Supplementary information

Appendix A. Nested variance analysis of variance for the effects of tillage treatments or field conditions on the population of pests (insects, diseases and weeds) and natural enemies.

	Treatments	*P* value	Sig.		Treatments	*P* value	Sig.
Rice planthopper	CT v NT	< 0.001	***	Infested ratio of rice sheath blight (%)	CT v NT	< 0.001	***
	CT v RT	< 0.001	***		CT v RT	< 0.001	***
	Row v Row	0.638	ns		Row v Row	0.617	ns
Rice leaf folder	CT v NT	0.504	ns	Annual no-xerophytic	CT v NT	0.327	ns
	CT v RT	0.440	ns		CT v RT	0.157	ns
	Row v Row	0.563	ns		Row v Row	0.964	ns
Stem borer	CT v NT	0.001	***	Perennial no-xerophytic weeds	CT v NT	0.507	ns
	CT v RT	0.382	ns		CT v RT	0.016	*
	Row v Row	0.734	ns		Row v Row	0.638	ns
Apple snails	CT v NT	0.074	ns	Annual xerophytic weeds	CT v NT	0.694	ns
	CT v RT	0.001	***		CT v RT	0.003	**
	Row v Row	0.707	ns		Row v Row	0.938	ns
Invertebrate predators	CT v NT	< 0.001	***	Perennial xerophytic weeds	CT v NT	0.581	ns
	CT v RT	< 0.001	***		CT v RT	1.000	ns
	Row v Row	0.641	ns		Row v Row	0.178	ns
Invertebrate parasites	CT v NT	0.005	**	Weedy rice	CT v NT	0.905	ns
	CT v RT	< 0.001	***		CT v RT	0.164	ns
	Row v Row	0.540	ns		Row v Row	0.781	ns
Vertebrate predator	CT v NT	0.849	ns	Total weeds	CT v NT	0.4312	ns
	CT v RT	0.448	ns		CT v RT	0.0095	**
	Row v Row	0.756	ns		Row v Row	0.557	ns
Total populations	CT v NT	< 0.001	***	Grain yield of early rice in 2016	CT v NT	0.053	ns
	CT v RT	< 0.001	***		CT v RT	0.528	ns
	Row v Row	0.924	ns		Row v Row	0.922	ns
Disease index of rice blast	CT v NT	< 0.001	***	Grain yield of late rice in 2016	CT v NT	0.058	ns
	CT v RT	< 0.001	***		CT v RT	0.150	ns
	Row v Row	0.951	ns		Row v Row	0.981	ns
Infested ratio of rice blast (%)	CT v NT	< 0.001	***	Grain yield of early rice in 2017	CT v NT	0.052	ns
	CT v RT	< 0.001	***		CT v RT	0.008	**
	Row v Row	0.688	ns		Row v Row	0.896	ns
Disease index of rice sheath blight	CT v NT	< 0.001	***	Grain yield of late rice in 2017	CT v NT	0.348	ns
	CT v RT	< 0.001	***		CT v RT	< 0.001	***
	Row v Row	0.586	ns		Row v Row	0.656	ns

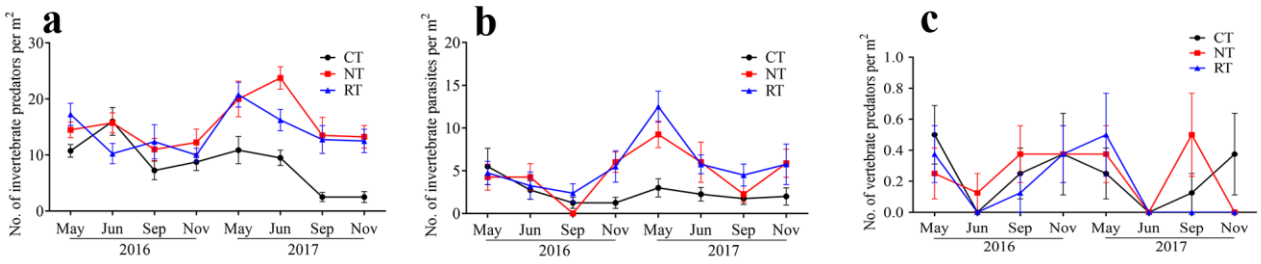
*, **and***, significant at 0.05, 0.01 and 0.001 probability levels (*P*), respectively; ns, no significant at *P*>0.05.

Appendix B. Repeated measures ANOVA analysis of variance for the effects of tillage practices on the population of insects, natural enemies, diseases, weeds over the study years.

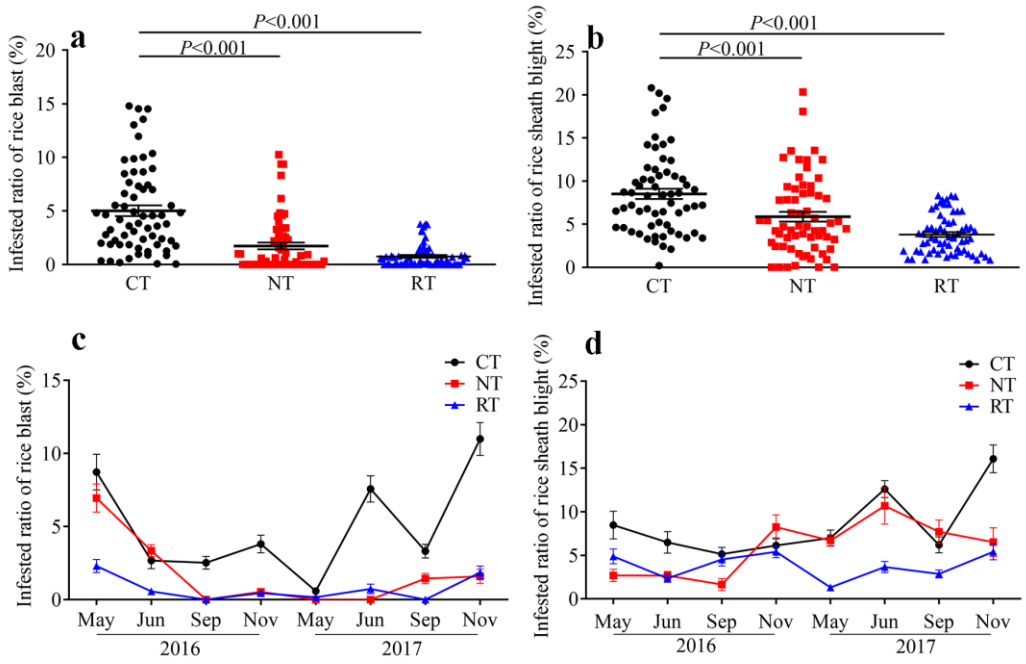
	Treatments	*P* value	Sig.		Treatments	*P* value	Sig.
Rice planthopper	CT	0.032	*	Disease index of rice sheath blight	CT	0.000	***
	NT	0.134	ns		NT	0.064	ns
	RT	0.140	ns		RT	0.387	ns
Rice leaf folder	CT	0.154	ns	Infested ratio of rice sheath blight (%)	CT	0.000	***
	NT	0.228	ns		NT	0.000	***
	RT	0.266	ns		RT	0.037	*
Stem borer	CT	0.138	ns	Annual no-xerophytic	CT	0.372	ns
	NT	0.233	ns		NT	0.181	ns
	RT	0.578	ns		RT	0.139	ns
Apple snails	CT	0.005	**	Perennial no-xerophytic weeds	CT	0.002	**
	NT	0.008	**		NT	0.006	**
	RT	0.170	ns		RT	0.004	**
Invertebrate predators	CT	0.003	**	Annual xerophytic weeds	CT	0.012	*
	NT	0.321	ns		NT	0.005	**
	RT	0.081	ns		RT	0.299	ns
Invertebrate parasites	CT	0.198	ns	Perennial xerophytic weeds	CT	0.170	ns
	NT	0.210	ns		NT	0.351	ns
	RT	0.000	***		RT	0.170	ns
Vertebrate predator	CT	0.535	ns	Weedy rice	CT	0.040	*
	NT	0.330	ns		NT	0.330	ns
	RT	0.336	ns		RT	0.265	ns
Total populations	CT	0.000	***	Total weeds	CT	0.101	ns
	NT	0.000	***		NT	0.192	ns
	RT	0.016	*		RT	0.296	ns
Disease index of rice blast	CT	0.002	**	Grain yields	CT	0.005	**
	NT	0.046	*		NT	0.000	***
	RT	0.061	ns		RT	0.472	ns
Infested ratio of rice blast (%)	CT	0.106	ns				
	NT	0.055	ns				
	RT	0.205	ns				

*, **and***, significant at 0.05, 0.01 and 0.001 probability levels (*P*), respectively; ns, no significant at *P*>0.05.

Appendix C. Various natural enemy populations classified according to whether they have a spine and the ways of feeding under different survey periods. CT, conventional tillage; NT, no tillage; RT, reduced tillage; NS, No significant at $P>0.05$. a, The density of invertebrate predative natural enemy; b, invertebrate parasitic natural enemy; and c, vertebrate predators (mean ±SD, $n=8$).



Appendix D. Infested ratio of rice blast and rice sheath blight under different tillage practices. CT, conventional tillage; NT, no tillage; RT, reduced tillage; NS, No significant at $P>0.05$. a, Rice blast under the tillage systems over the whole investigation (mean ±SD, $n=64$). b, Rice sheath blight under the tillage systems over the whole investigation (mean ±SD, $n=64$). c, The time course of rice blast (mean ±SD, $n=8$). d, The time course of rice sheath blight (mean ±SD, $n=8$).

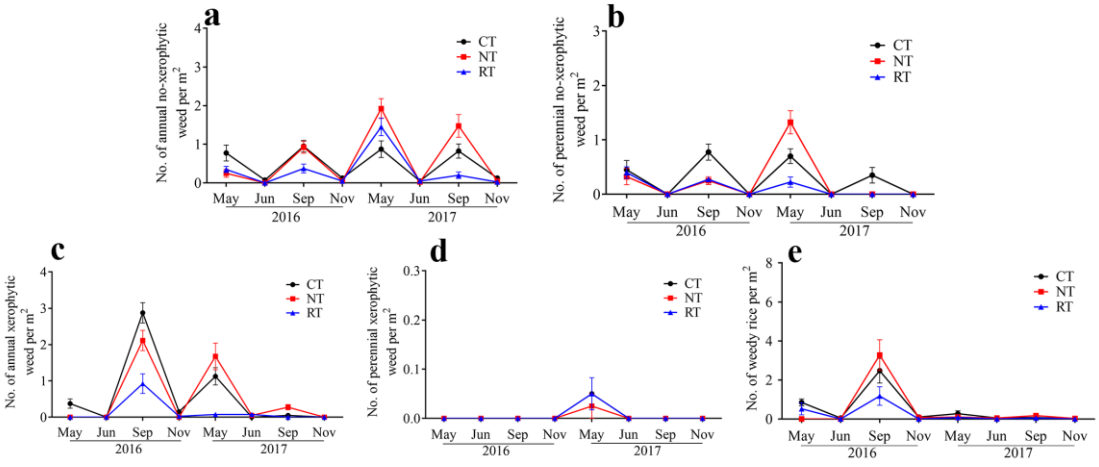


Appendix E. Species and characteristics of weeds in the paddy field.

Family	Species	Phanerogam	Feature
Graminaceous	*Eleusine indica*	+	Annual, xerophytic
	Echinochloa crusgalli	+	Annual, xerophytic
	Digitaria sanguinalis	+	Annual, xerophytic
	Leptochloa chinensis	+	Annual, xerophytic
	Triarrhena sacchariflora	+	Perennial, no-xerophytic
Amaranthaceae	*Alternanthera philoxeroides*	+	Perennial, no-xerophytic
	Amaranthus tricolor	+	Annual, no-xerophytic
	Amaranthus lividus	+	Annual, xerophytic
Cyperaceae	*Cyperus iria*	+	Annual, no-xerophytic
	Cyperus difformis	+	Annual, no-xerophytic
	Cyperus rotundus	+	Perennial, xerophytic
	Fimbristylis miliacea	+	Annual, no-xerophytic
Euphorbiaceae	*Acalypha wilkesiana*	+	Annual, no-xerophytic
Polygonaceae	*Polygonum orientale*	+	Annual, no-xerophytic
	Polygonum hydropiper	+	Annual, no-xerophytic
Compositae	*Eclipta prostrata*	+	Annual, no-xerophytic
Lhraceae	*Ammannia baccifera*	+	Annual, no-xerophytic
	Rotala indica	-	Annual, no-xerophytic
Alismataceae	*Alisma plantagoaquatica*	+	Perennial, no-xerophytic
	Sagittaria trifolia	+	Perennial, no-xerophytic
Portulacaceae	*Portulaca oleracea*	+	Annual, xerophytic
Commelinaceae	*Commelina communis*	+	Annual, xerophytic
Pontederiaceae	*Monochoria vaginalis*	+	Annual, no-xerophytic
Solanaceae	*Solanum americanum*	+	Annual, xerophytic
Onagraceae	*Ludwigia prostrata*	+	Annual, no-xerophytic
Scrophulariaceae	*Mazus japonicus*	+	Annual, no-xerophytic
	Lindernia antipoda	+	Annual, no-xerophytic
Graminaceous	*Oryza Sativa*	+	/

"+" indicates the weed belongs to Phanerogam. "Xerophytic" refers to the general drought-tolerant weeds

Appendix F. Occurrence of weeds classified according to their life cycle and xerophytic resistance under different survey periods. CT, conventional tillage; NT, no tillage; RT, reduced tillage; NS, No significant at $P>0.05$. a, The density of annual no-xerophytic weeds; b, perennial no-xerophytic weeds; c, annual xerophytic; d, perennial xerophytic and e, weedy rice (mean ±SD, $n=8$).



Appendix G. Some other kinds of pest densities under different survey periods. CT, conventional tillage; NT, no tillage; RT, reduced tillage; NS, No significant at $P>0.05$. a, rice leaf folder; b, stem borer and c, apple snail (mean ±SD, $n=8$).