concerning procedural justice, it is coded as mixed;
$C_{6.4}$ If indicated in any way: he/she has no idea about any of the three questions, or cannot give any judgment as he/she has never dealt with local agricultural bureau officers or the officers never come, it is coded as elusive/missing.

C_7 Ability to obey

$C_{7.1}$ Financial ability (using annual family gross income as a proxy)
$C_{7.1.1}$ If indicated: family income >40,000 RMB,[13] it is coded as high[14];

[13]Notice that here according to the Chinese Peasant Economic Status Report published by the China Rural Institute of Central China Normal University in 2012, the average family cash income in rural areas in 2011 was 38,894.38 RMB. Thus, in this research, we set 40,000 RMB as the standard level for analyzing vegetable farmers' financial ability to obey the law. For these farmers who earn less than the average family income, it is more difficult for them to obey the law at the cost of family income. Hence, in this study we defined these who earn less than the average family as these who have low financial ability to comply.

[14]Here compared to defining a positive/negative ability to obey, it is better to define a high/low ability to obey, as it is very difficult to decide on which level of financial ability that vegetable famers have engouth to obey the law; rather, we can say that the higher their financial ability, the higher their ability to obey.

$C_{7.1.2}$ If indicated: family gross income <40,000 RMB, it is coded as low.
$C_{7.2}$ Technical ability (using the subjective need of technology as a proxy)[15]
$C_{7.2.1}$ If indicated: no necessity of technical assistance or high need of technical assistance but sufficient technical training opportunities, it is coded as high;
$C_{7.2.2}$ If indicated: high need of technical assistance but insufficient technical training opportunities, it is coded as low.

C_8 Legal knowledge[16]

$C_{8.1}$ If indicated: relevant[17] legal knowledge (on use of types of pesticides/disposal of pesticide containers/time interval) from the law/other sources, it is coded as high[18];
$C_{8.2}$ If indicated: irrelevant legal knowledge (on use of types of pesticides/disposal of pesticide containers/time interval), it is coded as low.

[15]Here technical ability was indirectly measured by asking farmers' subjectively reported need of technology including the necessity of technology and the technical opportunity of obtaining technical training.
[16]Notice that here vegetable farmers responded to questions about what the law dictates rather than the right thing or the proper thing to do. For these who indicated legal knowledge from relevant parties or by reading instructions, they also indicated legal knowledge as they thought that the state publishes the rules on the pesticide instructions, or through other parties.
[17]Here instead of defining correct/incorrect, relevant/irrelevant legal knowledge is measured as it is difficult for farmers to indicate correct legal knowledge as exactly what the law says. Similar to the ability to obey, here high/low legal knowledge is measured.
[18]Notice that here legal knowledge is defined as a compromise. Specifically, for the use of types of pesticides, it is clear that these who can state all the types of prohibited pesticides are defined as having a high legal knowledge, but it is not necessary for farmers to name all the types of prohibited pesticides. They just need to indicate that these highly-toxic pesticides are prohibited for use on vegetables or only these low-toxic ones are permitted for use on vegetables, and also indicated that they can know about which specific highly toxic pesticides are prohibited by consulting relevant parties like the pesticide sellers or enforcement officers or cooperatives or associations. This is consistent with the rules on types of pesticides, because according to the rules, these prohibited pesticides are all highly toxic or extremely toxic ones. Second, for these who indicated that based on the rules, pesticide containers should be disposed of by recycling or burying in the ground or burning are defined as having a high legal knowledge. Third, these farmers who indicated that the general safety interval is one week based on the rules are defined as having relevant legal knowledge. These who did not directly indicate the general time interval, but instead indicated that they can learn about safety interval by reading pesticide instructions or consulting other relevant parties like these who indicated having relevant legal knowledge. Here the two kinds of discourses are both consistent with the law, as according to the law, the regulated actors should obey the safety interval based on the pesticide instructions. Generally, the basic rule for safety interval is seven days. But the specific time interval on the pesticide instructions varies from three days to seven days or even longer, so both are coded as indicating having relevant legal knowledge.

Appendix D
Flowcharts on Specific Interviewing Questions for Vegetable Farmers

The research employs a dialogue strategy to deal with some challenges during the interviewing process. Taking the measurement of the operational cost-benefit calculation of compliance as an example, the first challenge is the sensitivity, that is, asking the respondents directly about comparing legal behavior with illegal will make the whole conversation more sensitive. Here the approach is to ask smoothly through a dialogue leading them to state what they do (legal or illegal) and what is the opposite of that (illegal or legal), and then to compare the two. Consider for instance a dialogue below:

The interviewer: Which pesticide/pesticides in the chart do you usually use on what vegetable for what pest or disease? (shows the respondent a chart of collected types of pesticides (most frequent ones with mixed legal and illegal types))

Respondent A: Now I use some bio-pesticides like Avermectins for killing pests, and Fenaminosulf (敌克松) for sterilization … But I do not use Methamidophos (甲胺磷,a type of illegal pesticides). It is too toxic. I sometimes use Carbofuran (呋喃丹, a type of illegal pesticides)…

The interviewer: Do most similar others use Carbofuran?
Respondent A: Yes. It is for killing soil insects…
The interviewer: Any other alternatives?
Respondent A: Yes. A lot of new brands can kill soil insects.
The interviewer: In comparison with these new alternatives, is carbofuran cheaper?
Respondent A: Yes, I think it is cheaper.
The interviewer: How about its effectiveness?
Respondent A: The effectiveness is better. (Quotes from case D.T.No.2)

The second challenge is about the misunderstanding. In the study, the interviewees are vegetable farmers who are generally less well educated. If the questions are asked too broadly, it may be too abstract for them to understand the question. So questions like costs and benefits are operationalized into simpler ones: is pesticide A or B cheaper than the alternatives? How about its effectiveness? The specific dialogues for each variable are illustrated below in the format of flowchart.

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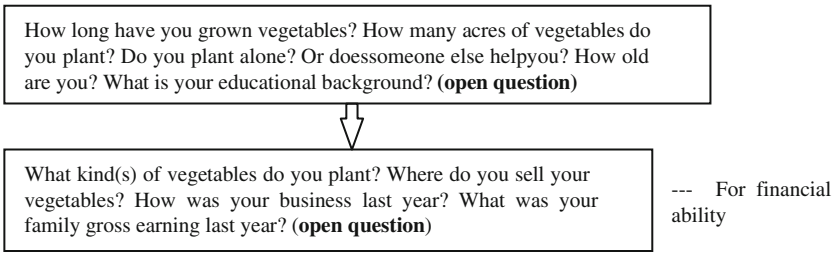
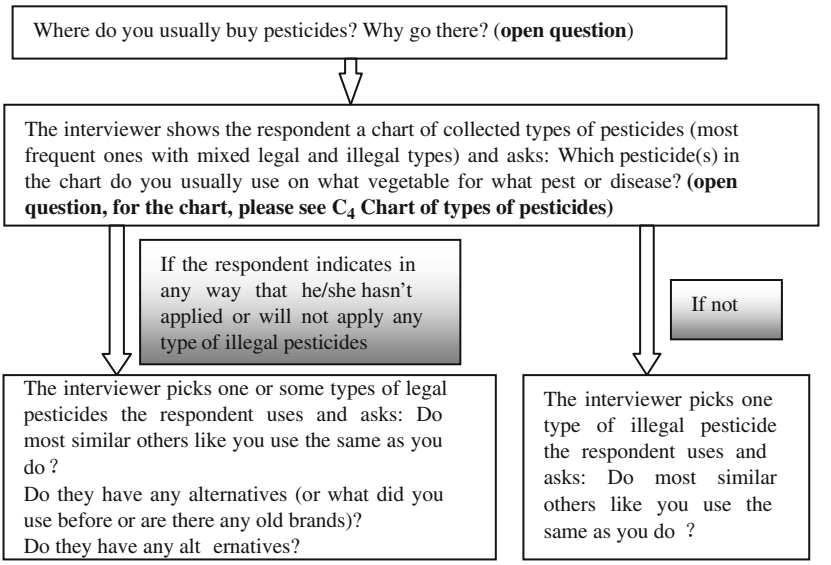
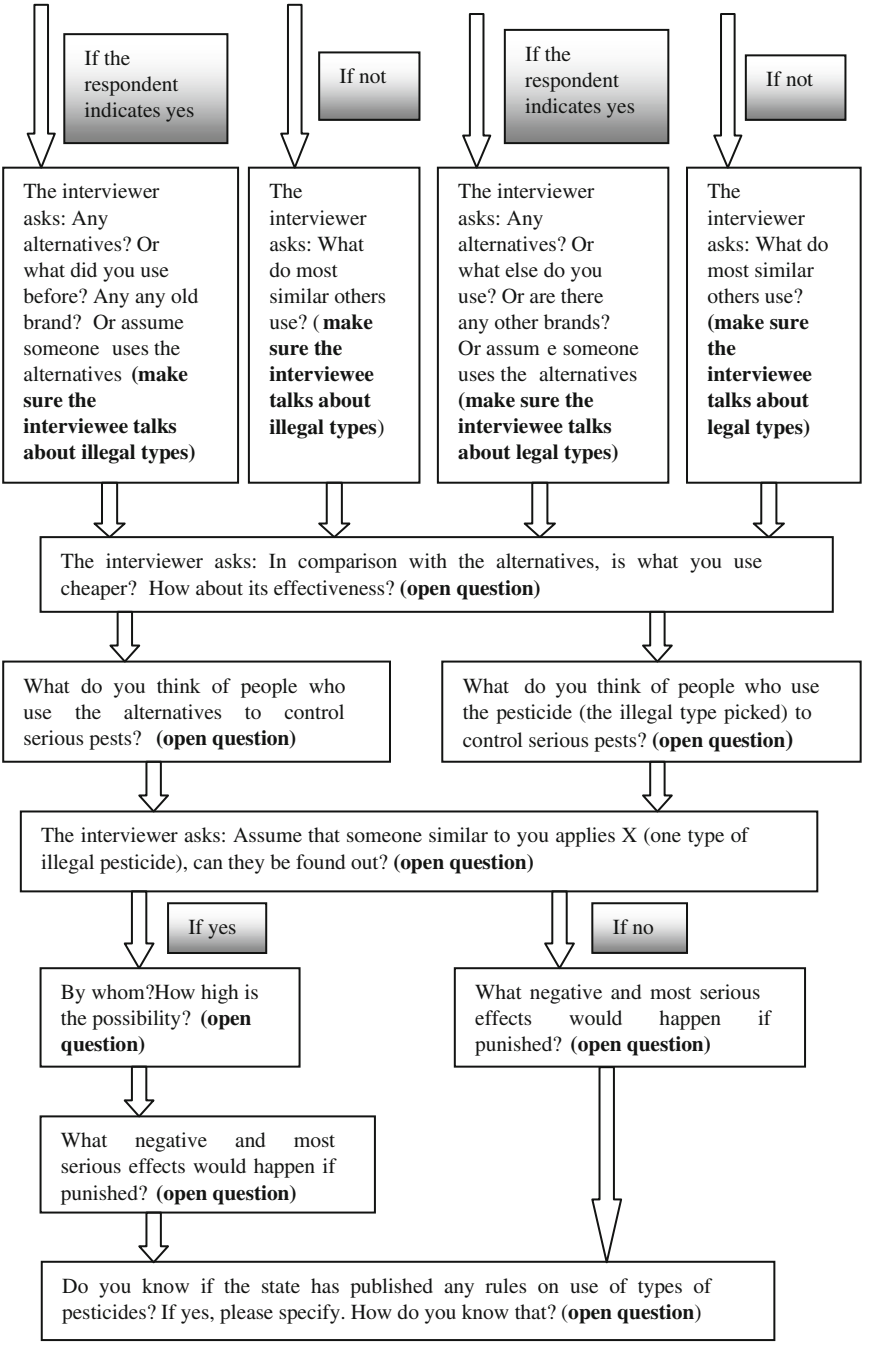
D_1 First questions



D_2 Main questions

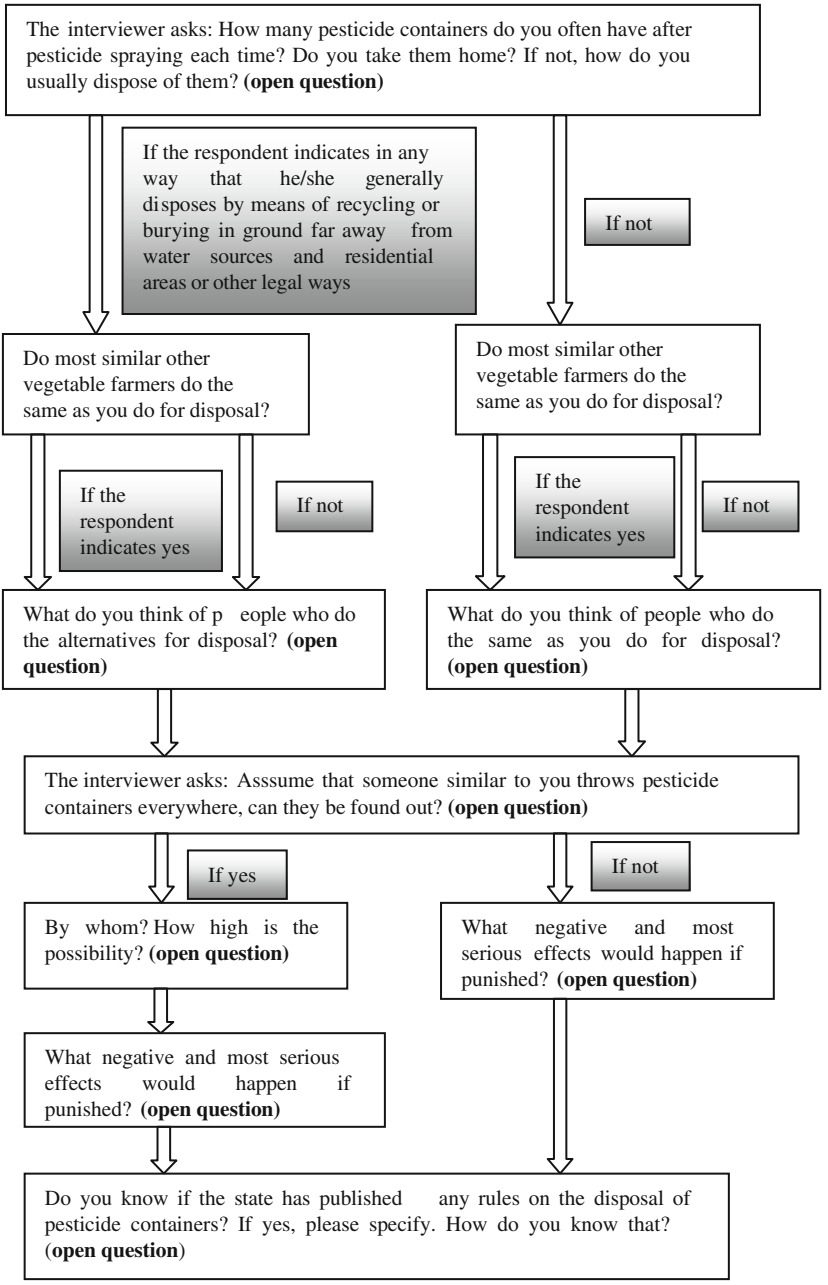
$D_{2.1}$ Compliance behavior one: use of types of pesticides





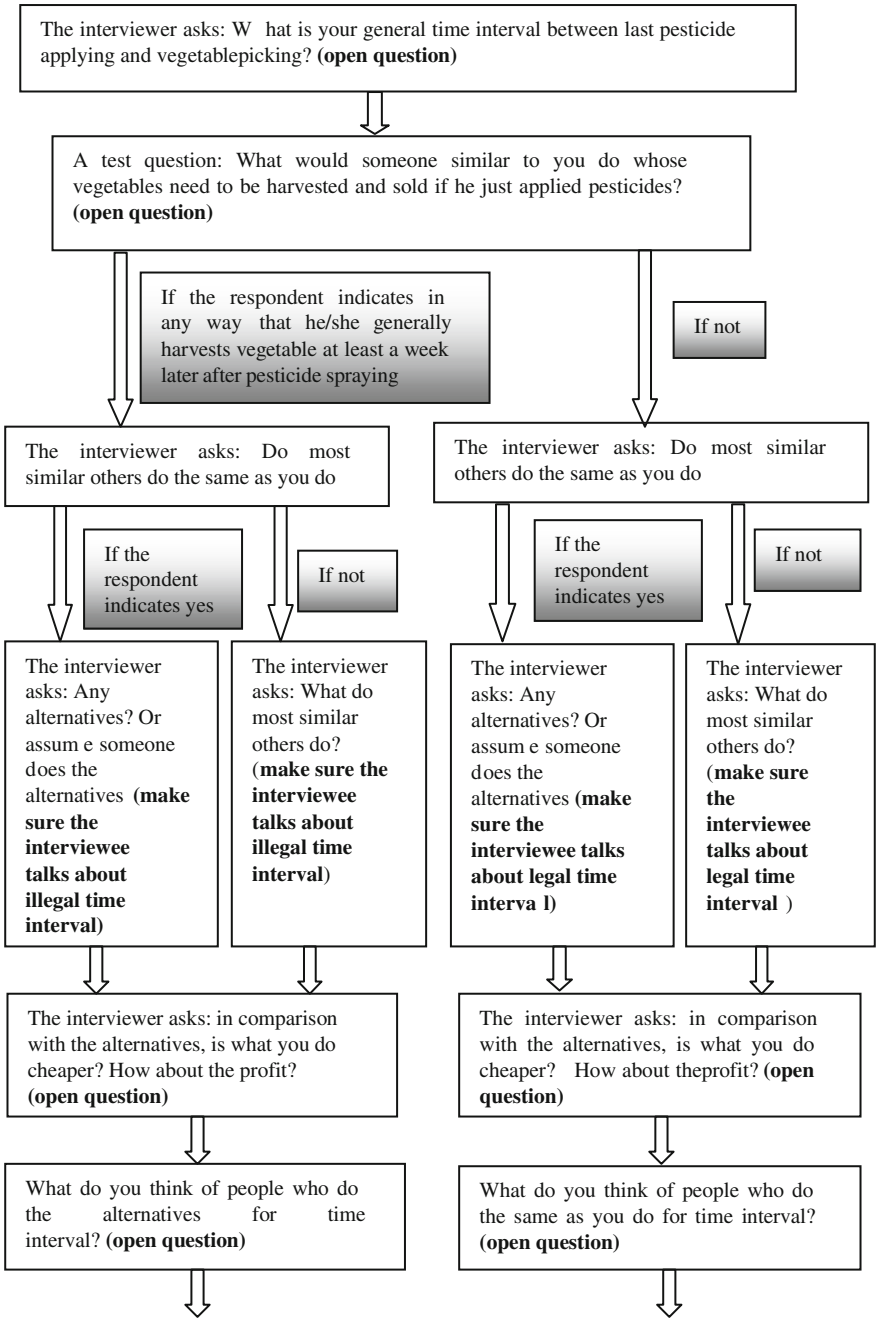
Flowchart of interviewing questions I

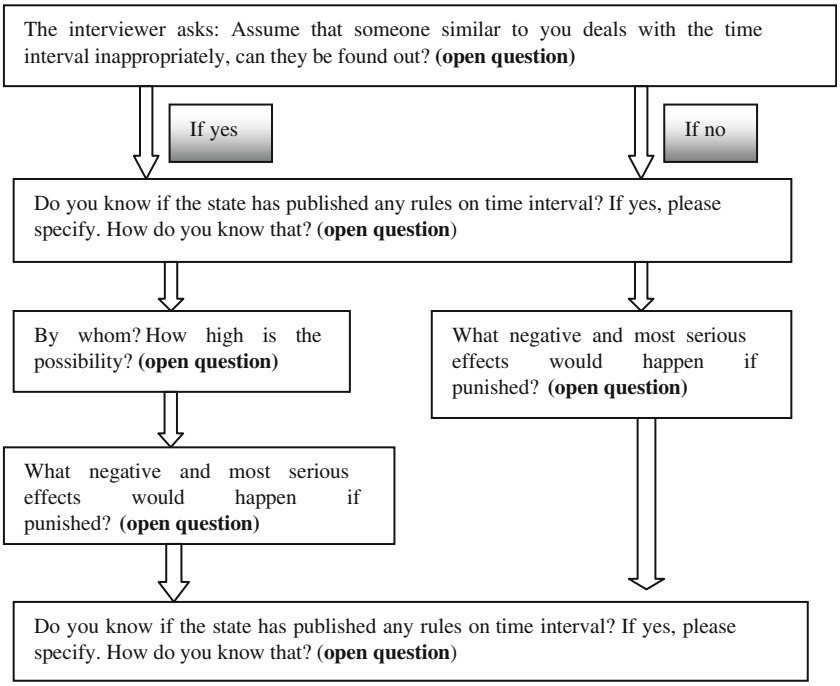
$D_{2.2}$ Disposal of pesticide containers



Flowchart of interviewing questions II

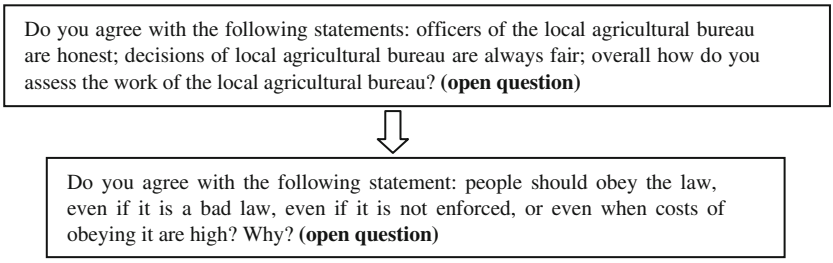
$D_{2.3}$ Time interval



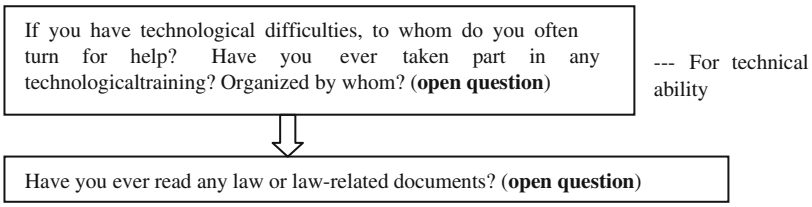


Flowchart of interviewing questions III

$D_{2.4}$ General duty to obey and procedural justice



D_3 Final questions



D_4 Chart of types of pesticides

Below are selected types of pesticides (in Chinese), including illegal ones;[19] they were listed by referring to relevant laws, rules and regulation, and legal ones were selected by consulting the local agricultural officers, village leaders and several vegetable farmers. Then all the selected legal and illegal pesticides were mixed to avoid untruthful answers. It is notable that all types of prohibited highly toxic pesticides as well as some most frequently used pesticides are included in the chart, but these illegal and extremely highly toxic pesticides are excluded, except DDT, BHC and chlorphenamidine, because they are seldom applied by farmers based on the pilot interview. Another reason is that these extremely highly toxic ones were prohibited in the early 1980s, and are now seldom sold on the rural market. Thus, there are 22 illegal ones included in the chart.

The types of pesticides in bold are high-ly toxic (only visible to the interviewer), and these in brackets are some old brand names that may still be used by vegetable farmers.

Chart of types of pesticides

阿维菌素 (灭虫灵)	毒·氯氰 (除虫净)	高效氯氰菊酯	溴氰菊酯 (敌杀死)
氰戊菊酯 (速灭杀丁)	甲基对硫磷 (甲基1605)	氯氰菊酯 (灭百可)	啶虫脒
哒螨灵	甲拌磷 (3911/西梅脱)	克螨特	甲胺磷 (多灭磷)
敌敌畏	多菌灵	农地乐 (好乐士)	辛硫磷
毒死蜱 (乐斯本)	对硫磷 (1605)	甲霜灵·锰锌 (瑞毒霉锰锌)	磷胺 (大灭虫/迪莫克)
克百威 (呋喃丹)	甲基异柳磷	杀虫双 (杀虫丹)	甲基硫环磷 (甲基棉安磷)

(continued)

[19]For the prohibited pesticides, according to No. 194 and No. 199 of the *Announcement of Ministry of Agriculture of the People's Republic of China*, 18 extremely highly-toxic types of pesticides are completely prohibited by the state, and the other 19 highly-toxic types are prohibited for application on vegetables, fruit trees, teas and traditional Chinese herbal medicines. types of pesticides are prohibited by the state; according to No.274, No. 322 and No.632 of the *Announcement of Ministry of Agriculture 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)are completely prohibited for use in agriculture.

(continued)

定虫隆(抑太保/7899)	苯线磷(力满库/克线磷/线威磷)	霜脲氰·锰锌(克露/霜露)	硫环磷(棉安磷/乙基硫环磷)
灭线磷 (丙线磷/盆收宝)	吡虫啉(一遍净、蚜虱净)	涕灭威 (铁灭克/丁醛肪威才)	三唑酮(粉锈宁)
氧化乐果	地虫硫磷(地虫磷/大风雷)	恶霜·锰锌(杀毒矾)	氢氧化铜(可杀得)
乐果	滴滴涕	百菌清	代森锰锌
敌克松	氯唑磷(异唑磷)	丙森锌(安泰生)	久效磷(纽克瓦/铃杀)
爱多收(丰产素、谷粒宝)	腐霉利(速克灵)	特丁硫磷(特丁磷)	乙酰甲胺磷(高灭磷)
甲基托布津	氟虫腈(锐劲特)	康宽	氟虫脲(卡死克)
治螟磷(苏化203)	内吸磷(1059)	普尊	丁硫克百威(好年冬)
蝇毒磷(蝇毒硫磷)	溴虫腈(除尽/虫螨腈)	六六六	毒·辛(地虎净)

Appendix E
Measuring Compliance and Compliance Motivations for CsQCA

Brief interview questions as well as the specific scoring arrangement based on csQCA methods and tools are shown below in Table E.1.

From what is shown in Table E.1, compliance behaviors and compliance determinants are defined in a binary way. For pesticide compliance, any way vegetable farmers indicate any noncompliance should be defined as absent and scored as 0, and any way they indicate any compliant, it should be defined as present and scored as 1. Notice that here only vegetable farmers' annual family gross income in the last year was used as a proxy for their ability to obey, without considering the technical ability. As discussed in Chap. 5, vegetable farmers' indications about technical ability including necessity of technical support and opportunity of getting sufficient technical support turn out to be quite similar and less comparable and thus are ignored as an index for measuring ability to obey. These farmers whose reported annual family gross income was 40,000 RMB or

Table E.1 Measuring compliance and compliance variables for csQCA

Items	Brief introduction of interview questions	Scoring arrangement	
		0	1
Compliance behaviors			
Use of types of pesticides	Which pesticides do you usually use on what vegetables for what pests or diseases?	In any way indicates that he/she has applied or will apply any type of illegal pesticides	Does not indicate in any way that he/she has applied or will apply any type of illegal pesticides
Disposal of pesticide containers	How do you usually dispose of pesticide containers after pesticide application?	In any way indicates that he/she generally disposes by means of recycling or burying in ground far away from water sources and residential areas or other legal ways	In any way indicates that he/she generally disposes of pesticide containers by throwing away on farm or in village, or other illegal ways

(continued)

H. Yan, *Pesticide Law and Compliance Decision Making*,
DOI 10.1007/978-981-10-3917-1

Table E.1 (continued)

Items	Brief introduction of interview questions	Scoring arrangement	
		0	1
Time interval	What is your general time interval between the last pesticide applying and vegetable picking?	In any way indicates that he/she generally harvests vegetables at least a week after pesticide spraying	In any way indicates that he/she generally harvests vegetables within a week after pesticide spraying
Compliance variables			
Amoral calculation			
Deterrence (Becker 1968; Thornton et al. 2005; Winter and May 2001)	Assume that someone in the same business area with you does (any of the three specific violation behaviors), can they be found out? How high is the possibility? By whom? What negative and most serious effects would happen if punished?	In any way indicates low possibility of being discovered by the inspection bureau/other sources as well as no sanction impact	In any way indicates high possibility of being discovered by the inspection bureau/other sources as well as an sanction impact
Operational cost benefit calculation of compliance (Kagan and Scholz 1984; Winter and May 2001)	How is your behavior (legal or illegal) in comparison with the alternatives (illegal or legal) in terms of price and effectiveness (for use of types of pesticides)/ cost and earnings (for a time interval)?	In any way indicates comparison with the violation behavior, any of the two specific compliance behaviors is less/more costly and less effective/profitable	In any way indicates comparison with the violation behavior, any of the two specific compliance behaviors is less/more costly and more effective/profitable
Legitimacy			
Descriptive social norms of compliance (Cialdini 2007; Tyran et al. 2002)	Do most other vegetable farmers do the same as you do on (any of the three specific behaviors)?	In any way indicates that most other vegetable farmers do not comply with the rules on (any of the three specific pesticide behaviors)	In any way indicates that most other vegetable farmers comply with the rules on (any of the three specific pesticide behaviors)
Morals (Tyler 1990)	How do you think of people who do (any of the three specific violation behaviors)?	In any way indicates in such conditions the law should not be obeyed	In any way indicates in such conditions the law should be obeyed
General duty to obey (Tyler 1990; McGraw and Scholz 1991)	Do you agree with the following statement: people should obey the law, even if it is a	In any way indicates negative views on general duty to obey[a]	In any way indicates positive views on general duty to obey

(continued)

Table E.1 (continued)

Items	Brief introduction of interview questions	Scoring arrangement	
		0	1
	bad law, even if it is not enforced, or even when costs of obeying it are high?		
Procedural justice (Tyler 1990)	Do you agree with the following statements: officers of the local agricultural bureau are honest; decisions of local agricultural bureau are always fair; overall, how do you assess the work of the local agricultural bureau?	In any way indicates negative views or mixed views toward the three aspects concerning procedural justice[b]	In any way indicates positive views toward all three aspects concerning procedural justice
Capacity			
Ability to obey (Winter and May 2001; Kagan and Scholz 1984)	What was your family gross earning last year?	In any way indicates family gross income <40,000 RMB	In any way indicates family income $\geq$40,000 RMB
Legal knowledge (Winter and May 2001; Kim 1998)	Do you know if the state has published any rules on (use of types of pesticides/disposal of pesticide containers/time interval)? If yes, please specify. How do you know this?	In any way indicates irrelevant legal knowledge on (use of types of pesticides/disposal of pesticide containers/time interval) from the law/other sources	In any way indicates relevant legal knowledge on (use of types of pesticides/disposal of pesticide containers/time interval) from the law/other sources

[a]Notice that for cases who indicated elusive/missing discourses concerning general duty to obey, they were coded as missing

[b]Notice that for cases who indicated elusive/missing discourses concerning procedural justice, they were coded as missing

more are defined as indicating the presence of a high annual family gross income and thus scored as 1, and vice versa. Notice that procedural justice here is defined in a rigid way. For these who in any way indicate positive views on all three aspects concerning procedural justice, procedural justice is defined as present; otherwise, it is defined as absent (Table E.1).

Appendix F
CsQCA Analysis

The steps of csQCA analyses for the three pesticide behaviors are given below (Tables F.1, F.2, F.3, F.4, F.5, F.6, F.7, F.8and F.9).

Table F.1 Truth table for use of types of pesticides

Capacity			Amoral calculation			Legitimacy				No. of cases	V	O
A	B	C	D	E	F	G	H	I	J			
1	0	1	1	0	1	1	1	1	0	10	1	O1
0	0	1	0	1	1	1	1	1	0	9	1	O2
0	0	1	1	0	1	1	1	1	0	9	1	O3
1	0	1	0	1	1	1	1	1	0	8	1	O4
0	0	1	0	1	1	1	1	0	0	7	1	O5
0	0	1	1	1	1	1	1	1	0	7	1	O6
0	0	1	0	0	1	1	1	1	0	5	1	O7
0	0	0	0	0	1	1	1	1	0	4	1	O8
0	0	1	1	1	1	1	1	0	0	4	1	O9
1	0	1	0	0	1	1	1	1	0	2	1	O10
0	0	1	1	1	1	1	1	1	1	3	1	O11
1	0	1	1	1	1	1	1	1	0	3	1	O12
0	0	1	0	0	0	0	0	0	0	2	0	O13
1	0	1	0	0	0	0	0	0	0	2	0	O14
0	0	1	0	0	0	0	0	1	0	3	0	O15

Note V = value of use of types of pesticides; O = original combinations of characteristics; A = family gross income 2011; B = legal knowledge direcetly from the law; C = legal knowledge from other sources; D = deterrence from the state; E = deterrence from other sources; F = operational cost-benefit calculation of compliance; G = descriptive social norms of compliance; H = morals; I = generally duty to obey; J = procedural justice; frequency cutoff: 2; consistency cutoff: 0.8

H. Yan, *Pesticide Law and Compliance Decision Making*,
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Table F.2 CsQCA solutions for use of types of pesticides

	P	S	No. of cases
O1a	P1. b* C * F * G * H * I * j	S1.Medium capacity * medium amoral calculation * high legitimacy	48
	P2. a * b * C* E * F * G * H* j	S2.Medium capacity * high amoral calculation * medium legitimacy	27
	P3. a * b * d * e * F * G * H * I * j	S3. Low capacity * medium amoral calculation * high legitimacy	9
	P4. a * b * C * D * E * F * G * H * I	S4. Medium capacity * high amoral calculation * high legitimacy	10
O1b	P5. b * C * d * e * f * g * h * i * j	S5.Medium capacity * low amoral calculation * low legitimacy	4
	P6. a * b * C * d * e * f * g * h * j		5

Note O1a = logically possible patterns for compliance as present; O1b = logically possible patterns for compliance as absent; P = simplified patterns based on csQCA logic and tools; S = simplification in the broader categories; the lower-case letters represent the absence of a given causal factor; * signifies logical AND; abbreviations: see Table F.1(a)

Table F.3 Simplified pattern chart for use of types of pesticides

P	Original combinations of characteristics														
	O1	O2	O3	O4	O5	O6	O7	O8	O9	O 10	O 11	O 12	O 13	O 14	O 15
P1	×	×	×	×		×	×			×		×			
P2		×			×	×			×						
P3							×	×							
P4						×					×				
P5													×	×	
P6													×		×

Abbreviations: see Table F.1(a, b)

Table F.4 Truth table for disposal of pesticide containers

Capacity			Amoral calculation		Legitimacy				No. of cases	V	O
A	B	C	D	E	G	H	I	J			
1	0	0	0	0	1	1	0	0	2	1	O1
0	0	0	0	0	1	1	0	0	2	1	O2
1	0	1	1	0	1	1	1	0	5	1	O3
0	0	0	0	0	1	1	1	0	7	1	O4
1	0	1	0	0	1	1	1	0	6	1	O5
1	0	0	0	0	1	1	1	0	6	1	O6
0	0	1	0	0	1	1	1	0	5	1	O7
0	0	0	0	0	0	1	1	0	11	0	O8
0	0	0	0	0	0	0	0	1	2	0	O9

(continued)

Table F.4 (continued)

Capacity			Amoral calculation		Legitimacy				No. of cases	V	O
A	B	C	D	E	G	H	I	J			
0	0	0	0	0	0	0	0	0	7	0	O10
0	0	1	0	0	0	0	1	0	2	0	O11
1	0	0	0	0	0	0	1	0	7	0	O12
0	0	1	0	0	0	1	1	0	2	0	O13
1	0	0	0	0	0	1	0	0	2	0	O14
1	0	0	0	0	0	1	1	0	2	0	O15
0	0	0	0	0	0	0	1	0	14	0	O16

Note V = value of disposal of pesticide containers; frequency cutoff: 2; consistency cutoff: 0.8; abbreviations: see Table F.1(a)

Table F.5 CsQCA solutions for disposal of pesticide containers

	P	S	No. of cases
O2a	P1. b * c * d * e * G * H * j	S1. Low capacity * low amoral calculation * medium legitimacy	22
	P2. b * d * e * G * H * I * j	S2. Low capacity * low amoral calculation * high legitimacy	24
	P3. A * b * C * e * G * H * I * j	S3. High capacity * low amoral calculation * high legitimacy	11
O2b	P4. b * c * d * e * g * I * j	S4. Low capacity * low amoral calculation * low legitimacy	34
	P5. a* b * d * e * g * I * j		29
	P6. a * b * c * d * e * g * h * i		9
	P7. A * b * c * d * e * g * H * j	S5. Medium capacity * low amoral calculation * low legitimacy	4

Note: O2a = logically possible patterns for compliance as present; O2b = logically possible patterns for compliance as absent; abbreviations: see Table F.1(a, b)

Table F.6 Simplified pattern chart for disposal of pesticide containers

P	Original combinations of characteristics															
	O1	O2	O3	O4	O5	O6	O7	O8	O9	O 10	O 11	O 12	O 13	O 14	O 15	O 16
P1	×	×		×		×	×									
P2				×	×	×	×									
P3			×		×											
P4								×				×			×	×
P5								×			×		×			×
P6									×	×						
P7														×	×	

Abbreviations: see Table F.1(a, b)

Table F.7 Truth table for time interval

Capacity			Amoral calculation			Legitimacy				No. of cases	*V*	*O*
A	B	C	D	E	F	G	H	I	J			
1	0	1	0	0	1	1	1	0	0	2	1	O1
0	0	1	0	0	1	1	1	1	0	8	1	O2
0	0	0	0	0	1	1	1	1	0	6	1	O3
1	0	1	0	0	1	0	1	0	0	2	1	O4
1	0	1	0	0	1	1	1	1	0	3	1	O5
1	0	1	1	0	1	1	1	1	0	4	1	O6
0	0	1	0	0	1	1	1	0	0	5	1	O7
0	0	0	0	0	0	0	1	1	0	5	0	O8
1	0	1	0	0	0	0	1	1	0	4	0	O9
1	0	0	0	0	0	0	0	1	0	5	0	O10
0	0	0	0	0	0	0	1	0	0	3	0	O11
1	0	1	0	0	0	0	0	1	0	6	0	O12
0	0	1	0	0	0	0	1	0	0	3	0	O13
0	0	1	0	0	0	0	0	0	0	3	0	O14
0	0	0	0	0	0	0	0	0	0	2	0	O15
0	0	0	0	0	0	0	0	1	1	2	0	O16
0	0	1	0	0	0	0	0	0	1	2	0	O17
0	0	1	0	0	0	0	0	1	0	2	0	O18
1	0	0	0	0	0	0	1	1	0	2	0	O19
0	0	1	0	0	0	0	1	1	0	6	0	O20
0	0	0	0	0	0	0	0	1	0	12	0	O21

Note V = value of time interval; frequency cutoff: 2; consistency cutoff: 0.8; abbreviations: see Table F.1(a)

Table F.8 CsQCA solutions for time interval

	P	S	No. of cases
O3a	P1. b * C * d * e * F * G * H * j	S1. Medium capacity * medium amoral calculation * medium legitimacy	18
	P2. A * b * C * d * e * F * H * i * j	S2. High capacity * medium amoral calculation * low legitimacy	4
	P3. a * b * d * e * F * G * H * I * j	S3. Low capacity * medium amoral calculation * high legitimacy	14
	P4. A * b * C * e * F * G * H * I * j	S4. High capacity * medium amoral calculation * high legitimacy	7
O3b	P5. a * b * d * e * f * g * j	S4. Low capacity * low amoral calculation * low legitimacy	36
	P6. b * d * e * f * g * I * j	S5. Low capacity * low amoral calculation * low legitimacy	42
	P7. a * b * C * d * e * f * g * h * i	S6. Low capacity * low amoral calculation * low legitimacy	5
	P8. a * b * c * d * e * f * g * h * I	S7. Medium capacity * low amoral calculation * low legitimacy	14

Note: O3a = logically possible patterns for compliance as present; O3b = logically possible patterns for compliance as absent; abbreviations: see Table F.1(a, b)

Table F.9 Simplified pattern chart for outcome O3

P	Original combinations of characteristics																				
	O1	O2	O3	O4	O5	O6	O7	O8	O9	O 10	O 11	O12	O13	O14	O15	O 16	O 17	O 18	O 19	O 20	O 21
P1	×	×			×		×														
P2	×			×																	
P3			×	×																	
P4					×	×						×				×					
P5								×			×		×	×	×			×		×	×
P6								×	×	×		×						×	×	×	×
P7														×			×				
P8																×					×

Abbreviations: see Table F.1(a, b)

Appendix G
Additional Interviews

Prior to the formal interviews with vegetable farmers, some semi-structured interviews were conducted with several farmers to collect some detailed and directive information. In addition, local pesticide regulatory officers (informants in the local agricultural bureau and some other relevant informants), village committee members, relative insiders in agricultural integration organizations (vegetable cooperatives with large farms, vegetable cooperatives or associations cooperating with local vegetable farmers with small farms) and related informants in agricultural materials companies (pesticide operation stores or pesticide operation branches) were selected for semi-structured interviews to collect supplementary materials. All of these interviews were mainly conducted by conversations and observation. It was felt to be much more important to know about things rather than measure things. The detailed interview questions are listed below separately.

G_1 Preparatory interviews with several vegetable farmers in the pilot phase

This was an essential and preparatory stage for the formal case interviews. It served to provide information and materials, seeking for an appropriate way to draw up the formal case interview questions, and checking and getting truthful answers. Several vegetable farmers were selected and interviewed. In order to collect truthful and honest answers, the interviewer selected these farmers who trusted her the most and these whom she knew well, these with experience in vegetable planting who were well-known in the village because of vegetable planting were also considered. The detailed interview outline is given below.

The interviewer showed every vegetable farmer the chart of types of pesticides and asked them the following:

$G_{1.1}$ How do vegetable farmers recognize and name the kinds of vegetable pesticides on the chart[20]? Do they continue to call them by their brand name? Or do they begin to use the changed common names or simplified common names? If neither,

[20]According to Article 8, The Procedures for the Administration of Pesticide Labels and Guidelines, Article 2 Decree No.009 of the Ministry of Agriculture of the People's Republic of China, and Decisions about Revising Measures for the Implementation of Regulations on Control of Agricultural Chemicals, pesticide names refer to pesticide common names or simplified common names, which came into effect on 8 January 2008.

H. Yan, *Pesticide Law and Compliance Decision Making*,
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how do they recognize and name these pesticides now? By the pesticide producer or the trademark?

Note: these questions are designed to figure out the farmers' own language of what they call different kinds of pesticides, which is helpful when asking them questions about pesticide usage in their own languages and to overcome any misunderstanding. After asking the question, the interviewer should note down the farmers' own way of naming the kinds of pesticides.

$G_{1.2}$ Are there any changes in the vegetable farmers' use of types of pesticide?

If yes, since when? Why did that happen? Which pesticides did vegetable farmers use before?[21] (let farmers speak first and then show them the chart and ask them to identify items). Can vegetable farmers continue to buy these old pesticides? If yes, from where? Which pesticides do vegetable farmers usually use now? (show them the chart and ask them to identify first and then supplement).

If no, what types of pesticides do vegetable farmers usually use? (show them the chart and ask them to recognize first and then to supplement).

Note: these questions were designed to clarify whether there had been a big change in the use of pesticide types after the change of pesticide regulations, and to simplify the types of pesticides in the chart while making sure that some frequently used pesticides are listed. These illegal types should not be deleted. The interviewer should mark and remember these pesticides frequently used by farmers, and supplement the banned pesticides in the chart. Also delete these types they never or seldom use.

$G_{1.3}$ What are the main functions of pesticides listed in the chart (including these types supplemented during the above process)? Are there any alternatives for each pesticide listed?

Note: these questions are designed to understand the main functions of all kinds of pesticides, and to seek alternatives for each illegal pesticide, which is helpful for comparing legal and illegal alternative pesticides (specifically for measuring the operational cost-benefit calculation of compliance). Note that the interviewer should write down the functions of pesticides and ask about the functions of these illegal pesticides as well as figure out their possible alternatives.

$G_{1.4}$ What kinds of pesticide containers pesticides are usually used? How do vegetable farmers dispose of these containers? Are there different methods of disposing of different kinds of containers?

[21] In 2002, 37 types of extremely toxic and highly toxic pesticides were prohibited for use on vegetables by the Ministry of Agriculture, including 18 types of pesticides that were no longer permitted to be used, while the remaining 19 types were prohibited for application on vegetables, fruit trees, teas and traditional Chinese herbal medicines. (For more details, please see Announcement No. 199 of the Ministry of Agriculture of the People's Republic of China). Later in 2003, five high-ly 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 (For more details, please see Announcement No. 322 of the Ministry of Agriculture of the People's Republic of China.).

Note: these questions are designed to clarify the vegetable farmers' possible disposal methods.

$G_{1.5}$ How do vegetable farmers deal with the time interval between the last pesticide application and vegetable harvesting? What is their general time interval? Do they have any rules? If so, how do they decide on the time interval? According to traditional experience? Or by the nature of different types of pesticides? Or by the weather? Or by vegetable quotation? Or by reading the pesticide instructions? Or by asking other farmers in the village?

Note: these questions are designed to understand the vegetable farmers' considerations of the time interval between the last pesticide application and vegetable marketing, which is helpful for seeking a suitable and non-confrontational method for interviewing respondents and checking their answers.

$G_{1.6}$ Did the local government organize any pesticide training courses? If yes, which agencies conducated them? For whom? Did they publicize any rules concerning the use of types of pesticides, or disposing of pesticide containers, or time interval? How? Was there any influence on the farmers' pesticide behaviors?

$G_{1.7}$ What do you think about the local agricultural bureau's pesticide regulatory measures? Are they doing a good job?

Note: these questions are designed to understand the enforcement performance of the local pesticide regulatory agency as well as its effect on pesticide compliance, which is helpful for obtaining background information on the objective pesticide enforcement.

G_2 Interviews with some local pesticide regulatory officers (officers in the local agricultural bureau or other informants)

The interviewer first sought possible "guanxi" in the local agricultural bureau and then introduced herself to the agency that as a sociologist who would like to learn about the pesticide laws and rules. Then she conducted interviews with some relevant officers based on the pre-designed interview outline. During the process, she encouraged the dialogues to flow in a certain order and allowed the informants to continue the dialogues themselves. She paid attention to the conversation continuity and gave some appropriate guidance when they digressed from the subject. The interview outline is presented as follows.

$G_{2.1}$ What are the responsibility divisions of the local agricultural bureau (e.g., the agricultural law enforcement brigade)? What is their daily working schedule for pesticide regulation (e.g., pesticide market investigations; random field inspections; training for vegetable farmers; forecasts of diseases, pests and weeds; activities of organizing and promoting safe and effective pesticides, etc.)?

$G_{2.2}$ What are the training services or instructions carried out to promote vegetable farmers' legal, quality and safety awareness of vegetable products and safety level of pesticide application (e.g. financial support; publicity of basic knowledge of pesticide laws and rules; basic knowledge of pesticides, and technological knowledge of pesticide application; promotions of awareness of applying pesticides in correct ways, etc.)?

$G_{2.3}$ What are the enforcement instruments of the agricultural law enforcement brigade? What are its enforcement resources (including quantity and quality of law enforcement officers, funds, etc.)?

$G_{2.4}$ What do you think of the performance of the local vegetable farmers' pesticide compliance behavior? To what extent do they comply or not comply? Do you have any ideas about why they comply or do not comply? Do you have any suggestions for regulating farmers' pesticide compliance behavior?

$G_{2.5}$ Please indicate if any critical pesticide violation cases of vegetable farmers happened in the past 5 years. What happened? What were the results?

Note: the interviewer should pay attention to writing down some other useful information during the conversation and process of observation. If possible, the interviewer should accompany officers on an inspection, focus on aspects including how they choose inspection areas, how many cars they have, what they do if they find someone is violating pesticide laws and rules, how the farmers respond to them, how they issue sanctions and are the farmers deterred, do they help farmers if the farmers do not know about the law and what do they do, etc.

G_3Interviews with some local village committee members

$G_{3.1}$ What are the population and geographic characteristics of your village? (e.g. number of villagers, number of vegetable farmers, male and female ratio, arable land area, vegetable planted area, vegetable species, the constitution of vegetable farmers, history of village development, and the development of vegetable production, etc.)

$G_{3.2}$ Are there any vegetable associations or cooperatives in the village? How do they operate?

$G_{3.3}$ What do you think about the performance of the local vegetable farmers' pesticide compliance behavior? To what extent do they comply or not comply? Do you have any ideas about why they comply or do not comply? Do you have any suggestions for regulating the farmers' pesticide compliance behavior?

$G_{3.4}$ What do you think about the local agricultural bureau's pesticide regulatory measures? Are they doing a good job?

Note: the interviewer should pay attention to writing down some other useful information during the conversation and process of observation.

G_4 Interviews with some insiders in agricultural integration organizations (vegetable cooperatives, vegetable associations or farmer-based vegetable cooperatives)

$G_{4.1}$ How does your organization operate? Do you have any regulations? Do you cooperate with local farmers, and how does the organization regulate their pesticide behavior? Do you have any contact with the local enforcement agency?

$G_{4.2}$ What do you think about the local vegetable farmers' pesticide compliance behavior? To what extent do they comply or not comply? Do you have any ideas about why they comply or do not comply? Do you have any suggestions for regulating the farmers' pesticide compliance behavior?

$G_{4.3}$ What do you think about the local agricultural bureau's pesticide regulatory measures? Are they doing a good job?

Note: the interviewer should pay attention to writing down some other useful information during the conversation and process of observation.

G_5 Interviews with some informants in the agricultural materials company (pesticide operational stores or pesticide operational branches)

$G_{5.1}$ What are the main sources of the vegetable pesticides sold in your company? Which one(s) sell(s) best? Have you ever stocked unqualified or fake pesticides? If yes, have you ever taken any actions to protect your rights and benefits? If yes, what happened? What were the results?

$G_{5.2}$ Do you know of any governmental initiatives prohibiting the use of highly and extremely toxic pesticides? What do you think about this? Does it affect your pesticide business (both negative and positive)?

$G_{5.3}$ What do you think about the local vegetable farmers' pesticide compliance behavior? To what extent do they comply or not comply? Do you have any ideas about why they comply or do not comply? Do you have any suggestions for regulating the farmers' pesticide compliance behavior?

$G_{5.4}$ What do you think about the local agricultural bureau's pesticide regulatory measures? Are they doing a good job?

$G_{5.5}$ Do you think that some pesticide operation branches or stores in the rural areas still sell any prohibited highly or extremely toxic pesticides? Which one(s)?

Note: the interviewer should pay attention to writing down some other useful information during the conversation and process of observation.

References

Becker, Crime. 1968. Punishment: an economic approach, *Journal of Political Economy* 169 (177): 183–184.

Thornton, Dorothy, Neil Gunningham, and Robert A. Kagan. 2005. General deterrence and corporate environmental behavior. *Law & Policy* 27 (2): 262–288.

Winter, Soren C. and Peter J. May. 2001. Motivation for compliance with environmental regulations. *Journal of Policy Analysis and Management* 20 (4): 675–698.

Kagan, R. A. and J. T. Scholz. 1984. The criminology of the corporation and regulatory enforcement strategies. Enforcing Regulation 67: 69–74.

Cialdini, Robert B. 2007. Descriptive social norms as underappreciated sources of social control. *Psychometrika* 72 (2): 263–268.

Tyler, Tom R. 1990. Why people obey the law. New Haven and London: Yale University Press.

McGraw, Kathleen M. and John T. Scholz. 1991. Appeals to civic virtue versus attention to self-interest: Effects on tax compliance. *Law and Society Review* 471–498.

Summary

Why Chinese Farmers Obey the Law:
Pesticide Compliance in Hunan Province, China
Huiqi Yan

The goal of this book is to analyze pesticide compliance in China. By doing so, this book seeks to provide a more comprehensive understanding of compliance and some feasible and adaptive suggestions for enhancing pesticide enforcement effectiveness in China. It seeks to benefit from both qualitative and quantitative methods, and uses a larger N qualitative approach which allows for systematic analysis and in-depth exploration.

Chapter 1 begins by describing the weak implementation of Chinese laws and rules, and emphasizes the necessity and importance of a compliance perspective in China that focuses on why the regulated actors obey or break the law. It reviews some recent compliance and pesticide compliance literature in both developed and developing economies. The theoretical and methodological relevance as well as innovations are presented by illustrating the gaps in the existing literature. Building on all these, this chapter proposes the main research questions.

The first one is: *what are the main factors and how do they interact to shape vegetable farmers' pesticide compliance or violation behavior in Hunan Province in China?* The second one is: *what are promising strategies to coordinate and strengthen pesticide regulation in China, with the aim to increase pesticide compliance?* The third one is: *what are the theoretical implications from this pesticide compliance study in the Chinese regulatory context for regulatory compliance theory?*

In order to define and understand pesticide compliance better, this chapter briefly introduces the background and legal context of the pesticide case, including the legal framework, and the regulatory divisions and responsibilities. Specifically, this book focuses on three aspects to measure vegetable farmers' pesticide compliance: use of types of pesticide, disposal of pesticide containers, and time interval between pesticide spraying and vegetable harvesting. It also concentrates on the county agricultural bureau responsible for enforcing pesticide compliance locally. The last two sections of this chapter deal with research limitations and an outline of the other chapters.

H. Yan, *Pesticide Law and Compliance Decision Making*,
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Chapter 2 presents the theoretical framework underlying this book. It operationalizes compliance into three aspects: definition, causality and measurement of compliance. It defines compliance and regulatory compliance, proposes compliance motivations, and explains how to measure compliance in a specific regulatory context. Specifically, compliance is understood here as the regulated actor's conformance with regulatory laws and rules. Eight individual compliance variables were examined: (1) operational cost-benefit calculation, (2) deterrence, (3) descriptive social norms, (4) morals, (5) general duty to obey the law, (6) procedural justice, (7) ability to obey, and (8) legal knowledge. These variables were classified into three broad categories: amoral calculation, legitimacy and capacity.

Subsequently, Chap. 2 addresses the methodology by illustrating the process of case selection and case interview, the specific data measurement, and the coding method. This book employed a stratified sampling method for selecting respondents. Altogether, 119 vegetable farmers in ten villages in three counties of Hunan Province in China were selected, with complementary interviews with another 31 informants or insiders during the case interview period. Three specific case interview phases were done: the pilot study phase, the in-depth case interview phase, and the supplementary material and data analysis phase. The three phases coherently connect with one another, with the preceding phase preparing for and supporting the next. In the pilot study phase, some background information and a refined and structured interview question outline were prepared; in the in-depth case interview phase, a specific dialogical strategy was employed for conducting in-depth interviews with respondents, which enabled the interview to flow naturally; some supplementary materials were collected after the interview period. All the data collected were analyzed by means of descriptive data analysis, texts and quotes. In addition, a specific crisp-set Qualitative Comparative Analysis method (referred to as csQCA) was employed to analyze how all the variables defined interact to produce compliance. Finally, this chapter examines the vegetable farmers' self-reported pesticide compliance behavior. The majority of them indicated compliance with rules on the use of types of pesticides, but fewer of them indicated compliance with rules on disposal and time interval.

Chapter 3 begins by exploring the first compliance paradigm: amoral compliance calculation. It seeks to examine how the vegetable farmers' perceptions of amoral calculation (including operational cost-benefit calculation and deterrence) affect their pesticide compliance behavior. In this book, the variable of operational cost-benefit calculation is used to help analyze compliance by looking at how the actors make rational amoral decisions on how to use pesticides based on their expected costs and their yields or gross return. The variable of deterrence helps analyze compliance by examining how the regulated actors are motivated by threats of possible costs with regards to punishments or legal sanctions. A subjective utility approach, built on a specific dialogical scheme, is employed to look at how the regulated actors perceive the amoral calculation elements.

Based on the collected data, this chapter concludes that, first, the operational cost-benefit calculation of compliance is almost always positively associated with the vegetable farmers' pesticide compliance, while deterrence has more mixed

results, especially with quite a few compliant farmers reporting low deterrence. Second, both elements of amoral calculation were shown to be highly contextual, with clear differences among different vegetable farmers, showing the relevance of the idea of "deterrability" and the benefits of using a subjective dialogical approach to amoral calculation. Some offenders (cooperatives or associations instead of individual vegetable farmers) and offences (use of types of pesticides instead of disposal and time interval) are more susceptible to deterrence. Other factors such as their geographic location, the nature of the vegetables they plant, and their knowledge and experience also contribute to variations in their subjective amoral cost-benefit calculation. However, this chapter finds that context is not everything as even very similar farmers can have different calculations, and thus more individualistic elements such as personality and individual preferences and knowledge may be involved.

Chapter 4 analyzes how the legitimacy of law is related to compliance. The vegetable farmers' perceptions of legitimacy elements, including descriptive social norms, morals, general duty to obey the law and procedural justice, as well as how such perceptions stimulate or hinder their pesticide compliance behavior are examined. Specifically, descriptive social norms assume that regulated actors are motivated by what most similar others do (social legitimacy), morals look at the regulated actor's intrinsic moral judgment (moral legitimacy); general duty to obey the law assumes that regulated actors' compliance behavior is shaped by their belief in the legitimacy of the state power of imposing regulations (systematic legitimacy); procedural justice examines the regulated actors' discernment of the enforcing officers' honesty, the enforcement authorities' procedural fairness, and the overall assessment of the enforcement agencies (procedural legitimacy).

Based on the collected data, this chapter concludes that, in general, there is compliance legitimacy which is situational. Except for procedural justice, the farmers' indicated descriptive social norms of compliance, morals, and general duty to obey the law are situational and circumstantial. The three elements of legitimacy are shown to be rather contextual and highly varied among different vegetable farmers in different settings. The variations might be explained by variables including the type of vegetable farmer, the geographic location, the type of the vegetables they plant, their education level and pesticide training and knowledge, the local economic development, and their personal experience with pesticide compliance or other relevant experiences. The farmers' perceived or indicated descriptive social norms of compliance as well as morals being positively related to their self-reported compliance behaviors is a situational issue. In other words, vegetable farmers only report compliance when they focus on either of the two elements. However, there seems to be no obvious association between their indicated general duty to obey the law as well as their perceptions of procedural justice and their reported compliance behavior.

Chapter 5 deals with the third compliance paradigm: capacity. Capacity consists of two elements: ability to obey and legal knowledge. The former assumes that the regulated actors' compliance is shaped by their ability to obey the law; the latter analyzes compliance by looking at the regulated actors' knowledge about the

relevant laws and rules. This chapter analyzes the vegetable farmers' indicated financial and technical abilities (using annual family gross income and reported need of technology as proxies) as well as knowledge of pesticide rules, and how the indicated capacity elements influence their pesticide compliance behavior.

Based on the systematically collected data from the 119 vegetable farmers, this chapter concludes that, first, there is a moderate relationship between the vegetable farmers' legal awareness and their compliance behavior, with these who indicate high awareness of legal rules more frequently indicating compliance. Moreover, the farmers' different sources of legal knowledge also influence their pesticide compliance differently, with these who indicate obtaining legal knowledge directly from the law or translated by an official source more frequently indicating compliance. Second, the vegetable farmers' indications of capacity elements vary. For financial ability, such a variation could be explained by some circumstantial variables like the type of vegetable farmer, the geographic location, the local economic development and the local governmental policies. For technical ability (using reported need of technology as a proxy) little variation was found, although the vegetable farmers showed varied legal knowledge. Moreover, they specified differing legal and extralegal actors providing legal translation. Such variations could be largely explained by the type of vegetable farmer and the pesticide behaviors studied. Furthermore, vegetable farmers tend to choose legal translators by the trustworthiness and consistency of the sources. Third, no obvious association was found between the vegetable farmers' financial ability (using annual family gross income as a proxy) and their pesticide compliance behavior.

In contrast to the previous three chapters, which examined categorized compliance variables, Chap. 6 seeks to understand better how all the compliance variables interact to shape compliance. Using csQCA logic and tools, this chapter explores the data in two ways: (1) by discussing the interaction between all individual variables and seeking to explore (a) path(s) through which variables interact to produce compliance, and (2) by discussing the interaction between the variables when grouped into the "ideal" types found in existing compliance literature: capacity, amoral calculation and legitimacy.

This chapter draws conclusions as follows: first, complex paths were found with plural and contingent combinations of variables leading to compliance; second, the csQCA data do not confirm the approach of the "ideal" types. Plural constellations of the three broader categories rather than singular ones were seen. Nevertheless, the ideal typical approach could be used as a tool, to some extent, to simplify complex patterns and understand how variables interact to produce compliance, as well as figuring out the possible underlying compliance dynamics.

Chapter 7 concludes the research. It starts by summarizing the results. Building on these findings, it presents some key theoretical and methodological insights as well as regulatory and policy implications. From the theoretical perspective, this research shows the significance of exploring how variables behave, the variation of key compliance variables, contextual and subjective explanations for variations of variables; variations of variables shape variations in compliance and many explanatory paths for compliance. From the methodological perspective, this

research shows insights by means of a larger N qualitative method study which features both in-depth qualitative understanding and enlarged representativeness of the respondents, a subjective utility approach and a "dialogical" strategy, and the use of the csQCA method to analyze compliance.

With regards to regulatory and policy implications, in general, a form of responsive regulation is suggested. Specifically, it should follow a case-specific enforcement strategy, combining a mix of regulatory approaches and engaging various parties. Meanwhile, such combinations of approaches and broader engagement should particularly respond to the contextual and subjective conditions of the regulated actors.

Finally, some possibilities for future research are discussed, such as explorations of the influence of individual preferences and personality on compliance behavior, explorations of the influence of much broader social and political contexts on compliance, focusing on the perspective of pesticide regulators, and usage of other QCA tools and techniques.

Bibliography

An Baijie (China Daily). Mining company blamed for blast., on 11 Sept 2012. http://www.chinadaily.com.cn/china/2012-09/11/content_15748563.htm.

Axelrad, Lee and Robert A. Kagan. 2000. *Regulatory encounters: Multinational corporations and American adversarial legalism*, vol. 1 University of California Pr.

Beccaria, C. 1764. On crimes and punishments. In *Theories of Punishment*, ed. Grupp, S.E. Indiana University Press, Bloomington.

Black, J. 2001. Decentring regulation: Understanding the role of regulation and self-regulation in a Post-Regulatory world. *Current Legal Problems* 54: 103–146.

Black, J. 2008. Constructing and contesting legitimacy and accountability in polycentric regulatory regimes. *Regulation & Governance* 2: 137–164.

CCTV.com. Corruption cases in 2012, 1 Sept 2013. http://english.cntv.cn/program/china24/20130109/108159.shtml.

China Daily. KFC supplier used excessive additives in chicken feed, 21 Dec 2012. http://www.chinadaily.com.cn/china/2012-12/21/content_16037397.htm.

Cialdini, Robert B., and Noah J. Goldstein. 2004. Social influence: Compliance and conformity. *Annual Review Psychology* 55: 591–621.

David Butcher. What Chinese IP violations cost the U.S., 2 Aug 2011. http://news.thomasnet.com/IMT/2011/08/02/what-chinese-intellectual-property-violations-cost-american-businesses-economy/.

Development Research Centre of the State Council (DRC). 2004. Zhonguo Shipin Anquan Celue Yanjiu (China's food safety strategy research), Editors: Chen Xiwen, Deng Nan; Associate editors: Han Jun, Wang Xiaofang, Chemical Industry Press, Beijing.

Fryxell, Gerald E., and W.Lo. Carlos. 2003. The influence of environmental knowledge and values on managerial behaviors on behalf of the environment: An empirical examination of managers in China. *Journal of Business Ethics* 46: 45–69.

Hood, Christopher, Henry Rothstein and Robert Baldwin. 2001. *The government of risk: Understanding risk regulation regimes*. Oxford University Press.

Jerome A. Cohen. Law Unto Itself, South China morning post, 30 Mar 2011. http://usali.org/wp-content/uploads/2011/03/2011.3.30-SCMP-Cohen-Law-unto-itself.pdf.

Kagan, R.A.N. Gunningham and D. Thornton. 2003. Explaining corporate environmental performance: How does regulation matter? *Law & Society Review* 37 (1): 51–90.

Kelman, Herbert C. 1958. Compliance, identification, and internalization: Three processes of attitude change. *The Journal of Conflict Resolution* 2 (1): 51–60.

Liu, Elaine M. and Jikun Huang. 2013. Risk preferences and pesticide use by cotton farmers in China. *Journal of Development Economics*.

Lo, Carlos WH. 2005. Governmental and societal support for environmental enforcement in China: An empirical study in Guangzhou. *Journal of Development Studies* 41 (4): 558–588.

Michelson, Ethan and Benjamin Read. 2011. Public attitudes toward official justice in Beijing and Rural China. Chinese Justice.

H. Yan, *Pesticide Law and Compliance Decision Making*,
DOI 10.1007/978-981-10-3917-1

Reno, Raymond R., Robert B. Cialdini and Carl A. Kallgren. 1993. The transsituational influence of social norms. *Journal of Personality and Social Psychology* 64 (1): 104.

Rousseau, Jean Jacques and Ed by N.K. Singh. 2006. *Of the social contract, or, principles of political right*. Global Vision Publishing House.

Scott, Colin. 2004. Regulation in the age of governance: The rise of the post-regulatory state. In *The Politics of Regulation: Institutions and Regulatory Reforms for the Age of Governance* 145.

The New York Times. 2013. Costs of environmental damage in china growing rapidly amid industrialization, 29 March 2013. http://www.nytimes.com/2013/03/30/world/asia/cost-of-environmental-degradation-in-china-is-growing.html?ref=asia.

The New York Times. 2013. Air pollution linked to 1.2 million premature deaths in China, 1 April 2013. http://www.nytimes.com/2013/04/02/world/asia/air-pollution-linked-to-1-2-million-deaths-in-china.html?_r=0.

Troyer, Ronald J. 1989. Publicizing new laws: The public legal education campaign. *Social Control in the People's Republic of China* 70–83.

Tyler, Tom R. 2006. Psychological perspectives on legitimacy and legitimation. *Annual Review Psychology* 57: 375–400.

Tyran, Jean-Robert and Lars Feld. 2002. Why people obey the law: Experimental evidence from the provision of public goods. CESifo Working Papers, no. 651 (2).

Van Rooij, Benjamin. Stern, Rachel E. and Furst, Kathinka. 2014. The authoritarian logic of regulatory pluralism: Understanding China's new environmental actors. UC Irvine School of Law Research Paper No. 2014–26. SSRN: http://ssrn.com/abstract=2413872.

Viswanathan, K. Kuperan, N. Mustapha, Indah Susilowati, Ida M. Siason and Cynthia Ticao. 1997. Enforcement and compliance with fisheries regulations in Malaysia, Indonesia and the Philippines. In *Proceedings of the International Workshop on Fisheries Co-management* 1–25.

Wang, Hua, Nlandu Mamingi, Benoit Laplante, and Susmita Dasgupta. 2003. Incomplete enforcement of pollution regulation: Bargaining power of chinese factories. *Environmental and Resource Economics* 24 (3): 245–262.

Wenzel, Michael. and Centre for Tax System Integrity. 2005. Motivation or rationalisation? Causal relation between ethics, norms and tax compliance. Canberra: Centre for Tax System Integrity.

Wenzel, Michael. and Integrity Centre for Tax System. 2001. Misperceptions of social norms about tax compliance (2): A field-experiment centre for tax system integrity.

World Health Organization. 2008. Children's health and the environment. WHO Training Package for the Health Sector.

Zhao, Jianxin. 2008. Nonghu Anquan Shucai Gongji Juece Jizhi Yanjiu—Jiyu Heibei、Shandong He Zhejiang Nongnong De Shizheng (Research on farmers' decision-making mechanism on safe vegetable supply: Empirical study based on vegetable farmers in Hebei, Shandong and Zhejiang). Doctoral Thesis from CNKI (China Knowledge Resource Integrated Database), http://oversea.cnki.net/kns55/default.aspx.