

Supplementary Material

Endosulfan Residues and Farmers' Replacement Behaviours of Endosulfan in the Northwest Inland Cotton Region

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Questionnaire on Knowledge, Attitude, and Behavior towards the Elimination and Alternative Technologies of Endosulfan

I. Basic information of participants in the questionnaire (a total of 11 questions in this part)

1. Your gender [single-choice] *

- Male
- Female

2. Your age [fill in the blank] *

3. Your education level [single-choice] *

- Below primary school
- Primary school
- Junior high school
- High school or technical secondary school
- College and above

4. Number of permanent residents in your home [fill in the blank] *

5. Are you the main labor force for family cotton planting [single-choice] *

- Yes
- No

6. Are you enrolled in a cooperative [single-choice] *

- Yes
- No

7. Cotton Sowing Area (mu) in 2020 [single-choice] *

- 50 mu and below
- 51-100 mu
- 100-499 mu
- 500 mu or more

8. How long have you grown cotton [fill in the blank] *

9. Is the income from cotton cultivation the main source of income for your family [single-choice] *

- Yes
- No

II. Knowledge related to endosulfan (8 questions in total in this part)

10. What type of pesticide is endosulfan [single-choice] *

- Organophosphorus
- Organic chlorine
- Pyrethroids
- Nicotinoids

11. Toxicity of endosulfan is [single-choice] *

- Highly toxic
- High toxicity
- Moderate toxicity
- Low toxicity

12. In China, endosulfan is mainly applied to control [single-choice] *

- Cotton aphid
- Red spider
- Cotton bollworm
- Tetranychid

13. How long is the shelf-life of endosulfan in general [single-choice] *

- 1 year
- 1.5 years
- 2 years
- 3 years

14. What is the maximum times of use per growing season when endosulfan is used for pest control [single-choice] *

- 1 time
- 2 times
- 3 times
- 4 times

15. How to apply endosulfan [single-choice] *

- Spray method
- Water method
- Applying to root or casting
- Fumigation

16. Is endosulfan currently produced, sold and used in the country [single-choice] *

- Production is not allowed, but still can be sold and used
- Production and sales are not allowed, but still can use
- Can be produced, sold and used
- Shall not be produced, sold or used

17. Which of the following crops can endosulfan be currently used for [single-choice] *

- Tobacco
- Fruit trees
- Cotton
- None of the above is allowed

III. Attitude towards endosulfan phase-out and application of alternative technologies (6 questions in this part)

18. Will the ban on endosulfan have implications for cotton pest control [single-choice] *

- Influential
- Not clear
- No impact

19. Do you think endosulfan should be banned [single-choice] *

- No

- Yes

20. The cost for controlling cotton pests using biological pesticides, sex pheromones, natural enemies and other methods is higher than that of traditional pesticides. Is this acceptable to you [single-choice] *

- Yes
- No

21. Would you like to receive the information and participate in the technical training on pesticide ban and restriction [single-choice] *

- Yes
- Not interested
- No idea

22. Has the relevant government department organized training on green prevention and control technology [single-choice] *

- Yes
- No

23. Has the relevant government department publicized on green prevention and control technology [single-choice] *

- No
- Yes

IV. Substitution behavior of endosulfan (4 questions in total in this part)

24. Have you adopted any green prevention and control measures such as natural enemies, sex pheromones, and light during the cotton planting process [single choice] *

- Never used
- Occasionally
- Frequently used

25. Would you recommend the above green prevention and control measures to others [single-choice] *

- No
- Rarely recommended
- Yes

26. What do you think of the effectiveness of the above-mentioned green prevention and control technologies? [single-choice] *

- Not clear
- General
- Good

27. Will you carefully read the pesticide instructions and apply the pesticide in strict accordance with the dosage recommended in the instructions [single-choice] *

- No
- Will read that, and apply empirically
- Will read that and apply in strict accordance with the instructions

Table S1 Sampling point information

| Sampling point number | Sampling Year | Longitude | Latitude |
|-----------------------|---------------|-----------|-----------|
| 1 | 2020 | 85.635657 | 44.363468 |
| 2 | 2020 | 85.607926 | 44.369934 |
| 3 | 2020 | 85.331616 | 44.370849 |
| 4 | 2020 | 85.299031 | 44.374963 |
| 5 | 2020 | 85.690607 | 44.312533 |
| 6 | 2020 | 85.701982 | 44.346719 |
| 7 | 2020 | 85.862310 | 44.440193 |
| 8 | 2020 | 85.852947 | 44.430145 |
| 9 | 2020 | 85.873134 | 44.475091 |
| 10 | 2020 | 85.876723 | 44.505537 |
| 11 | 2020 | 85.911879 | 44.615563 |
| 12 | 2020 | 85.899811 | 44.591989 |
| 13 | 2020 | 85.878518 | 44.643071 |
| 14 | 2020 | 85.899602 | 44.617309 |
| 15 | 2020 | 85.707766 | 44.652139 |
| 16 | 2020 | 85.667331 | 44.676756 |
| 17 | 2020 | 85.666597 | 44.705948 |
| 18 | 2020 | 85.701525 | 44.697095 |
| 19 | 2020 | 85.720965 | 44.738061 |
| 20 | 2020 | 85.73980 | 44.753088 |
| 21 | 2020 | 85.708337 | 44.773107 |
| 22 | 2020 | 85.752532 | 44.597521 |
| 23 | 2020 | 85.774764 | 44.644525 |
| 24 | 2020 | 85.808394 | 44.633269 |
| 25 | 2020 | 85.822953 | 44.615736 |
| 26 | 2020 | 85.802085 | 44.606984 |
| 27 | 2020 | 85.829272 | 44.600109 |
| 28 | 2020 | 85.819788 | 44.691737 |
| 29 | 2020 | 85.842211 | 44.722855 |
| 30 | 2020 | 85.748527 | 44.562298 |
| 31 | 2020 | 85.810384 | 44.356993 |
| 32 | 2020 | 85.973707 | 44.358767 |
| 33 | 2020 | 85.974195 | 44.382405 |
| 34 | 2020 | 85.812109 | 44.298707 |
| 35 | 2020 | - | - |
| 36 | 2020 | 85.359112 | 44.656824 |
| 37 | 2020 | 86.077426 | 44.593807 |
| 38 | 2020 | 86.123037 | 44.584181 |
| 39 | 2020 | 85.231708 | 44.722878 |
| 40 | 2020 | 85.195741 | 44.773342 |
| 41 | 2020 | 85.472758 | 44.524971 |
| 42 | 2020 | 85.481750 | 44.522889 |
| 43 | 2020 | 85.571166 | 44.721690 |
| 44 | 2020 | 85.582677 | 44.788781 |
| 45 | 2020 | 85.551690 | 44.702562 |
| 46 | 2020 | 85.557575 | 44.726564 |
| 47 | 2020 | 85.129730 | 44.858974 |
| 48 | 2020 | 85.414873 | 44.655685 |
| 49 | 2020 | 85.030940 | 45.175433 |
| 50 | 2020 | 85.021741 | 45.185521 |
| 51 | 2020 | 85.049825 | 45.151306 |
| 52 | 2020 | 85.382413 | 44.597439 |
| 53 | 2020 | 85.426791 | 44.517601 |
| 54 | 2020 | 85.611618 | 44.508196 |
| 55 | 2020 | 85.608983 | 44.533093 |
| 56 | 2020 | 86.325198 | 44.838421 |
| 57 | 2020 | 86.351828 | 44.821578 |
| 58 | 2020 | 86.244961 | 44.938697 |
| 59 | 2020 | 86.173154 | 44.957330 |

| | | | |
|----|------|-----------|-----------|
| 60 | 2020 | 86.154765 | 44.953625 |
| 61 | 2020 | 86.131859 | 44.991503 |
| 62 | 2021 | 86.309667 | 41.331831 |
| 63 | 2021 | 86.28216 | 41.289373 |
| 64 | 2021 | 86.7812 | 41.7455 |
| 65 | 2021 | 86.7915 | 41.74339 |
| 66 | 2021 | 84.206627 | 41.729631 |
| 67 | 2021 | 84.267844 | 41.740794 |
| 68 | 2021 | 85.872352 | 41.339167 |
| 69 | 2021 | 76.7423 | 39.2135 |
| 70 | 2021 | 80.451589 | 40.472277 |
| 71 | 2021 | 83°11'54" | 41°4'20" |
| 72 | 2021 | 83°53'5" | 40°55'26" |
| 73 | 2021 | 83.180154 | 41.338516 |
| 74 | 2021 | 83.100622 | 41.541204 |
| 75 | 2021 | 83.183577 | 41.461688 |
| 76 | 2021 | 93°50'6" | 42°44'18" |
| 77 | 2021 | 84.2431 | 41.1657 |
| 78 | 2021 | 76°23'8" | 39°23'54" |
| 79 | 2021 | 77°37'2" | 39°0'55" |
| 80 | 2021 | 77°36'18" | 38°46'33" |
| 81 | 2021 | 78°11'31" | 39°30'41" |
| 82 | 2021 | 76°46'15" | 39°37'18" |
| 83 | 2021 | 76°29'26" | 38°40'25" |
| 84 | 2021 | 77°2'33" | 38°12'57" |
| 85 | 2021 | 77°43'43" | 39°32'43" |
| 86 | 2021 | 76.3577 | 39.5235 |
| 87 | 2021 | 76.3459 | 39.515 |
| 88 | 2021 | 76.4168 | 39.0248 |
| 89 | 2021 | 82.91629 | 41.249722 |
| 90 | 2021 | 94.818139 | 40.249544 |
| 91 | 2021 | 94.821039 | 40.249544 |
