

## Supplemental Materials

# Do Pesticide Retailers' Recommendations Aggravate Pesticide Overuse? Evidence from Rural China

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**Table S1.** Estimation results of falsification test of instrumental variable.

Variable	Pesticide retailers' recommendations	Pesticide overuse
Instrumental variable	0.007*** (0.001)	0.002 (0.001)
Male	0.220*** (0.060)	0.152** (0.061)
Age	0.003 (0.002)	0.005** (0.002)
Education	-0.031*** (0.006)	0.001 (0.006)
Village leader	-0.371*** (0.064)	-0.001 (0.056)
Technology training	-0.394*** (0.043)	-0.165*** (0.041)
Total rice-sown area	-0.013*** (0.003)	0.002 (0.001)
Late-season rice	-0.212*** (0.040)	0.221*** (0.044)
Hybrid rice	0.209*** (0.038)	0.088** (0.043)
Pesticide price	0.000*** (0.000)	-0.001*** (0.000)
Major pest	-0.045 (0.056)	0.099* (0.059)
Weed	0.032 (0.063)	-0.295*** (0.068)
Constant	-1.177*** (0.163)	-0.263 (0.170)
District dummy	Controlled	Controlled
Observations	7171	5245

Notes: Figures in parentheses are standard errors. \*\*\*, \*\*, and \* indicates the significance at the 1%, 5%, and 10% level, respectively.

**Table S2.** Descriptive statistics of main variables across provinces.

Variable	Guizhou	Hubei	Jiangsu	Zhejiang
Pesticide retailers' recommendations (1 = yes, 0 = no)	0.26(0.44)	0.27(0.44)	0.26(0.44)	0.36(0.48)
Male (1 = yes, 0 = no)	0.85(0.36)	0.92(0.27)	0.87(0.33)	0.94(0.23)
Age (years)	53.24(9.65)	56.14(9.32)	57.88(10.00)	58.95(8.96)
Education (years)	6.22(3.08)	6.67(3.11)	7.21(3.47)	6.23(3.23)
Village leader (1 = yes, 0 = no)	0.06(0.24)	0.10(0.29)	0.12(0.32)	0.10(0.30)
Technology training (1 = yes, 0 = no)	0.17(0.38)	0.34(0.47)	0.27(0.44)	0.16(0.36)
Total rice sown area (ha)	0.15(0.10)	2.06(8.12)	1.70(6.48)	3.03(17.71)
Late-season rice (1 = yes, 0 = no)	0.05(0.21)	0.12(0.33)	0.81(0.39)	0.68(0.47)
Hybrid rice (1 = yes, 0 = no)	0.96(0.19)	0.63(0.48)	0.03(0.17)	0.57(0.50)
Pesticide price (RMB/kg)	128.68(113.60)	161.38(150.09)	122.83(100.52)	120.07(125.33)
Instrumental variable (%)	25.34(9.44)	26.67(13.73)	25.61(12.99)	36.34(15.60)
Number of farmers	131	315	320	318

Notes: Data from the authors' survey. Figures outside and in parentheses are mean values and standard deviations, respectively.

**Table S3.** Number of pest-control observations and average index application rate for each pest.

Pest category	No. of pest-control observation			Index application rate (g/ha)		
	Farmers obtaining information from pesticide retailers	Farmers not obtaining information from pesticide retailers	All farmers	Farmers obtaining information from pesticide retailers	Farmers not obtaining information from pesticide retailers	All farmers
<b><u>Major pests</u></b>	1301	3654	4955	603.44	551.83	565.38
Leaf folder ( <i>Cnaphalocrocis medinalis</i> )	222	557	779	571.01	659.59	634.35
Planthopper ( <i>Nilaparvata lugens</i> Stal)	344	934	1278	710.17	436.74	510.34
Striped stem borer ( <i>Chilo suppressalis</i> )	317	819	1136	570.11	680.82	649.93
Blast ( <i>Pyricularia oryzae</i> )	190	632	822	759.77	540.70	591.34
Sheath blight ( <i>Thanatephorus cucumeris</i> )	228	712	940	390.08	480.01	458.20
<b><u>Secondary pests</u></b>	197	530	727	527.78	370.65	413.23
Aphid ( <i>Aphidoidea</i> )	28	104	132	482.74	314.33	350.05
Diamondback moth ( <i>Plutella xylostella</i> )	6	11	17	268.33	212.99	232.52
Grasshopper ( <i>Oxya yezoensis</i> )	5	18	23	170.00	1056.09	863.46
Pink stem borer ( <i>Sesamia inferens</i> )	1	20	21	7.50	176.51	168.46
Thrip ( <i>Chloethrips oryzae</i> )	22	26	48	516.04	311.90	405.46
Weevil ( <i>Echinocnemus squameus</i> Billberg)	6	18	24	1865.63	1192.64	1360.89
Yellow stem borer ( <i>Scirpophaga incertulas</i> )	19	42	61	309.12	450.99	406.80
Damping off ( <i>Rhizoctonia solani</i> )	6	15	21	3262.50	424.59	1235.42
Downy mildew ( <i>Peronospora</i> spp.)	52	88	140	548.08	279.68	379.37
False smut ( <i>Ustilaginoidea oryzae</i> )	20	114	134	85.33	269.69	242.17
Sheath rot ( <i>Sarocladium oryzae</i> )	12	9	21	379.41	566.67	459.66
Stripe ( <i>Coniella castaneicola</i> )	8	31	39	137.75	385.85	334.96
Other secondary pests (NA)	12	34	46	344.23	340.24	341.29
<b><u>Weeds</u></b>	428	1061	1489	1138.83	958.10	1010.05

Notes: Words in parentheses are Latin name of each pest.

**Table S4.** Number and proportion of pesticide-overuse observations.

Pest category	Farmers obtaining information from pesticide retailers		Farmers not obtaining information from pesticide retailers		All farmers	
	Number	Proportion (%)	Number	Proportion (%)	Number	Proportion (%)
<b><u>Major pests</u></b>	809	62.18	2089	57.17	2898	58.49
Leaf folder ( <i>Cnaphalocrocis medinalis</i> )	136	61.26	295	52.96	431	55.33
Planthopper ( <i>Nilaparvata lugens</i> Stal)	231	67.15	574	61.46	805	62.99
Striped stem borer ( <i>Chilo suppressalis</i> )	176	55.52	451	55.07	627	55.19
Blast ( <i>Pyricularia oryzae</i> )	109	57.37	344	54.43	453	55.11
Sheath blight ( <i>Thanatephorus cucumeris</i> )	157	68.86	425	59.69	582	61.91
<b><u>Secondary pests</u></b>	117	59.39	283	53.40	400	55.02
Aphid ( <i>Aphidoidea</i> )	21	75.00	78	75.00	99	75.00
Diamondback moth ( <i>Plutella xylostella</i> )	2	33.33	4	36.36	6	35.29
Grasshopper ( <i>Oxya yezoensis</i> )	0	0.00	8	44.44	8	34.78
Pink stem borer ( <i>Sesamia inferens</i> )	0	0.00	11	55.00	11	52.38
Thrip ( <i>Chloethrips oryzae</i> )	19	86.36	11	42.31	30	62.50
Weevil ( <i>Echinocnemus squameus</i> Billberg)	6	100.00	7	38.89	13	54.17
Yellow stem borer ( <i>Scirpophaga incertulas</i> )	10	52.63	18	42.86	28	45.90
Damping off ( <i>Rhizoctonia solani</i> )	6	100.00	7	46.67	13	61.90
Downy mildew ( <i>Peronospora</i> spp.)	33	63.46	42	47.73	75	53.57
False smut ( <i>Ustilaginoidea oryzae</i> )	4	20.00	59	51.75	63	47.01
Sheath rot ( <i>Sarocladium oryzae</i> )	11	91.67	6	66.67	17	80.95
Stripe ( <i>Coniella castaneicola</i> )	1	12.50	12	38.71	13	33.33
Other secondary pests (NA)	4	33.33	20	58.82	24	52.17
<b><u>Weeds</u></b>	162	37.85	443	41.75	605	40.63

Notes: Words in parentheses are Latin name of each pest.